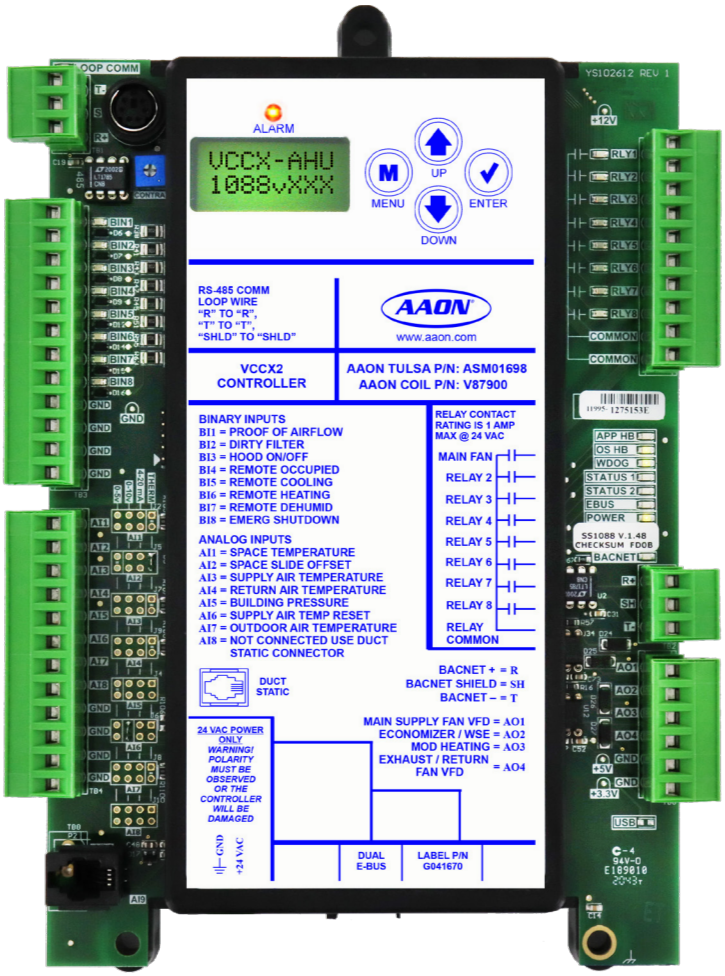
VCCX2 Controller Technical Guide

VCCX2 Controller Code: DT003800-001/SS1088 Version 1.02 and up
Service Tool SD Code: DT001240-001/SS1063 Version 1.11 and up
System Manager SD Code: DT002150-001/SS1068 Version 1.11 and up
System Manager Touch Screen (Limited Access): DT004254-001/SS7013



VCCX2 CONTROLLER TECHNICAL GUIDE	
REVISION AND DATE	**CHANGE**
Rev. 01N, January 20, 2020	Liquid Line 1-4 Solenoid relay configurations changed to A1,A2,B1,B2 Comp Run Status in relay table and in wiring illustrations
Rev. 01N, January 20, 2020	Added BI: 126 - Exhaust Fan / Return Fan Proof of Flow Alarm
Rev. 01N, February 13, 2020	Added 11 = OA Damper Calibration to BACnet AI:3
Rev. 01N, July 14, 2020	Miscellaneous minor edits
Rev. 01P, October 1, 2020	Added RSMZ module and BACnet parameters
Rev. 01P, October 1, 2020	Added Subcool Monitor Module and BACnet parameters
Rev. 01P, December 11, 2020	10-foot cable changed to 25-foot cable for E-BUS Outdoor Air and Humidity sensors
Rev. 01P, December 11, 2020	Revision to Sump Heater and Sump Drain Enable operation
Rev. 01P, December 11, 2020	Added BACnet AV:94 Sump Drain Override
Rev. 01P, January 21, 2021	Added SIG1 - Return Air Plenum Pressure Sensor and AOUT4 - Modulating Exhaust Damper to VCC-X EM1 Wiring
Rev. Q, March 24, 2021	Updated RSMZ Trendlog tables, updated labels, miscellaneous minor edits
Rev. R, May 26, 2021	Updated BACnet points to latest VCCX2 software, updated Appendix A figures, various cosmetic updates
Rev. S. November 24, 2021	Added information regarding Paragon Air Flow. Edited BACnet table. Corrected errata. Updated formatting.
Rev. T. March 25, 2022	Added information about operation sequences for MUA systems.

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Features

The VCCX2 Controller is designed with eight analog inputs, four analog outputs, eight binary inputs, and eight relay outputs (seven configurable). It also has an on-board BACnet port for connection to an MS/TP network. The VCCX2 contains a 2 x 8 LCD character display and four buttons that allow for status and alarm display, force modes, and BACnet configuration.

The VCCX2 Controller can communicate with all of AAON's Refrigerant System Modules (RSM). In addition, the VCC-X EM1 Expansion Module and 12 Relay E-BUS Expansion Module provide additional inputs and outputs.

There are two E-BUS expansion connectors on the VCCX2 which allow for the connection of the expansion modules listed above, communicating sensors, and future E-BUS modules via modular E-BUS cables. There are presently seven communicating sensors available:

- E-BUS Digital Space Temperature Sensor with display
- E-BUS Digital Space Temperature and Humidity Sensor with display
- E-BUS Space Temperature and Humidity Sensor without display
- E-BUS Space CO_2 Sensor
- E-BUS Duct CO_2 Sensor
- E-BUS Horizontal or Vertical Outdoor Air Temperature and Humidity Sensor
- E-BUS Return Air Temperature and Humidity Sensor

The VCCX2 Controller provides for the following applications: constant air volume (CAV), variable air volume (VAV), single zone VAV, make-up air (MUA), and space temperature control of high percentage outdoor air.

Other features of the VCCX2 include:

- Controls up to eight digital compressors
- Controls up to four sets of tandem variable frequency drive (VFD) compressors
- Controls up to 12 stages of heat
- Modulating cooling output for chilled water valve control
- Modulating heating output (hot water valve, steam valve, SCR electric heat control)
- Full integration with the AAON RSMs
- Full integration with the AAON MODGAS-X Module
- Full integration with the AAON MHGRV-X Module
- Full integration with the AAON PREHEAT-X Module
- Advanced dehumidification capabilities
- Air-to-air heat pump and water source heat pump applications
- Airflow monitoring of outdoor air, supply air, return air, and exhaust air streams with approved EBTRON, GreenTrol, or Paragon Airflow MicroTransEQ Monitoring Stations
- Airflow control of outdoor air damper
- Single zone VAV control with optional CAV heating
- Primary/secondary heating control
- Remote forced cooling, heating, and dehumidification control
- Remote supply air temperature reset signal
- Adaptive supply air temperature 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
- Waterside economizer capability
- Building pressure control (direct or reverse acting)
- Exhaust duct static control of exhaust fan
- Remote forced occupied capability
- Configurable for AAON Return Air Bypass Applications
- Indoor air quality economizer reset
- Title 24 economizer certified
- Seven-day, two-events-per-day scheduling
- 14 holiday event scheduling
- Daylight Saving Time adjustment
- Trend logging capability
- Static pressure control for filter loading applications
- Heat wheel - on/off control
- Head pressure control
- On-board BACnet port for connection to a MS/TP network

Applications

Variable Air Volume Unit

The VCCX2 Controller can 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 variable frequency drive to maintain a Duct Static Pressure Setpoint.

The VCCX2 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.

Constant Air Volume Unit

The VCCX2 Controller can be configured for CAV applications that are typically space temperature or return air temperature controlled.

The VCCX2 can also be used for restaurant kitchen or lab applications that are 100% outdoor air part of the time and recirculating air part of the time. A hood on binary input forces the VCCX2 to switch to 100% outdoor air control based on an exhaust hood switch activation. The VCCX2 requires Space Temperature (and Humidity) Sensors to accomplish this application.

Single Zone Variable Air Volume

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 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.

Space Temperature Control of High Percentage Outdoor Air Units

This application allows the unit to be configured to use the space temperature to initiate Cooling and Heating Modes on units that are high percentage outdoor air or 100% outdoor air units. Before entering Vent Mode, the VCCX2 will first determine if the outdoor air temperature is above or below Outdoor Air Cooling and Heating Setpoints. If so, the unit will leave stages of Cooling or Heating on as necessary to achieve a neutral supply air temperature – thus avoiding dumping very hot or cold air into the space.

Make-Up Air Unit

The VCCX2 can be configured for 100% outdoor air control for MUA 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.

AAON Return Air Bypass Control

This control scheme can only be used on CAV HVAC units that are equipped with a return air bypass damper and that use Space Temperature and Humidity Sensors as the controlling sensors.

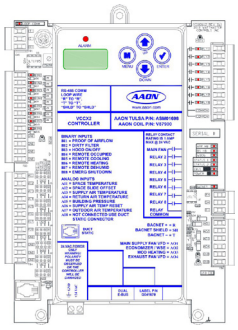
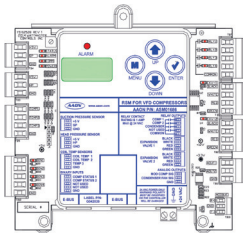
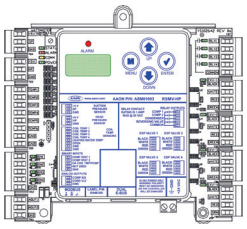
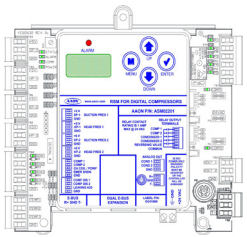
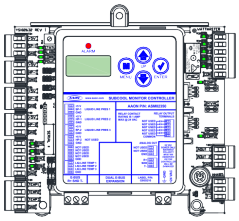
AAON Return Air Bypass Control provides improved moisture removal capabilities while utilizing internal space loads for reheat by redirecting return air from the upstream side of the DX Evaporator Coil to the downstream side of the coil during dehumidification.

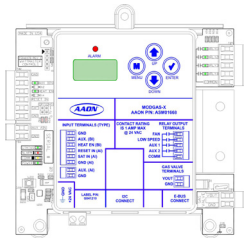
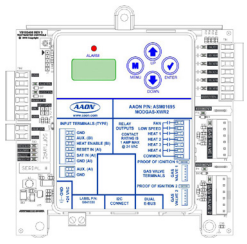
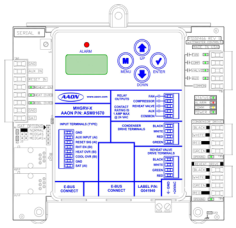
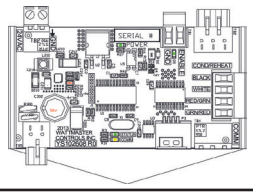
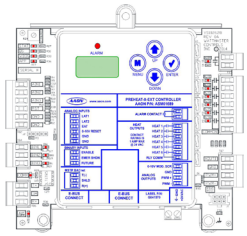
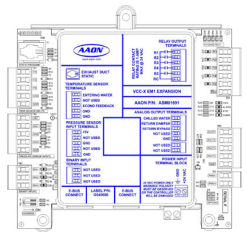
Zone Voting

The VCCX2 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, zone controllers must also be used in order to allow communication between the zones and the VCCX2. Duct static pressure control can be accomplished with a supply fan variable frequency drive or a bypass damper.

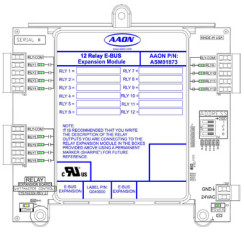
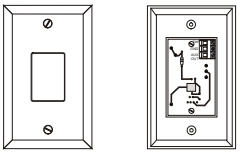
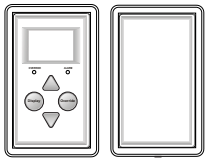
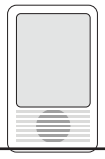
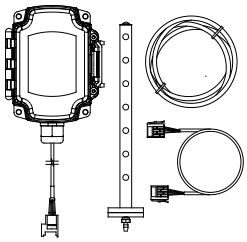
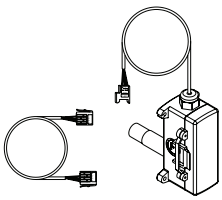
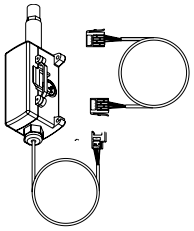
PART DESCRIPTION	ORION	AAON
VCCX2 Controller	OE338-26B-VCCX2	ASM01698
VCC-X EM1 Expansion Module	OE336-23-VCCXEM1	ASM01691
Refrigerant System Module for VFD Compressors	OE370-26-RSMV	ASM01686
Refrigerant System Module VFD Compressors - Heat Pump	OE370-26-RSMV-HP	ASM01693
Refrigerant System Module for Digital Compressors	OE370-26-RSMD	ASM02201
Refrigerant System Module for VFD Compressors (RSMZ)	N/A	ASM02351
Subcool Monitor Module	N/A	ASM02350
12 Relay E-BUS Expansion Module	OE358-23E-12R	ASM01873
Building Static Pressure Transducer	OE258-01	ASM01832
CommLink 5 Communications Interface	OE361-13	ASM01874
Duct Static Pressure Transducer and Pickup Tube	OE271 and OE290	ASM01640 and ASM02242
Duct Temperature Sensor - 6” or 12”	OE230 / OE231	G051240 / G051250
E-BUS Cable Assembly E-BUS Power and Comm 1.5 ft., 3 ft., 10 ft., 25 ft., 50 ft., 75 ft., 100 ft., 150 ft., 250 ft., and 1000 ft. Spool	EBC-1.5F, EBC-3F, EBC-10F, EBC-25F, EBC-50F, EBC-75F, EBC-100F, EBC-150F, EBC-250F, EBC-SPOOL	G029440 (1.5 ft..), G012870 (3 ft.), G029460 (10 ft.), G045270 (25 ft.), G029510 (50 ft.), G029530 (75 ft.), G029450 (100 ft.), G029470 (150 ft.), V36590 (250 ft.), G018870 (SPOOL)
E-BUS Adapter Hub	MS000248	G033970
E-BUS Adapter Hub with 1.5 ft. EBC Cable	HZ-EBC-248	ASM01635
E-BUS Adapter Board	OE365-15-EBA	ASM01878
E-BUS CO_2 Space Sensor (wall or duct mounted)	OE256-05 / OE256-07	ASM01829 / ASM01831
E-BUS Digital Room Sensor - LCD - Temp. or Temp and RH	OE217-02 / OE217-03	ASM01819 / ASM01820
E-BUS Digital Room Sensor - No LCD - Temp and RH	OE217-04	ASM02221
E-BUS Horizontal Outdoor Air Temperature and RH Sensor	OE265-15	ASM01836
E-BUS Vertical Outdoor Air Temperature and RH Sensor	OE265-16	ASM01838
E-BUS Return Air Temperature and RH Sensor	OE265-17	ASM01840
E-BUS CO_2 Return Air Sensor Emulator Board	OE365-07-EBSE	ASM01623
E-BUS CO_2 Space Sensor Emulator Board	OE365-06-EBSE	ASM01622
E-BUS Outdoor Air Temp/RH Sensor Emulator Board	OE365-05-EBSE	ASM01697
E-BUS Return Air Temp/RH Sensor Emulator Board	OE365-04-EBSE	ASM01621
E-BUS Space Temp/RH Sensor Emulator Board	OE365-03-EBSE	ASM01696
GPC-XP Controller	OE338-23-GPCXP	ASM01868
IP Module Kit	OE415-02	ASM01902
MHGRV-X Module / Reheat Expansion Module	OE377-26-00059 / OE377-01-00059	ASM01670 / ASM01687
MiniLink Polling Device 5	OE364-23-OR	ASM01626
MODGAS-X Module	OE377-26-00058	ASM01668
MODGAS-XWR2 Module	OE377-26-00060-1	ASM01695
Modular Service Tool SD - Operator Interface	OE391-12	ASM01895
Modular System Manager SD - Operator Interface	OE392-12	ASM01901
Outdoor Air Temperature Sensor	OE250	G042230
PREHEAT-X Module / PREHEAT-X-EXT Module	OE377-26-00061 / OE377-26-00061-1	ASM01688 / ASM01689
Standard Room Sensor - Plain or W/ Override	OE210 / OE211	ASM02227 / ASM01638
Standard Room Sensor - with Setpoint Adjust or Setpoint Adjust and Override	OE212 / OE213	ASM01642 / ASM01643
Strap-On Temperature Sensor Kit	OE233	ASM01624
Suction Pressure Transducer	OE275-01	ASM02222
System Manager TS-L (Touch Screen - Limited Access)	OE392-11	ASM01900
USB-Link 2 Kit	OE366	ASM02244

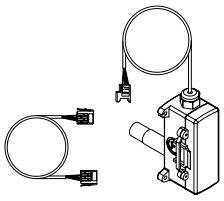
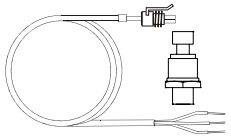
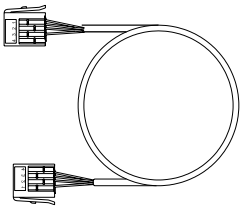
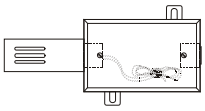
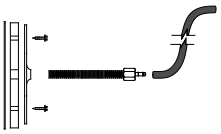
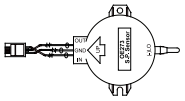
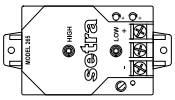
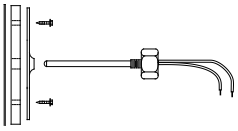
Parts and Descriptions

PART NO.	PART DESCRIPTION	ILLUSTRATION	PAGE NO.
ASM01698	**VCCX2 Controller** The VCCX2 Controller provides eight analog inputs, four analog outputs, eight binary inputs, and eight relay outputs. 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 four buttons that allow for status and alarm display as well as BACnet configuration. It allows for the addition of the RSM, EM1 Expansion Module, and the 12 Relay E-BUS Expansion Module. **NOTE:** Set-up, configuring, and monitoring of the VCCX2 Controller requires one of the following communication interfaces—Prism 2 front-end software used with a personal computer, Modular System Manager SD, or Modular Service Tool SD.		*Pages 20, 25, 26*
ASM01686	**Refrigerant System Module for VFD Compressors** The Refrigerant System Module for VFD Compressors (RSMV) monitors and controls one tandem compressor refrigeration circuit of the HVAC unit. The module is designed for R410-A refrigerant. Up to four RSMV Modules can be connected, depending on the size of the system. There are two E-BUS expansion ports which allow for the use of communicating sensors and E-BUS modules. The RSMV provides four analog inputs, three binary inputs, three relays, and four analog outputs. It connects with an E-BUS cable to the VCCX2 Controller.		*Pages 21, 51-52*
ASM01693	**Refrigerant System Module for VFD Heat Pumps** The Refrigerant System Module for VFD Heat Pumps (RSMV-HP) monitors and controls one refrigeration circuit of the HVAC unit. The module is designed for R410-A refrigerant. The RSMV-HP is connected to the VCCX2 Controller. Up to four RSMV-HP Modules can be connected, depending on the size of the system. There are two E-BUS expansion ports which allow for the use of communicating sensors and E-BUS modules. The RSMV-HP provides six analog inputs, four binary inputs, four relays, and two analog outputs. It connects with an E-BUS cable to the VCCX2 Controller.		*Pages 21, 53-54*
ASM02201	**Refrigerant System Module for Digital Compressors** The Refrigerant System Module for Digital Compressors (RSMD) monitors and controls one or two refrigeration circuits of the HVAC unit. The module is designed for R410-A refrigerant. Up to four RSMD Modules can be connected, depending on the size of the system. There are two E-BUS expansion ports which allow for the use of communicating sensors and E-BUS modules. The RSMD provides three analog inputs, four binary inputs, five relays, and two analog outputs. It connects with an E-BUS cable to the VCCX2 Controller.		*Pages 21, 55-56*
ASM02351	**Refrigerant System Module for RNZ** The Refrigerant System Module for RNZ (RSMZ) monitors and controls one refrigeration circuit of the HVAC unit. The module is designed for R410-A refrigerant. Either three or six RSMZ Modules can be connected, depending on the size of the system. There are two E-BUS expansion ports which allow for the use of communicating sensors and E-BUS modules. It connects with an E-BUS cable to the VCCX2 Controller.		*Pages 21, 57-58*
ASM02350	**Subcool Monitor Module** The Subcool Monitor Module reads the liquid line pressure then converts it to a saturated liquid temperature and compares it to the measured liquid line temperature to calculate subcooling. The Subcool Monitor Module is used in conjunction with the RSMZ Module. One or two Subcool Monitors can be connected, depending on the size of the system: • One is used when three RSMZ Modules are used • Two are used when six RSMZ Modules are used. It connects with an E-BUS cable to the VCCX2 Controller.		*Page 59*

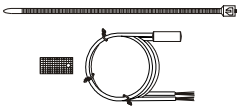
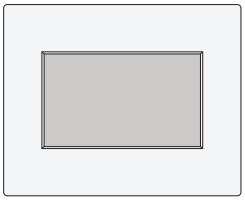
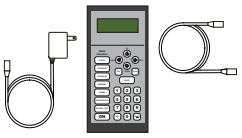
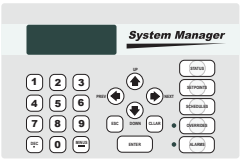
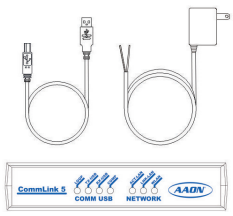
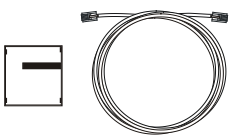
PART NO.	PART DESCRIPTION	ILLUSTRATION	PAGE NO.
ASM01668	**MODGAS-X Module** The MODGAS-X modulates up to two gas valves to maintain a desired discharge air temperature. It also controls the speed of the induced draft fan to maintain proper combustion in the heat exchanger. It connects with an E-BUS cable to the VCCX2 Controller.		*Page 61*
ASM01695	**MODGAS-XWR2 Module** The MODGAS-XWR2 is designed to be used with White-Rodgers valves only. It will modulate up to two White-Rodgers gas valves to maintain a desired discharge (supply) air temperature. Up to four modulating gas valves may be controlled when a second MODGAS-XWR2 is configured as a slave module. It also controls the speed of the induced draft fan to maintain proper combustion in the heat exchanger. It connects with an E-BUS cable to the VCCX2 Controller.		*Page 62*
ASM01670	**MHGRV-X Module** The MHGRV-X controls a Modulating Hot Gas Reheat Valve to maintain a desired supply air temperature and Dehumidification Setpoint. It connects with an E-BUS cable to the VCCX2 Controller.		*Page 60*
ASM01687	**MHGRV REHEAT Expansion Module** The MHGRV Reheat Expansion Module is designed to control one set of reheat valves. The Reheat Expansion Module connects to the MHGRV-X via an E-BUS communication cable. Connected together, the Reheat Expansion Modules provide a system that allows the proper control of multiple sets of valves.		*N/A*
ASM01688 ASM01689	**PREHEAT-X and PREHEAT-X-EXT Modules** The PREHEAT-X and PREHEAT-X-EXT are designed to control fixed stages of Preheat or optional Modulating Preheat to maintain a desired Preheat Leaving Air Temperature Setpoint. The PREHEAT-X is limited to a 35°F Leaving Air Temperature Setpoint. The PREHEAT-X-EXT module has an extended Leaving Air Temperature Setpoint minimum of 0°F and should only be used with the approval of AAON. The module directly connects to the VCCX2 Controller or indirectly using an E-BUS Expansion Board via an E-BUS cable.		*Page 63*
ASM01691	**VCC-X EM1 Expansion Module** The EM1 Expansion Module adds Title 24 economizer feedback and chilled water applications. It also provides a duct static input for exhaust fan control, return air plenum pressure control, and return/exhaust proof of flow. It provides two analog outputs for controlling a return air bypass damper and a return damper in return air bypass applications. It also has five configurable relay outputs. It connects with an E-BUS cable to the VCCX2 Controller.		*Pages 22, 45-46*

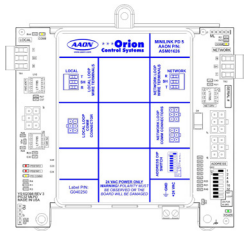
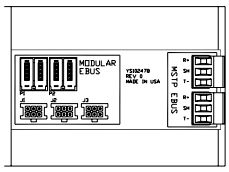
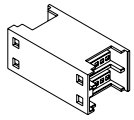
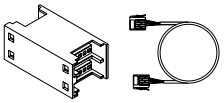
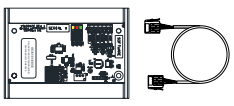
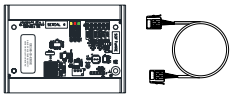
Parts and Descriptions

PART NO.	PART DESCRIPTION	ILLUSTRATION	PAGE NO.
ASM01873	**12 Relay E-BUS Expansion Module** The 12 Relay Expansion Module adds 12 configurable relays to the VCCX2 Control System. It connects to the VCCX2 Controller with an E-BUS cable.		*Pages 23, 49*
ASM02227 **ASM01638** **ASM01642** **ASM01643**	**Standard Room Sensor – Standard, with Override, with Slide Adjust, and with Override and Slide Adjust** Includes: Standard Room Sensor - Standard, with Override, with Slide Adjust, and with Override and Slide Adjust. For wall mounting. Use with VCCX2 Controller only. Connects to controller via field fabricated wiring.		*Page 30*
ASM01819 **ASM01820** **ASM02221**	**E-BUS Digital Room Sensor - Temp Only and Temp and Humidity** The ASM01819 is used with the VCCX2 Controller for space air temperature sensing applications. The ASM01820 and ASM02221 (no LCD display) are used with the VCCX2 Controller for room air temperature and humidity sensing applications. All three use E-BUS cables.		*Page 27*
ASM01829	**E-BUS CO_2 Wall-Mounted Sensor** Used with the VCCX2 Controller for CO_2 sensing applications where wall mounting in the space is desired. Connects to the VCCX2 Controller with an E-BUS cable of required length. Cable sold separately.		*Page 28*
ASM01831	**E-BUS CO_2 Duct-Mounted Sensor with Remote Pickup Tube** Used with the VCCX2 Controller for duct mounted CO_2 sensing applications. Connects to the VCCX2 Controller with an E-BUS cable of required length. Includes: Duct-Mounted CO_2 Sensor, Integral Aspiration Box, Airflow Pickup Tube and 10 ft. E-BUS cable.		*Page 29*
ASM01836	**E-BUS Horizontal Outdoor Air Temperature and Humidity Sensor** Used for outdoor air temperature and humidity sensing applications. Connects to VCCX2 Controller or E-BUS Adapter Hub using E-BUS cable. Includes: E-BUS Horizontal Outdoor Air Temperature and Humidity Sensor, mounted in a weatherproof handy box with attached 3 ft. E-BUS cable with jack. A 25 ft. E-BUS cable is included to connect to the VCCX2 Controller. If a longer E-BUS cable is required, it must be ordered separately.		*Page 36*
ASM01838	**E-BUS Vertical Outdoor Air Temperature and Humidity Sensor** Used for outdoor air temperature and humidity sensing applications. Connects to VCCX2 Controller or E-BUS Adapter Hub using E-BUS cable. Includes: E-BUS Vertical Outdoor Air Temperature and Humidity Sensor, mounted in a weatherproof handy box with attached 3 ft. E-BUS cable with jack. A 25 ft. E-BUS cable is included to connect to the VCCX2 Controller. If a longer E-BUS cable is required, it must be ordered separately.		*Page 36*

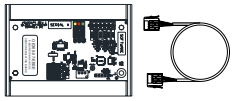
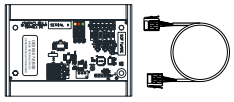
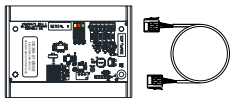
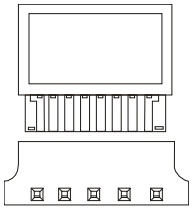
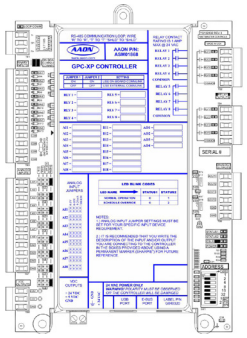
PART NO.	PART DESCRIPTION	ILLUSTRATION	PAGE NO.
ASM01840	**E-BUS Return Air Temperature and Humidity Sensor** Used for return air temperature and humidity sensing applications. Connects to VCCX2 Controller or E-BUS Adapter Hub using E-BUS cable. Includes: E-BUS Return Air Temperature and Humidity Sensor, mounted in a weatherproof handy box attached with a 3 ft. E-BUS cable with jack. A 50 ft. E-BUS cable is included to connect to the VCCX2 Controller. If a longer E-BUS cable is required, it must be ordered separately.		*Page 37*
ASM02222	**Suction Pressure Transducer** Used for suction pressure sensing applications. Connects to the Refrigerant System Modules. Includes: Suction Pressure Transducer and modular cable with a modular connector on one end and bare stripped wires on the other end.		*Pages 52, 53, 55*
G029440 (1.5F) **G012870** (3F) **G029460** (10F) **G045270** (25F) **G029510** (50F) **GO29530** (75F) **G029450** (100F) **G029470** (150F) **V36590** (250F) **G018870** (SPOOL)	**E-BUS Cables** The E-BUS cables connect to the VCCX2 Controller, VCC-X Expansion Modules, and E-BUS Sensors. Different lengths can be joined together using an E-BUS Adapter Hub, if necessary. The E-BUS cables are available in 1.5 ft., 3 ft., 10 ft., 25 ft., 50 ft., 75 ft., 100 ft., 150 ft., and 250 ft. lengths. Includes: E-BUS Cable Assembly. The E-BUS CABLE SPOOL is bulk E-BUS cable that can be used with the E-BUS Bulk Connectors.		*Pages 25-63*
G018890	**E-BUS Bulk Connectors** Attaches to E-BUS Spool Cable. Must be crimped using either the G034180 E-BUS Crimp Tool or one matching the requirements listed in the pricing list. Includes: E-BUS Bulk Connector.		*N/A*
G034180	**E-BUS Crimp Tool** Crimps the E-BUS Connectors for use with the E-BUS Spool Cable. Includes: E-BUS Crimp Tool.		*N/A*
G042230	**Outdoor Air Temperature Sensor** Used for temperature sensing applications. Includes: 10K ohm Outdoor Air Temperature Sensor, two wire, mounted in a weatherproof handy box only.		*Page 35*
ASM02242	**Duct Static Pressure Pick-up Tube** Used with the Duct Static Pressure Rransducer for static pressure sensing applications. Includes: static pressure pick-up tube with 1 ft. length of FRP tubing, gasketed mounting bracket, and screws.		*Page 38*
ASM01640	**Duct Static Pressure Sensor** Used for duct static pressure sensing applications. Includes: 0-5″ W.C., 0-5 VDC, Static Pressure Sensor only.		*Page 38*
ASM01832	**Building Static Pressure Sensor** Used for building pressure sensing. Includes: -0.25 to +0.25″ W.C., 0-5 VDC, and 24 VAC/VDC supply power Building Pressure Sensor only.		*Page 33*
G051240 (6") **G051250** (12")	**Duct Temperature Sensor - 6" Probe** **Duct Temperature Sensor - 12" Probe** G051240 = 6″ probe length. G051250 = 12″ probe length. Used for return or supply air temperature sensing applications. Includes: 10K ohm Duct Temperature Sensor, two-wire only.		*Pages 31 and 32*

Parts and Descriptions

PART NO.	PART DESCRIPTION	ILLUSTRATION	PAGE NO.
ASM01624	**Strap-on Temperature Sensor Kit** Includes: Type III 10K ohm two-wire Strap-on Temperature Sensor, thermal mastic, and plastic mounting strap. Used for water temperature sensing applications.		*Pages 43 and 44*
ASM01900	**System Manager Touch Screen - Limited Access** The System Manager Touch Screen - Limited Access (SMTS-L) provides a direct, graphic-enhanced, menu-driven link. The SMTS-L is an end-user interface only and allows the end user to view status points, change Space Setpoints, and view certain alarms of most controllers on the Orion Controls System. The SMTS-L is equipped with a 4.3" 480 x 272 WQVGA RGB TFT LCD Touch Screen Display. The SMTS-L is furnished with hardware for flush mounting into hollow drywall or surface mounting on concrete brick or plaster surfaces. Includes: SMTS-L with 12 ft. pigtail cable.		*See the System Manager TS-L Technical Guide*
ASM01895	**Modular Service Tool SD** Used to program and monitor all Orion controllers. Includes: Modular Service Tool, power supply, communication cables, 4 GB SD card, and four AA batteries.		*See the VCCX2 Controller Operator Interfaces SD Technical Guide*
ASM01901	**Modular System Manager SD** Used to program and monitor all Orion controllers. Designed for hollow core wall mounting. When System Manager is to be mounted on a solid wall (concrete), AAON recommends attaching the System Manager to a standard handy box. Includes: Modular System Manager SD with 4 GB SD card and 12 ft. pigtail cable assembly.		*See the VCCX2 Controller Operator Interfaces SD Technical Guide*
ASM01874	**CommLink 5 Communications Interface** The CommLink 5 connects to the 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 the IP Module Kit. Includes: CommLink 5, 6 ft. 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 user computer's USB 1.1 or 2.1 port. Prism 2 computer front-end software must be installed on the direct connected or remote connected computer in order to communicate with user's system.		*See the CommLink 5 Technical Guide*
ASM01902	**IP Module Kit - Internet/LAN Connection** 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 the building's LAN. It can also be configured to allow access to the control system from the Internet through the LAN if the Ethernet firewall is configured for this option. Includes: IP Link module, 10 ft. long Ethernet cable, and installation instructions. Prism 2 computer front-end software must be installed on the remote computer in order to dial-up and communicate with the controls system.		*See the IP Module Technical Guide*

PART NO.	PART DESCRIPTION	ILLUSTRATION	PAGE NO.
ASM02244	**USB-Link 2 Kit** The USB-Link 2 is a pocket-sized communications interface used to connect a laptop computer to the controls system for programming and monitoring purposes, utilizing a modular cable to allow connection to the service port connector on the controllers and a USB cable to connect to a laptop computer. Includes: USB-Link 2 for multiple or single loop systems, USB cable, modular connection cable, two mini-DIN to terminal adapters, and Prism 2 software.		*See the USB-Link 2 Technical Guide*
ASM01626	**MiniLink PD 5** Used with all Orion controllers to provide network communications, zone voting, alarming, and tenant logging capabilities. A MiniLink Polling Device is required on each loop of a networked system. Includes: MiniLink Polling Device 5.		*See the Orion MiniLink PD 5 Technical Guide*
ASM02533	**Prism 2 Front-End Computer Software** Prism 2 provides standard, easy to understand status screens for each type of equipment installed. Prism 2 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.		*Page 64*
ASM01878	**E-BUS Adapter Board** The E-BUS Adapter Board is used for connecting the EBTRON, GreenTrol, or Paragon Airflow Measurement Digital Transmitter to the VCCX2 Controller. It connects with an E-BUS cable to the VCCX2 Controller. Cable supplied separately.		*Page 50*
G033970	**E-BUS Adapter Hub** The E-BUS Adapter Hub is used for connecting E-BUS devices and controllers together with E-BUS cables of varying lengths. Includes: E-BUS Adapter Hub.		*Pages 36 and 37*
ASM01635	**E-BUS Adapter Hub with 1.5 ft. E-BUS Cable** The E-BUS Adapter Hub is used for connecting E-BUS devices and controllers together with E-BUS cables of varying lengths. Includes: E-BUS Adapter Hub and 1.5 ft. E-BUS cable.		*Pages 36 and 37*
ASM01696	**E-BUS Space Temperature and Humidity Sensor Emulator Board with 1.5 ft. E-BUS Cable** The E-BUS Space Temperature and Humidity Sensor Emulator Board allows the use of third-party analog space temperature and humidity sensors to emulate the AAON E-BUS Space Temperature and Humidity Sensor. Includes: E-BUS Sensor Emulator Board and 1.5 ft. E-BUS cable.		*N/A*
ASM01621	**E-BUS Return Air Temperature and Humidity Sensor Emulator Board with 1.5 ft. E-BUS Cable** The E-BUS Return Air Temperature and Humidity Sensor Emulator Board allows the use of third-party analog return air temperature and humidity sensors to emulate the AAON E-BUS Return Air Temperature and Humidity Sensor. Includes: E-BUS Sensor Emulator Board and 1.5 ft. E-BUS cable.		*N/A*

Parts and Descriptions

PART NO.	PART DESCRIPTION	ILLUSTRATION	PAGE NO.
ASM01697	**E-BUS Outdoor Air Temperature and Humidity Sensor Emulator Board with 1.5 ft. E-BUS Cable** The E-BUS Outdoor Air Temperature and Humidity Sensor Emulator Board allows the use of third-party analog outdoor air temperature and humidity sensors to emulate the AAON E-BUS Outdoor Air Temperature and Humidity Sensor. Includes: E-BUS Sensor Emulator Board and 1.5 ft. E-BUS cable.		*N/A*
ASM01622	**E-BUS Space CO_2 Sensor Emulator Board with 1.5 ft. E-BUS Cable** The E-BUS Space CO_2 Sensor Emulator Board allows the use of a third-party analog CO_2 sensor to emulate the AAON E-BUS Wall-Mounted Space CO_2 Sensor. Includes: E-BUS Sensor Emulator Board and 1.5 ft. E-BUS cable.		*N/A*
ASM01623	**E-BUS Return Air CO_2 Sensor Emulator Board with 1.5 ft. E-BUS Cable** The E-BUS Return Air CO_2 Sensor Emulator Board allows the use of a third-party analog CO_2 sensor to emulate the AAON E-BUS Duct-Mounted CO_2 Sensor. Includes: E-BUS Sensor Emulator Board and 1.5 ft. E-BUS cable.		*N/A*
ASM01907	**Communication Surge Protector Kit** 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. Includes: Communication Bus Surge Protector, Base Module, and mounting/wiring instructions.		*N/A*
ASM01868	**GPC-XP Controller** 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 lead/lag start capabilities. The GPC-XP has eight configurable analog inputs which will accept signals from Thermistor Temperature Sensors, 4-20 mA or 0-5 VDC or 0-10 VDC 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 eight wet contact binary inputs which can be configured for either normally open or normally closed operation. The GPC-XP has eight relay outputs for on/off control and four 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 eight separate 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 HVAC equipment installed on the control system loop. Includes: GPC-XP Controller.		*See the GPC-XP Controller Technical Guide*

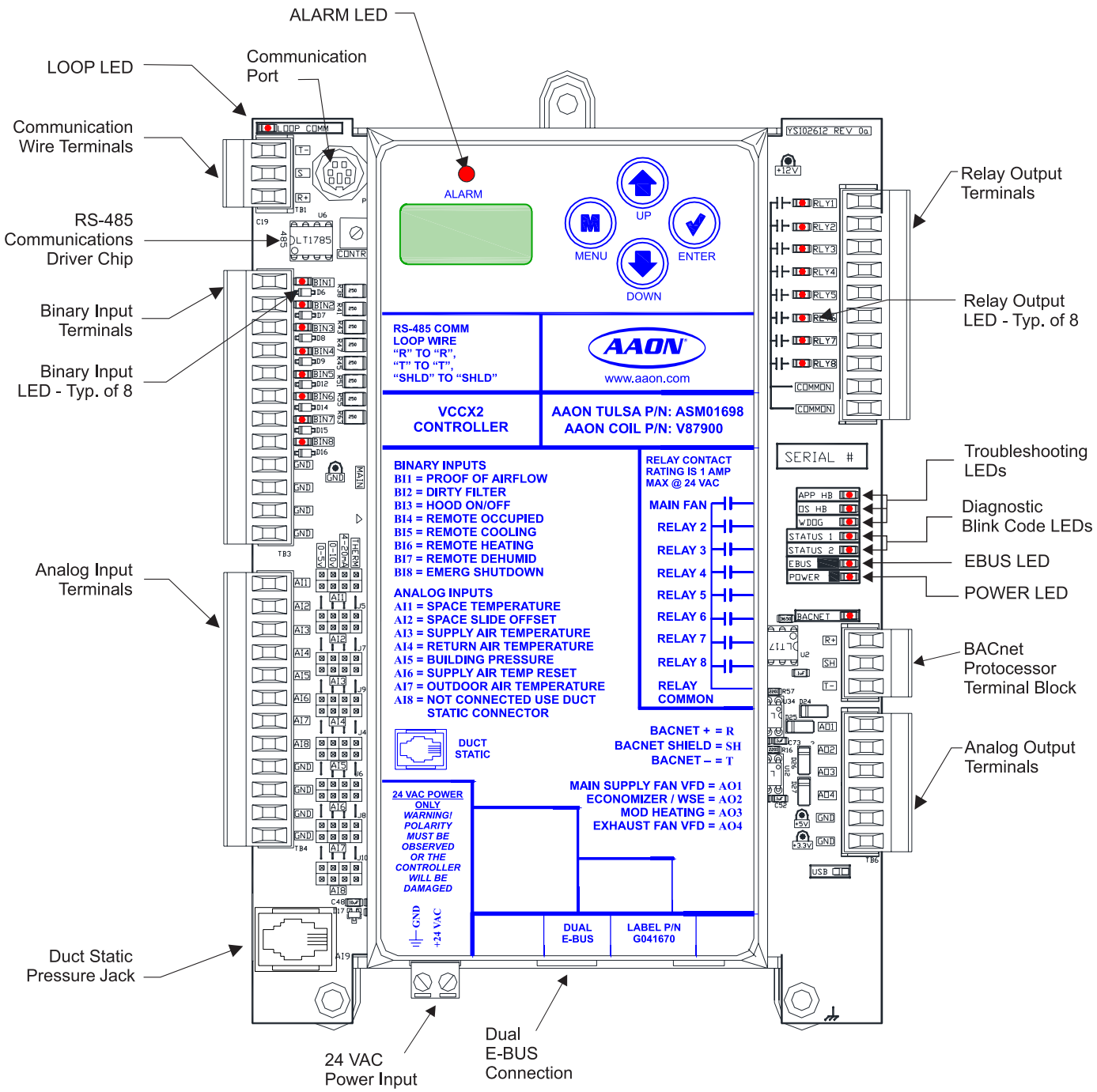


Figure 1: VCCX2 Controller Components

VCCX2 Controller

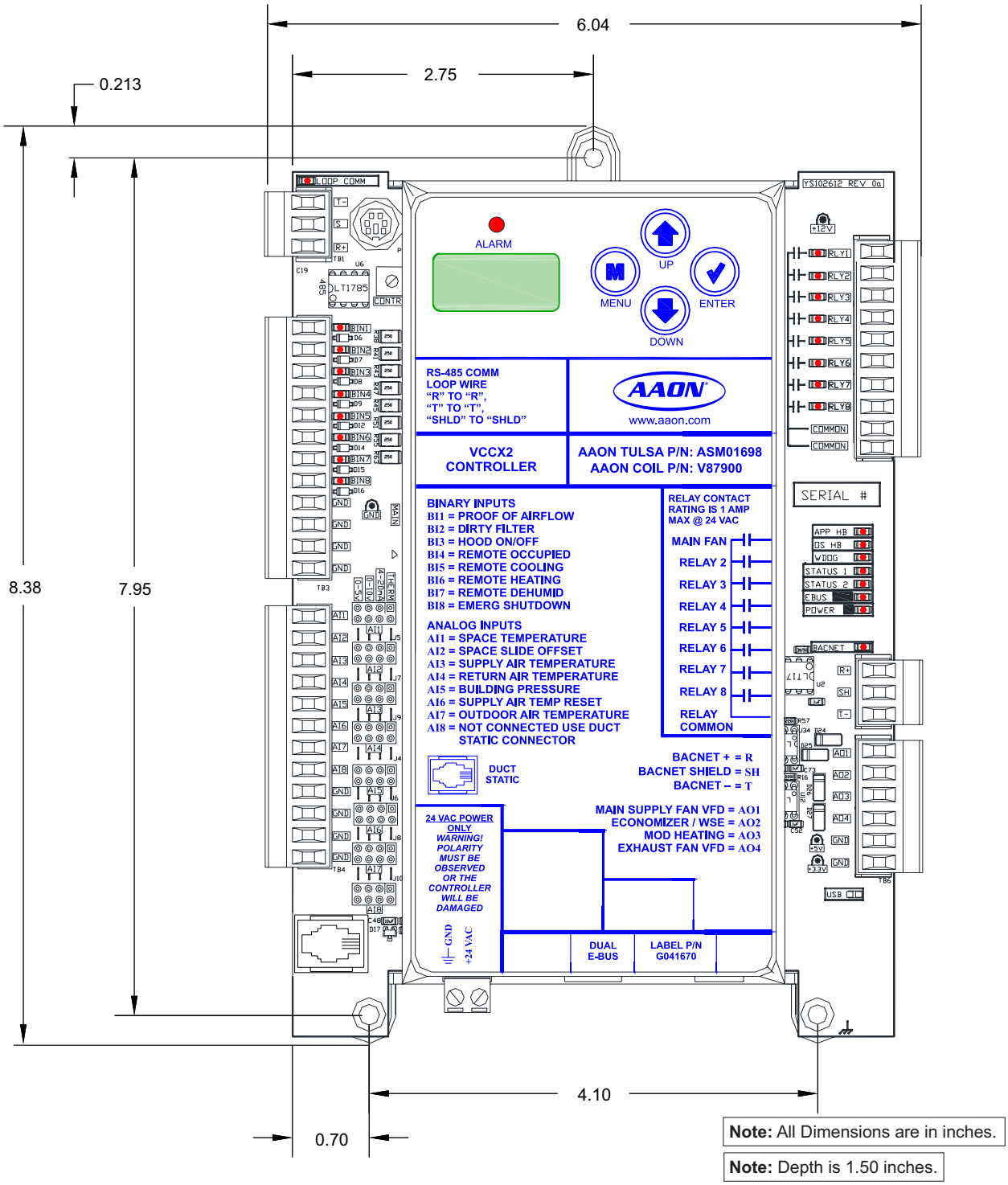
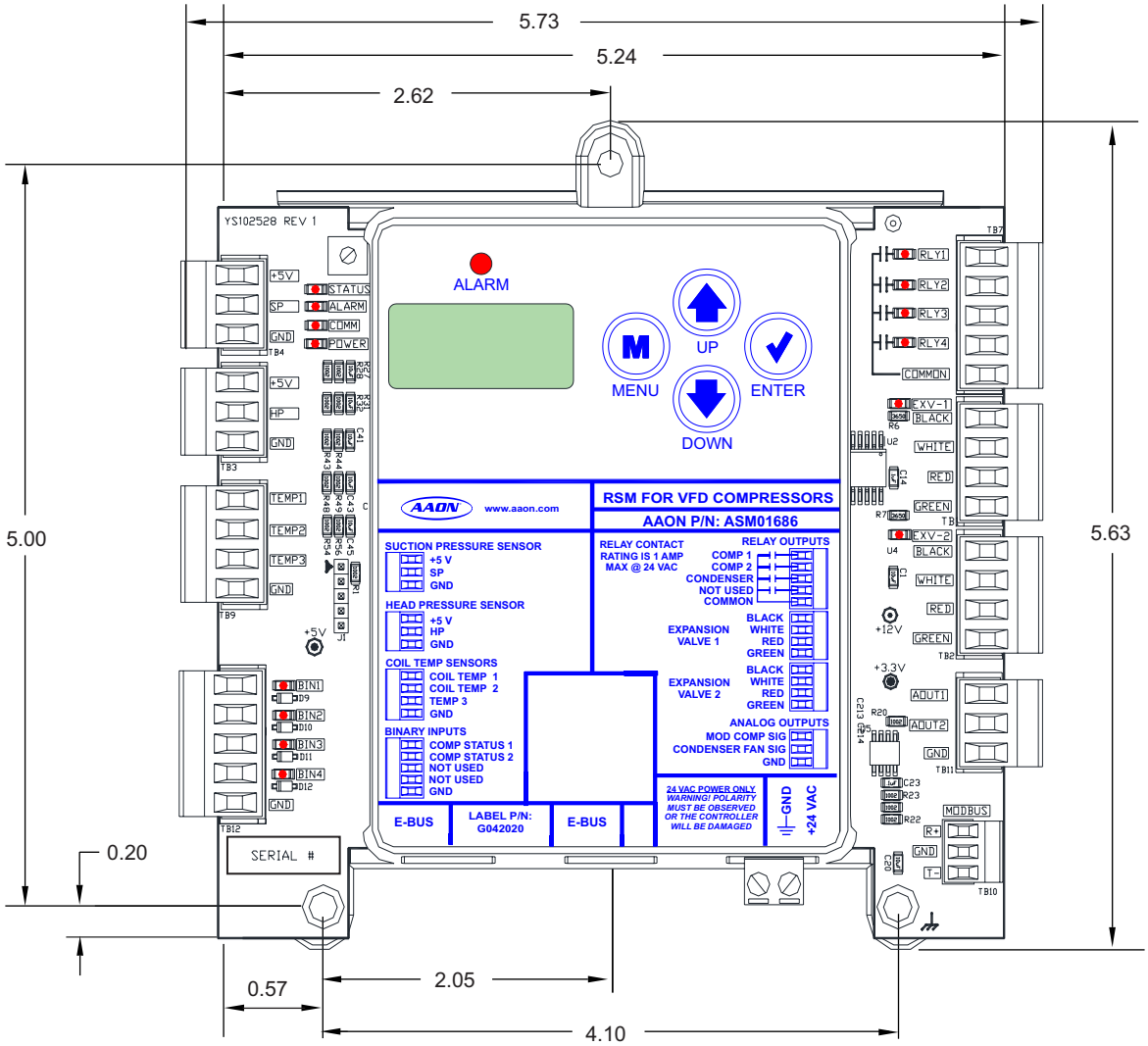


Figure 2: VCCX2 Controller Dimensions

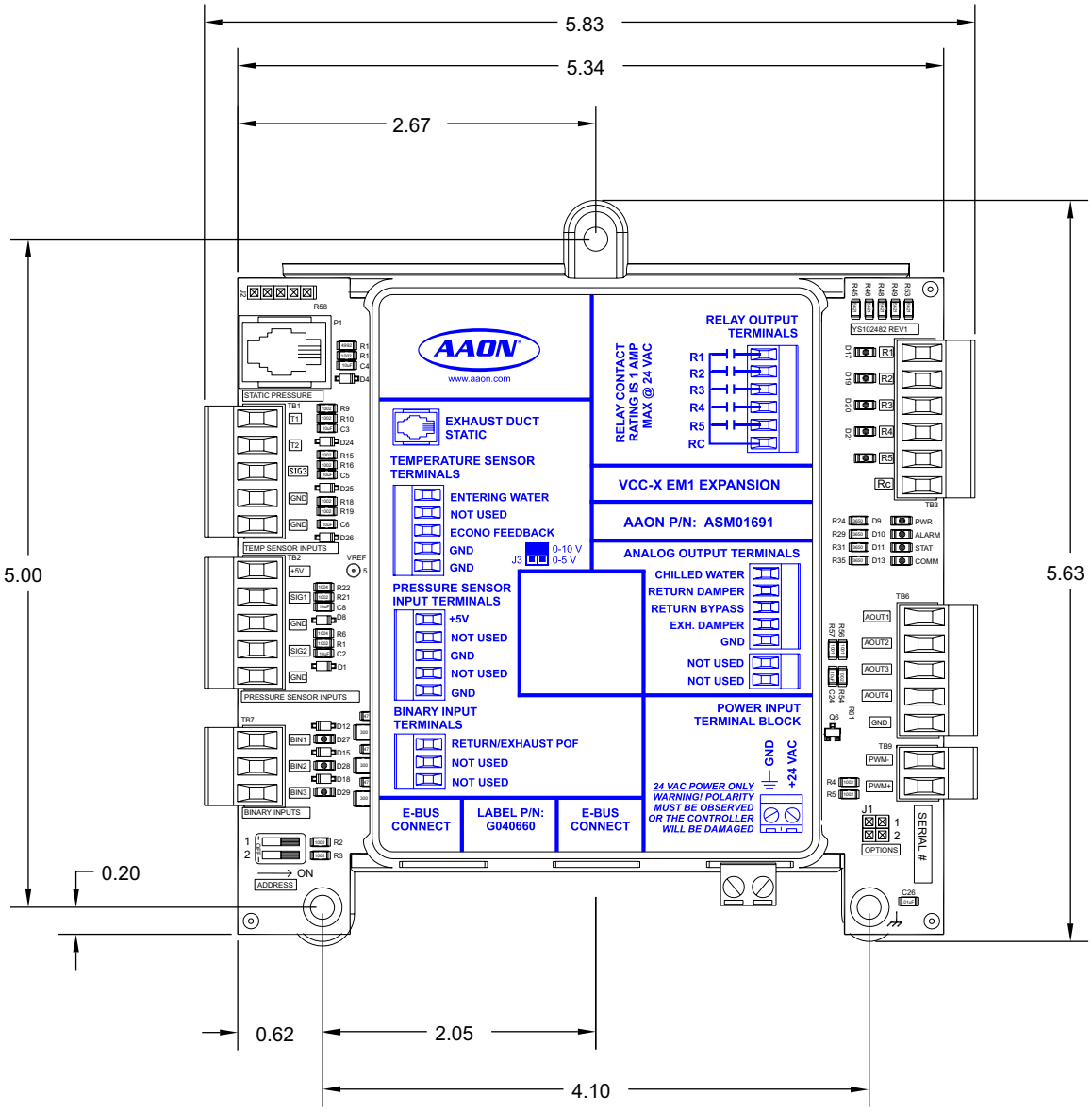


Note: All Dimensions are in inches.

Note: Depth is 1.50 inches.

Figure 3: Typical Refrigerant System Module Dimensions (RSMV Shown)

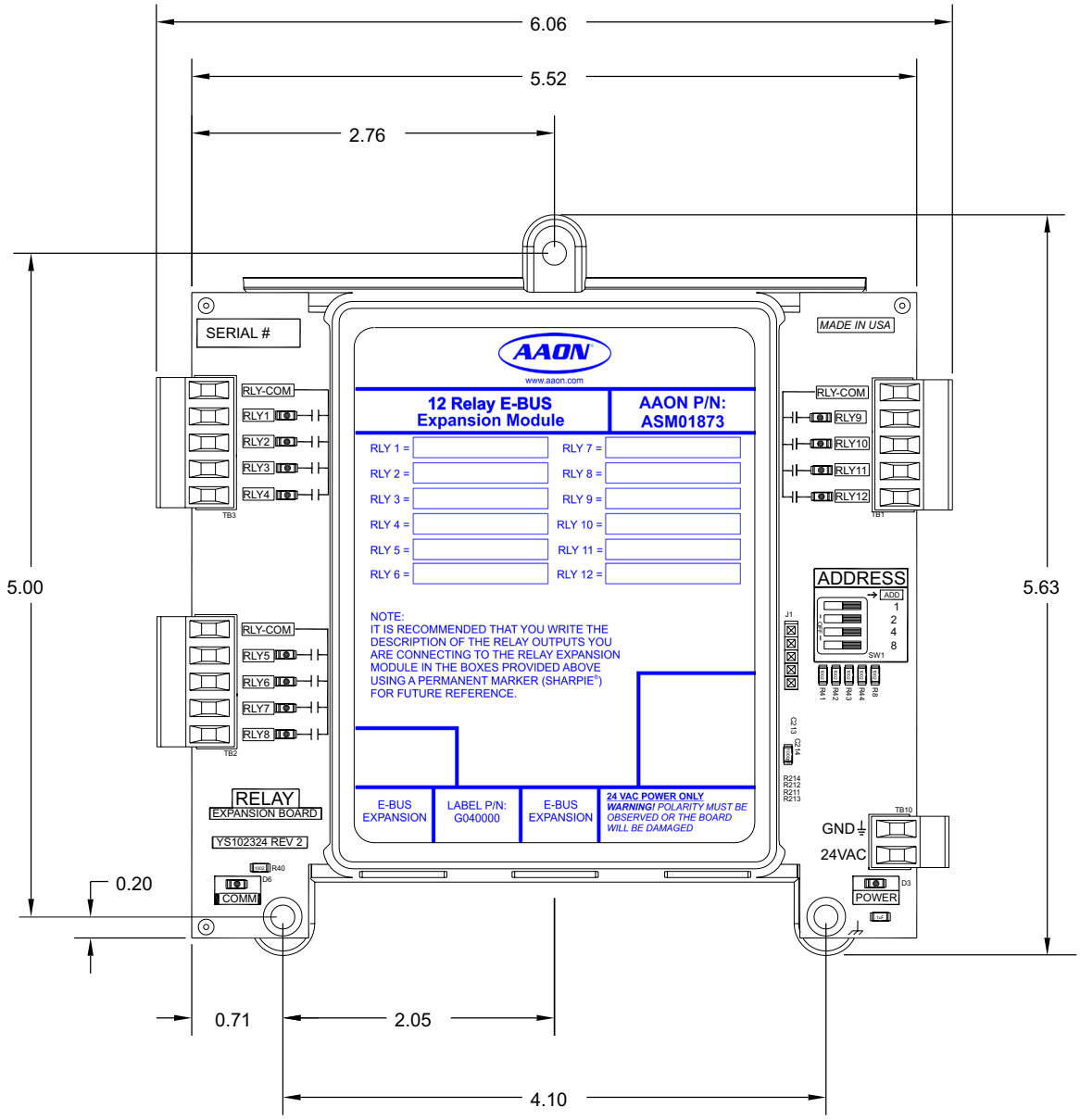
VCC-X EM1 Expansion Module



Note: All Dimensions are in inches.

Note: Depth is 1.50 inches.

Figure 4: VCC-X EM1 Expansion Module Dimensions



Note: All Dimensions are in inches.

Note: Depth is 1.50 inches.

Figure 5: 12 Relay E-BUS Module Dimensions

Important Wiring Considerations

General

Correct wiring of the VCCX2 Controller is the most important factor in the overall success of the controller installation process. In general, most VCCX2 Controllers are installed and wired at the AAON factory. It is also possible to purchase these controllers through a local AAON representative for installation in the field. Some of the following information pertains to field wiring and may not apply to the installation if it was pre-wired at the factory. However, if troubleshooting of the controller is required, it is a good idea to be familiar with the system wiring, no matter if it was factory or field wired.

Controller Mounting

When the controller is to be field mounted, 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, this page,** for a list of the required operating conditions for the VCCX2 Controller and associated expansion modules.

The VCCX2 Controller is housed in a plastic enclosure. It is designed to be mounted by using the three mounting holes in the enclosure base. The VCCX2 Controller needs to be installed in an environment which can maintain a temperature range between -22°F and 158°F not to exceed 95% relative humidity levels (non-condensing). Be careful not to damage the electronic components when mounting the controller.

Wiring

The VCCX2 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, this page.**

Control Device	Voltage	VA Load	Temperature	Humidity (Non-Condensing)
VCCX2 Controller	18-30 VAC	15	-22°F to 158°F	0-95% RH
Evaporative Condenser, RSMD, RSMV, RSMV-HP, RSMZ Refrigerant System Modules and Subcool Monitor	18-30 VAC	18	-22°F to 158°F	0-95% RH
VCCX EM1 Expansion Module	18-30 VAC	5	-22°F to 158°F	0-95% RH
12 Relay E-BUS Expansion Module	18-30 VAC	15	-22°F to 158°F	0-95% RH

Table 1: Voltage and Environment Requirements

WARNING: When using a single transformer to power multiple controllers or expansion modules, the correct polarity must always be maintained between the boards. Failure to observe correct polarity will result in damage to the controller and expansion modules.

Please carefully read and apply the following information when wiring the VCCX2 Controller, RSMs, and expansion modules.

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 two-conductor wire and some require three-or four-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 VCCX2 Controllers together or to connect to other communication devices, all wiring must be plenum-rated, minimum 18-gauge, two-conductor, twisted pair with shield. AAON can supply communication wire that meets this specification and is color coded for the network or local loop. If desired, Belden #82760 or equivalent wire may also be used.
8. Before applying power to the VCCX2 Controller, be sure to recheck all wiring connections and terminations thoroughly.

Powering Up

When the VCCX2 and connected modules are first powered up, the POWER LED should light up and stay on continuously. If it does not light up, check to be sure the 24 VAC is connected to the controller, the wiring connections are tight, and they are wired for the correct polarity. The 24 VAC power must be connected so all ground wires remain common. If after making all these checks, the POWER LED does not light up, please contact AAON Controls Support for assistance.

VCCX2 Controller Inputs

The VCCX2 Controller is designed with eight analog inputs, four analog outputs, eight binary inputs and eight relay outputs.

There are also two E-BUS expansion ports which allow the use of communicating sensors and E-BUS modules.

See **Figure 6, this page,** and **Figure 7, page 26,** for wiring details.

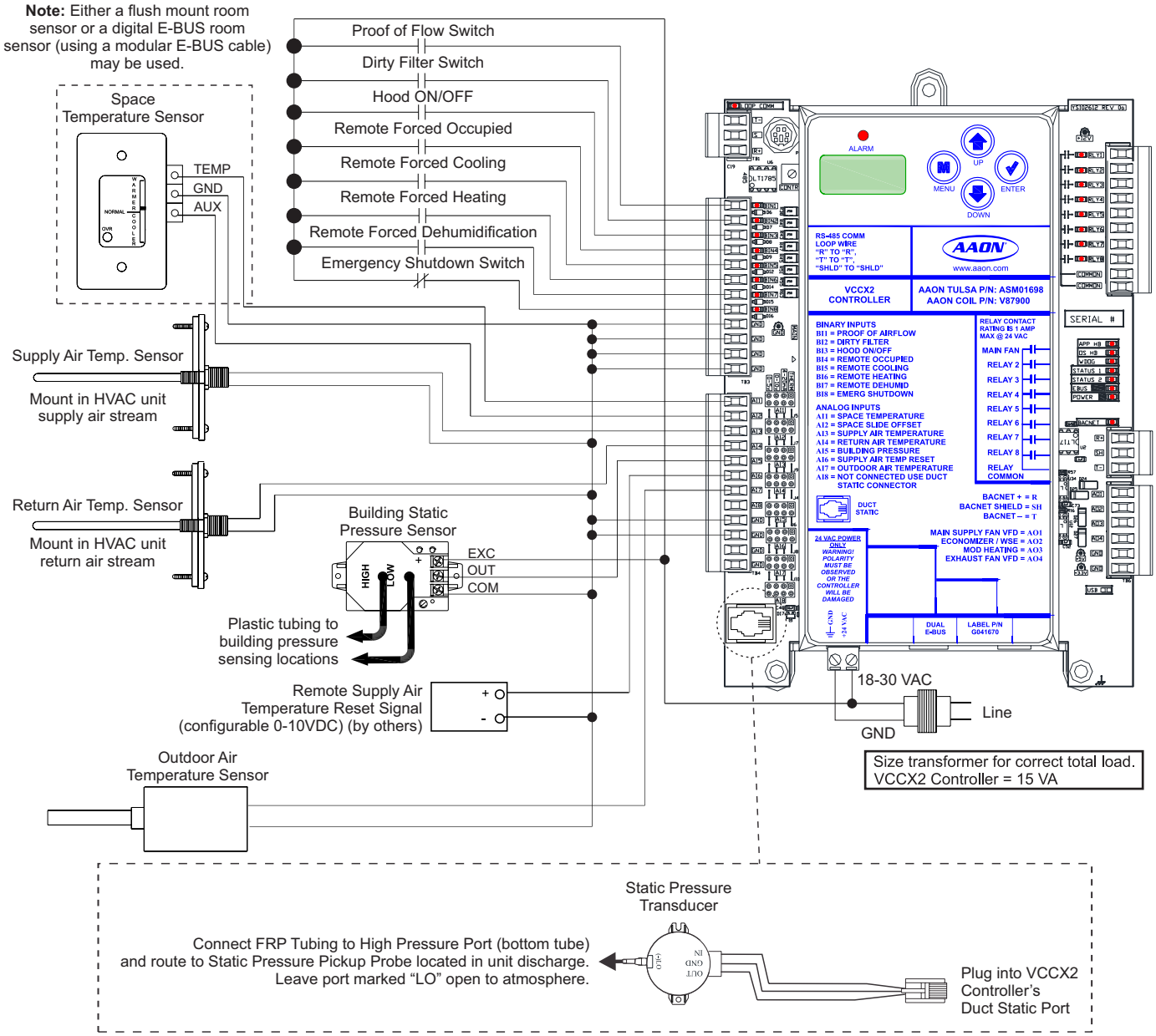


Figure 6: VCCX2 Controller Input Wiring

VCCX2 Controller Outputs

NOTE: Relay contacts for R2-R8 may be configured for:

1.) COOLING STAGES
2.) HEATING STAGES
3.) AUX HEAT
4.) EMERGENCY HEAT
5.) MOD HEAT ENABLE
6.) MOD COOL ENABLE
7.) MORNING WARM-UP
8.) MORNING COOL-DOWN
9.) REHEAT
10.) PREHEAT
11.) LOW AMBIENT
12.) EXHAUST
13.) ECONOMIZER
14.) HEAT WHEEL
15.) OCCUPIED
16.) OVERRIDE
17.) ALARM
18.) A1 COMP RUN STATUS
19.) A2 COMP RUN STATUS
20.) B1 COMP RUN STATUS
21.) B2 COMP RUN STATUS
22.) CONDENSER PUMP
23.) SUMP HEATER
24.) SUMP PUMP DRAIN

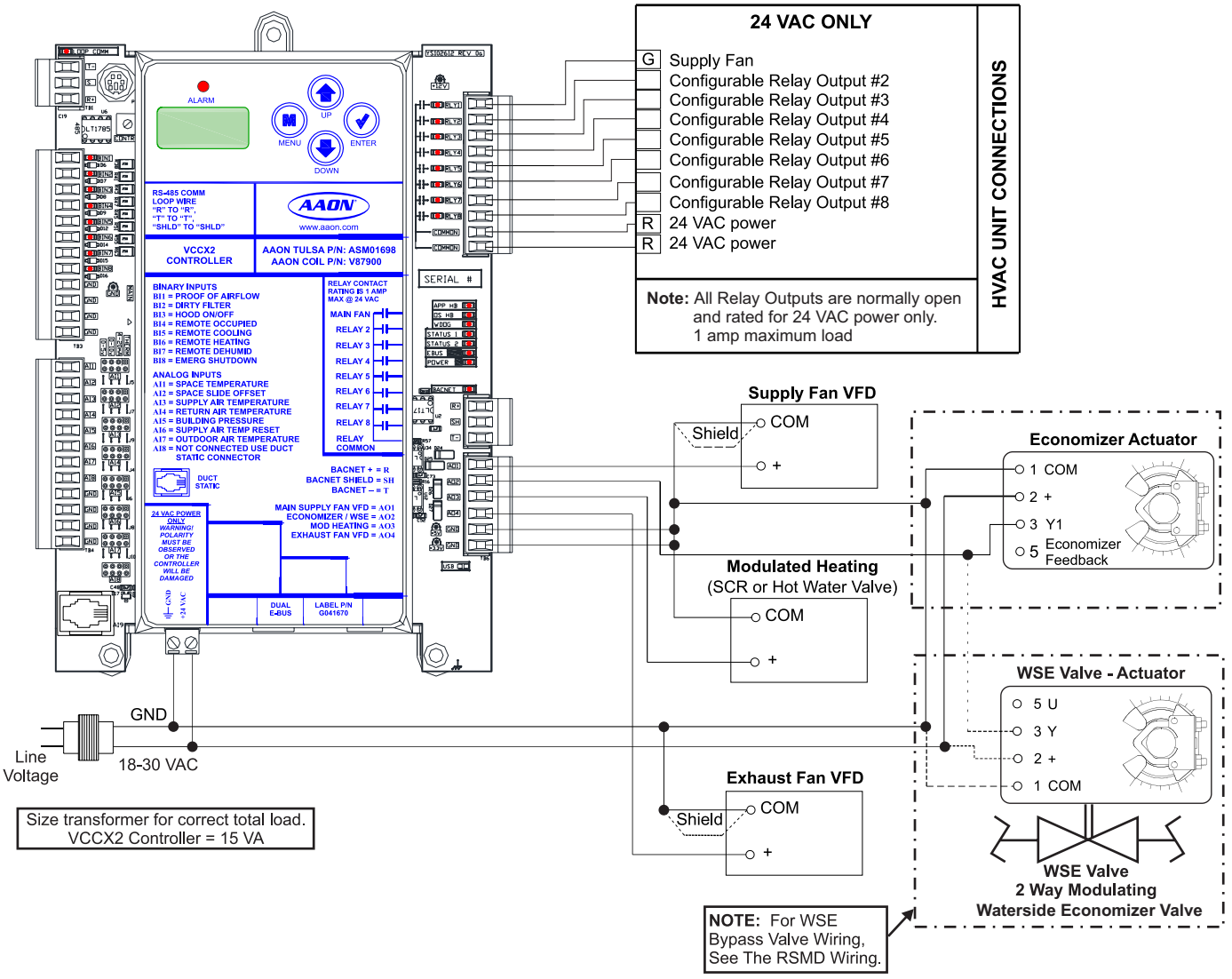


Figure 7: VCCX2 Controller Output Wiring

E-BUS Digital Room Sensor

The ASM01819 E-BUS Digital Room Sensor can be used to monitor space temperature. The ASM01820 or ASM02221 E-BUS Digital Room Sensor can be used to sense space temperature and humidity. The ASM02221 has no LCD display or keypad. The sensor connects to the VCCX2 Controller with an E-BUS cable. It can also be daisy-chained with a CO_2 sensor for applications requiring both a wall-mounted CO_2 sensor and one of the three Digital Room Temperature Sensors.

The E-BUS Digital Room Sensor should be mounted on the wall in an area that does not have drafts or is exposed to direct sunlight. See **Figure 8, this page,** for wiring details.

NOTE: If using multiple E-BUS sensors or modules, the E-BUS hub or adapter board may be required.

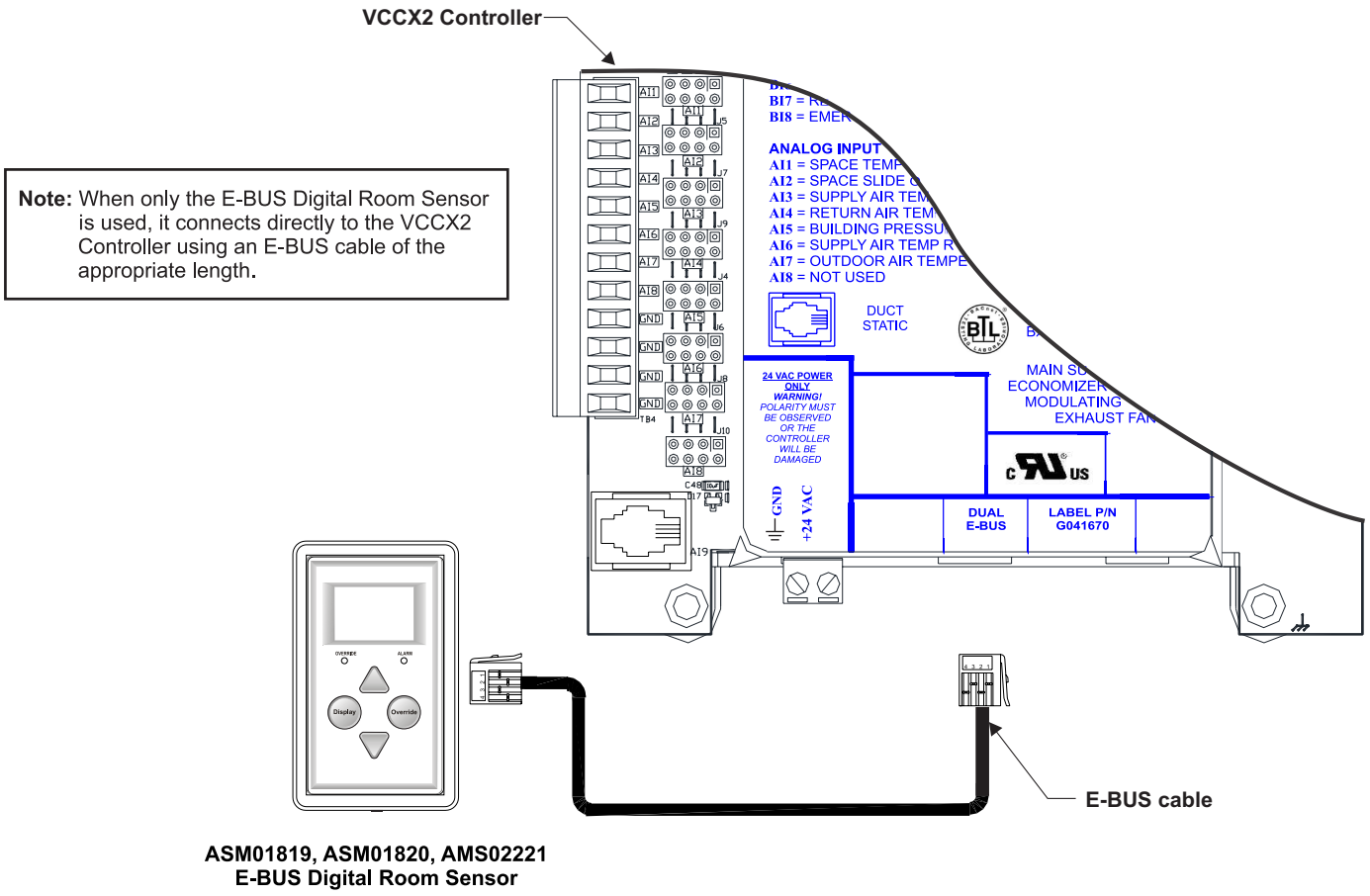


Figure 8: E-BUS Digital Room Sensor Wiring

Wall-Mounted E-BUS CO_2 Sensor

The ASM01829 Wall-Mounted E-BUS CO_2 Sensor is used to monitor CO_2 levels in the space served by the HVAC unit. The E-BUS CO_2 Sensor connects to the VCCX2 Controller with an E-BUS cable. It can be daisy-chained with the E-BUS Digital Room Sensor for applications requiring both a Room CO_2 Sensor and Room Temperature Sensor.

It should be mounted on the wall in an area that does not have drafts or is exposed to direct sunlight. See **Figure 9, this page,** for wiring details and installation notes.

A Duct-Mounted E-BUS CO_2 Sensor can be used, if desired, instead of the Wall-Mounted E-BUS CO_2 Sensor. See **Figure 10, page 29,** for Duct-Mounted E-BUS CO_2 Sensor wiring details.

NOTE: If using multiple E-BUS sensors or modules, the E-BUS hub or adapter board may be required.

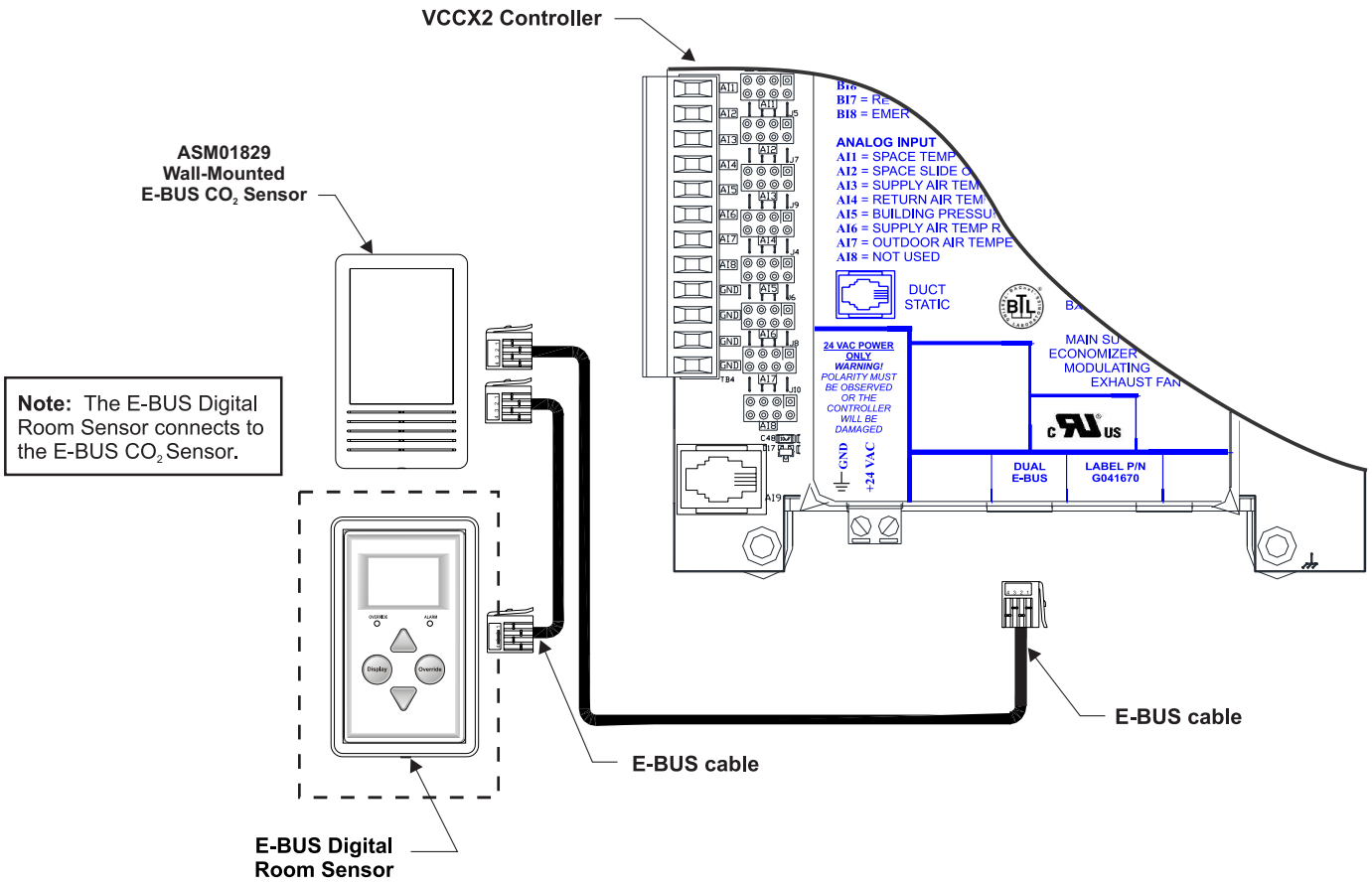


Figure 9: Wall-Mounted E-BUS CO_2 Sensor Wiring

Duct-Mounted E-BUS CO_2 Sensor

The ASM01831 Duct-Mounted E-BUS CO_2 Sensor with Remote Pickup Tube is used for sensing the current CO_2 level in the HVAC unit's return air stream. This is useful for getting a CO_2 reading in the area served by the HVAC unit or when a Wall-Mounted E-BUS CO_2 Sensor is not possible due to sensor tampering concerns in the space.

The Duct-Mounted E-BUS CO_2 Sensor is comprised of the CO_2 Sensor, the AAON Aspiration Box Assembly, and a remote pickup tube.

The Duct-Mounted E-BUS CO_2 Sensor with Remote Pickup Tube is designed to be mounted in the return air duct of the HVAC unit and uses its integral aspiration box to sample the CO_2 level in the duct. See **Figure 10, this page,** for wiring and installation details.

NOTE: If using multiple E-BUS sensors or modules, the E-BUS hub or adapter board may be required.

Note: The Duct-Mounted E-BUS CO_2 Sensor connects to the VCCX2 Controller using an E-BUS cable of the required length or the provided 10 ft. E-BUS cable.

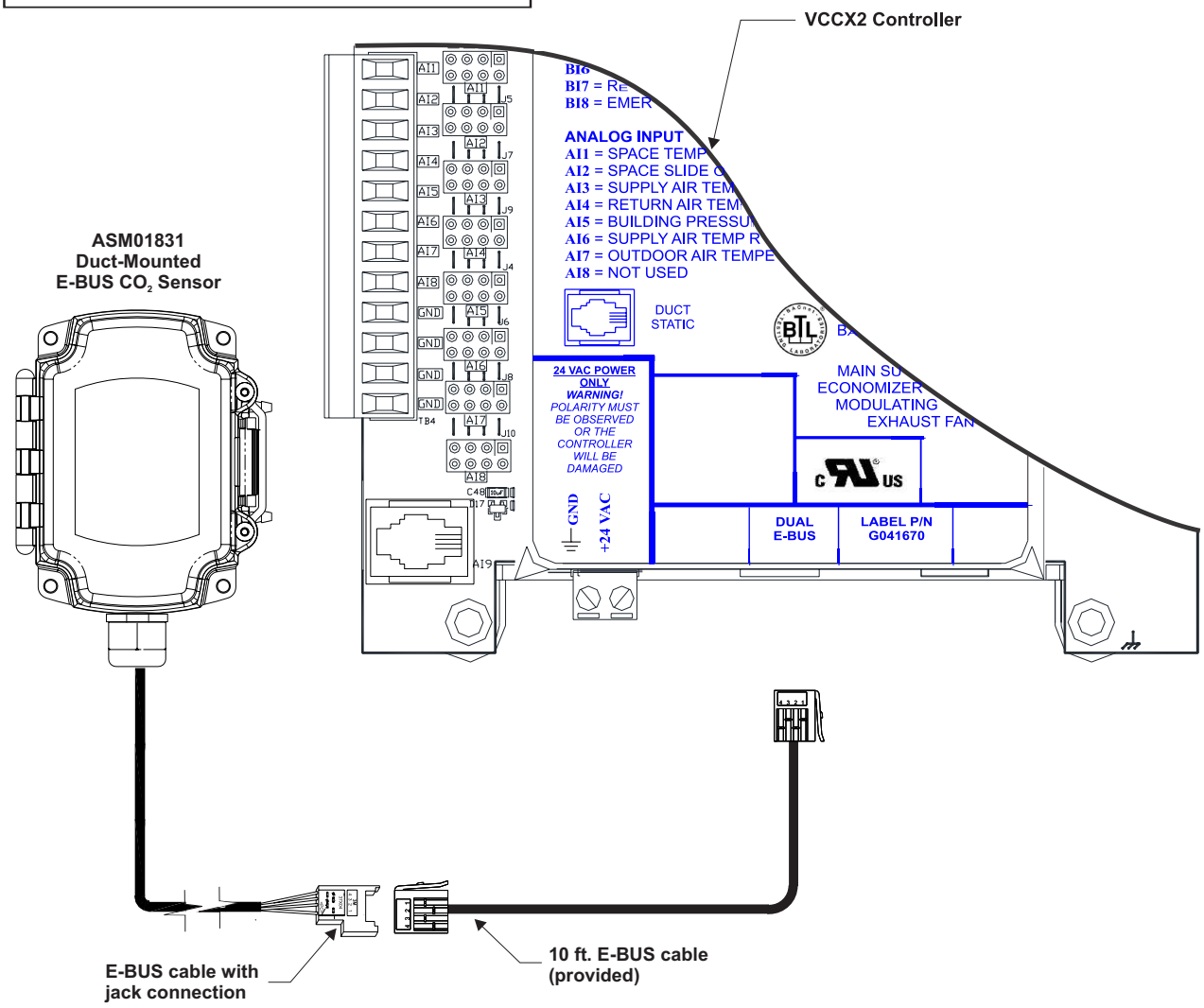


Figure 10: Duct-Mounted E-BUS CO_2 Sensor Wiring

Space Temperature Sensor

The ASM02227, ASM01638, ASM01642, ASM01643 Space Temperature Sensor is typically used for CAV HVAC unit applications controlling one zone. The Space Temperature Sensor is a 10K Type III Thermistor Sensor and should be mounted approximately five feet above the floor in the space that is to be controlled.

The Space Temperature Sensor is available as a sensor only, sensor with override button, sensor with slide adjust, and sensor with slide adjust and override configurations.

A space temperature signal can be connected to Analog Input 1 (AI1) for applications requiring a Space Temperature Setpoint.

See **Figure 11, this page,** for complete Space Temperature Sensor wiring details.

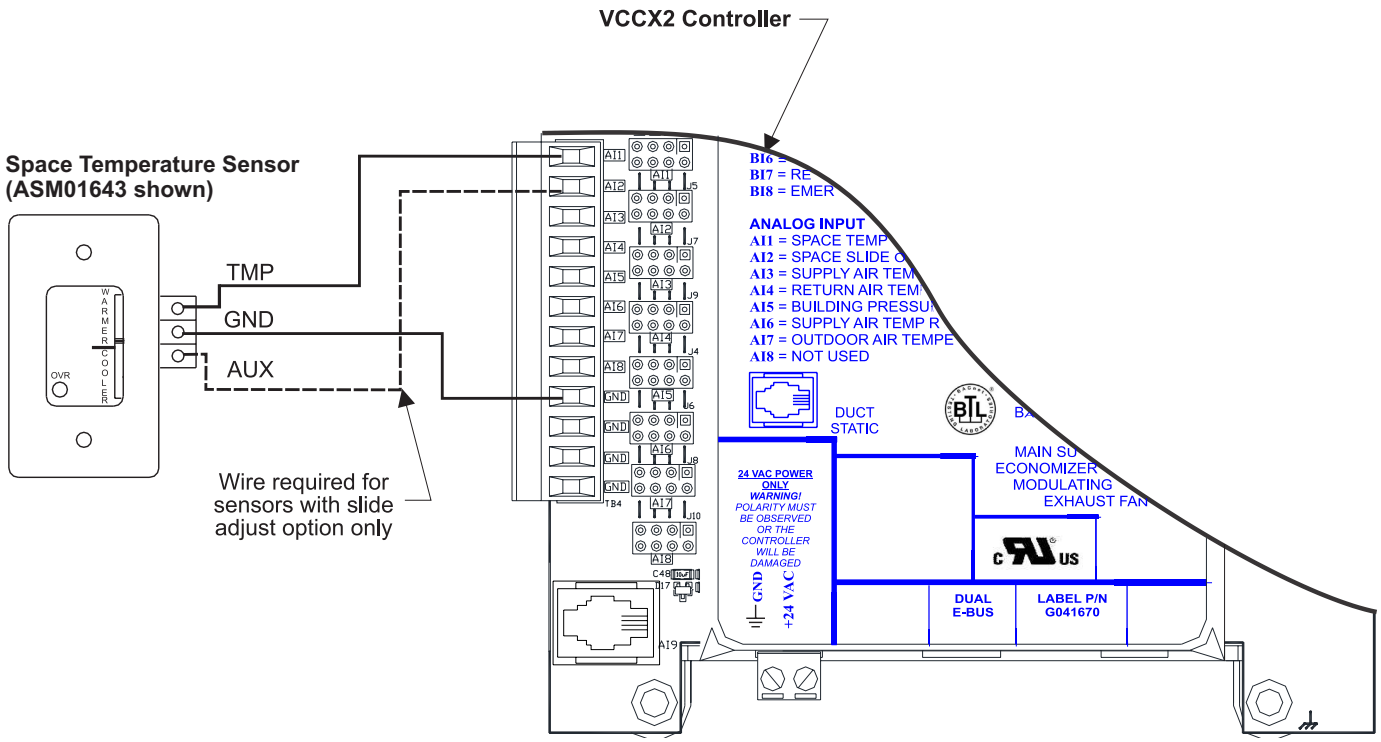


Figure 11: Space Temperature Sensor Wiring and Slide Adjust

Supply Air Temperature Sensor

The G051240 (6 inch) or G051250 (12 inch) Supply Air Temperature Sensor must be wired as shown for proper operation.

The Supply Air Temperature Sensor is a 10K Type III Thermistor Sensor. The Supply Air Temperature Sensor should be mounted in the unit discharge plenum or in the supply air duct.

A supply air temperature signal can be connected to AI3 for applications requiring a Supply Air Temperature Setpoint.

See **Figure 12, this page,** for details.

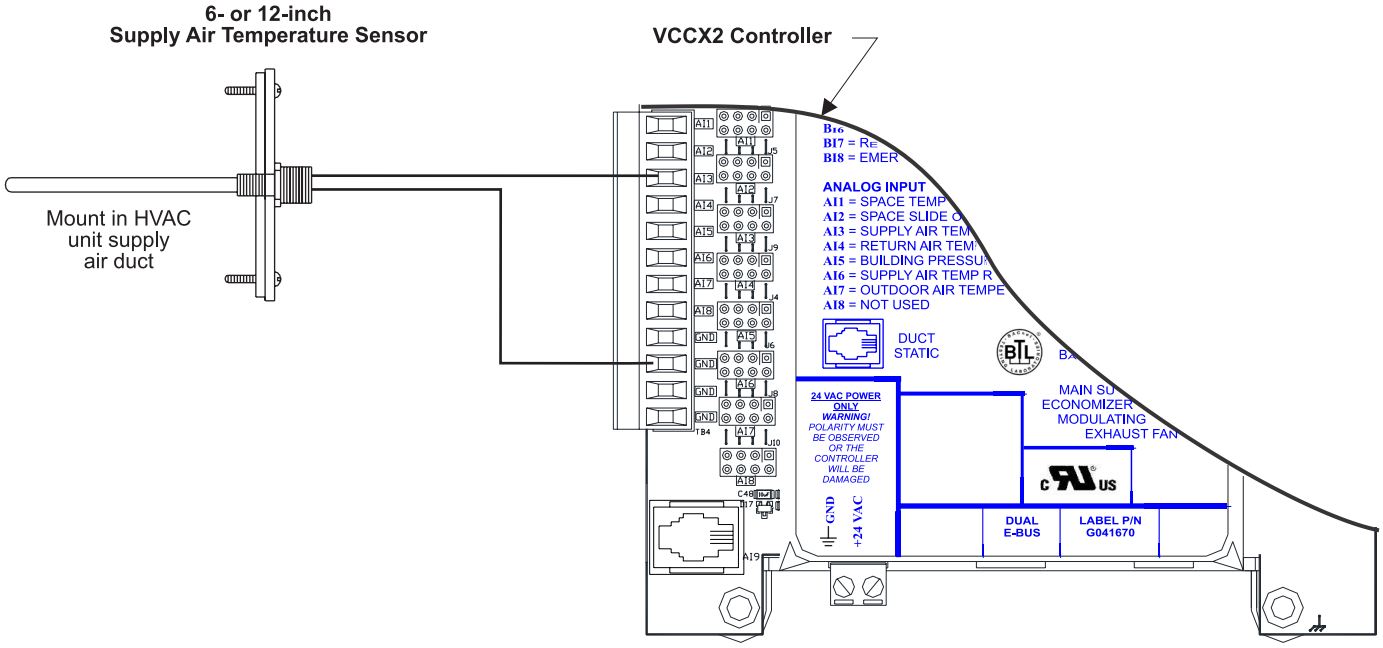


Figure 12: Supply Air Temperature Sensor Wiring

Return Air Temperature Sensor

G051240 (6 inch) or G051250 (12 inch) Return Air Temperature Sensor must be wired as shown for proper operation. 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.

A return air temperature signal can be connected to AI4 for applications requiring a Return Air Temperature Setpoint.

See **Figure 13, this page,** for details.

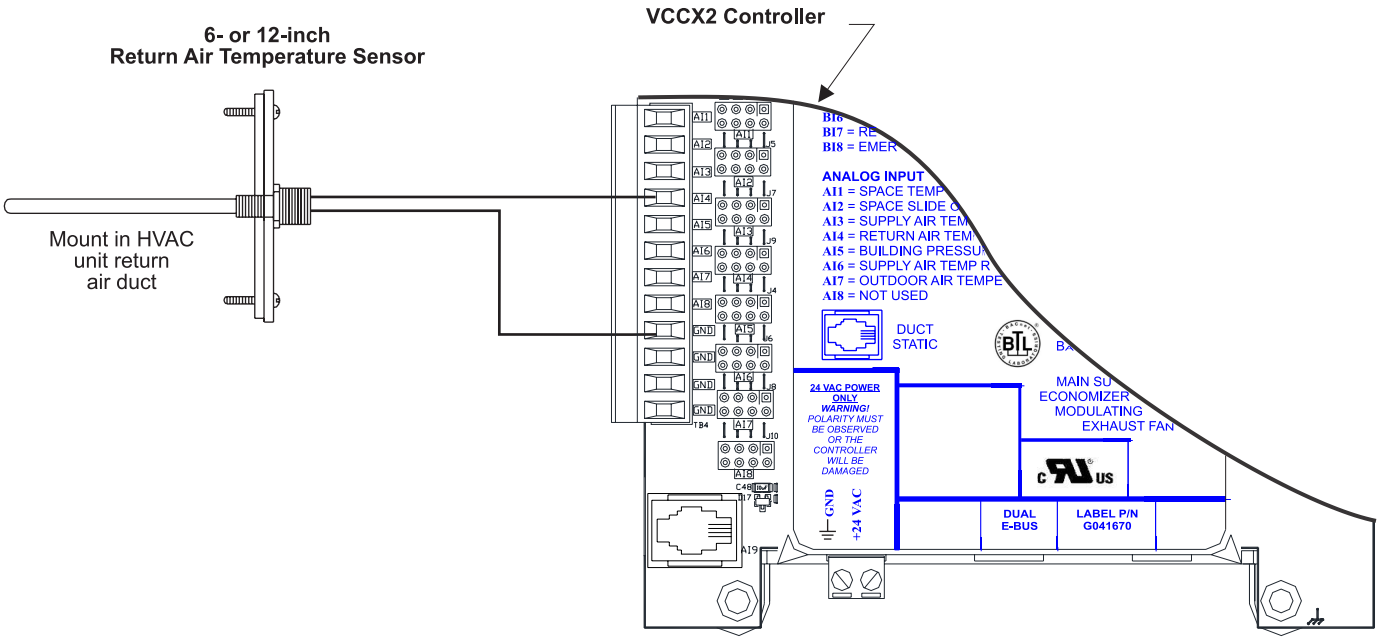


Figure 13: Return Air Temperature Sensor Wiring

Building Pressure Sensor

The ASM01832 Building Pressure Sensor must be wired as shown in **Figure 14, this page**. There are three terminal connections on the Building 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 AI5 on the VCCX2 Controller.

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 VCCX2 Controller or Building Pressure Sensor.

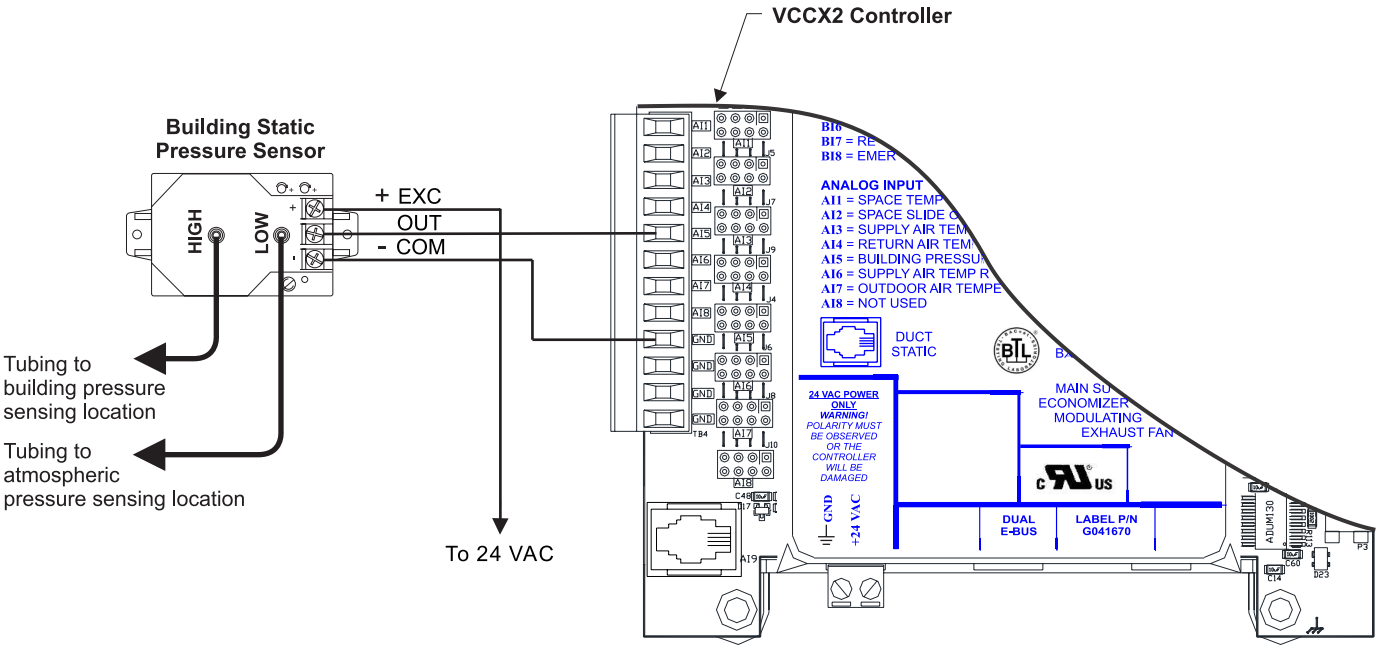


Figure 14: Building Pressure Sensor Wiring

Remote Supply Air Temperature Reset

Remote Supply Air Temperature Reset Signal

A remote supply air temperature reset signal can be connected to AI6 for applications requiring remote reset of the Supply Air Temperature Setpoint. See **Figure 15, this page**.

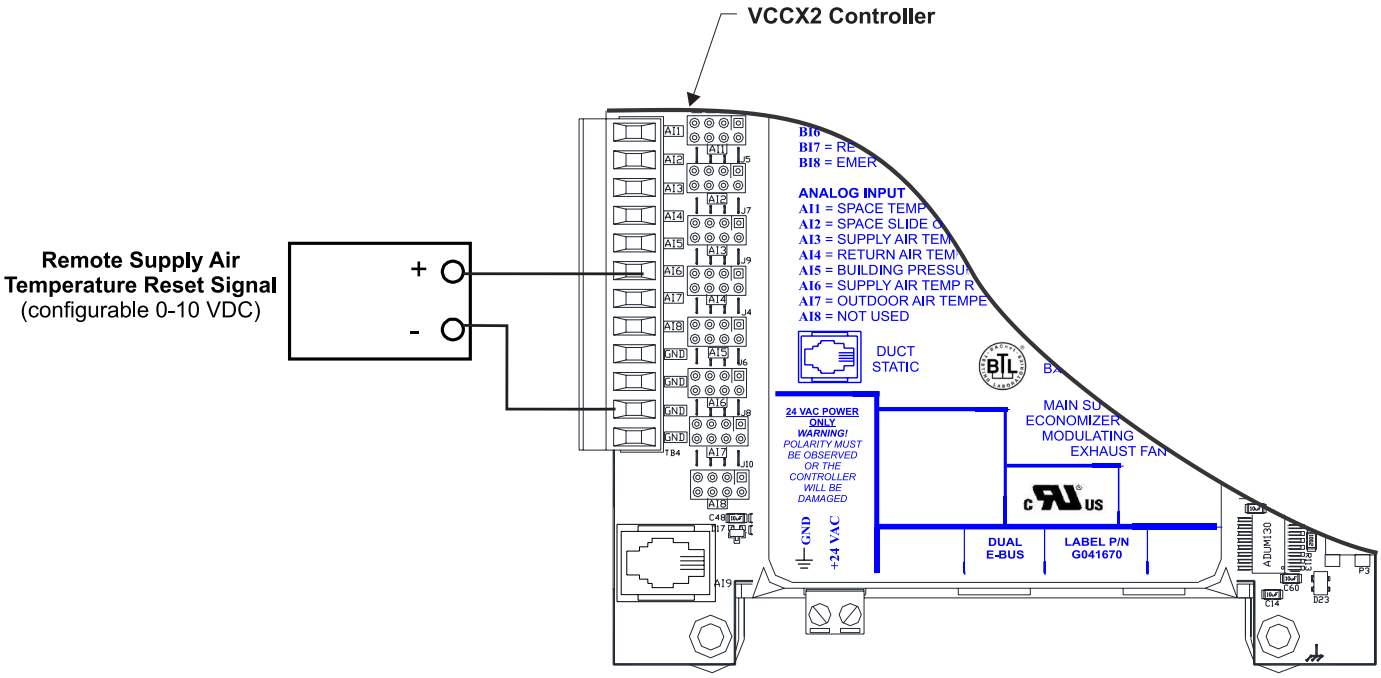


Figure 15: Remote SAT Reset Signal Wiring

Outdoor Air Temperature Sensor

The G042330 Outdoor Air Temperature Sensor must be wired as shown for proper operation of the VCCX2 Controller. The Outdoor Air Temperature Sensor is a 10K Type III Thermistor Sensor.

An outdoor air temperature signal can be connected to AI7 for applications requiring an Outdoor Air Temperature Setpoint.

See **Figure 16, this page,** for details.

For applications involving outdoor air humidity, the vertical or horizontal E-BUS Outside Air and Humidity Sensor must be used instead. See **Figure 17, page 36,** for details.

CAUTION: Be sure to mount the sensor in the upright position, in an area that is not exposed to direct sunlight, and is protected from the elements. 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.

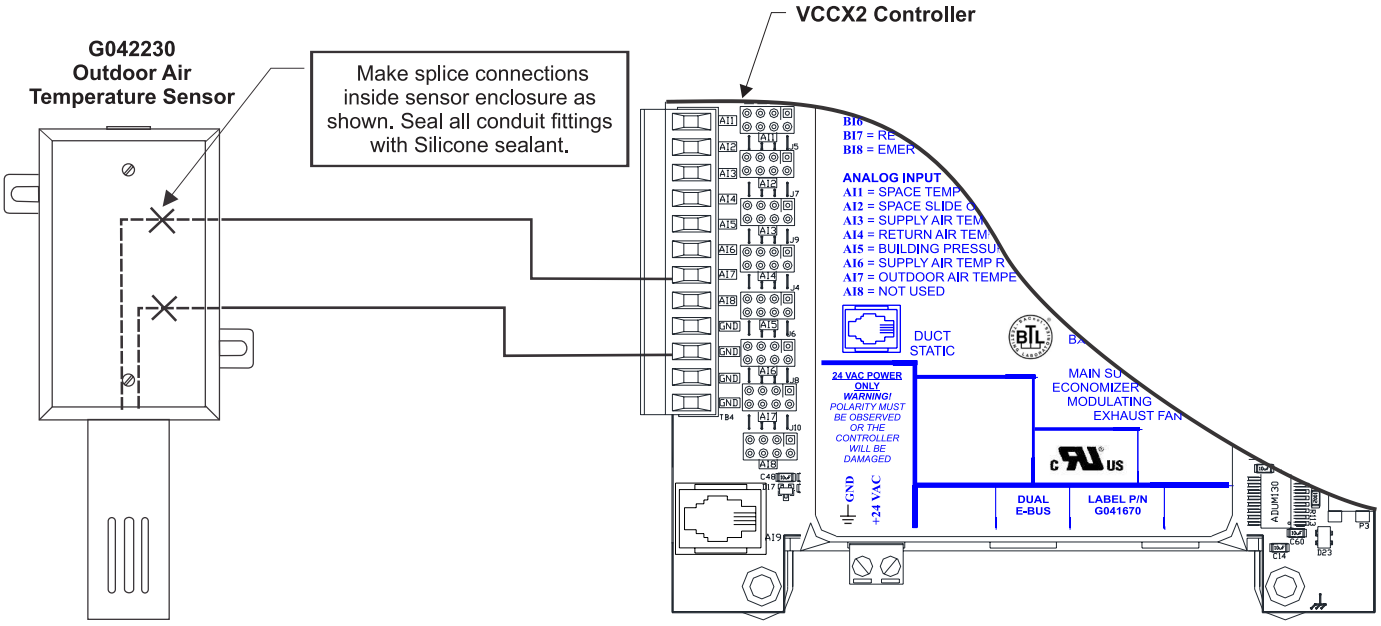


Figure 16: Outdoor Air Temperature Sensor Wiring

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

The ASM01836 (Horizontal) or ASM01838 (Vertical) E-BUS Outdoor Air Temperature and Humidity Sensor connects to the VCCX2 Controller. A 25 ft. E-BUS cable (provided) plugs into the sensor's attached 3 ft. cable and then plugs into the E-BUS port of the VCCX2 Controller or other E-BUS Expansion Board. See **Figure 17, this page,** for details.

CAUTION: Be sure to mount the sensor in the upright position, in an area that is not exposed to direct sunlight, and is protected from the elements. 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 or E-BUS adapter board may be required.

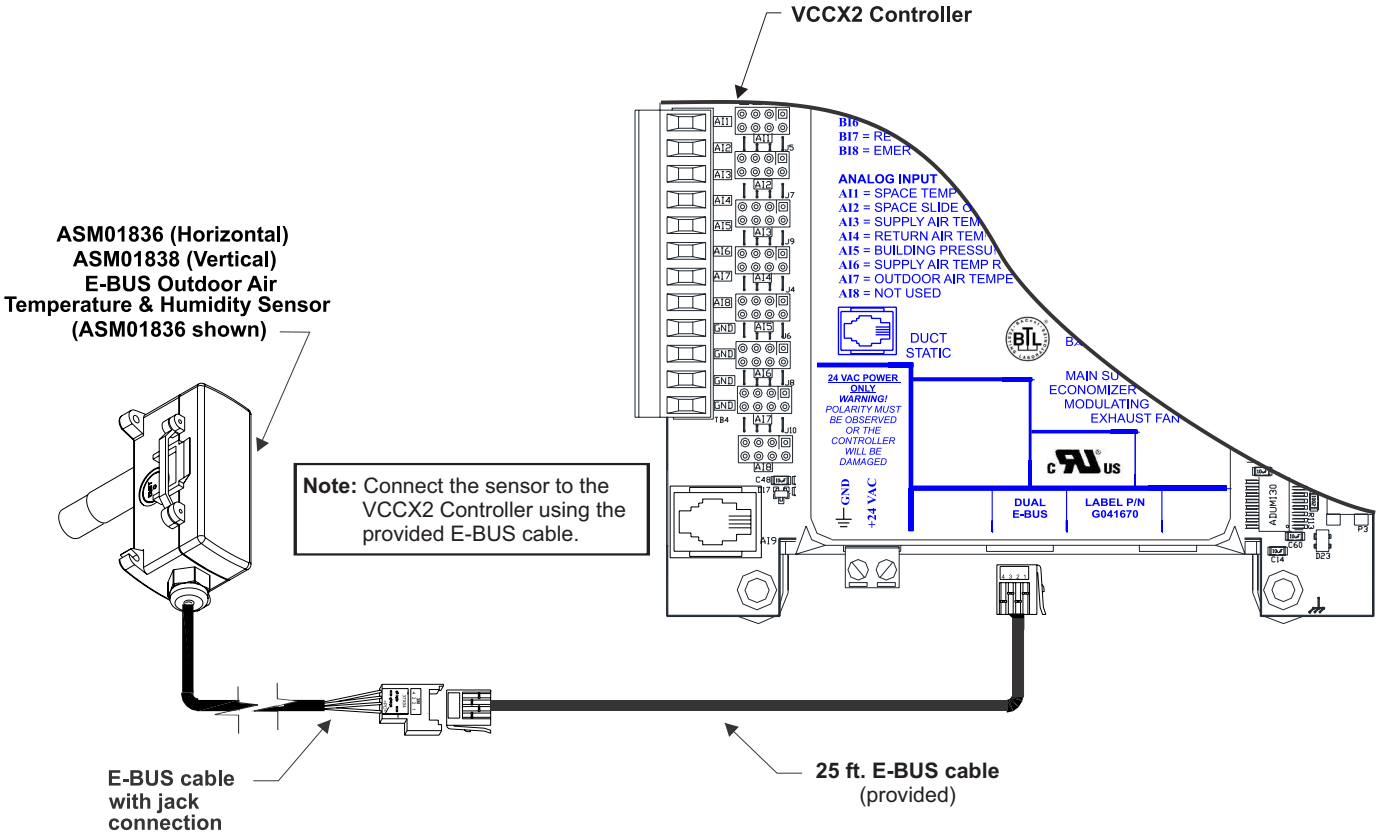


Figure 17: E-BUS Outdoor Air Temperature and Humidity Sensor Wiring

E-BUS Return Air Temperature and Humidity Sensor

The ASM01840 E-BUS Return Air Temperature and Humidity Sensor connects to the VCCX2 Controller. A 50 ft. E-BUS cable (provided) plugs into the sensor's attached 3 ft. cable and then plugs into the E-BUS port of the VCCX2 Controller or other E-BUS expansion board. See **Figure 18, this page,** for details.

CAUTION: Be sure to mount the sensor in the upright position, in an area that is not exposed to direct sunlight, and is protected from the elements. 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 or E-BUS adapter board may be required.

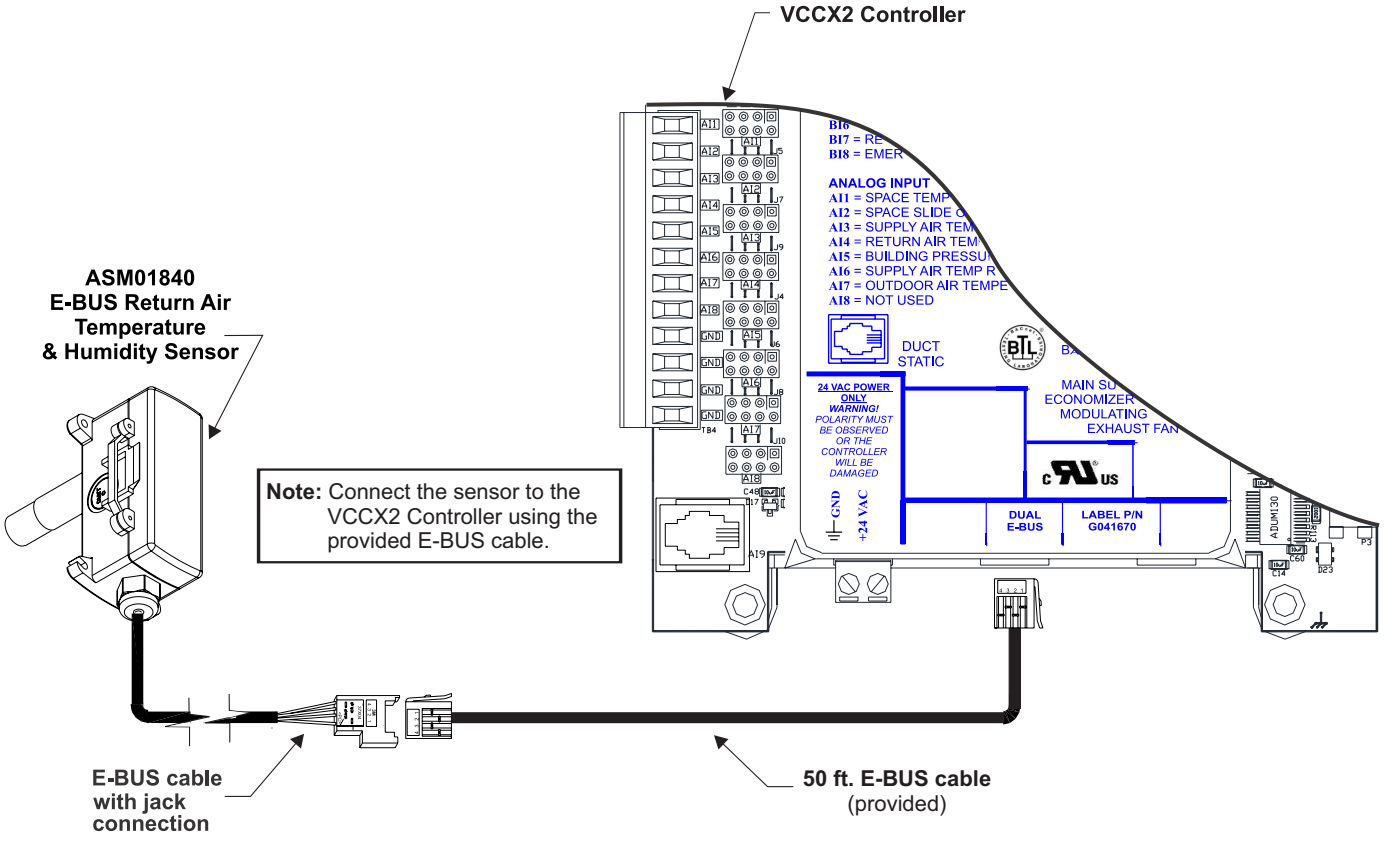


Figure 18: E-BUS Return Air Temperature and Humidity Sensor Wiring

Duct Static Pressure Transducer

The ASM01640 Duct Static Pressure Transducer plugs directly into the VCCX2 Controller'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, zone damper actuator or bypass damper actuator. If the HVAC unit is configured for CAV operation, this sensor is optional. If it is installed on a CAV unit, it will not affect operation, but rather will be used as a status-only reading. See **Figure 19, this page,** for detailed wiring.

CAUTION: AAON strongly recommends using pneumatic tubing instead of relocating the sensor. Extending the wires could cause voltage drop problems.

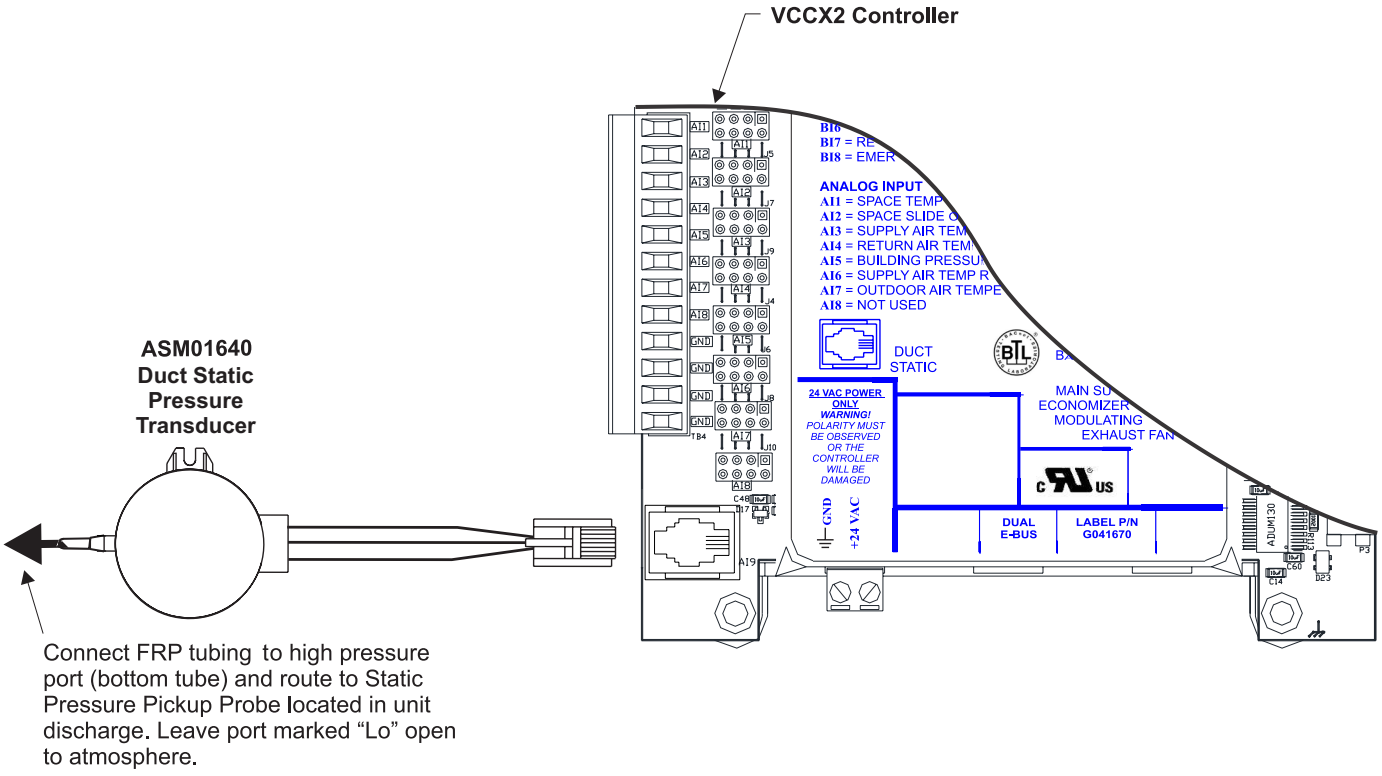


Figure 19: Static Pressure Transducer Wiring

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 Analog Output 1 (AO1) on the VCCX2 Controller. This signal output can be connected to either:

- The Supply Fan VFD to modulate the supply fan speed;
- A Bypass Damper for zoning applications.

See **Figure 20, this page,** for detailed wiring.

CAUTION: VFD units can 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 VFD and the HVAC unit electrical wiring.

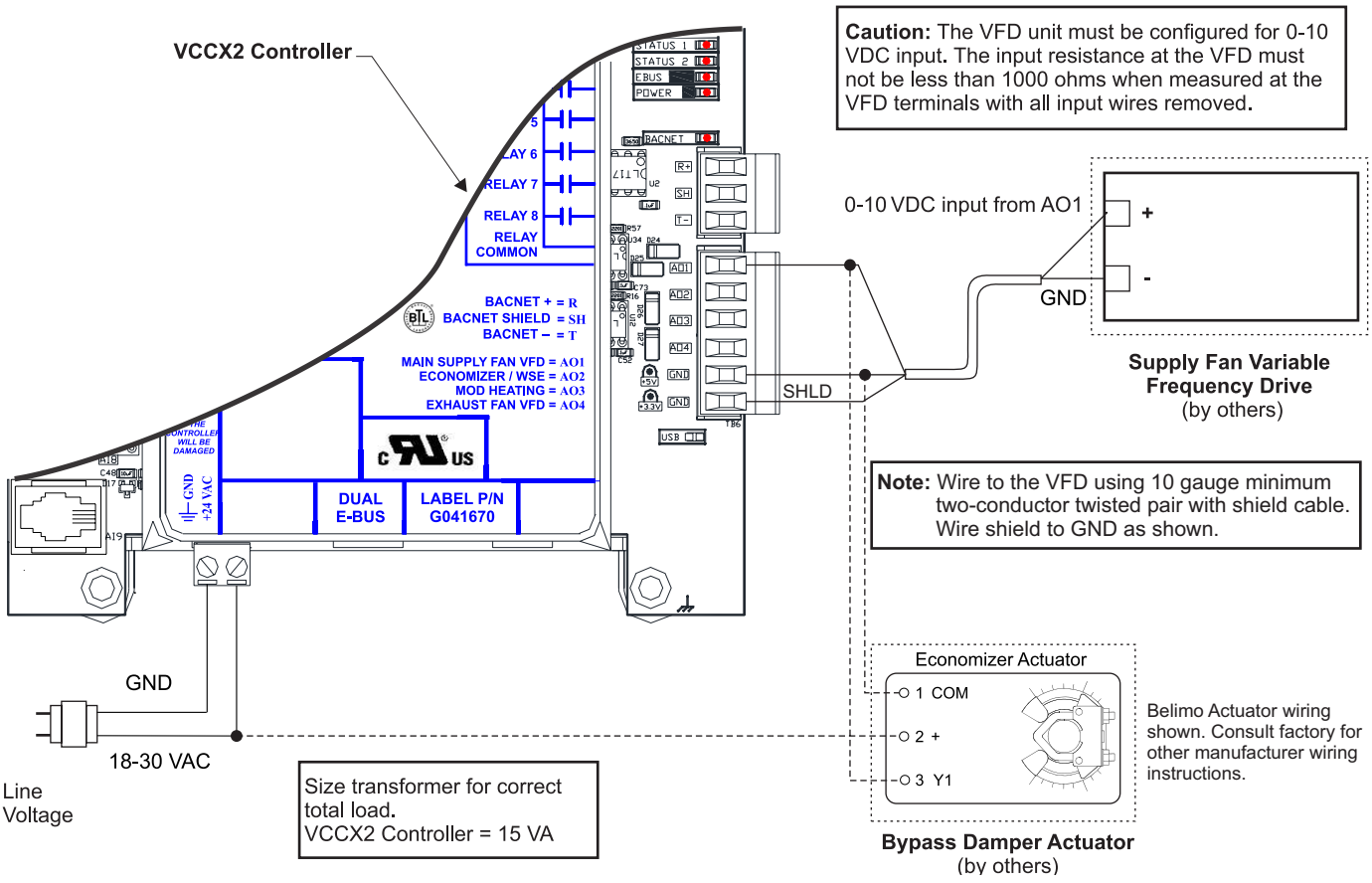


Figure 20: Supply Fan VFD Wiring

Economizer Damper Actuator or Waterside Economizer Actuator

Economizer Damper Actuator

The economizer damper actuator signal voltage output, using AO2 is user-adjustable, but must be set to 2-10 VDC for this application. This signal output is used by the VCCX2 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. See **Figure 21, this page,** for detailed wiring.

WARNING: It is 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 VCCX2 Controller.

Waterside Economizer Valve

The waterside economizer valve must be wired as shown in **Figure 21, this page,** for proper operation. The waterside economizer valve connects to AO2 on the VCCX2 Controller.

Waterside Economizer Bypass Valve

The waterside economizer bypass valve must be wired to AO2 on the RSMD. See the *RSMD Technical Guide* for more information.

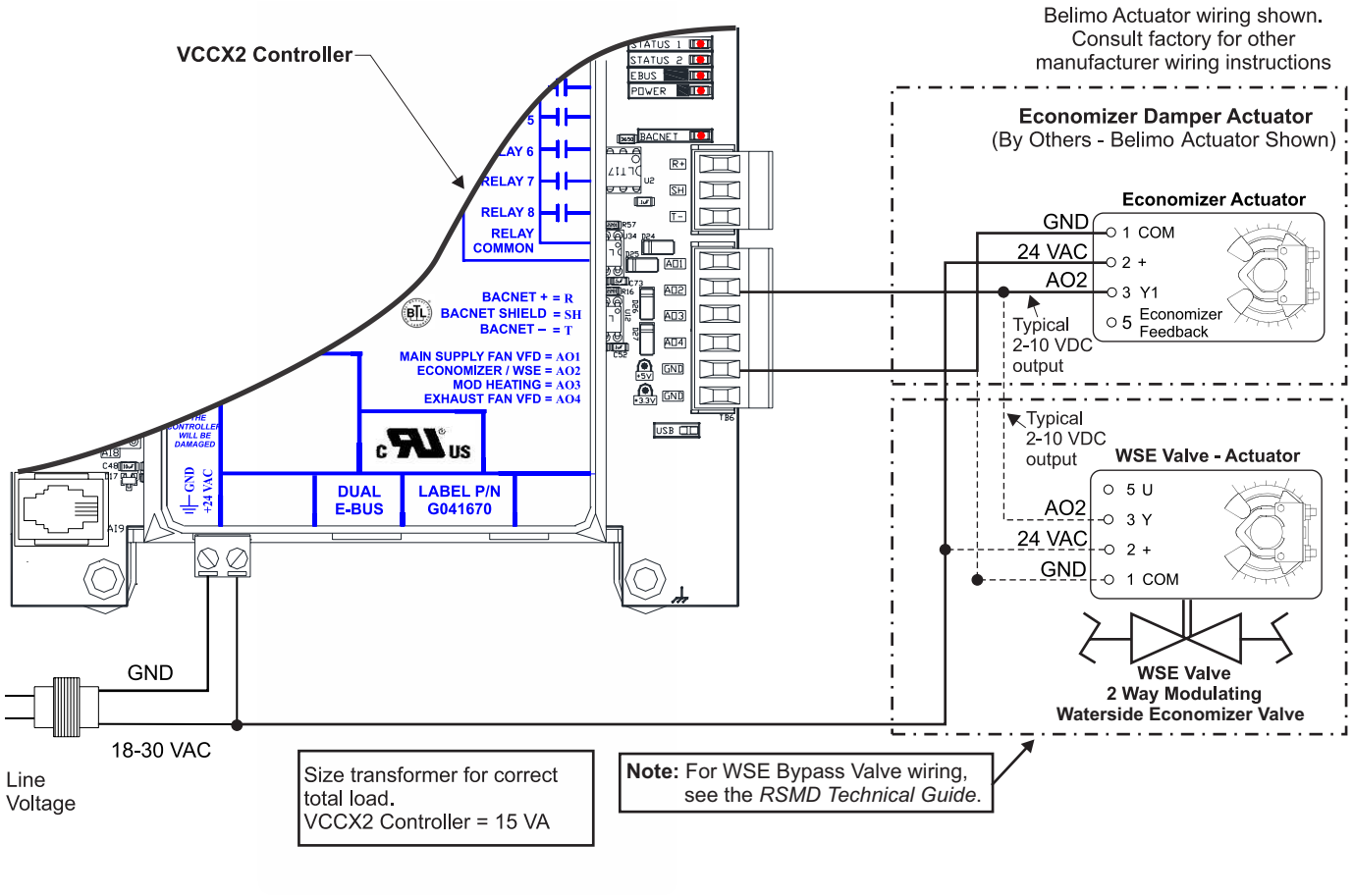


Figure 21: Economizer Damper Actuator or Waterside Economizer Actuator Wiring

Modulating Heating Device

The Modulating Heating Device signal voltage output is a user-adjustable signal with a range of 0-10 VDC from AO3 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 22, this page,** 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 VCCX2 Controller.

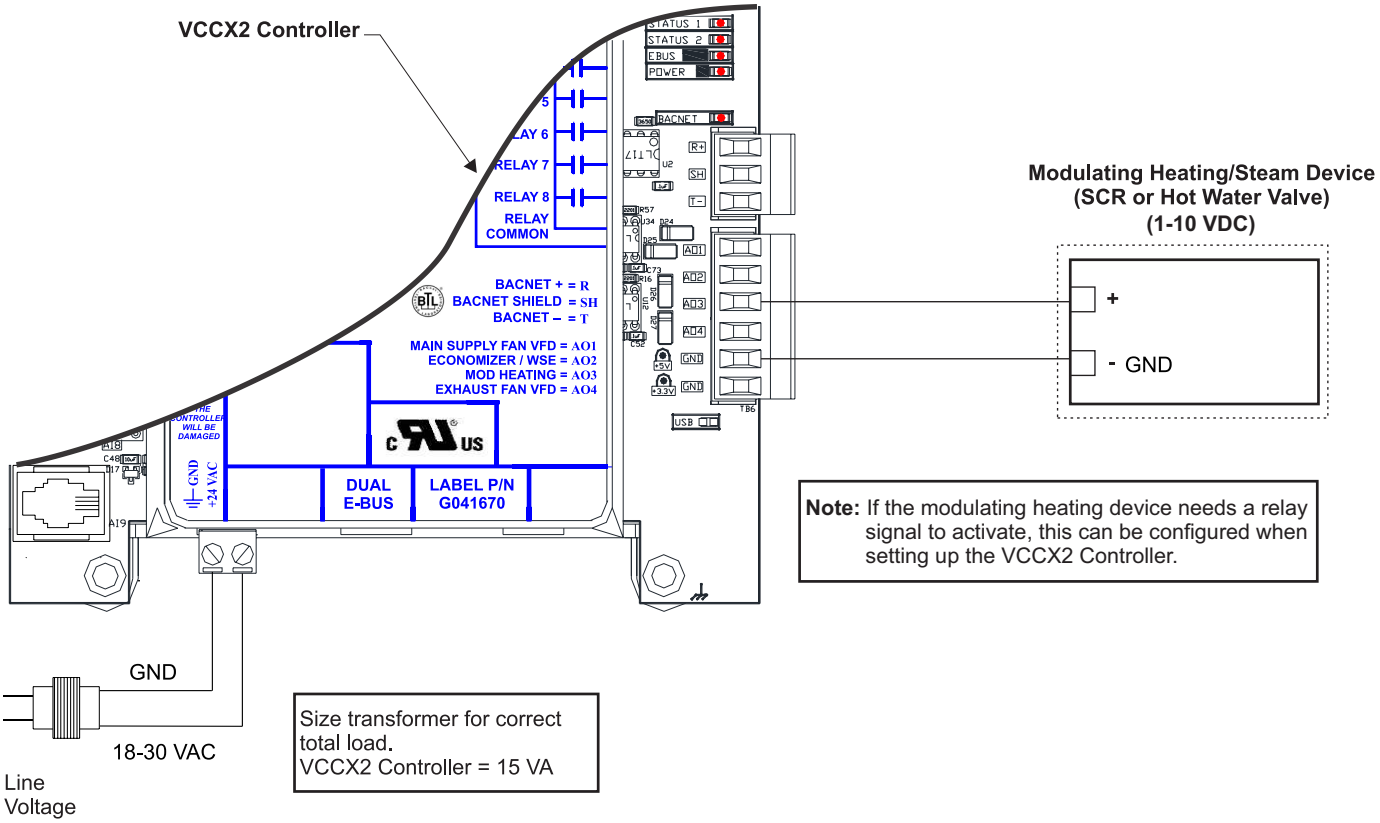


Figure 22: Modulating Heating Device Wiring

Building Pressure Control Outputs

Building Pressure Control Output

The Building Pressure Control Output is a 0-10 VDC or 2-10 VDC signal sent from the VCCX2 Controller. 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 VFD 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 23, this page,** 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 outdoor air damper or supply fan VFD would be used.

When using the outside air damper for reverse building pressure control, the output signal must be configured for reverse acting operation. A Building Pressure Sensor connected to AI5 on the VCCX2 Controller 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.

CAUTION: VFD 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 VFD and the HVAC unit electrical wiring.

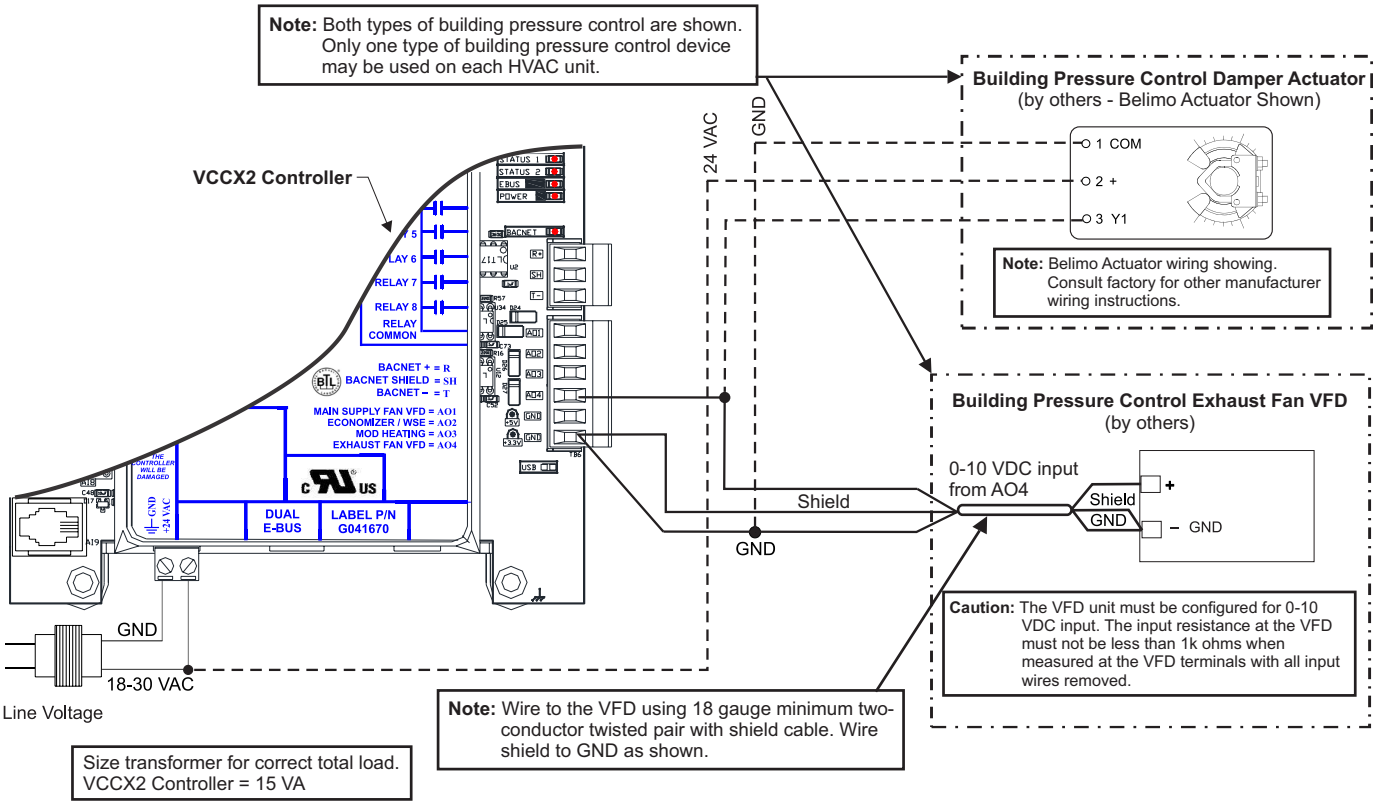


Figure 23: Building Pressure Control Output Wiring

VCC-X EM1 Expansion Module

The VCC-X EM1 Expansion Module connects to the VCCX2 Controller with an E-BUS cable and adds an additional: five analog inputs, five analog outputs, three binary inputs, and five configurable relay outputs.

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

Entering Water Temperature Sensor

The Entering Water Temperature Sensor is a 10K ohm Type III Thermistor Sensor. The Entering Water Temperature Sensor should be mounted in the entering water piping.

Return Air Plenum Pressure Sensor

The ASM01832 Return Air Plenum Pressure Sensor (also used as a Building Static Pressure Sensor, as shown on **page 33**) must be wired as shown in **Figure 24, this page**. There are three terminal connections on the pressure sensor. Connect 24 VAC to the terminal labeled "+ EXC." Connect the GND terminal on the EM1 Expansion Module terminal block to the terminal labeled "- COM." Connect the remaining terminal labeled "OUT" to SIG1 on the EM1.

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 VCCX2 Controller or Return Air Plenum Pressure Sensor.

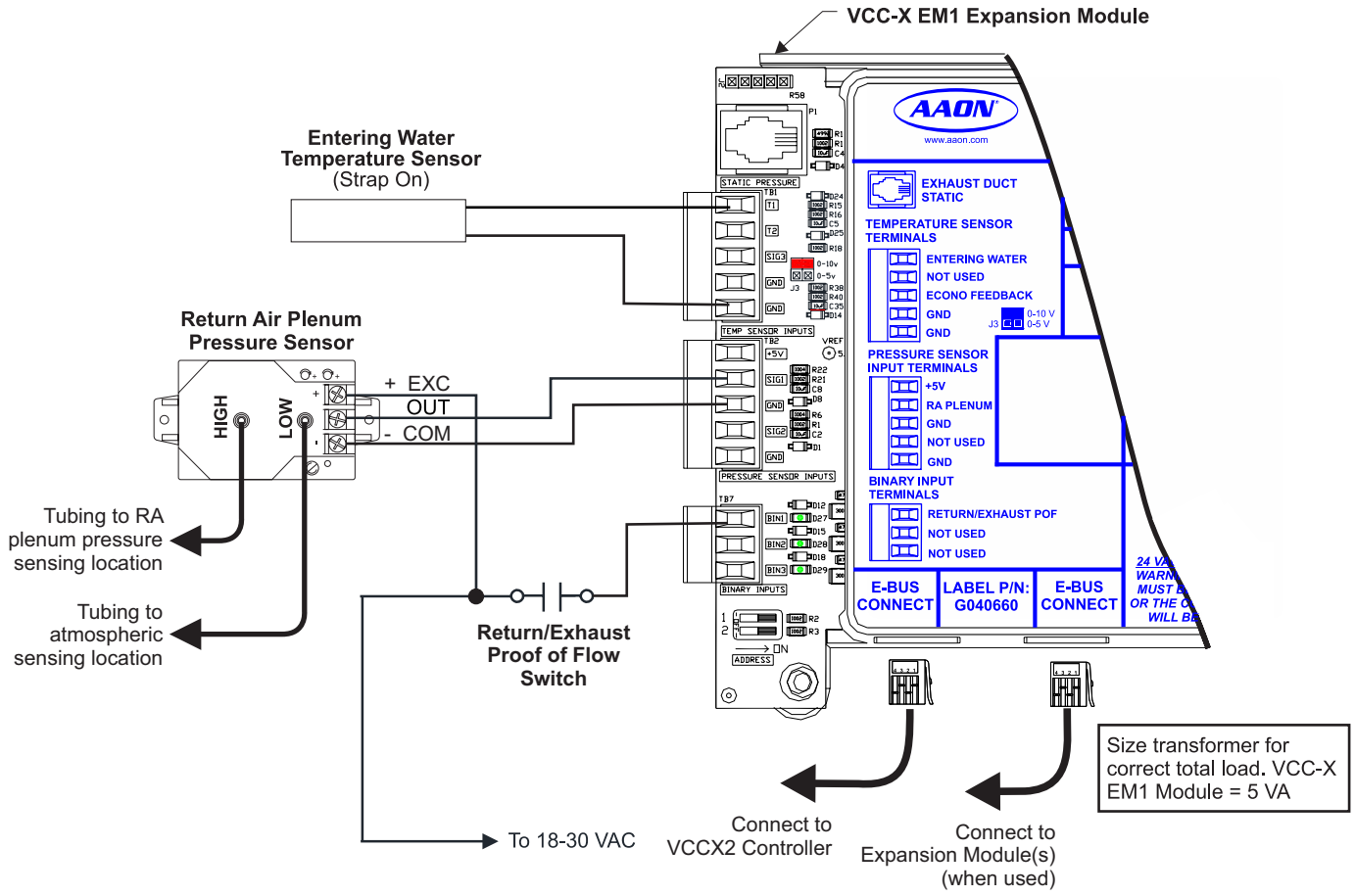


Figure 24: Entering Water Temperature Sensor, Return Air Plenum Pressure and Return/Exhaust Proof of Flow

Entering Water Temperature Sensor

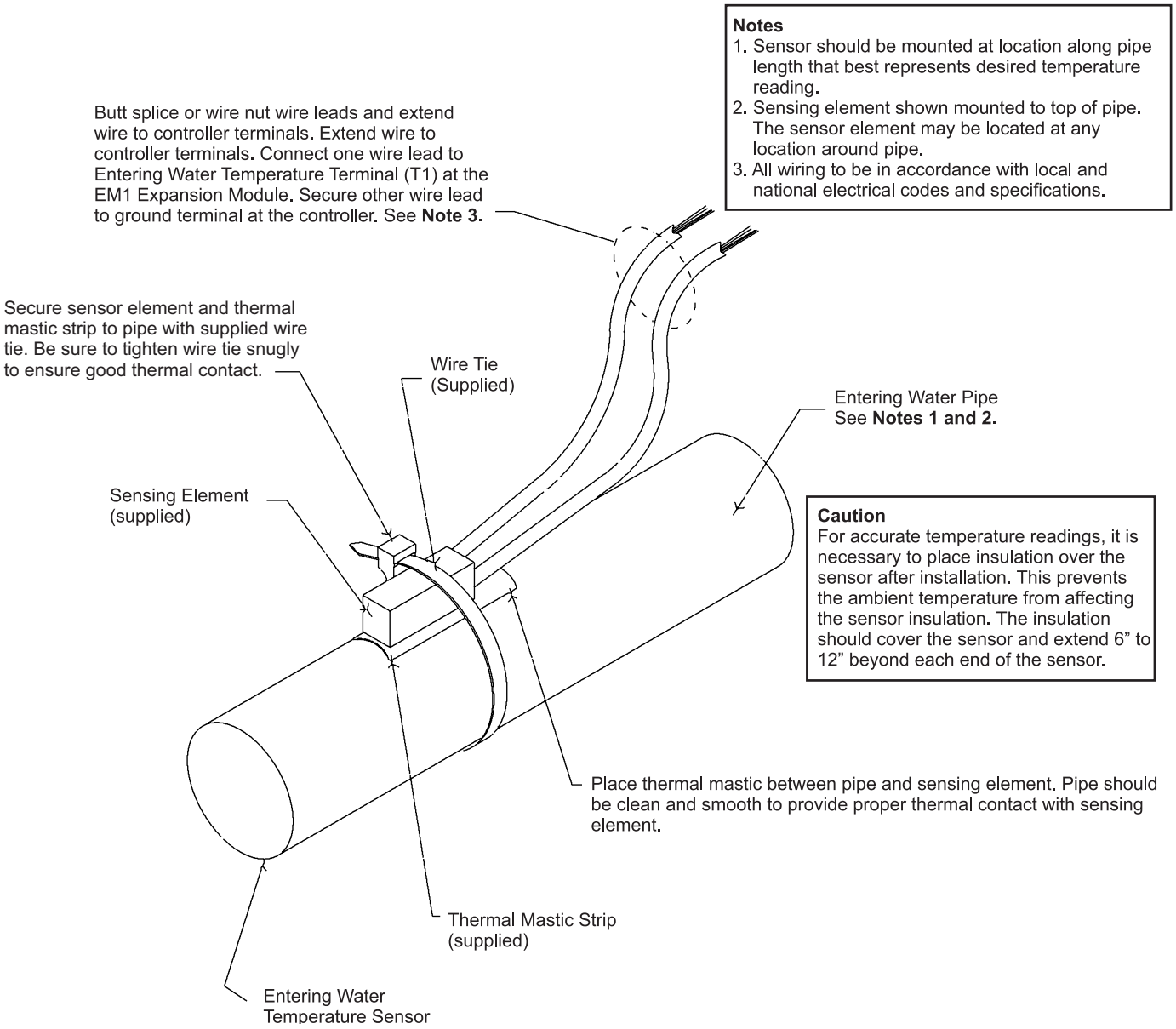


Figure 25: Entering Water Temperature Sensor

Exhaust Duct Static Pressure Sensor

The ASM01640 Exhaust Duct Static Pressure Sensor plugs directly into the EM1's static pressure port. The Duct Static Pressure Sensor reading is used to determine current exhaust duct static pressure. This static pressure reading is used to control the output signal (AO4 on the VCCX2 Controller) supplied to the exhaust fan VFD. See **Figure 26, this page,** for wiring.

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 VCC-X EM1's SIG3 input. The jumper should be set to 0-10 VDC. See **Figure 26, this page,** for wiring.

WARNING: Observe polarity! All boards must be wired with GND-to-GND and 24 VAC-to-24 VAC. Failure to observe polarity will result in damage to one or more of the boards. Expansion modules must be wired in such a way that the expansion modules and the 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.

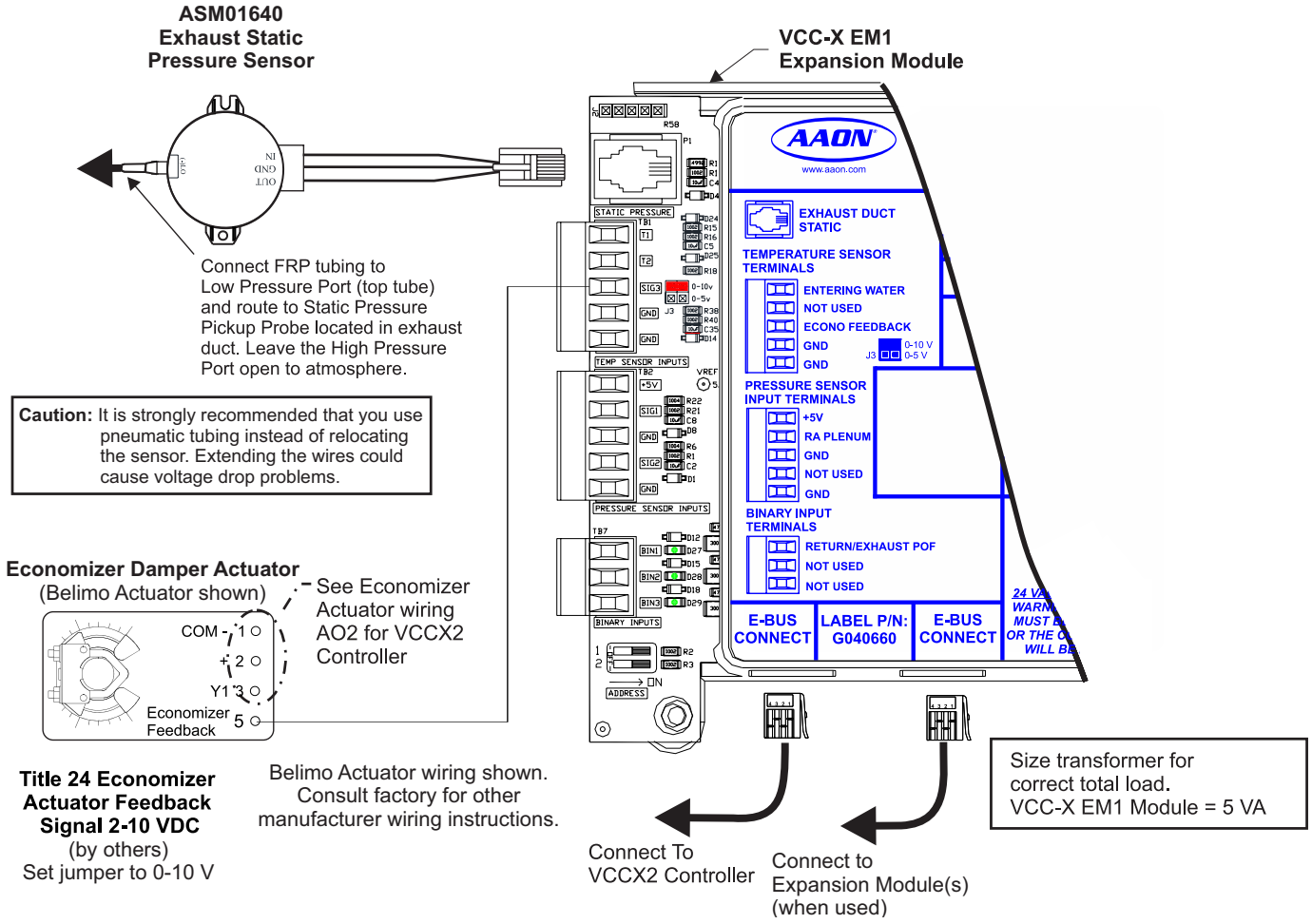


Figure 26: VCC-X EM1 Exhaust Duct Static Pressure and Economizer Actuator Feedback Wiring

VCC-X EM1 Expansion Module Outputs

The VCC-X EM1 Expansion Module must be connected to 24 VAC as shown in the wiring diagram below. Please see **Table 1, page 24,** for correct VA requirements to use when sizing the transformer(s) used for powering the expansion module.

Also, please note that when wiring the VCC-X EM1 Expansion Module, its contacts must be wired as wet contacts (connected to 24 VAC).

See **Figure 27, this page,** for output wiring.

WARNING: Observe polarity! All boards must be wired with GND-to-GND and 24 VAC-to-24 VAC. Failure to observe polarity will result in damage to one or more of the boards. Expansion modules must be wired in such a way that the expansion modules and the 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.

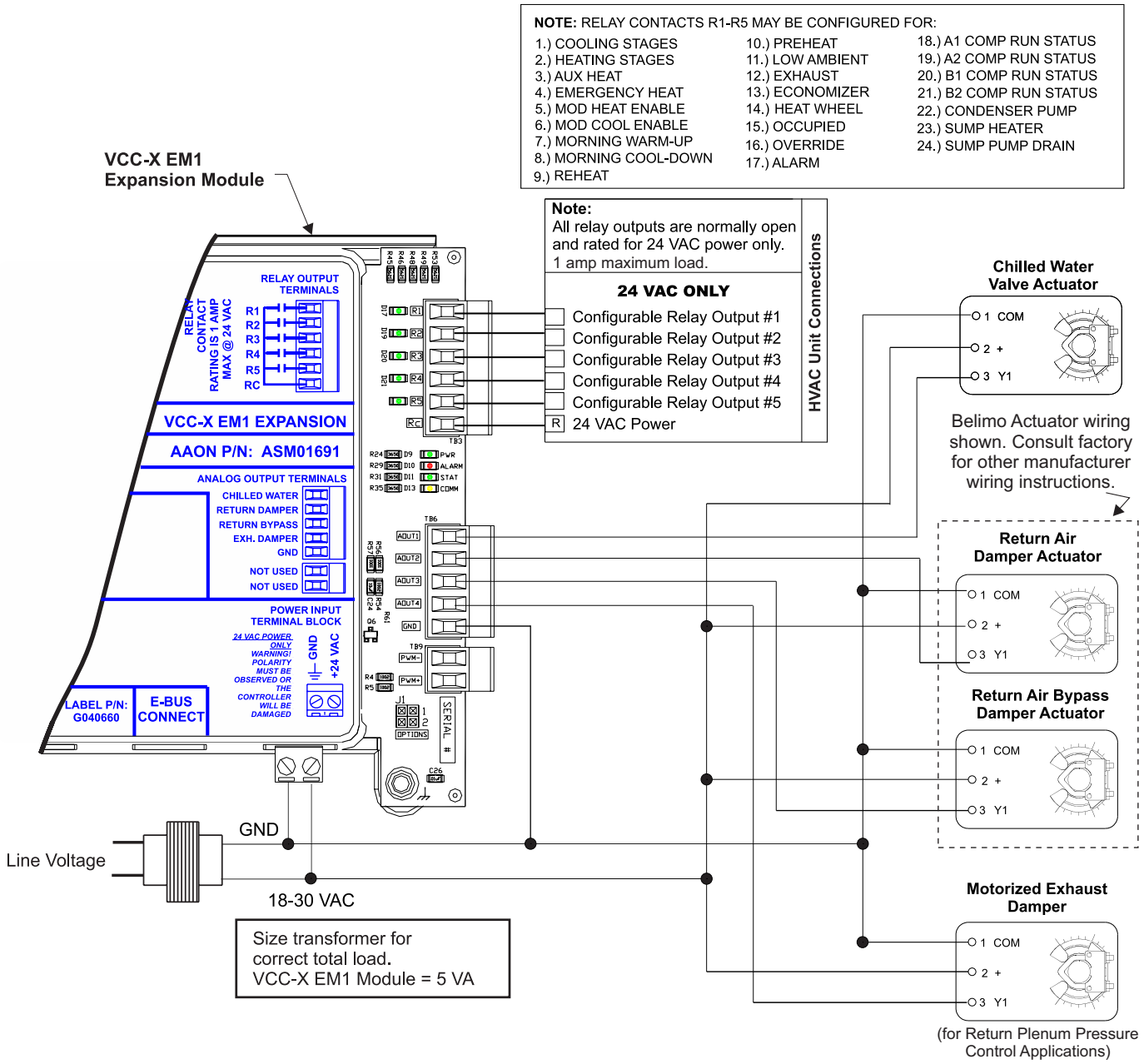


Figure 27: VCC-X EM1 Expansion Module Output Wiring

Modulating Cooling Output

This output is used to control a modulating chilled water valve to maintain the Cooling Supply Air Temperature Setpoint. The output is configured for 2-10 VDC direct acting operation. See **Figure 28, this page,** for wiring details.

WARNING: Observe polarity! All boards must be wired with GND-to-GND and 24 VAC-to-24 VAC. Failure to observe polarity will result in damage to one or more of the boards. Expansion modules must be wired in such a way that the expansion modules and the 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.

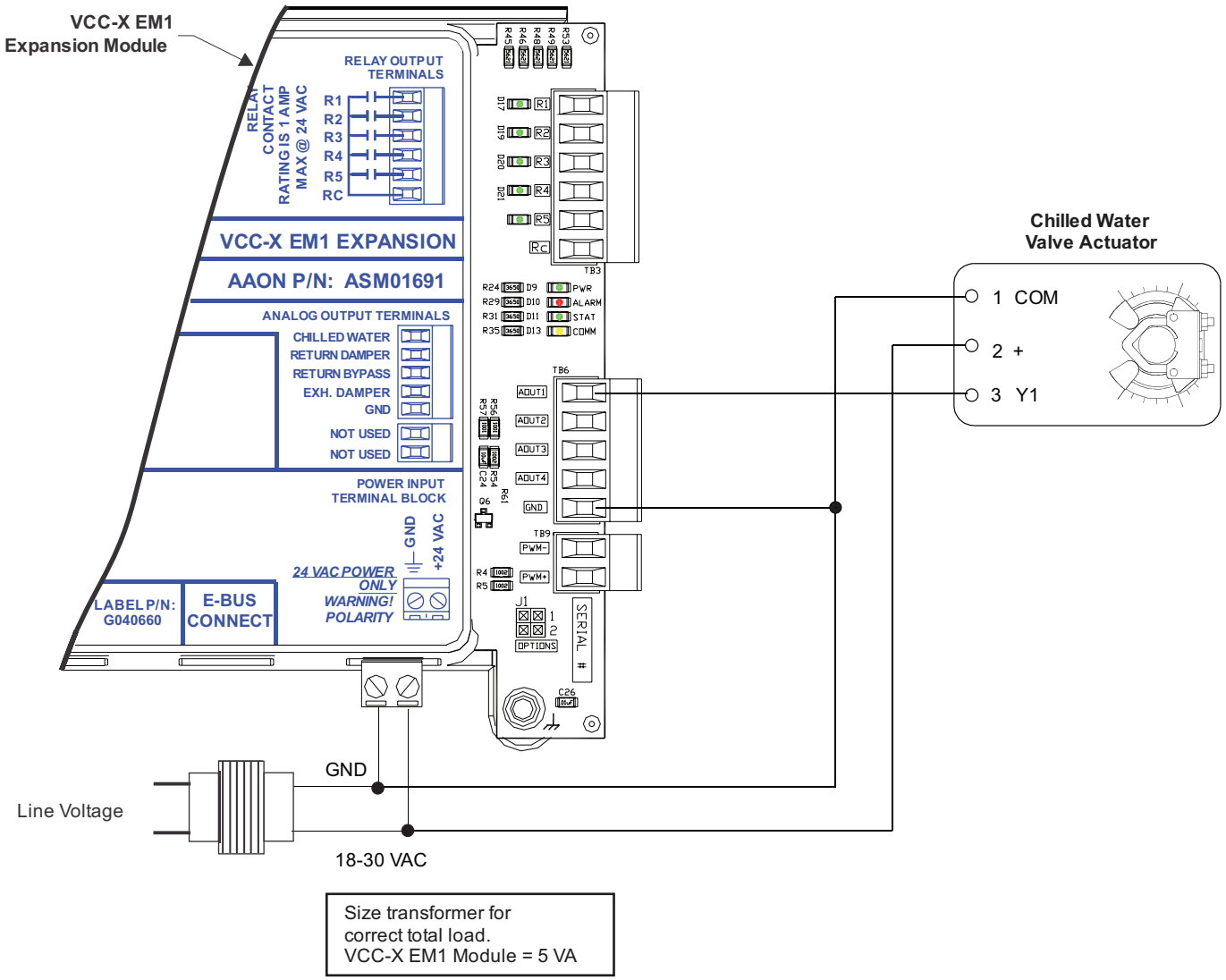


Figure 28: Chilled Water Valve Actuator Wiring

Return Air Bypass

The VCCX2 Controller can be configured for AAON Return Air Bypass applications. These provide improved moisture removal capabilities while utilizing internal space loads for reheat by redirecting return air around the evaporator coil instead of through the coil. See the **AAON Return Air Bypass** application section of this manual on **page 10** for complete operation details.

The AAON Return Air Bypass application utilizes a return air bypass damper actuator and a return air damper actuator to modulate the return air and return air bypass dampers to control the amount of air that is redirected around the evaporator coil.

The output is configured for 2-10 VDC direct acting operation. See **Figure 29, this page,** for detailed wiring of the return air bypass and return air damper actuators.

WARNING: Observe polarity! All boards must be wired with GND-to-GND and 24 VAC-to-24 VAC. Failure to observe polarity will result in damage to one or more of the boards. Expansion modules must be wired in such a way that the expansion modules and the 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.

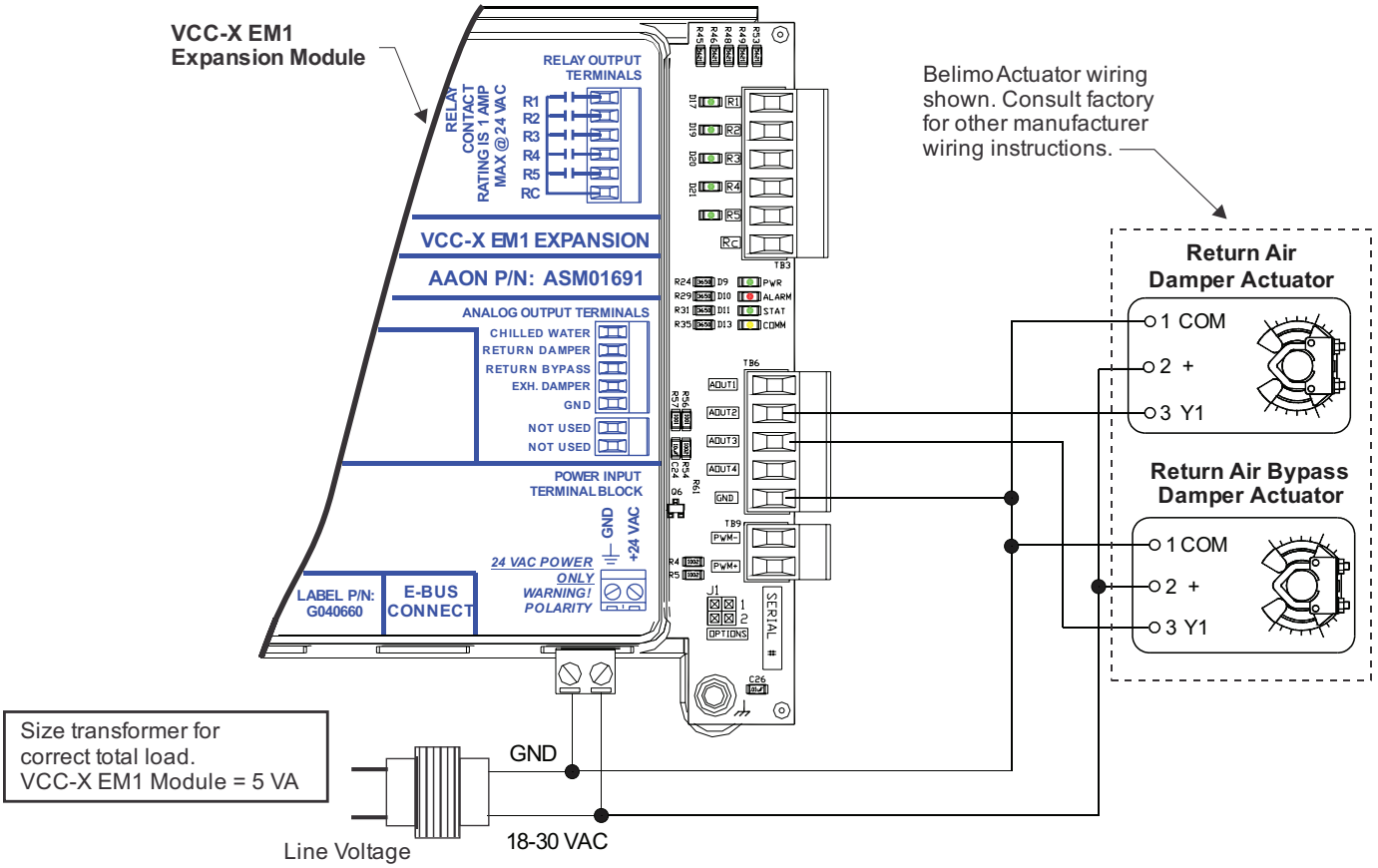


Figure 29: Return Air Bypass Wiring

12 Relay E-BUS Expansion Module

The ASM01873 12 Relay E-BUS Expansion Module provides for 12 dry contact configurable relay outputs. See **Figure 30, this page,** for complete wiring details.

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

WARNING: Observe polarity! All boards must be wired with GND-to-GND and 24 VAC-to-24 VAC. Failure to observe polarity will result in damage to one or more of the boards. Expansion modules must be wired in such a way that the expansion modules and the 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.

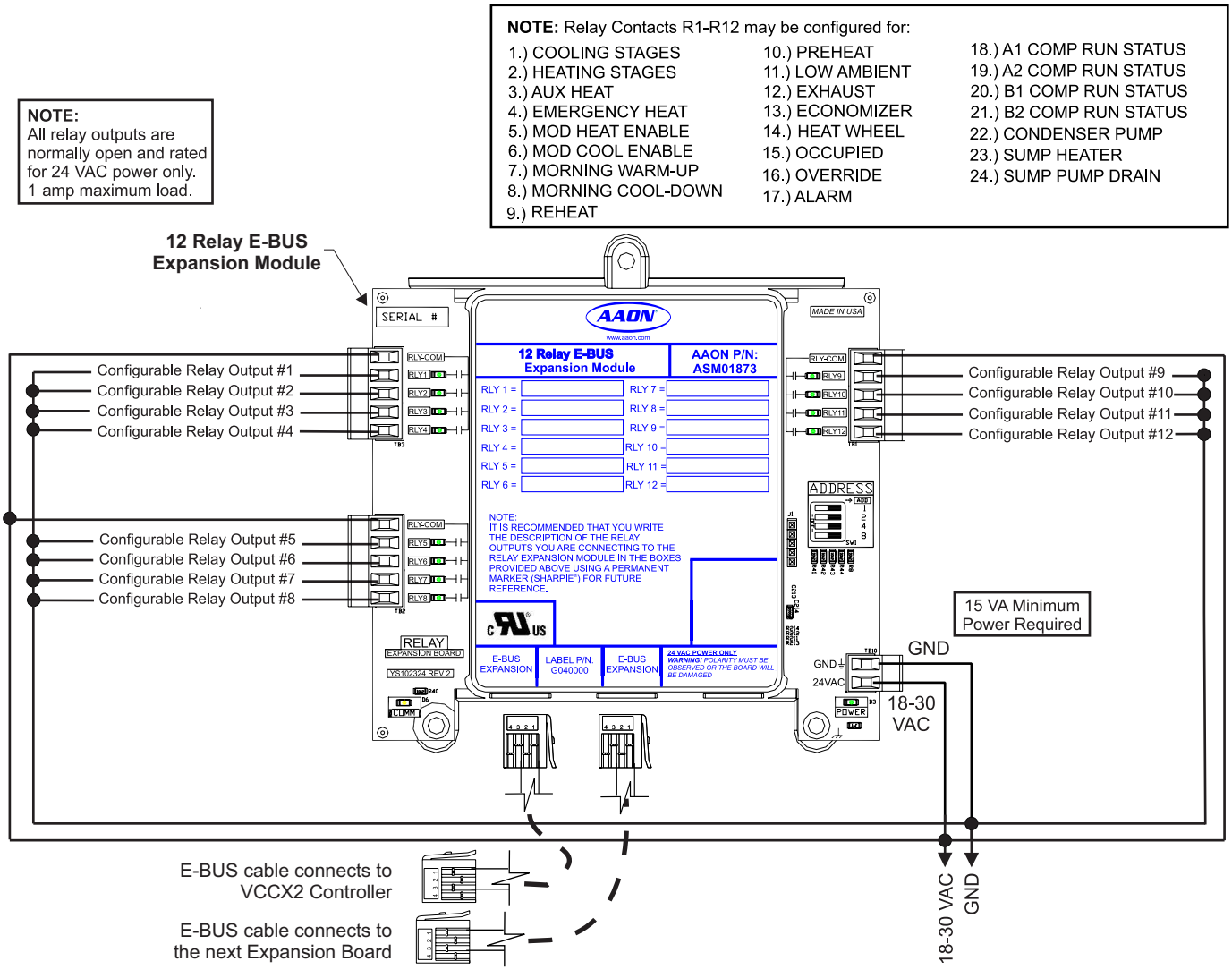


Figure 30: 12 Relay E-BUS Expansion Module Wiring

EBTRON, GreenTrol, and Paragon Airflow Measurement Digital Transmitters

The E-BUS Adapter Board attaches to the VCCX2 Controller with an E-BUS cable. The Adapter Board is used for connecting the EBTRON, GreenTrol, or Paragon Airflow Measurement Digital Transmitter to the VCCX2 Control System. Wire the irflow Measurement Digital Transmitter to the adapter board as shown in **Figure 31, this page**.

Up to four EBTRON, GreenTrol, or Paragon MicroTrans[EQ] Airflow Measurement Digital Transmitters can be attached to each Adapter Board. Only one Paragon Multi-Trans Smart Ecosystem (MTSE) can be attached.

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.

NOTE: Only the EBTRON GTC116 or HTN104 series, GreenTrol GA-200-N Module (with GF series Airflow Station), or Paragon MicroTrans[EQ] series of MODBUS RTU transmitters are compatible with the VCCX2 Controller. No other series of transmitters will work for this application. Contact AAON Controls for information on other airflow station options.

NOTE: The Airflow Station's baud rate needs to be set to 19,200 in order to communicate with the VCCX2 Controller (excludes Paragon MTSE).

NOTE: When configuring the GTC116 or HTN104 Series, be sure to set the parity to "NO PARITY, 1 STOP BIT."

NOTE: Paragon MTSE must be configured for MODBUS communication with baud rate set to 57,600 and its MODBUS ID set to "9".

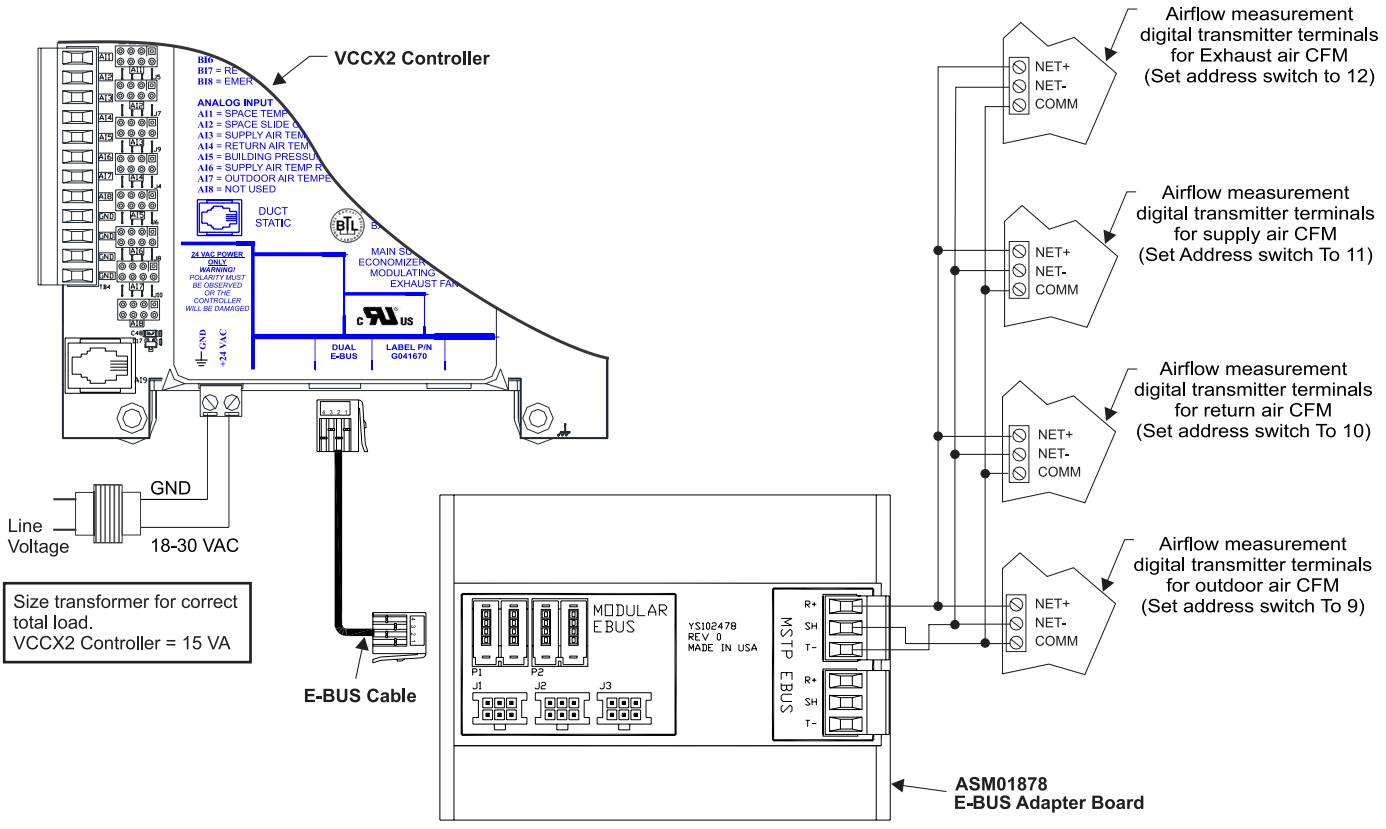


Figure 31: EBTRON GTC116 or HTN104 Series, GreenTrol GA-200-N Series, and Paragon MicroTrans[EQ] Series Airflow Measurement Digital Transmitter Wiring

Refrigerant System Module for VFD Compressors

The ASM01686 RSMV monitors and controls one tandem refrigeration circuit of the HVAC unit. The module is designed for R410-A refrigerant.

The RSMV is connected to the VCCX2 Controller. Up to four RSMV Modules can be connected, depending on the size of the system. There are two E-BUS expansion ports which allow the use of communicating sensors and E-BUS modules.

The RSMV provides four analog inputs, three binary inputs, three relays, and four analog outputs. See **Figure 32, this page,** for inputs wiring and **Figure 33, page 52,** for outputs wiring.

The RSMV provides the following:

- Modulates the compressors to satisfy the suction coil (saturated) temperature. The Suction Coil (Saturated) Temperature Setpoint is reset by the VCCX2 Controller to maintain the supply air temperature during Cooling Mode. During Dehumidification Mode, it controls the compressors to the Suction (Saturation) Temperature Setpoint.
- Modulates the condenser fan to maintain the Head Pressure Setpoint.
- Modulates the expansion valves to maintain the Superheat Setpoint.
- Provides alarms and safeties for the compressor and condenser operation.
- Provides a 2 x 8 LCD character display and four buttons that allow for status of system operation, system setpoints, system configurations, sensors, and alarms, and to change the module's address, if necessary.

WARNING: Observe polarity! All boards must be wired with GND-to-GND and 24 VAC-to-24 VAC. Failure to observe polarity will result in damage to one or more of the boards. Expansion modules must be wired in such a way that the expansion modules and the 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.

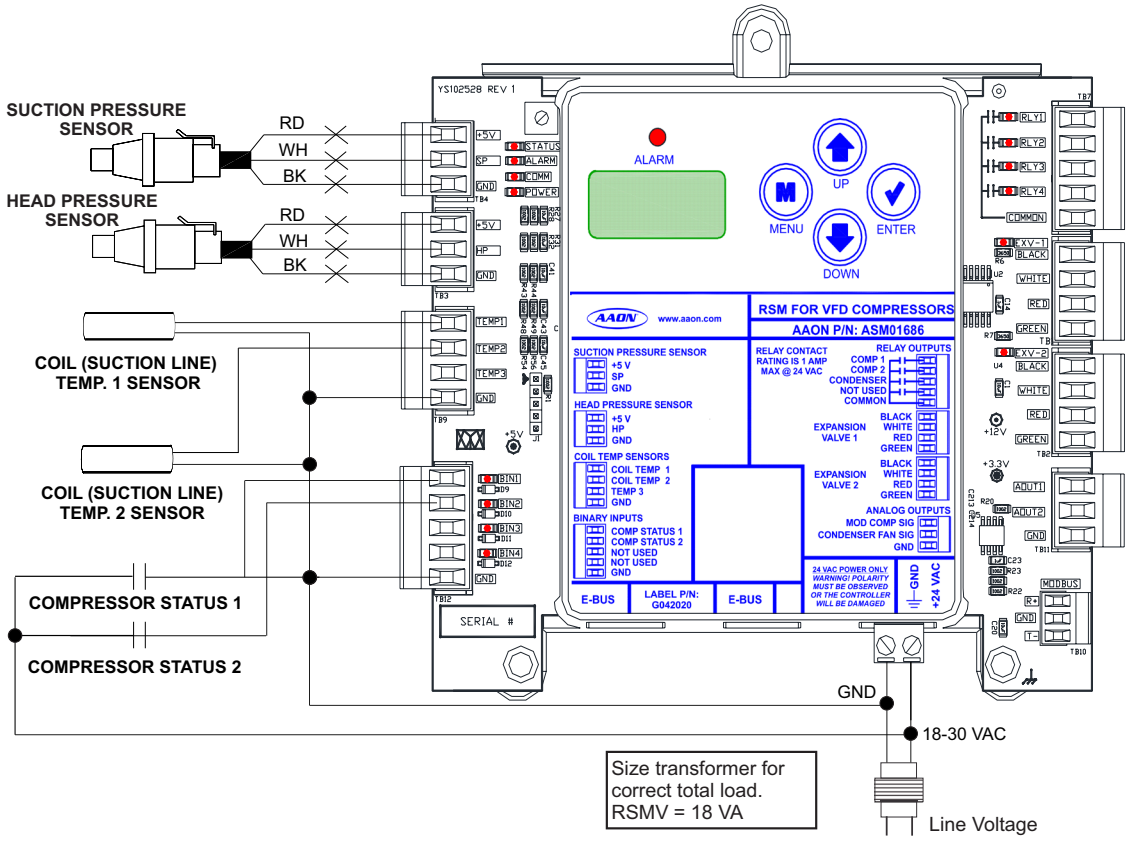


Figure 32: RSMV Inputs Wiring

Suction Pressure Transducer

The ASM02222 Suction Pressure Transducer must be wired as shown in **Figure 32, page 51**. It is required for all compressorized VCCX2 applications.

The Suction Pressure Transducer is used to measure suction pressure at the HVAC unit's direct expansion evaporator coil suction line. This suction line pressure is converted to saturated refrigerant temperature by the RSMV Module. This temperature is used by the RSMV to accurately control the expansion valves to maintain superheat. The saturated refrigerant temperature is used to properly control the compressors to maintain a given Suction Coil (Saturated) Temperature Setpoint. In Cooling and Heat Pump Mode, the VCCX2 resets the Suction Coil (Saturated) Temperature Setpoint to maintain a given Supply Air Temperature Setpoint. In Dehumidification Mode, the Suction Coil (Saturated) Temperature Setpoint is a user configurable setpoint that does not reset.

CAUTION: The Shraeder port used for installation of the Suction Pressure Transducer should be located in a vertical position of the suction line to prevent refrigerant oil from accumulating in the sensor.

Head Pressure Control

The RSMV can monitor a Head Pressure Transducer and control condenser fans to maintain a Head Pressure Setpoint. The condenser fan will be controlled with a 0-10 VDC output signal.

Coil Temperature Sensors

The Coil Temperature Sensors are used to measure coil temperature after each evaporator coil line. This temperature combined with the calculated saturated refrigerant temperature is used to calculate the superheat of each individual evaporator coil. The superheat is used to drive the expansion valves to maintain a given Superheat Setpoint.

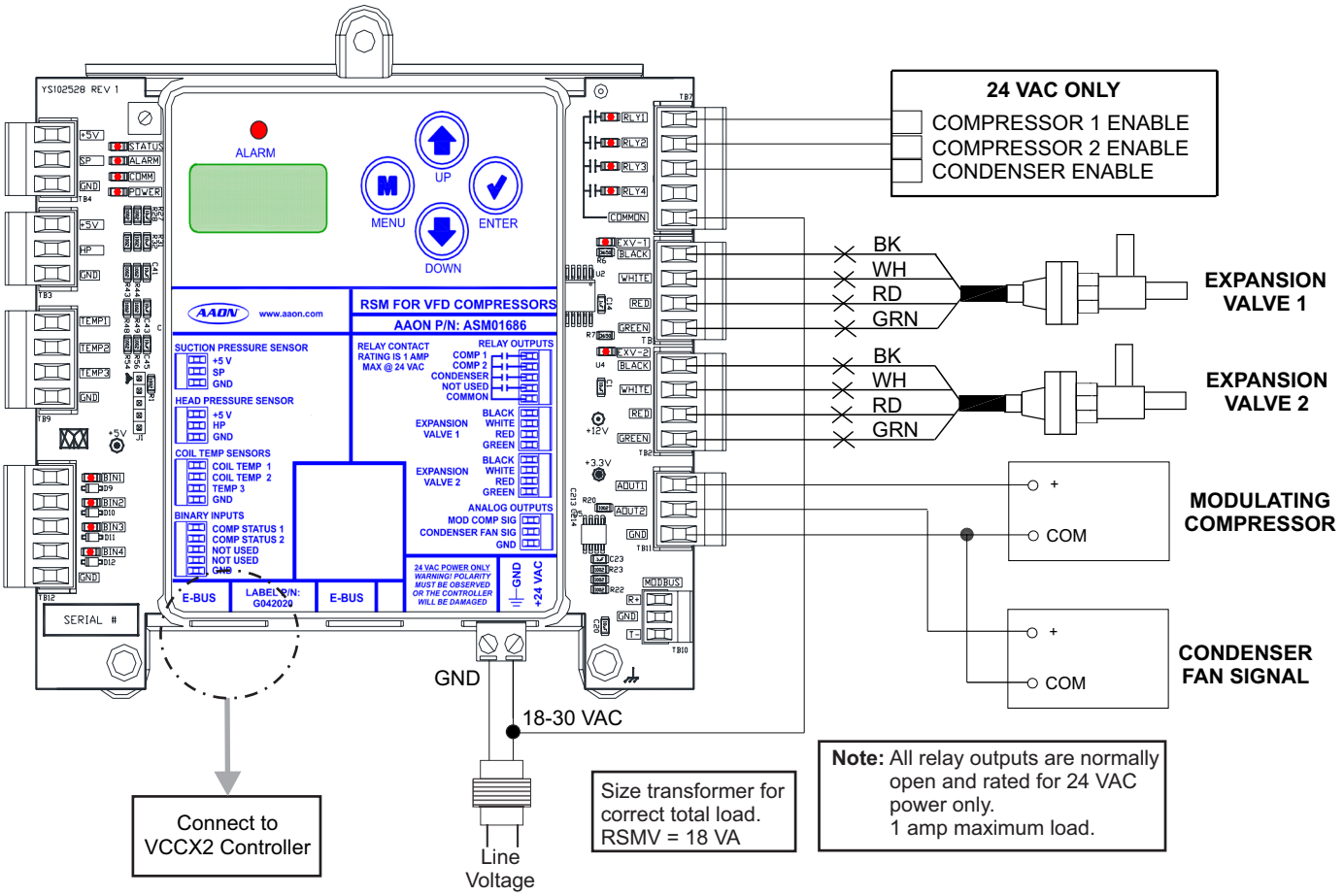


Figure 33: RSMV Outputs Wiring

Refrigerant System Module for VFD Compressors - Heat Pump

The ASM01693 RSMV-HP monitors and controls one refrigeration circuit of the HVAC unit. The module is designed for R410-A refrigerant.

The RSMV-HP is connected to the VCCX2 Controller. Up to four RSMV-HP Modules can be connected, depending on the size of the system. There are two E-BUS Expansion Ports which allow the use of communicating sensors and E-BUS modules.

The RSMV-HP provides six analog inputs, four binary inputs, four relays, and two analog outputs. See **Figure 34, this page**, for inputs wiring and **Figure 35, page 54,** for outputs wiring.

Suction Pressure Transducer

The ASM02222 Suction Pressure Transducer must be wired as shown in **Figure 34, this page**. It is required for all compressorized VCCX2 applications.

WARNING: Observe polarity! All boards must be wired with GND-to-GND and 24 VAC-to-24 VAC. Failure to observe polarity will result in damage to one or more of the boards. Expansion modules must be wired in such a way that the expansion modules and the 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.

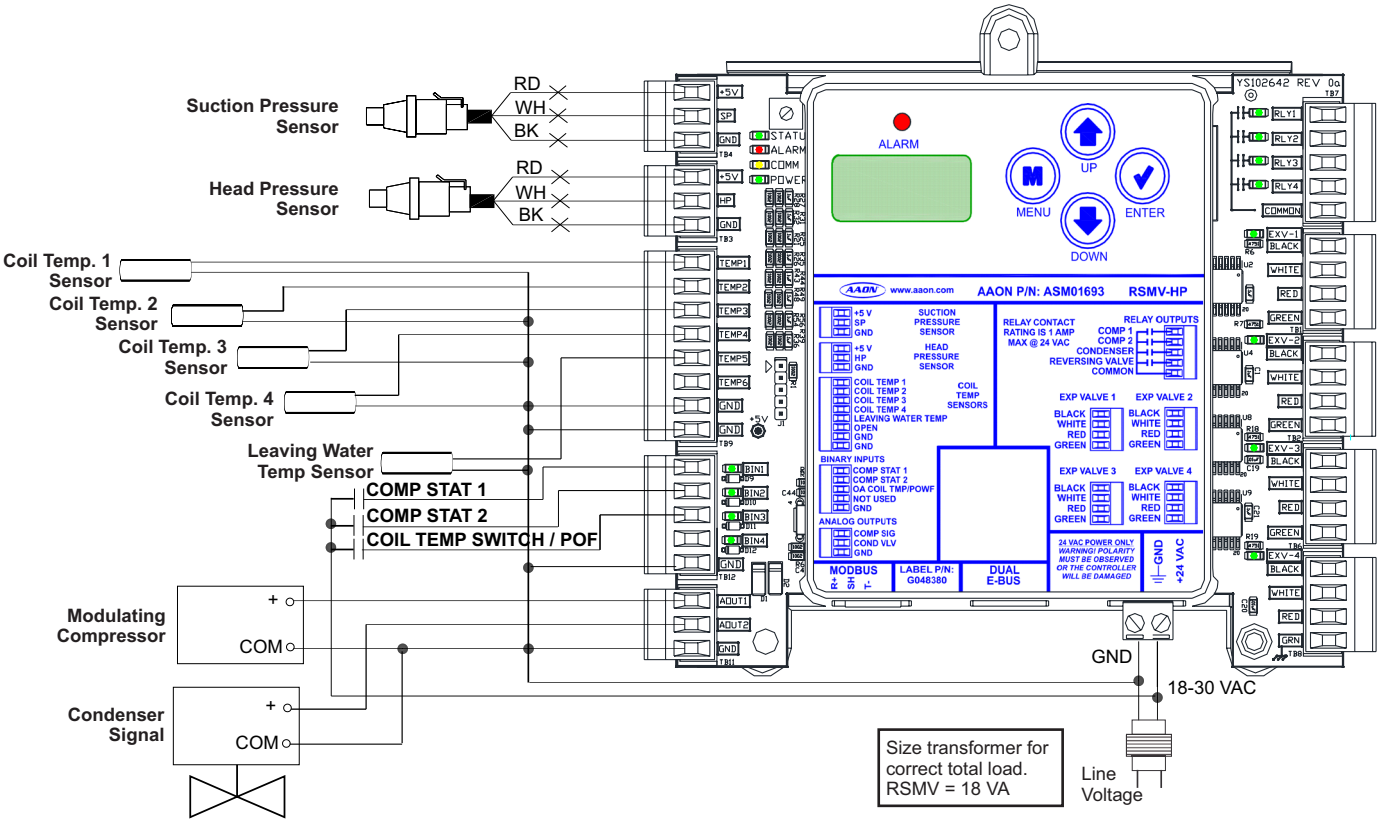


Figure 34: RSMV-HP Inputs Wiring

RSMV-HP Outputs

CAUTION: The Shraeder port used for installation of the Suction Pressure Transducer should be located in a vertical position of the suction line to prevent refrigerant oil from accumulating in the sensor.

NOTE: If there are two compressors on a single circuit (a tandem circuit), Suction Pressure 2, Head Pressure 2, and Condenser Signal 2 would not be used.

Head Pressure Control

The RSMV-HP can monitor a Head Pressure Transducer and control condenser fans to maintain a Head Pressure Setpoint. The condenser fan will be controlled with a 0-10 VDC output signal. Head pressure control can also be used to modulate the water valve when configured as a water source heat pump. The water valve signal is 2-10 VDC.

Coil Temperature Sensors

The Coil Temperature Sensors are used to measure coil temperature after each evaporator coil line. This temperature combined with the calculated saturated refrigerant temperature is used to calculate the superheat of each individual evaporator coil. The superheat is used to drive the expansion valves to maintain a given Superheat Setpoint.

Leaving Water Temperature Sensor

The Leaving Water Temperature Sensor is used to measure the leaving water temperature when used on a watersource heat pump unit.

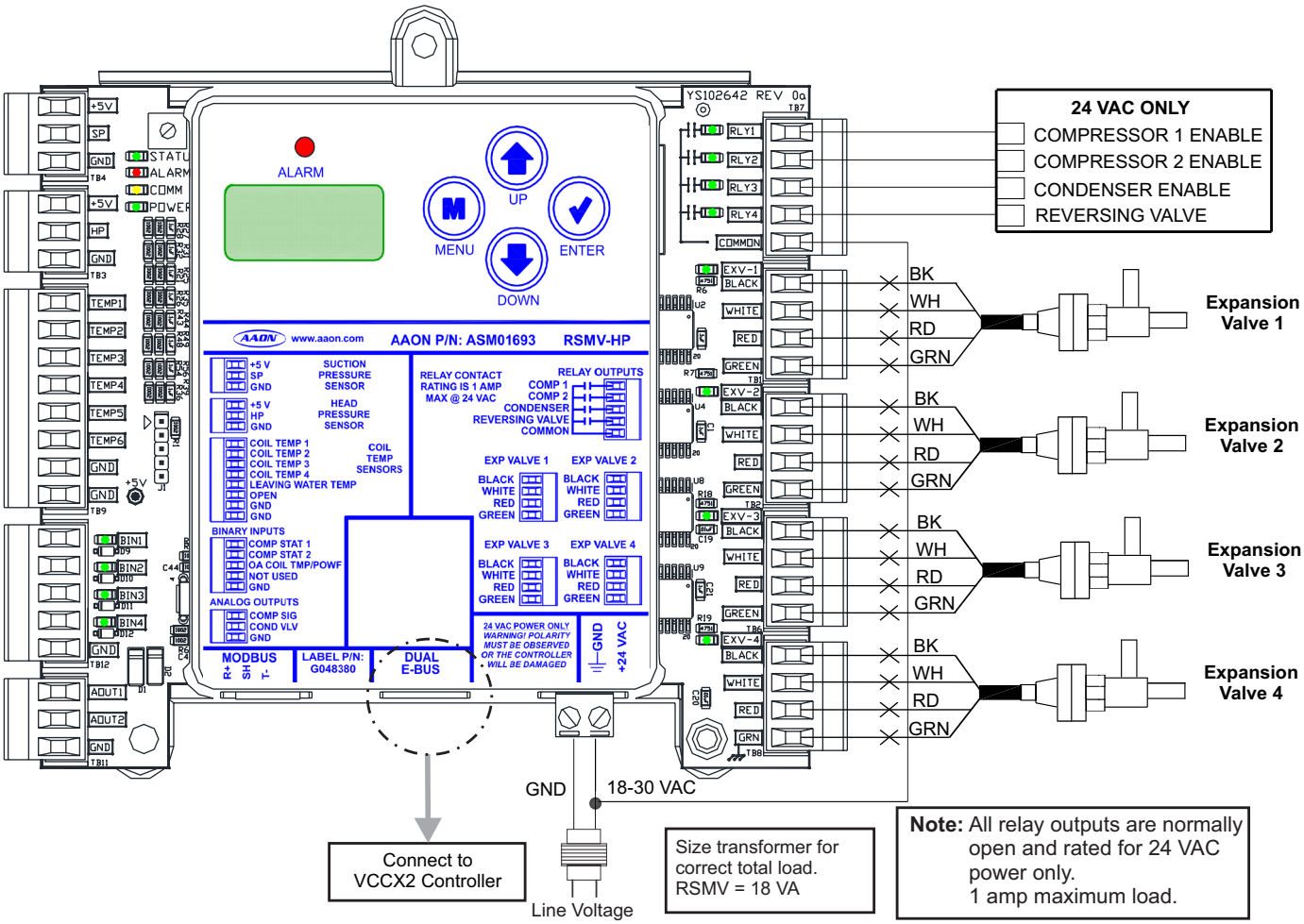


Figure 35: RSMV-HP Outputs Wiring

Refrigerant System Module for Digital Compressors

The ASM02201 RSMD can monitor and control up to two compressors and condensers. The compressors can be in either a tandem or non-tandem configuration. The module is designed for R410-A refrigerant.

The RSMD is connected to the VCCX2 Controller. Up to four RSMD Modules can be connected, depending on the size of the system. There are two E-BUS expansion ports which allow the use of communicating sensors and E-BUS Modules.

The RSMD provides three analog inputs, four binary inputs, five relays, and two analog outputs. See **Figure 36, this page**, for inputs wiring and **Figure 37, page 56,** for outputs wiring.

Suction Pressure Transducer

The ASM02222 Suction Pressure Transducers must be wired as shown in **Figure 36, this page**. It is typically required for all VCCX2 applications.

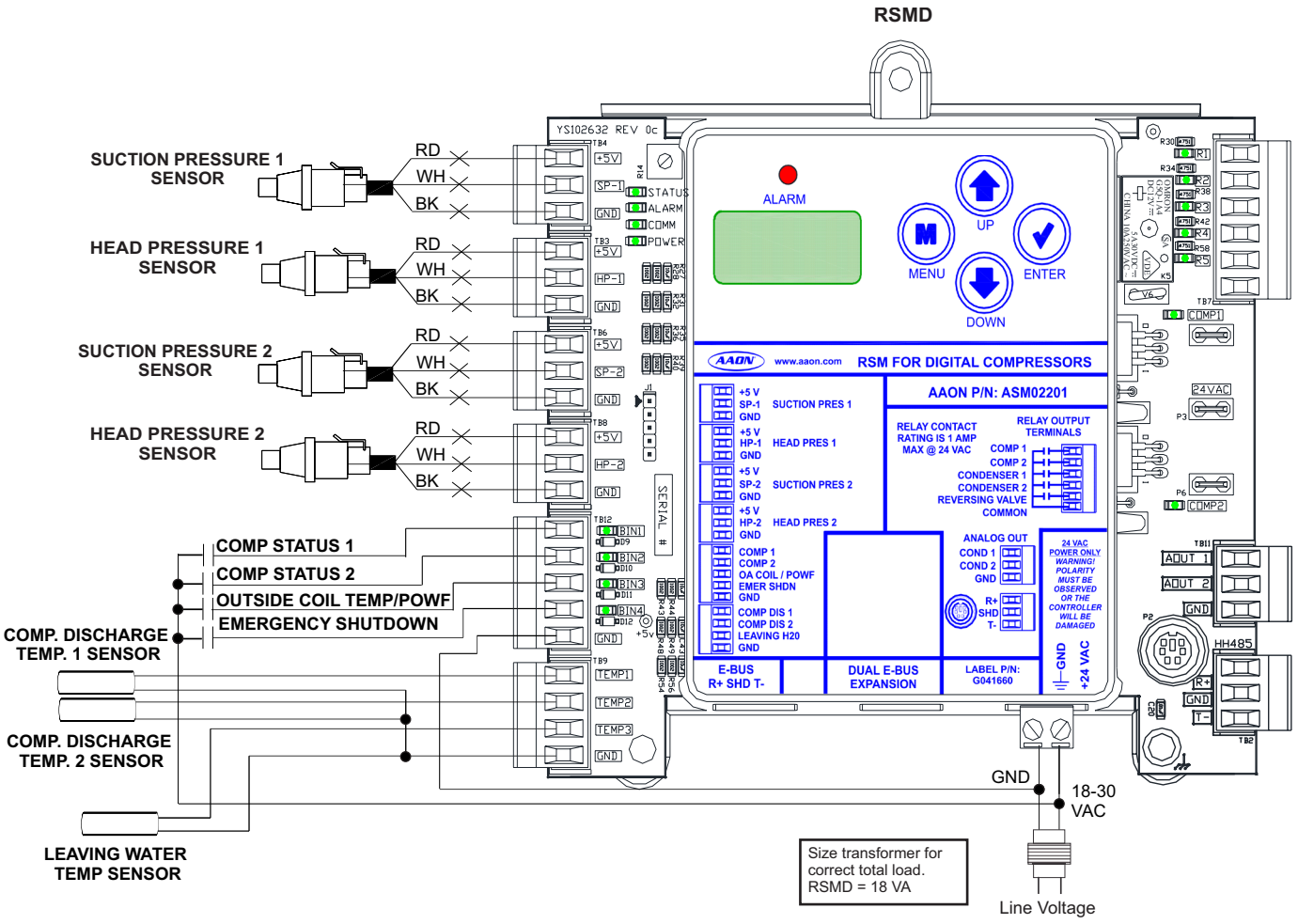


Figure 36: RSMD Inputs Wiring

RSMD Outputs

CAUTION: The Shraeder port used for installation of the Suction Pressure Transducer should be located in a vertical position of the suction line to prevent refrigerant oil from accumulating in the sensor.

NOTE: If there are two compressors on a single circuit (a tandem circuit), Suction Pressure 2, Head Pressure 2, and Condenser Signal 2 would not be used.

Head Pressure Control

The Head Pressure Transducers are used to measure head pressure at the discharge line. This head pressure is used to drive the condenser fans with a 0-10 VDC output signal to maintain a given Head Pressure Setpoint.

Compressor Discharge Temperature Sensor

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

Leaving Water Temperature Sensor

The Leaving Water Temperature Sensor is used to measure the leaving water temperature when used on a watersource heat pump unit.

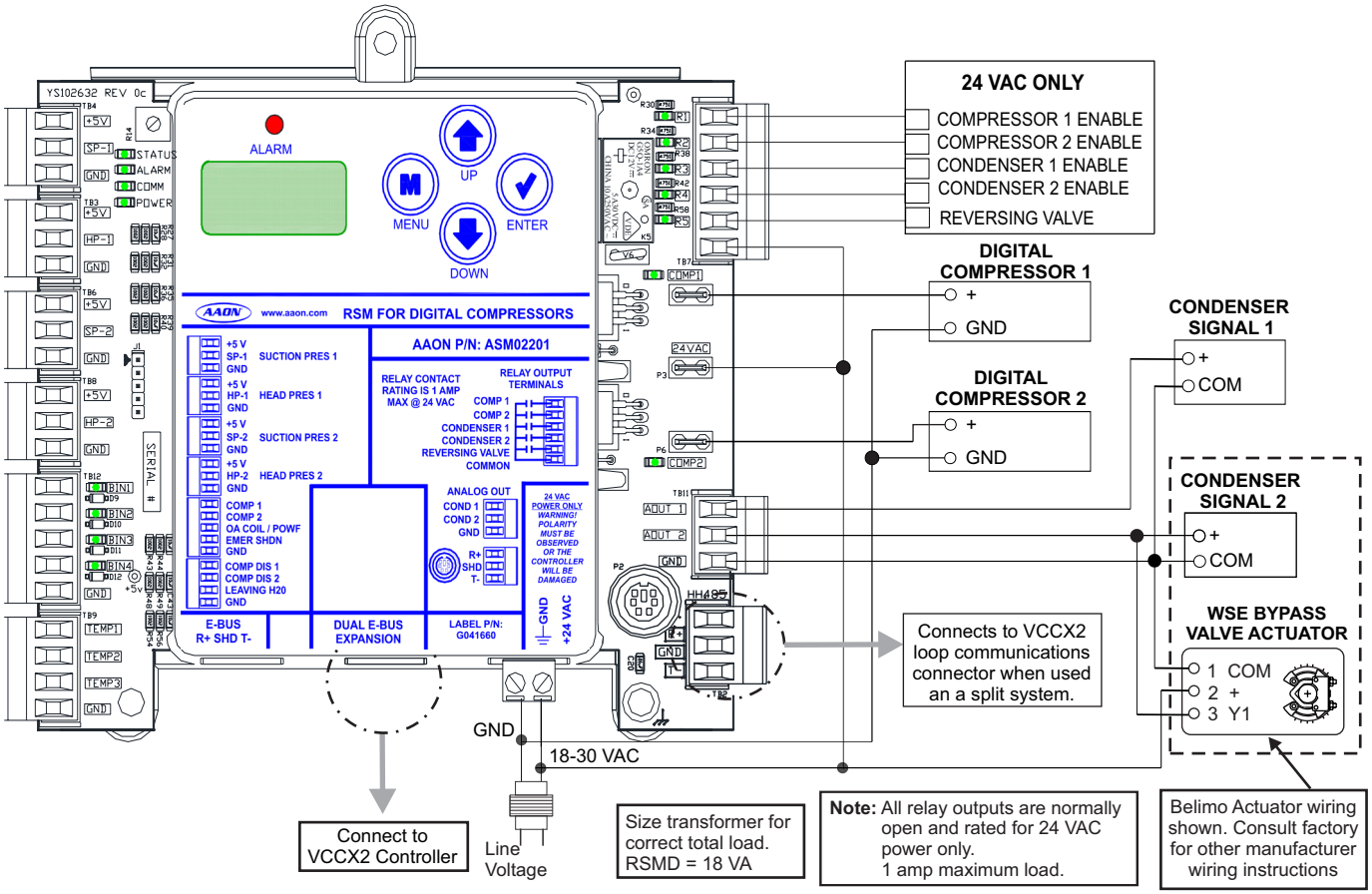


Figure 37: RSMD Outputs Wiring

RSMZ Inputs Wiring

The RSMZ monitors and controls one refrigeration circuit of the HVAC unit. The RSMZ is used on RZ units and on RN-E units with Danfoss compressors. The module is designed for R410-A refrigerant.

The RSMZ is connected to the VCCX2 Controller. Three or six RSMZ Modules can be connected, depending on the size of the system. There are two E-BUS expansion ports which allow the use of communicating sensors and E-BUS modules. There is a MODBUS terminal block which allows wiring to the Reheat Expansion Module or VFD Compressor.

See **Important Wiring Considerations, page 24,** for power source requirements. When wiring the RSMZ Module, its relay outputs must be wired as wet contacts (connected to 24 VAC). See **Figure 38, this page,** for input wiring.

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.

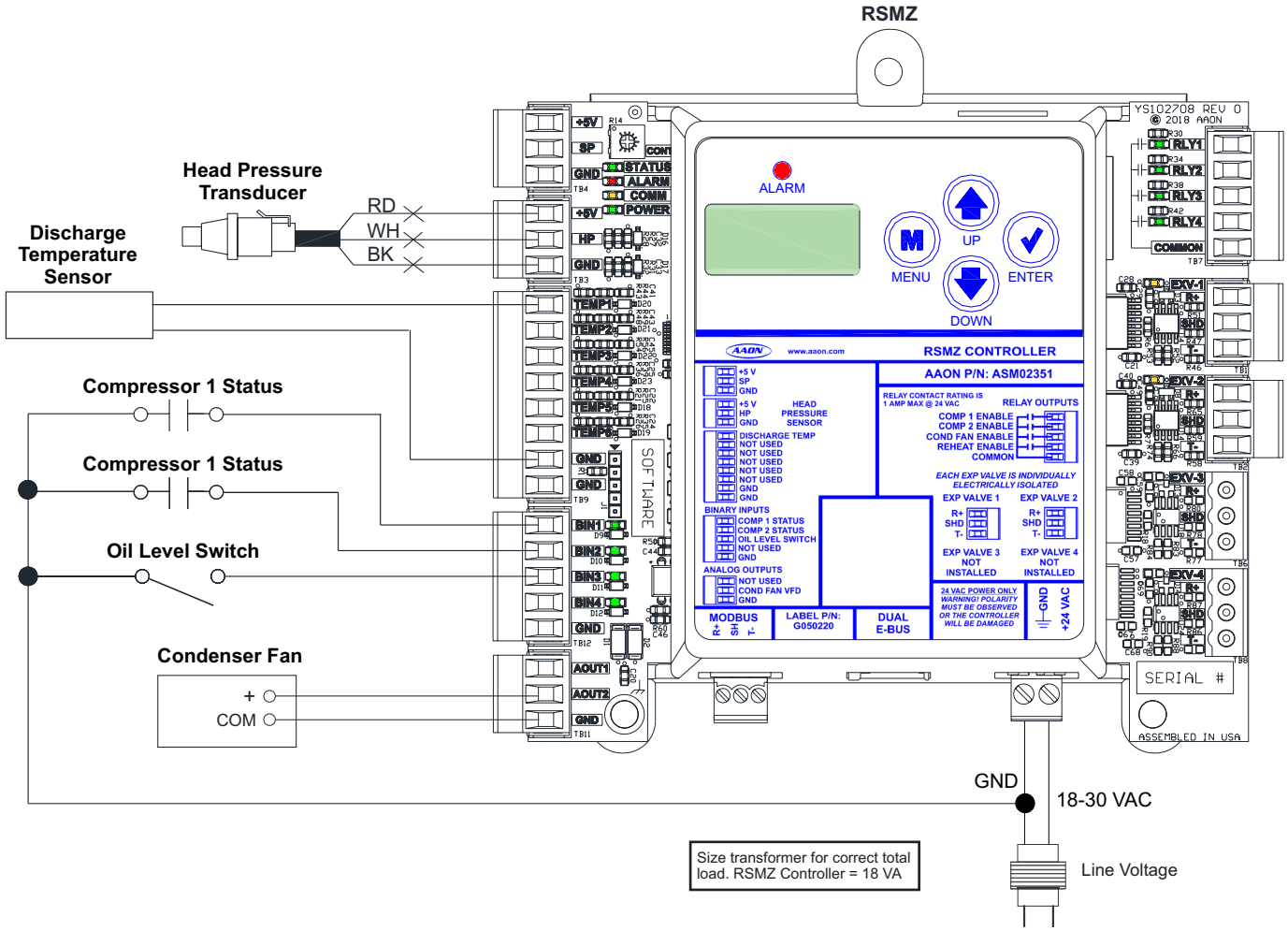


Figure 38: RSMZ Inputs Wiring

RSMZ Outputs Wiring

The RSMZ provides the following features:

- Modulates the compressors to satisfy the suction coil (saturated) temperature. The Suction Coil (Saturated) Temperature Setpoint is reset by the VCCX2 Controller to maintain the supply air temperature during Cooling Mode. During Dehumidification Mode, it controls the compressors to the Suction (Saturation) Temperature Setpoint.
- Modulates the condenser fan or valve to maintain the Head Pressure Setpoint.
- Monitors the performance of the DMQ Universal Superheat Controller/Sensor to maintain the Superheat Setpoint of each evaporator coil.
- Provides alarms and safeties for the compressor and condenser operation.
- Provides a 2 x 8 LCD character display and four buttons that allow for status of system operation, system setpoints, system configurations, sensors, and alarms, and to change the module's address, if necessary.

See **Figure 39, this page,** for output wiring.

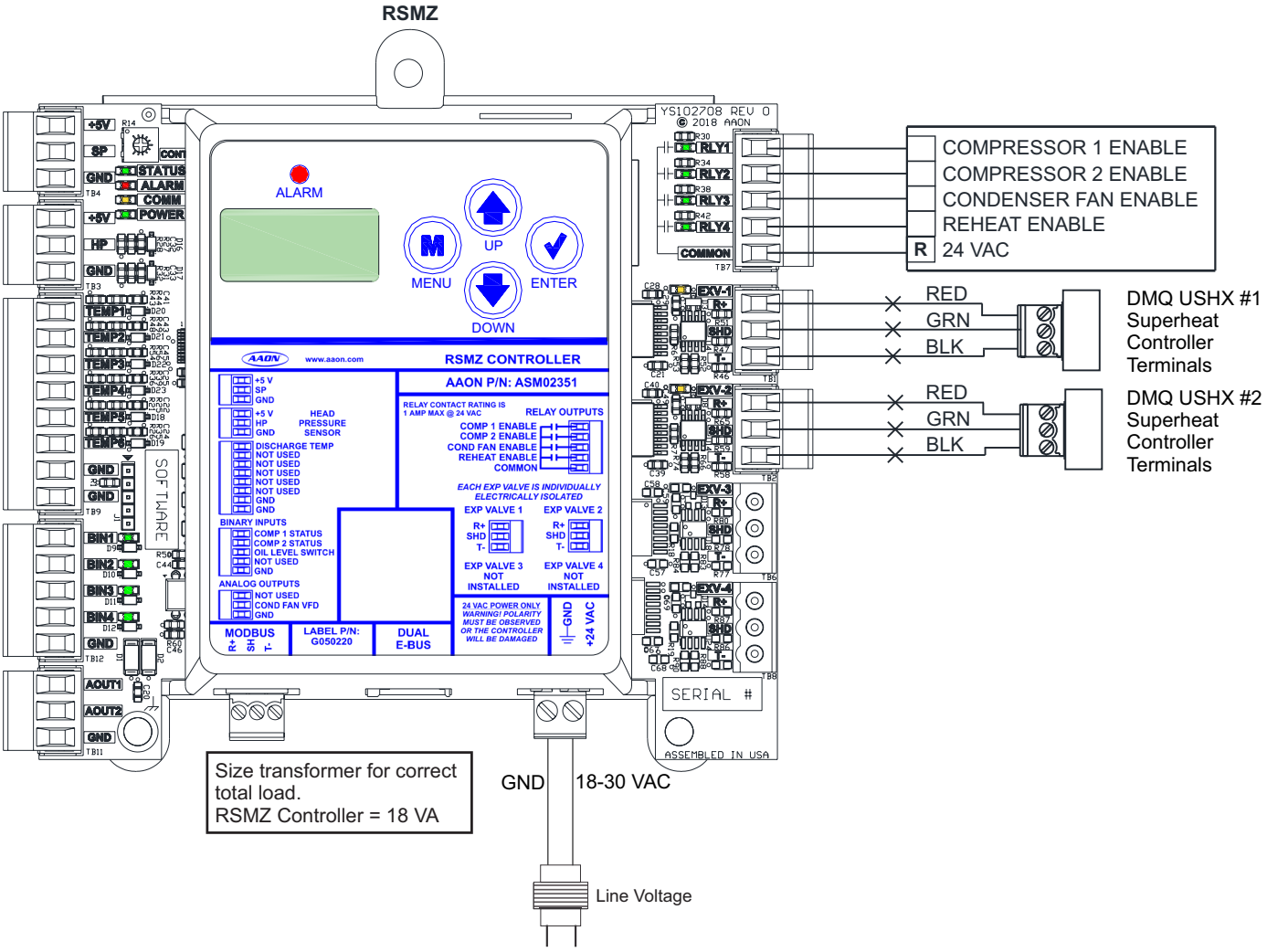


Figure 39: RSMZ Outputs Wiring

Subcool Monitor Wiring

The ASM02350 Subcool Monitor reads the liquid line pressure then converts it to the saturated liquid temperature and compares it to the measured liquid line temperature to calculate subcooling. The use of the Subcool Monitor Module is optional.

The Subcool Monitor is connected to the VCCX2 Controller. One or two Subcool Monitors can be connected, depending on the size of the system:

- One Subcool Monitor Module is used when three RSMZ Modules are used.
- Two Subcool Monitor Modules are used when six RSMZ Modules are used.

The Subcool Monitor contains a 2 x 8 LCD character display and four buttons that allow for configuration, status, and alarm display. This module must be configured to work with R410-A refrigerant and is configured for 667 psi liquid line pressure transducers.

See **Important Wiring Considerations, page 24,** for power source requirements.

See **Figure 40, this page,** for wiring.

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.

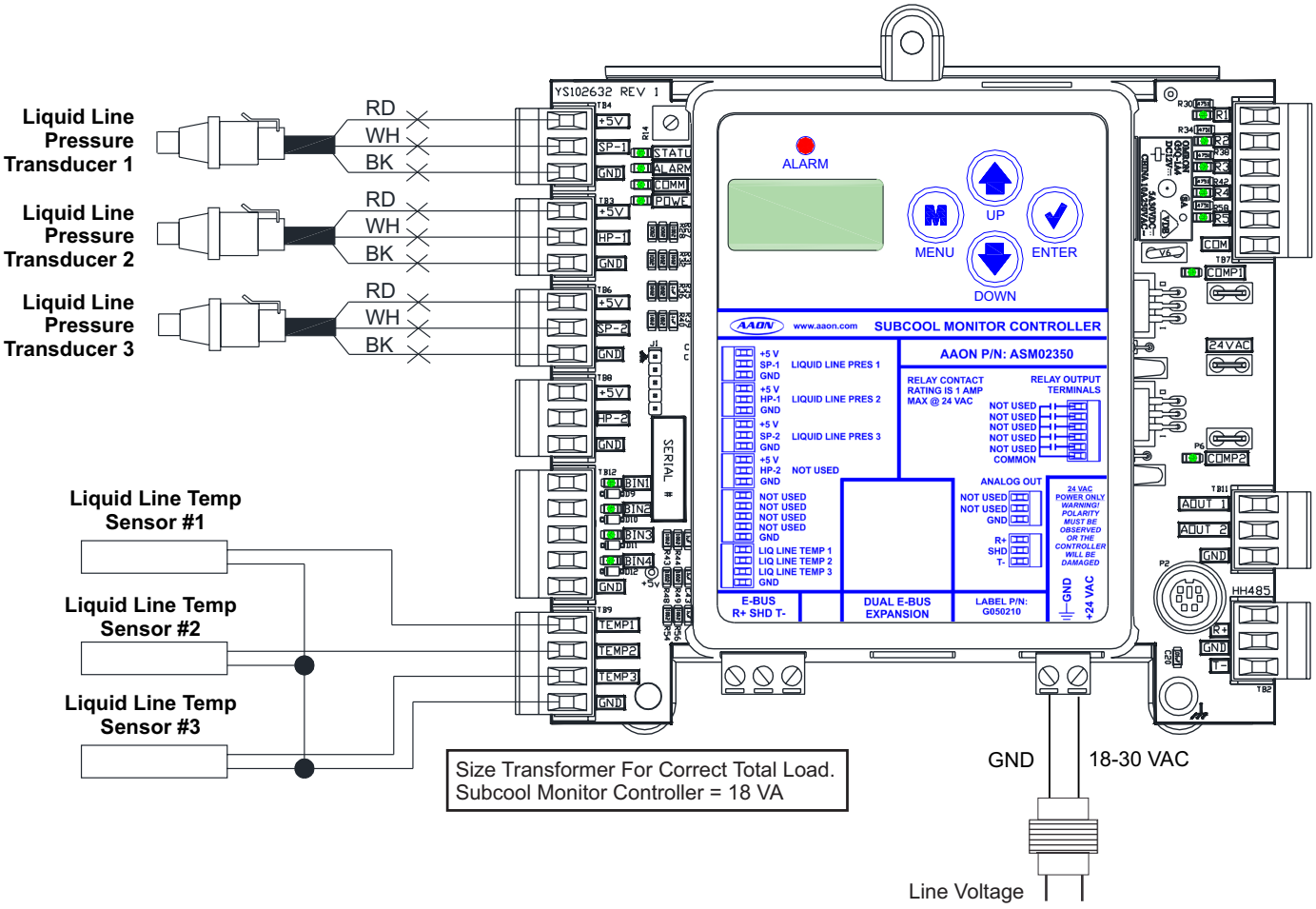


Figure 40: Subcool Monitor Wiring

MHGRV-X Wiring

The ASM01670 MHGRV-X is designed to control a modulating hot gas reheat valve to maintain a desired Supply Air Temperature and Dehumidification Setpoint. In addition, up to seven ASM01687 Reheat Expansion Modules can be connected to the MHGRV-X and to each other for additional reheat valve control. The MHGRV-X directly connects to the VCCX2 Controller or indirectly using an E-BUS Expansion Board via an E-BUS cable. See **Figure 41, this page**.

NOTE: If using multiple E-BUS sensors or modules, a E-BUS hub or adapter board may be required.

The following information will be passed between the MHGRV-X and the VCCX2 Controller:

- Reheat enable command
- Supply Air Temperature Setpoint
- The Reset Supply Air Temperature Setpoint
- The supply air temperature reset signal

If the communication is interrupted between the MHGRV-X and the VCCX2 Controller, the MHGRV-X will revert to stand-alone operation.

For more information, refer to the *MHGRV-X Technical Guide*.

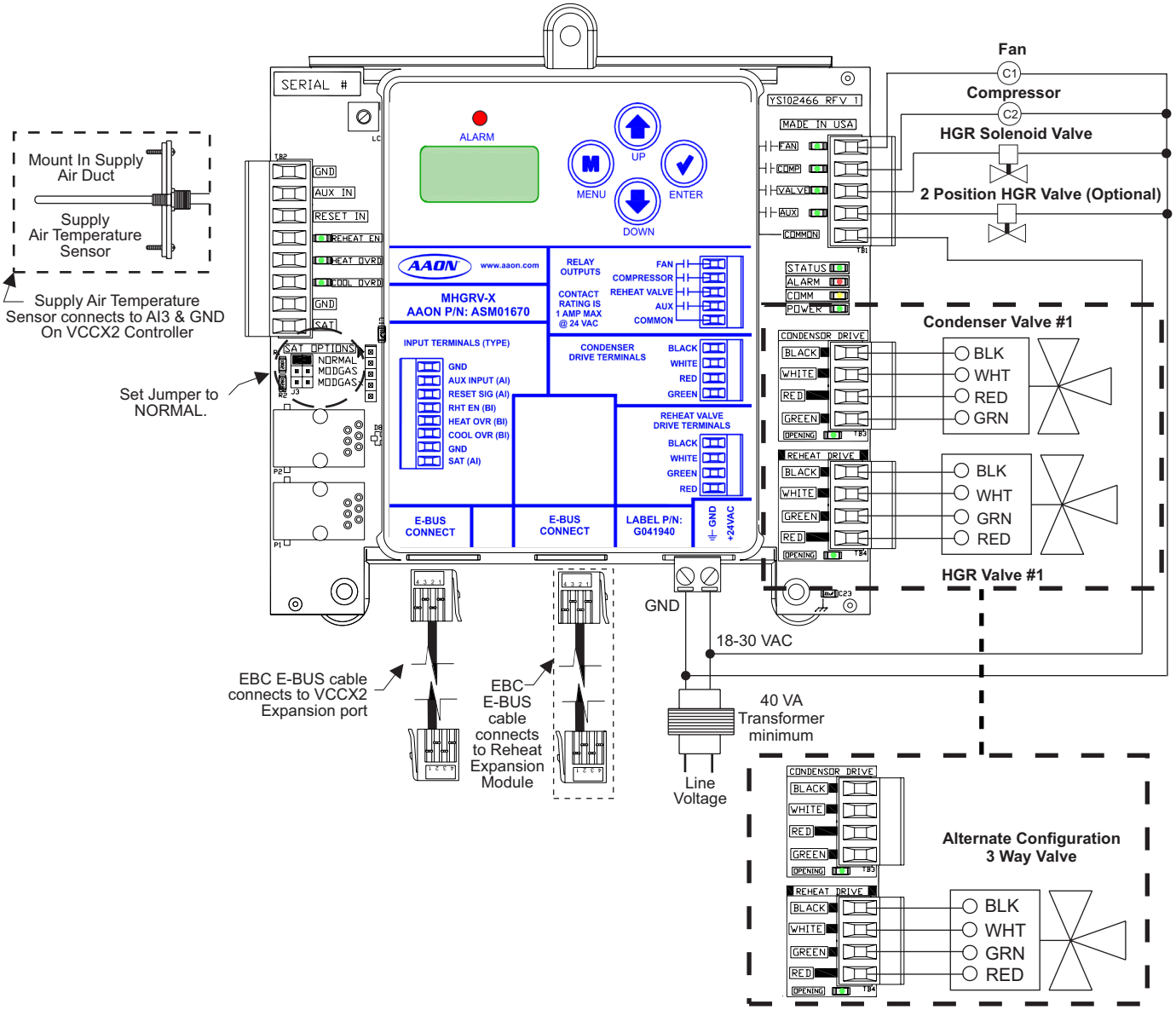


Figure 41: MHGRV-X to VCCX2 Controller Wiring

MODGAS-X Wiring

The ASM01668 MODGAS-X is designed to modulate up to two gas valves to maintain a desired discharge air temperature. It also controls the speed of the induced draft fan to maintain proper combustion in the heat exchanger. The MODGAS-X directly connects to the VCCX2 Controller or indirectly using an E-BUS Expansion Board via an E-BUS cable. See **Figure 42, this page**.

NOTE: If using multiple E-BUS sensors or modules, a E-BUS hub or adapter board may be required.

The following information will be passed between the MODGAS-X and the VCCX2 Controller:

- Heat activation command
- Heating Discharge Setpoint
- Supply Air Temperature Sensor offset
- High Limit Temperature Setpoint
- If the communication is interrupted between the MODGAS-X and the VCCX2 Controller, the MODGAS-X will revert to stand-alone operation.

For more information, refer to the *MODGAS-X Technical Guide*.

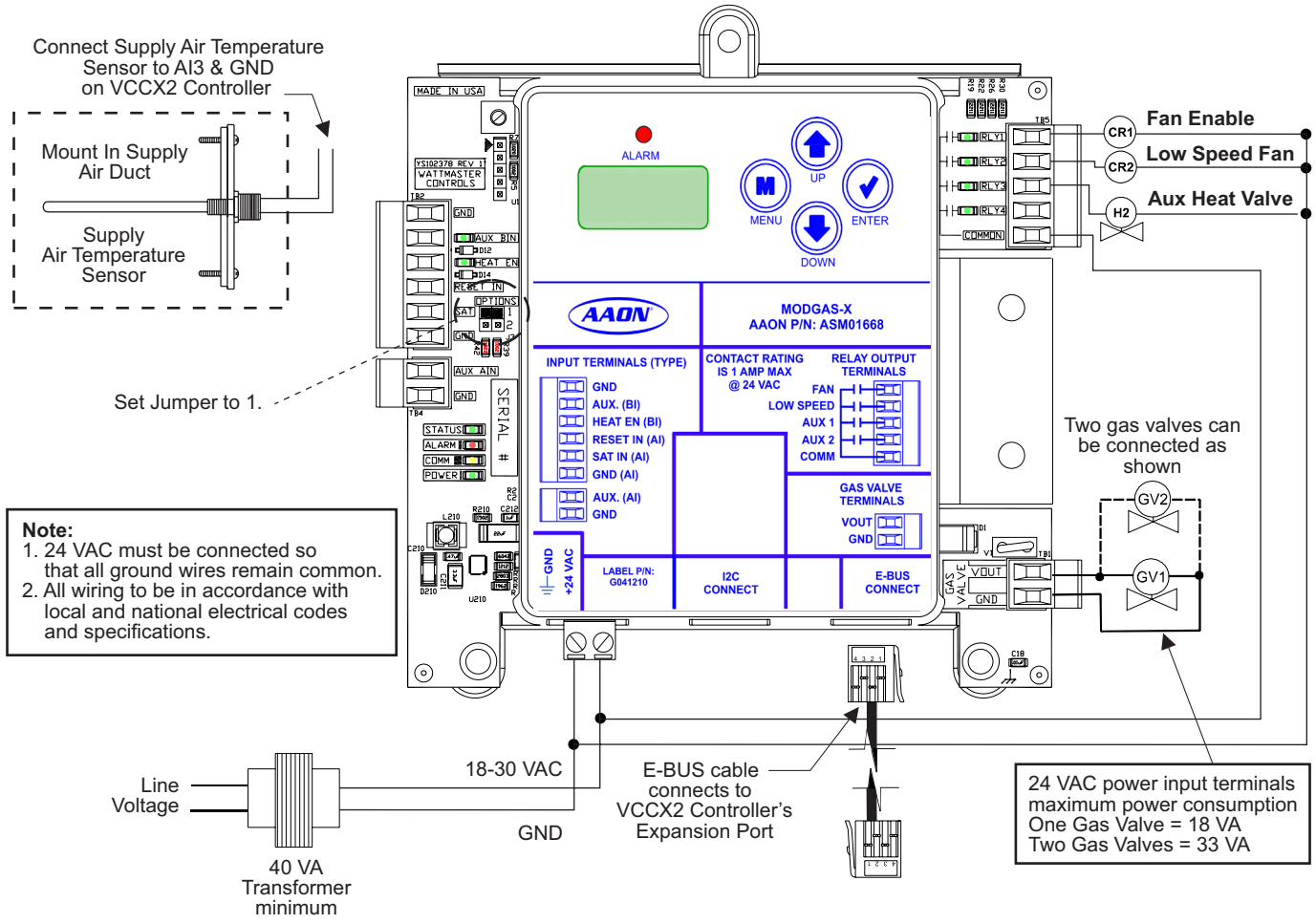


Figure 42: MODGAS-X to VCCX2 Controller Wiring

MODGAS-XWR2 Wiring

The ASM01695 MODGAS-XWR2 is designed to be used with White-Rodgers valves only. It will modulate up to two White-Rodgers gas valves to maintain a desired discharge (supply) air temperature. Up to four modulating gas valves may be controlled when a second MODGAS-XWR2 is configured as a slave module. The module also controls the speed of the induced draft fan to maintain proper combustion in the heat exchanger. The module can be used as a stand-alone unit or be connected to the 12 Relay E-BUS Expansion Module (stand-alone only) or VCCX2 Controller using an E-BUS cable. See **Figure 43, this page**.

The following information will be passed between the MODGAS-XWR2 and the VCCX2 Controller:

- Heat activation command
- Heating Discharge Setpoint
- The offset for the Supply Air Temperature Sensor
- High Limit Temperature Setpoint
- If the communication is interrupted between the MODGAS-XWR2 and the VCCX2 Controller, the MODGAS-XWR2 will revert to stand-alone operation.

For more information, refer to the *MODGAS-XWR2 Technical Guide*.

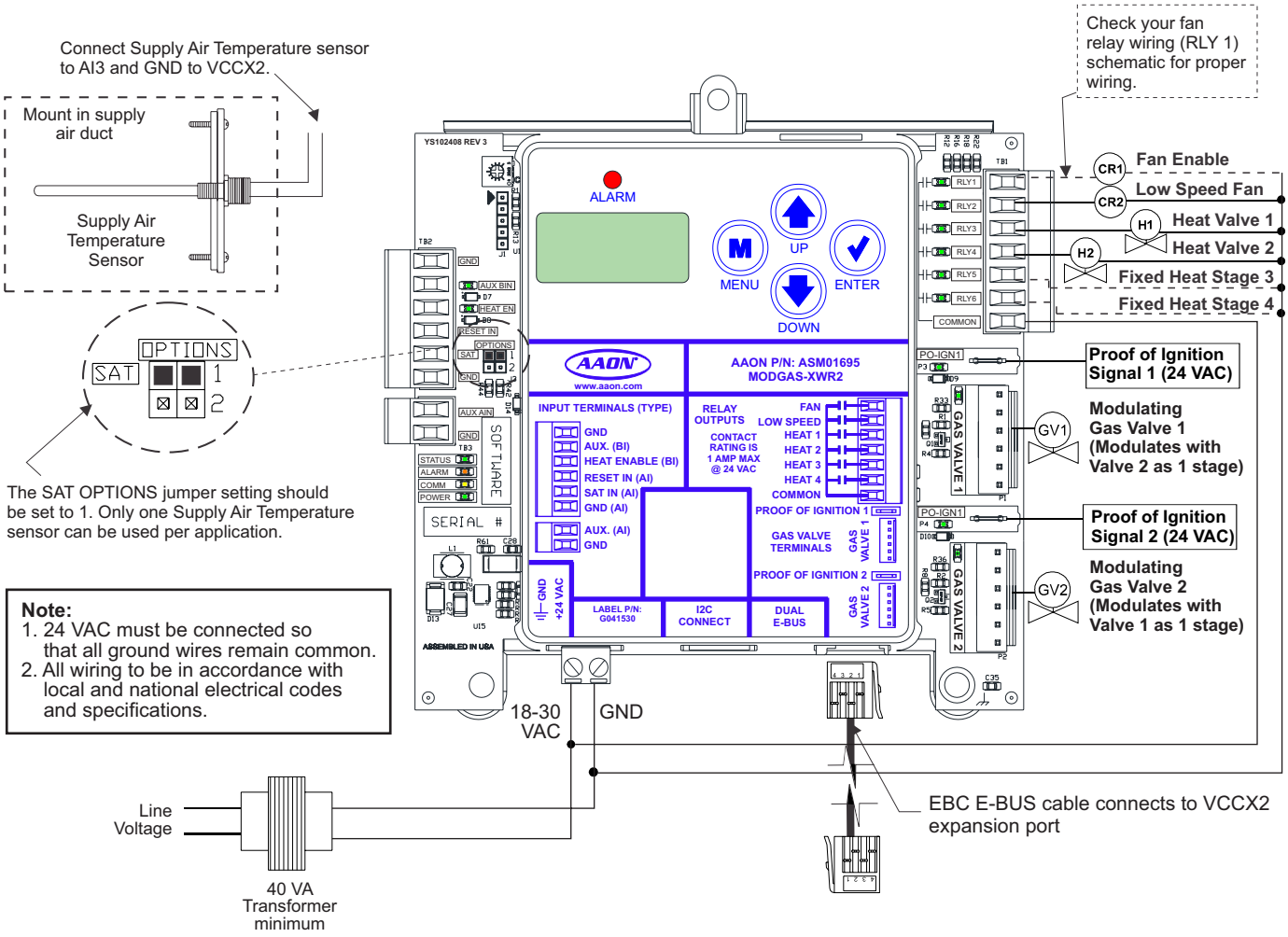


Figure 43: MODGAS-XWR2 to VCCX2 Controller Wiring

PREHEAT-X and PREHEAT-X-EXT Module Wiring

The ASM01688 PREHEAT-X and ASM01689 PREHEAT-X-EXT are designed to control fixed stages of preheat and optional modulating preheat to maintain a desired Preheat Leaving Air Temperature Setpoint. The PREHEAT-X is limited to a 35°F Leaving Air Temperature Setpoint. The PREHEAT-X-EXT has an extended Leaving Air Temperature Setpoint minimum of 0°F. It should only be used with the approval of AAON.

Either PREHEAT-X directly connects to the VCCX2 Controller or indirectly using an E-BUS expansion board via an E-BUS cable. See **Figure 44, this page,** for wiring.

The following information will be passed between either PREHEAT-X and the VCCX2 Controller:

- Leaving Air Temperature Setpoint
- Entering Air Temperature Setpoint
- Preheat enable signal
- Leaving air temperature status
- Entering air temperature status
- Alarm status
- If the communication is interrupted between the PREHEAT-X and the VCCX2 Controller, the PREHEAT-X will be disabled.

For more information, refer to the *PREHEAT-X* or *PREHEAT-X-EXT Technical Guide*.

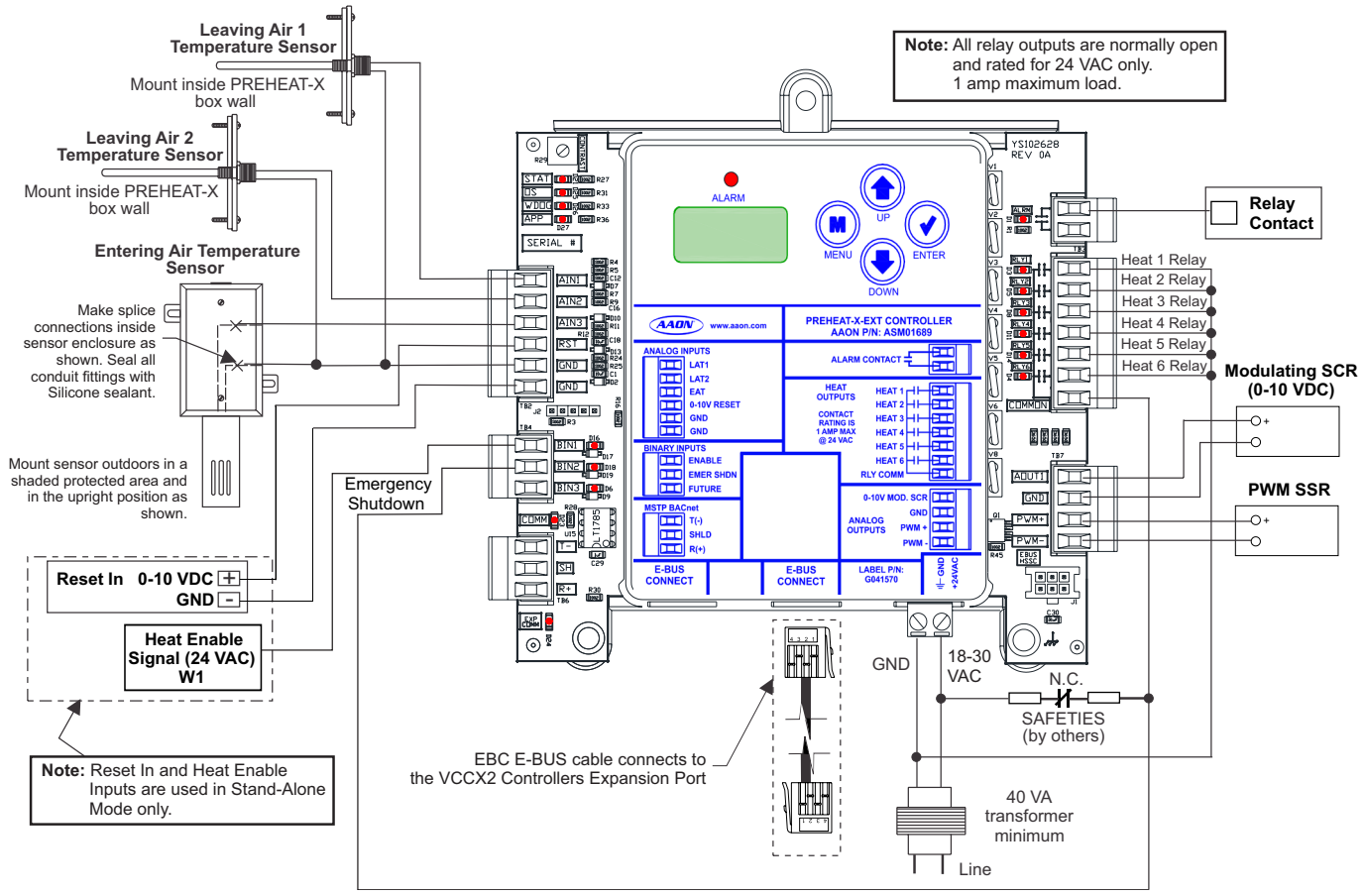


Figure 44: PREHEAT-X to VCCX2 Module Wiring

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 run through a few simple checks.

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 VCCX2 Controller requires 15 VA of power delivered to it at 24 VAC. Use separate transformers for each device (preferred) or power several devices from a common transformer.

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 all sensors required for the system are mounted in the appropriate location and wired into the correct terminals on the VCCX2 Controller.

After all the above wiring checks are complete, apply power to the VCCX2 Controller.

Configuring the Controller

The next step is configuring the controller for specific requirements. In order to configure the VCCX2 Controller, use an operator interface. Four different operator interfaces are available for programming and monitoring of the VCCX2 Controller. See **Figure 45, this page**. They are as follows:

- Modular Service Tool SD
- Modular System Manager SD
- PC with Prism 2 Software installed and CommLink 5
- System Manager TS-L (Touch Screen - Limited Access)

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

If using the Modular Service Tool SD or the Modular System Manager SD for programming, refer to the *VCCX2 Controller Operator Interface SD Technical Guide*. If using a computer and the Prism 2 software for programming, refer to the *Prism 2 Technical Guide*.

If using the System Manager TS-L for monitoring, please see the *System Manager TS-L Technical Guide.*

No matter which operator interface is used, AAON recommends proceeding with the programming and setup of the VCCX2 Controller in the order that follows:

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

NOTE: For BACnet Configuration, see **Appendix C.**

Figure 45: Operator Interfaces

VCCX2 CONTROLLER	
Analog Inputs (AI)	
1	Space Temperature (AI1)
2	Space Slide Adjust (AI2)
3	Supply Air Temperature (AI3)
4	Return Air Temperature (AI4)
5	Building Pressure (AI5)
6	Supply Air Temperature Reset (AI6)
7	Outdoor Air Temperature (AI7)
8	Supply Duct Static Pressure (Duct Static Jack) (AI8)
Binary Inputs (BI)	
1	Proof of Flow (BI1)
2	Dirty Filter (BI2)
3	Hood On/Off (BI3)
4	Remote Forced Occupied (BI4)
5	Remote Forced Cooling (BI5)
6	Remote Forced Heating (BI6)
7	Remote Forced Dehumidification (BI7)
8	Emergency Shutdown (BI8)
Analog Outputs (AO) (0-10 VDC)	
1	Main Supply Fan VFD or Bypass Damper (AO1)
2	Economizer (Outdoor Air Damper) or Waterside Economizer Actuator (AO2)
3	Modulating Heating (Hot Water, Steam, or SCR) (AO3)
4	Exhaust Fan VFD / Building Pressure Control Signal (AO4)
Relay Outputs (RLY) (24 VAC)	
1	Fan Relay (RLY1)
2	Configurable Relay (RLY2)
3	Configurable Relay (RLY3)
4	Configurable Relay (RLY4)
5	Configurable Relay (RLY5)
6	Configurable Relay (RLY6)
7	Configurable Relay (RLY7)
8	Configurable Relay (RLY8)

Note: The following E-BUS sensors and modules are available to connect to the VCCX2 Controller via E-BUS ports or E-BUS Expansion Modules:

1. E-BUS Digital Room Sensor - LCD Display - Temp Only or Temp and Humidity
2. E-BUS Digital Room Sensor - No LCD Display - Temp and Humidity
3. E-BUS Space and Return Air CO_2 Sensors
4. E-BUS connection to EBTRON, GreenTrol and Paragon airflow stations
5. E-BUS Outdoor Air Temperature and Humidity Sensor

Table 2: VCCX2 Controller Inputs and Outputs

Input/Output Map

See **Table 2, this page,** for VCCX2 Controller inputs and outputs and **Table 3, this page,** for VCC-X EM1 inputs and outputs. For the RSM Module and Evaporative Condenser input and output tables, please see the individual Technical Guides.

VCC-X EM1 EXPANSION MODULE	
Analog Inputs	
1	Entering Water Temperature Sensor (T1)
2	Economizer Actuator Feedback (SIG3) (0-5 or 0-10 V)
3	Return Air Plenum Pressure (SIG1) (0-5V)
4	Exhaust Duct Static Pressure (Duct Static Jack)
Binary Inputs	
1	Return/Exhaust Proof of Flow (BI1)
Analog Outputs (0-10 or 2-10 VDC)	
1	Chilled Water (AO1)
2	Return Air Damper (AO2)
3	Return Air Bypass (AO3)
4	Motorized Exhaust Damper (AO4)
Relay Outputs (24 VAC)	
1	Configurable Relay (RLY1)
2	Configurable Relay (RLY2)
3	Configurable Relay (RLY3)
4	Configurable Relay (RLY4)
5	Configurable Relay (RLY5)

Table 3: VCC-X EM1 Inputs and Outputs

VCCX2 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 can also be configured to reset the Supply Air Temperature Setpoint.

AI2 - 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 supply air temperature reset source, the slide adjustment adjusts both the HVAC Mode Enable Heating and Cooling Setpoints and the Supply Air Temperature Reset Source Heating and Cooling Setpoints simultaneously by a user-configurable maximum amount.

AI3 - 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 Temperature Setpoint. The HVAC unit must always have a Supply Air Temperature Sensor installed.

AI4 - Return Air Temperature Sensor Input

To generate occupied heating and cooling demands based on return air remperature, 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/cool-down 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.

AI5 - Building Static Pressure Sensor Input

This sensor is only required if configuring the VCCX2 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 (or in certain cases, the VFD supply fan). The other available control method is to configure one of the output relays as an exhaust fan output that activates the exhaust fan any time the building pressure is above the Building Pressure Setpoint.

AI6 - Remote Supply Air Temperature Reset Signal

If a remote supply air temperature 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.

AI7 - Outdoor Air Temperature Sensor Input

To conserve energy, the outdoor air temperature is used to lock out heating or cooling at set temperatures 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 preheater operation and for low ambient protection operation.

NOTE: For AI1, AI3, AI4 and AI7, all temperature sensors must be Thermistor Type III which provide 77.0°F @ 10K ohms resistance.

AI8 - Supply Duct Static Pressure Sensor Input

This 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 the HVAC unit is configured for CAV operation, this sensor is optional. If it is installed on a CAV unit, it can be used for filter loading VFD control or used for a status-only reading.

BI1 - Proof of Flow Input

A proof of flow switch (by others) that provides a wet contact closure whenever the HVAC unit supply fan is operating can be connected to this input. If the proof of flow switch contact opens while the supply fan is operating, all heating and cooling is suspended or disabled.

BI2 - Dirty Filter Contact Closure Input

This wet contact input is required for filter status indication and requires a differential pressure switch to initiate a dirty filter alarm.

BI3 - Hood On/Off Input

When this wet contact input closes (hood on), the VCCX2 Controller switches from indoor air control to outdoor air control. This is typically used on CAV applications requiring CAV/MUA Dual Damper (Hood On/Off) Modes.

BI4 - Remote Forced Occupied Mode Input

When this wet contact input closes, it will force the VCCX2 Controller into the Occupied Mode. When the remote forced occupied signal is removed, the controller will revert to the Unoccupied Mode of operation if no internal or external schedule has been configured or is in effect when this occurs.

NOTE: If remote forced operation is used, it must apply to Cooling, Heating, and Dehumidification. The unit must be configured for Mode Set By Remote Contact.

BI5 - Remote Forced Cooling Mode Input

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

BI6 - Remote Forced Heating Mode Input

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

BI7 - Remote Forced Dehumidification Input

A wet contact closure on this input is used to provide a means for another building automation system or control device (by others) to force the VCCX2 Controller into Dehumidification Mode.

BI8 - Emergency Shutdown Input

This wet contact input is used to initiate shutdown of the HVAC unit when a normally closed smoke detector (by others), firestat (by others), or other shutdown condition (by others) contact is opened. The controller remains active and can initiate alarm relays.

NOTE: The binary inputs require wet contacts (24 VAC only) to recognize an active input. If only dry contacts are provided, the contact closure will not be recognized. All binary inputs are optional. This means the VCCX2 Controller must be configured to recognize these input signals.

VCCX2 Controller Outputs

AO1 - Main Supply Fan VFD Control Signal or Bypass Damper Control Signal

This user-adjustable voltage signal is used to modulate the supply fan VFD in VAV, single zone VAV, filter loading applications, or reverse acting building pressure control using the VFD. In a volume and variable temperature zoning application, this output would be used to control a bypass damper.

AO2 - Outdoor Air Damper Economizer Control Signal or Waterside Economizer Valve Signal

Outdoor Air Damper Economizer 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 Occupied Mode when the outdoor air temperature is not suitable for economizer cooling purposes. This minimum position can be reset based on CO_2 override conditions.

This output is also used to control the outdoor air damper based on an Outdoor Airflow Setpoint if using an outdoor airflow monitoring station. This position can be overridden during economizer control.

Finally, this output can be used to control the outdoor air damper during reverse acting building pressure control to maintain a Building Pressure Setpoint.

Waterside Economizer Valve Signal

This 2-10 VDC signal is used to modulate the waterside economizer valve during waterside economizer operation.

AO3 - 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.

AO4 - Exhaust Fan VFD Signal / 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 VCCX2 Controller will use the outputs specific to those devices. On the main VCCX2 Controller, AO2 would control the outdoor air damper and AO1 would control the supply fan VFD to maintain the Building Pressure Setpoint. Alternatively, this AO4 output will mirror those outputs and can be used as well.

RLY1 - Supply Fan (Enable)

This is a non-configurable output.

RLY2-RLY8 - User-Configurable Relays

These relays are configurable by the user. For all the available configuration options, see **Table 4, page 69**.

VCC-X EM1 Expansion Module

T1 - Entering Water Temperature Sensor Input

The entering water is used to determine when to initiate waterside economizer operation. If the unit is in Cooling Mode and the entering water temperature drops 10˚F (adjustable) below the entering air temperature, the unit will begin to modulate the waterside economizer valve as part of the Cooling operation. See **Waterside Economizer, page 87**, for a full description of this operation.

SIG1 - Return Air Plenum Pressure Sensor Input

The sensor is only required when controlling a motorized exhaust damper to maintain the Return Air Plenum Pressure Setpoint.

SIG3 - Economizer Feedback

If Title 24 economizer operation has been configured, this input will be used for the 2-10 VDC feedback signal from the economizer actuator.

Exhaust Duct Static Pressure Sensor Input

This jack-style input connection accepts a Duct Static Pressure Sensor modular connector input used for exhaust duct static pressure control. This static pressure reading is used to control the output signal (AO4 on the VCCX2 Controller) supplied to the exhaust fan VFD.

BI 1 - Return/Exhaust Proof of Flow

A proof of flow switch that provides a wet contact closure whenever the HVAC unit return fan or exhaust fan is operating can be connected to this input.

AO1 - Modulating Chilled Water Valve Actuator

This output is used to control a modulating chilled water valve actuator to maintain the Cooling Supply Air Temperature Setpoint. This output provides a 0-10 or 2-10 VDC direct acting signal.

AO2 - Return Air Damper Actuator Signal

This output signal is a direct acting 2-10 VDC output signal that is used to modulate a return air damper actuator in conjunction with a Return Air Bypass Damper actuator for AAON Precise Air Control or Digital Precise Air Control applications.

AO3 - Return Air Bypass Damper Actuator Signal

This output signal is a direct acting 2-10 VDC output signal that is used to modulate a Return Air Bypass Damper actuator in conjunction with a return air damper actuator for AAON Precise Air Control or Digital Precise Air Control applications.

AO4 - Motorized Exhaust Damper Actuator Signal

This output signal is a direct acting 2-10 VDC output signal that is used to modulate the motorized exhaust damper actuator.

RLY1-RLY5 - User-Configurable Relays

These relays are configurable by the user. For all the available configuration options, see **Table 4, page 69.**

12 Relay E-BUS Expansion Module

Please refer to the user-configurable relays in **Table 4, page 69,** for relay definitions.

No.	Relay Description	Details
1	Cooling Stage	Configured for each fixed stage of cooling (except heat pump compressor).
2	Heating Stage	Configured for each fixed stage of heating.
3	Aux Heat	Configured for a fixed stage of aux heat in a heat pump unit.
4	Emergency Heat	Configured for a fixed stage emergency heat in a heat pump unit.
5	Mod Heat Enable	Configure if a 0-10 VDC modulating heat source needs a relay to enable it.
6	Mod Cool Enable	Configure if a 0-10 VDC modulating cool source needs a relay to enable it.
7	Morning Warm-Up/ Cool-Down (VAV Boxes)	Configure (1) relay for morning Warm-Up/Cool-Down when non-Orion VAV/Zone Controllers are used.
8	Reheat	Configure (1) relay for on/off reheat when used.
9	Preheat	Configure for preheat operation.
10	Low Ambient	Configure for low ambient operation.
11	Exhaust or Return Fan	Configure (1) relay for enabling exhaust or return fan when building pressure control is used.
12	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 or if the damper moves above a user-adjustable position setpoint.
13	Heat Wheel	Configure (1) relay that turns heat wheel on when in occupied operation and turns heat wheel off when in Economizer Mode.
14	Occupied Active	If configured, this relay will energize whenever the unit is in the Occupied Mode.
15	Override Active	If configured, this relay will energize anytime the space sensor push-button override is active.
16	Alarm Active	If configured, this relay will energize anytime a VCCX2 alarm is active.
17	A1 Comp Run Status	Will enable when the RSM A1 compressor activates.
18	A2 Comp Run Status	Will enable when the RSM A2 compressor activates.
19	B1 Comp Run Status	Will enable when the RSM B1 compressor activates.
20	B2 Comp Run Status	Will enable when the RSM B2 compressor activates.
21	Condenser Pump	If configured, this relay will energize when the unit requires the evaporative condenser to be enabled.
22	Sump Heater	If configured, this relay will energize when the unit requires the sump heater to be enabled.
23	Sump Pump Drain	If configured, this relay will energize when the unit requires the sump pump drain to be enabled.

Table 4: User-Configurable Relay Outputs

Supply Fan Operation and HVAC Source Configuration Options

Supply Fan Operation

Any time the supply fan is requested to start, a one-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.

To protect the dampers on MUA systems on startup, dampers open then the fan starts after the fan starting delay setpoint time expires. On shut down, the fan turns off first. The dampers close after the fan starting delay setpoint time expires or fan proving is deactivated.

In Fan Cycle Mode or when going Unoccupied, the supply fan is held on for 10 seconds after Cooling has staged off or after Leaving Vent Mode and 90 seconds after the Heating has staged 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

Upon going Unoccupied, the Cooling or Heating will turn off immediately. The fan will then turn off in 30 to 60 seconds. Typically, thereafter, the supply fan will cycle on a call for Heating, Cooling, or Dehumidification. The supply fan can also be configured for continuous operation during Unoccupied Mode.

HVAC Source Configuration Options

The VCCX2 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/Cool-Down.

Supply Air Tempering—Selected for VAV units maintaining a Cooling Setpoint with cooling or heating as required that may need heat to temper the supply air temperature during very cold conditions.

Space Temperature with High Outdoor Air %— Provides space temperature (instead of outdoor air temperature) control of 100% or high percentage outdoor air units by tempering the air during the space Vent Mode of operation to prevent dumping of hot or cold air into the space.

HVAC Mode Set by Remote Contact— Provides for wet contact closures to force the unit into Heating, Cooling, and Dehumidification Modes. If this option is selected, it applies to all three modes, and all three modes will only be initiated by these contact closures. If both the heating and cooling contacts are made, the unit will be in the Vent Mode.

Occupied/Unoccupied Mode of Operation

The VCCX2 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
- Broadcast week schedule from GPC-XP

The VCCX2 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 VCCX2 schedule. When this wet contact input closes, it will force the VCCX2 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 VCCX2 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 saving configuration.

Broadcast Schedule

Eight external broadcast schedules are available with use of the GPC-XP Controller.

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

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

- Cooling Mode
- Heating Mode
- Vent Mode
- Dehumidification Mode
- Purge 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 falls 1°F below the Cooling Lockout Setpoint and will remain disabled until the outdoor air temperature rises 1°F above the Cooling Lockout Setpoint. If the outdoor air temperature 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, **page 73**.

Cooling with the Refrigerant System Modules

On units with digital or VFD compressors, the VCCX2 Controller will utilize one or more RSMs. Units with only fixed staged compressors that are doing dehumidification or that require head pressure control would also utilize an RSM. Each RSM will control the compressors, condensers, and electronic expansion valves (on Bitzer VFD compressor units) for one or two refrigeration circuits. Up to four RSMs may be used in controlling up to eight circuits.

The RSMD is used for digital compressor units, including heat pumps. The RSMV is used for Bitzer VFD compressor units (non-heat pumps). The RSMV-HP is used for Bitzer VFD compressor units that are heat pumps. The RSMVC-P is used for Copeland VFD compressor units.

In Cooling Mode, as the supply air temperture rises above the active Cooling Supply Air Temperture Setpoint, **page 80**, the compressors will stage on and modulate to maintain the active Supply Air Cooling Setpoint. Each RSM will independently control its compressors to achieve the most efficient cooling control. Each stage must meet its minimum off time (adjustable) before it is allowed to energize. Successive stages are subject to a cooling stage-up delay (adjustable).

Cooling stages will continue to run until the supply air temperture falls below the active Supply Air Temperature Setpoint minus the cooling stage control window and the Cooling will begin to stage off. Each stage must meet its minimum run time (adjustable) before it is allowed to stage off. Successive stages are subject to a cooling stage down delay (adjustable). See the appropriate RSM Technical Guide for a more detailed sequence of operation.

Staged Cooling without the Refrigerant System Modules

An RSM will not be used on units with fixed stage compressors that are not doing dehumidification and that do not require head pressure control, or on units with on/off chilled water.

In Cooling Mode, as the supply air temperture rises above the active Supply Air Cooling Setpoint, **page 80**, cooling will begin to stage on. Each stage must meet its minimum off time (adjustable) before it is allowed to energize, and successive stages are subject to a cooling stage-up delay (adjustable).

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 (adjustable) before it is allowed to stage off and successive stages are subject to a cooling stage down delay (adjustable).

Modulating Chilled Water Cooling Control

In the Cooling Mode, as the supply air temperture rises above the active Supply Air Cooling Setpoint, **page 80**. The modulating cooling proportional window is used to determine the signal to the chilled water valve and is user-adjustable. The modulating cooling signal is calculated based on the differential between the supply air temperture 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 chilled water cooling signal and is user-adjustable. For example, if the modulating cooling proportional window is 5°F, the signal would adjust 2% per °F each time period above or below the active Supply Air Temperature Setpoint. When the supply air temperture is above or below the active Supply Air Temperature Setpoint by 5°F or more, the signal would adjust 10% each time period.

Economizer Operation (Standard)

NOTE: For Waterside Economizer Operation, see **page 88**.

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

The economizer acts as the first 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% for two minutes 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, **page 85**. During Unoccupied Mode, the economizer can be used for night setback free cooling; otherwise it will remain closed.

Indoor air quality (CO_2) override of the economizer simply resets the economizer minimum position higher. See Indoor Air Quality (CO_2) Control Operation, **page 78**, section for more details.

If utilizing the Title 24 economizer option, an economizer feedback signal (0-10 VDC) can be wired into the VCC-X EM1 Expansion Module for status monitoring. Several Title 24 alarm conditions can also be displayed.

Economizer Override Via BACnet

As stated above, the economizer must reach and remain at 100% before compressors will be allowed to stage on to meet the Cooling Supply Air Setpoint. Because of this 100% requirement, if a value of less than 100% is written to BACnet point AV:70 (Outdoor Air Damper Override) while compressors are operating, the controller effectively recognizes this as the economizer being active at less than 100% – so the compressor(s) will disable.

To avoid the economizer being disabled but compressors are enabled, AV:49 (Minimum Economizer Position) can be used. This will change the minimum position, while allowing compressors to remain on. However, if using AV:49 and the economizer operation is enabled, the damper can open more than the minimum position for true economizer operation.

Comparative Enthalpy Economizer Operation

A comparative enthalpy economizer option is also available. The E-BUS Outdoor Temperature/Humidity Sensor and the E-BUS Return Air Temperature/Humidity Sensor must be used for this operation to be available.

If the outdoor enthalpy is below the Comparative Economizer Enable Setpoint by the comparative economizer enable deadband amount, and the outdoor enthalpy is less than the return air enthalpy by the comparative economizer enable deadband amount, then economizer operation will be enabled to act as the first stage of Cooling.

If the outdoor air enthalpy rises above the Comparative Economizer Enable Setpoint by the comparative economizer enable deadband amount, or if the outdoor air enthalpy rises above the return air enthalpy by the comparative economizer enable deadband amount, then economizer operation will be disabled.

Dehumidification Mode

On VAV, CAV, single VAV, and high percentage outdoor units with space temperature control, the Dehumidification Mode is initiated when the indoor humidity rises above the Indoor Humidity High Reset Source Setpoint. The unit will leave the Dehumidification Mode when the humidity falls below the Indoor Humidity Low Reset Source 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.

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.

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 a MUA unit that does not have return air and is not configured for space controlled night setback operation. Damage to the unit could occur since the outdoor air damper remains closed in the Unoccupied Mode.

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.

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. Any calls for Unoccupied Dehumidification use the same Dehumidification Setpoint as during the Occupied Mode.

NOTE: Do not use this option on a 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 outdoor air damper remains closed in the Unoccupied Mode.

Dehumidification Operation on Direct Expansion Compressor Units

Any direct expansion unit doing dehumidification will utilize one or more RSMs. Each RSM will control the compressors, condensers, and electronic expansion valves (on Bitzer VFD compressor units) for one or two refrigeration circuits. Up to four RSMs may be used in controlling up to eight circuits.

The RSMD is used for digital compressor units, including heat pumps. The RSMV is used for Bitzer VFD compressor units (non-heat pumps). The RSMV-HP is used for Bitzer VFD compressor units that are heat pumps. The RSMVC-P is used for Copeland VFD compressor units.

In the Dehumidification Mode, the compressors are controlled to maintain the Suction (Saturation) Temperature Setpoint. Each RSM will independently control its compressors to achieve the most efficient dehumidification control.

See the appropriate RSM Technical Guide for a more detailed sequence of operation.

CAUTION: If the coil saturated temperature drops below 32˚F, any cooling remaining on will be forced to stage off.

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.

NOTE: Compressor operation is subject to the outdoor air temperature cooling lockout during Dehumidification.

Dehumidification Operation on Chilled Water Units

For chilled water units, the VCCX2 Controller will open the chilled water valve to a fixed 100% position to provide full moisture removal capability.

Reheat

During the Dehumidification Mode, the VCCX2 activates Cooling to extract moisture from the supply air and utilizes either Modulating Hot Gas Reheat, On/Off Hot Gas Reheat, or Heating to reheat the supply air. Hot Gas Reheat is the standard form of reheat.

Reheat is always controlled to the active Supply Air Setpoint (see the Supply Air Temperature Setpoint Reset section, **page 80**, 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 a MHGRV-X, during Dehumidification it will modulate the reheat valve to maintain the supply air temperature at the active Supply Air Temperature Setpoint.

If the unit is equipped with an on/off hot gas valve, then one of the relays will be configured for reheat. The reheat relay will be activated if the supply air temperature is less than the Supply Air Temperature 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.

The HVAC unit's heat source, heat pump auxiliary heat, or a heat source located in the supply air duct (which is used as the unit's heat source) can be used for reheat if the unit is not equipped with hot gas reheat or to supplement hot gas reheat.

WARNING: Simultaneous Heating and Cooling cannot be approved unless the HVAC unit has been specifically designed for this purpose. A Special Purchase Authorization must be obtained from the AAON factory for these applications to avoid warranty and/or rating problems. AAON assumes no liability for any simultaneous Heating and Cooling application if a Special Purchase Authorization is not obtained from the AAON Factory at the time the HVAC unit is ordered.

When unit heat is used for reheat instead of hot gas reheat, the VCCX2 can activate the heat source(s) discussed in the Heating Mode section to maintain the supply air temperature at the active Supply Air Temperature Setpoint. When unit heat is used to supplement modulating hot gas reheat, the modulating hot gas reheat signal must reach 100% before Heating will be enabled to add additional reheat.

Coil Suction (Saturated) Temperature Reset

The indoor humidity can be used to reset the Coil Saturated Temperature Setpoint. A user adjustable range of indoor humidity values can be used to reset the Coil Saturated Temperature Setpoint between a user adjustable range of values. As the indoor humidity rises within its range the Coil Saturated Temperature Setpoint will be lowered within its range.

Return Air Bypass Damper Control

The Return Air Bypass Damper is only used on CAV units with space temperature or return air temperature configured as the HVAC Mode Enable Sensor. The Return Air Bypass Damper is only active during the Dehumidification Mode and is used as the first form of reheat. If the HVAC unit is equipped with modulating hot gas reheat, the Return Air Bypass Damper needs to be at 100% before the modulating hot gas reheat can be used. The Return Air Bypass Damper modulates from 0-100% as the space (or return air) temperature falls below the Cooling Setpoint. When the space (or return air) temperature is equal to the Cooling Setpoint, the Return Air Bypass Damper will be at 0%. When the space (or return air) temperature falls to halfway between the Cooling and Heating Setpoints, the Return Air Bypass Damper will be at 100%.

If the HVAC unit is equipped with separate actuators for the outdoor air and return air dampers, the return air damper will proportionally close more as the Return Air Bypass Damper opens. The rate at which the return air damper closes is user-adjustable. The purpose of closing the return air damper more as the Return Air Bypass Damper opens is to allow more air to bypass the evaporator coil through the Return Air Bypass Damper. If more air needs to pass through the Return Air Bypass Damper, enter a larger number in the Return Air Damper Factor Setpoint. If less air needs to pass through the Return Air Bypass Damper, enter a smaller number in the Return Air Damper Factor Setpoint.

Heating Mode

Available heating options are staged gas, modulating gas, staged electric, on/off hot water, modulating hot water, and modulating SCR electric.

Occupied 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.

Unoccupied Heating operation is enabled when the space temperature falls below the Heating Mode Enable Setpoint minus the unoccupied heating offset.

In the Heating Mode, as the supply air temperature falls below the active Supply Air Heating Setpoint, **page 80**, the heating will begin to stage on or to modulate. Each stage must meet its minimum off time (adjustable) before it is allowed to energize, and successive stages are subject to a heating stage up delay (adjustable).

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 (adjustable) before it is allowed to stage off, and successive stages are subject to a heating stage down delay (adjustable).

Mechanical heating is disabled if the outdoor air temperature rises 1°F above the Heating Lockout Setpoint and will remain disabled until the outside air temperture falls 1°F below the Heating Lockout Setpoint. If the outside air temperture disables mechanical heating while it is currently operating, mechanical heating will stage off as minimum run times and stage down delays are satisfied.

Modulating Heating

The VCCX2 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 AO3 on the VCCX2 Controller with a user-adjustable voltage range between 0-10 VDC. Modulating gas, which is controlled by the MODGAS-X Module, is not included in this section. Whichever form of modulating heating is used, the VCCX2 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.

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

NOTE: Unless the following sequence is utilized, the hot water valve is closed (regardless if configured for direct or reverse acting control) when not being used for Heating.

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 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 10 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 air 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. This operation works during emergency shutdown.

Primary Modulating Heat with Secondary Staged Heat

The modulating heat source can be modulating gas, 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 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.

Off Mode

Off Mode occurs in the Unoccupied Mode when there is no heating or cooling demand. The supply fan is off and the outside 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.

Remote Contact Control

A remote contact control option can be configured on the VCCX2 Controller to initiate the HVAC Modes of operation. If this option is configured, all Heating, Cooling, and Dehumidification modes will only be initiated based on 24 VAC wet contact closures on the forced heating, forced cooling, and forced dehumidification inputs on the VCCX2 Controller. This is a single configuration option that applies to all three modes.

If both the forced heating and forced cooling inputs are inactive or if both are simultaneously active, then the unit is in Vent Mode 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 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 that is configured. The four configuration options are described in the Dehumidification Mode section on **page 74**.

Space Sensor Operation

Space sensors are available as a plain sensor, sensor with override, sensor with slide adjust, and sensor with override and 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 slide adjust can be programmed to allow Space Setpoint adjustment of up to ± 10° F.

If the space temperature is the supply air temperature/reset source, then the slide adjust will adjust the HVAC Mode Enable Setpoints and the Supply Air Temperature/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 three seconds) for a user-defined override duration of up to eight hours. Pressing the button between three to 10 seconds cancels the override.

Multiple Digital Space Sensors

Multiple (up to 10) Digital Space Sensors can be connected to the VCCX2 Controller in applications where multiple spaces (not utilizing VAV boxes) could be served by a single unit. These sensors can be either the E-BUS Digital Space Temperature Sensor with Display or the E-BUS Digital Space Temperature/ Humidity Sensor with Display.

The VCCX2 can be configured to use temperature (high and low) to determine the Cooling or Heating Mode or average the space temperature values and use that value to determine the mode of operation – in both cases relative to the VCCX2 Space Temperature Setpoints. It would use the highest humidity value relative to the Space Humidity Setpoint to initiate Dehumidification Mode.

The digital sensors each need to be configured with unique addresses (#1 -10) for this operation. In this arrangement, only the sensor at address #1 can utilize the slide adjust. All push-button overrides on the sensors will function. Each sensor can have its own calibration offset, if required.

Indoor Air Quality and Morning Mode Operations

Indoor Air Quality (CO_2) Control Operation

If the VCCX2 Controller is configured to monitor and control CO_2 levels, the economizer operation will be modified as follows:

1. If the CO_2 levels remain below the Low CO_2 Level Setpoint, the economizer minimum position (or airflow minimum) will remain at its configured value.
2. As the level of CO_2 increases above the Minimum CO_2 Level Setpoint, the economizer minimum position (or airflow minimum) will begin to be reset higher. The economizer minimum position (or airflow minimum) will be proportionally reset higher as the CO_2 rises within the range set by the Minimum CO_2 Level Setpoint and the Maximum CO_2 Level Setpoint. If the CO_2 level reaches the High CO_2 Level Setpoint, the economizer minimum position (or airflow minimum) will be reset to the maximum reset position.
3. The Maximum Reset Position Setpoint is the highest the economizer minimum position (or airflow minimum) can be reset to during CO_2 control operation. This setpoint is user-adjustable and does not keep the economizer from opening further during economizer operation.

Morning Warm-Up Mode Operation

NOTE: Morning Warm-Up 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 VCCX2 Controller is configured for Morning Warm-Up and switches to the Occupied Mode of Operation (not Override or Force Mode from an operator interface device), 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 stand-alone VAV boxes that need to be forced wide open during the Warm-Up Mode, 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.

Morning Cool-Down Mode Operation

When the VCCX2 Controller is configured for Morning Cool-Down and switches to the Occupied Mode of Operation (not Override or Force Mode from an operator interface device), the unit compares the return air temperature to a Morning 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 Mode 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 stand-alone VAV boxes that need to be forced wide open during the Cool-Down Mode, 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 Variable Air Volume

Single zone VAV is an application where the supply fan VFD modulates 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 Temperature 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 (cannot use return air temperature) determines the heating or cooling mode of operation. Heating and cooling are enabled and disabled as described previously in the Heating, **page 76**, and Cooling sections, **page 72**.

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 a user-adjustable 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 variable air volum 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 a user-adjustable 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, **page 76**. Once the unit enters the Heating Mode, the supply fan will run at the set maximum VFD heating speed (100% default).

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 Dehumidification or Heating Dehumidification.

When the controller is in the Vent-Dehumidification Mode, the supply fan VFD will still modulate based on the space temperature. It looks at a temperature half way between the Cooling and Heating Setpoints and modulates between the Cooling minimum and 100% as the space temperature goes from the midway value to 0.5°F above that value. For example, if the Cooling Enable Setpoint is 74°F, the Heating Enable Setpoint is 70°F, and the space temperature is 72°F or less, the supply fan will be running at the cooling minimum. As the space temperature rises to 72.5°F, the fan will go to 100%.

Night setback operation uses the same single zone VAV fan control logic. However, since the setbacks would normally be larger than the space reset range for the fan speed, the fan will typically always be at 100%.

If the hood on/off operation is used on a single zone VAV unit, then during hood on, the mode enable will switch to the Outdoor Air Temperature Sensor using Hood On Mode Enable Setpoints and the outdoor air damper will modulate to 100%. The supply fan VFD will modulate to 100%.

Supply Air Temperature, Airflow Monitoring, and Preheater Operation

Supply Air Temperature Setpoint Reset

Various sources can be configured to reset the Supply Air Temperature 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:

- Space temperature
- Outdoor air temperature
- Return air temperature
- Fan VFD signal
- Remote supply air temperature 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 Supply Air Temperature 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 Supply Air Temperature Setpoint will be reset to its lowest configured setpoint. When the reset source is at its lowest configured setpoint, the Supply Air Temperature Setpoint will be reset to its highest configured 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 Supply Air Temperature Setpoints.

If a remote supply air temperature 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. The voltage that corresponds to the Low Supply Air Temperature Setpoint and to the High Supply Air Temperature Setpoint in both the Heating and the Cooling Modes is user-configurable.

NOTE: This supply air temperature reset cannot be used on a single zone VAV unit.

Airflow Monitoring

Outdoor, supply, return and exhaust airflow can be monitored using the EBTRON GTC116 or HTN104 series, Paragon MicroTrans^{EQ} or MTSE series, or GreenTrol GA-200-N Module in conjunction with a GreenTrol GF series of airflow station. Contact AAON Controls for information on other airflow station options. The VCCX2 will control the outdoor air damper to maintain an Outdoor Air Cubic Foot per Minute Setpoint. This operation can be overridden higher by normal economizer control.

On an MUA unit or a unit configured for space control of high percentage outdoor air, since the damper is typically at 100%, the VCCX2 can be configured to modulate the supply fan VFD to maintain an Outdoor Cubic Foot per Minute Setpoint.

Preheater Operation

A preheat relay can be configured to energize anytime the supply fan is operating and the outdoor air temperature is below the Preheat Setpoint. This option allows preheating of cold outside air before it reaches the evaporator coils and is useful in hot water/chilled water applications or during CO_2 control of the economizer in low temperature conditions. This operation only occurs in the Occupied Mode.

If using the PREHEAT-X, an SCR Preheater and/or stages of preheat can be controlled. If the entering air temperature (sensor connected to the PREHEAT-X) falls below the Preheat Setpoint, then preheat will be controlled to either a Cooling, Heating or Vent Mode Preheater Leaving Air Setpoint — depending on if the VCCX2 is currently in the Cooling, Heating, or Vent Mode. These setpoints are all set in the VCCX2 Controller. If using the PREHEAT-X in conjunction with the VCCX2 Controller, the entering air temperature on the PREHEAT-X (instead of the Outdoor Air Temperature Sensor connected directly to the VCCX2 Controller) will be used as the temperature that locks out compressors. See the *PREHEAT-X Module Technical Guide* for more details.

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.

Heat Wheel

One of the relay outputs can be configured as a heat wheel relay. This relay will enable the heat wheel when the unit goes into the Occupied Mode. If the unit is a recirculating unit configured to use economizer free cooling, the relay will disable during economizer operation.

If the unit is a 100% outdoor air unit configured to use the Outdoor Air Sensor as the controlling sensor, then the heat wheel relay will disable in between the outdoor air Cooling and Heating Mode Enable Setpoints (Outdoor Air Vent Mode). Similarly, on a unit configured for space control of high percentage outdoor air, and the unit is in Outdoor Air Vent Mode, the wheel is disabled. The controller can also be configured to disable the heat wheel relay between High and Low Outdoor Air Enthalpy Setpoints.

Heat Wheel Defrost

A Defrost Mode will occur if the heat wheel relay is active, the outdoor air temperature is below the Heat Wheel Defrost Setpoint, and 30 minutes have elapsed since the last Defrost Mode. The Defrost Mode will disable the heat wheel relay for two minutes. Before the heat wheel relay disables, a two minute delay will occur while the economizer closes to a 10% position to allow the return air to have maximum defrost effect on the wheel. At the end of the Defrost Mode, the heat wheel relay will enable, and the economizer will return to its normal position. This 10% re-positioning will not occur on units configured for MUA control (Outdoor Air is the controlling sensor), or for units in hood-on operation, or for units that are configured for space temperature control of a high percentage of outdoor air.

Duct Static Pressure Control

If the VCCX2 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 or 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 VCCX2 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 higher than 0.5” water column above the Duct Static Pressure Setpoint, the duct static pressure control output signal value will be reduced by a maximum adjustment of 15% every control period until the static pressure is brought under control or the VFD fan minimum has been met. This is to prevent damage to the ductwork if all the VAV boxes are closed or some other blockage occurs in the ductwork.

Any time the supply fan is off, the duct static pressure control output signal will remain at 0 V. If duct static pressure control is not configured, the static pressure can still be monitored if a Static Sensor is installed, however, no control will occur.

WARNING: The manufacturer does not assume responsibility for protecting the equipment from over-pressurization. Always install mechanical high static protection cutoffs to protect the system.

Duct Static Setpoint Reset, Building Pressure Control

Duct Static Setpoint Reset

If the VCCX2 Controller is being used with AAON VAV box controllers in a VAV system, the Duct Static Pressure Setpoint can be dynamically reset based on the most-open VAV box associated with that unit. As long as the most-open box is less than 80% open, the Duct Static Setpoint will decrease at a user-adjustable reset rate from the Max Static Pressure Reset Limit Setpoint down to the Minimum Static Pressure Reset Limit. Once the most-open box exceeds 80%, the setpoint will increase toward the Maximum Static Pressure Reset Limit Setpoint. A MiniLink PD 5 is required to poll the VAV boxes for their damper position.

Duct Static Pressure Control for Filter Loading

In order to maintain a constant cubic feet per minute through the supply air ducts on a mixed air constant air unit, the VCCX2 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 VCCX2 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.

Building Pressure Control

The VCCX2 can maintain building static pressure anytime the supply fan is operating. A building pressure transducer must be connected to the VCCX2 Controller. 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.
- **Exhaust Fan VFD or Modulating Exhaust Damper:** If configured for modulating exhaust, a user-adjustable voltage output (AO4 – Building Pressure Output) 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 to 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 VCCX2 will use the user-adjustable economizer/ outdoor air damper output signal (AO2 – 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 to 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 CO_2 indoor air quality operation will be available.
- **Supply Fan VFD:** Careful consideration should be made regarding the effects of potential reduced airflow when using this option. If this option is selected, the supply fan VFD output (AO1 - Main Supply Fan VFD) 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.

NOTE: If reverse acting building pressure control using the outdoor air damper is configured, the hood on input is ignored and will not drive the outdoor air damper open.

Return Plenum Pressure Control

The VCCX2 Controller can control the return plenum pressure using a motorized exhaust damper. This is used on certain RNZ units that have a return fan that will be used to control building static pressure. This sequence will require the use of the VCC-X EM1 Expansion Module which has an input for a return plenum pressure transducer (the same transducer used for the building pressure control) and an analog output that is wired to the actuator used to control the motorized exhaust damper. When the return fan is active (based on building pressure) the motorized exhaust damper will modulate to control the Return Plenum Pressure Setpoint. If the pressure is above the setpoint the modulating signal will move towards 100%. If the pressure is below setpoint the modulating signal will move towards 0%.

Exhaust Duct Static Pressure Control of Exhaust Fan

The VCCX2 Controller can control an exhaust fan based off of exhaust duct static pressure. This sequence will require the use of the VCC-X EM1 Expansion Module which has a modular jack that the Duct Static Pressure Sensor will plug into. The building pressure output will be used to control the exhaust fan for this operation.

A standard pull-through exhaust fan creates negative duct static pressure. Since a Duct Static Pressure Sensor reads positive pressure, this sequence requires the tubing for the sensor to be reversed so that the low side is in the exhaust ductwork. So, although the user is actually controlling to a negative pressure, the VCCX2 will be configured to use (and will display) an equivalent positive Exhaust Duct Static Pressure Value and Setpoint. So, if the duct static pressure is below setpoint, the control signal will ramp up.

See the *VCCX2 Controller Operator Interfaces SD Technical Guide* for the setpoint and deadband ranges associated with this control. The control rate is the same as the control rate configured for the supply duct static pressure control.

Make-up Air, Dual Mode, and Space Temperature Control

Make-up Air Operation

Occupied Mode: The VCCX2 will use the normal Cooling and Heating Mode Enable Setpoints (not the Hood On Setpoints) in conjunction with the Outdoor Air Temperature Sensor to determine the mode of operation. The Outdoor Air Dewpoint Setpoint will initiate the Dehumidification Mode. The outdoor air damper will be modulated to the economizer minimum damper position (normally set at 100% for a MUA unit).

Unoccupied Mode: Normally, an 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 30ºF) 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 VCCX2 Controller will use the Space Humidity Setpoint for Unoccupied Dehumidification calls.

Constant Air Volume/Make-up Air Dual Mode (Hood On/Off Operation)

The VCCX2 Controller can be configured as a CAV controller but switch to MUA operation when an exhaust hood is energized. This MUA Force Mode occurs when a 24 VAC wet contact closure is received on the hood on binary input on the VCCX2 Controller. Under normal operation (CAV), the unit will operate as a recirculating space temperature (and space humidity) controlled unit. This sequence should not be used on a VAV unit.

When the hood on contact is made, the unit will open the outdoor air damper to its full open position. The Heating and Cooling Modes will then be determined by the Outdoor Air Temperature Sensor using the hood on Outdoor Air Heating and Cooling Setpoints which are used only in hood on operation. Dehumidification would then be initiated by an Outdoor Dewpoint Setpoint. If using reverse building pressure control using the outdoor air damper, the hood on input will not affect the damper position.

When the Hood On Force Mode is removed, the unit will revert to CAV operation with the outdoor damper returning to its minimum position (unless economizer operation is enabled) and with mode control initiated by the Space Temperature and Humidity Sensors.

Space Temperature Control of High Percentage Outdoor Air Units

This option allows for space temperature control of 100% outdoor air units or units with a high percentage of outdoor air (normally 50% or greater). For this application configure “Space Temperature w/High Percentage OA” for the controlling sensor option. The intent of this sequence is to allow space temperature and humidity control of the unit while preventing the dumping of hot or cold outside air into the space during the Space Vent Mode of operation. If a Return Air Humidity Sensor is available, it can be configured to initiate dehumidification.

As long as there is a space temperature call for Cooling or Heating or if there is a Space Dehumidification call, the unit will remain under space control. During this space control operation, if the configured minimum outdoor air damper (economizer) position is less than 100%, the economizer can open farther for free cooling during Space Cooling Mode. Additionally, the economizer minimum position can be overridden by indoor air quality CO_2 conditions.

If both the space temperature and the space humidity are satisfied, before switching to the Space Vent Mode, the controller compares the outdoor air temperature to the Hood On HVAC Setpoints (Hood On Maje-up Air Setpoints) to determine if a continued demand for heating or cooling is required to prevent dumping. If there is no demand, the VCCX2 Controller switches to Vent Mode. If the outdoor air temperature is greater than the Hood On HVAC Cooling Setpoint or less than the Hood On HVAC Heating Setpoint, plus the Occupied deadband, the VCCX2 Controller will continue mechanical cooling or heating operation and stage or modulate it as necessary to maintain the Vent Mode Supply Air Setpoint (calculated to be halfway between the Space Heating and Cooling Mode Enable Setpoints). During this outdoor control, if the configured minimum outdoor air damper (economizer) position is less than 100%, the minimum position can be overridden by indoor air quality CO_2 conditions.

While the unit is under outdoor air temperature control, Dehumidification Mode is then initiated based on an Outdoor Air Dewpoint Setpoint with reheat controlling to the Vent Mode Supply Air Setpoint.

Any call for space Cooling, Heating, or Dehumidification will cancel the outdoor operation and return the unit to space control.

NOTE: All minimum run times must be satisfied before mechanical cooling or heating is de-energized.

Variable Air Volume Operation with Supply Air Tempering (Variable Air Volume 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 VCCX2 Controller accomplishes the same result using the Hood-On Outdoor Air 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 Hood On HVAC Setpoints for the outdoor air temperature values that will enable Cooling and Heating. The Hood On Heating Setpoint should be set at or above the outdoor air 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 Hood On 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, 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 outdoor air temperature rises above the Hood On 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 outdoor air temperature is between the Hood On Cooling and Heating Setpoints, the economizer can modulate if necessary to maintain the Cooling Supply Air Setpoint.

Whenever the outdoor air temperature falls below the Hood On Heating Setpoint, the unit will be in Heating Mode controlling to the Heating Supply Air Setpoint. The economizer can still modulate during Heating Mode if the supply air temperature is too warm, and it will control to a setpoint calculated to be 2°F above the Heating Supply Air Setpoint. In this way, the economizer will have time to close to its minimum position before the supply air temperature falls below the Heating Supply Air Setpoint and Heating is initiated.

During Morning Warm-Up, heating will be controlled to the Morning Warm-Up Supply Air Setpoint.

In this operation, if night setback operation will be initiated by a Space Sensor connected to the VCCX2 Controller, then the night setback Cooling and Heating offsets will be applied to the normal Occupied HVAC Mode Enable Setpoints (not the Hood On Setpoints). During night setback operation, Heating will be controlled to the Morning Warm-Up Supply Air Setpoint.

Finally, configure the VCCX2 for duct static pressure control.

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 rises above the Supply Air Temperature 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 is below the heating lockout but above the outdoor air temperature compressor heating lockout, compressor heat will be used and can be supplemented by auxiliary heat.

When the outdoor air temperature is below the outdoor air temperature 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 outdoor air temperature is below the outdoor air temperature compressor lockout.

Heat Pump Standard Defrost, Adaptive Defrost, and Water Source Heat Pump

Heat Pump Standard Defrost Operation

If using the VCCX2 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 Supply Air Temperature Setpoint. Emergency heat cannot be used because it is locked out because the compressors are on.

The unit will leave the Defrost Mode after 10 minutes have elapsed or 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 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 eighth and ninth minute, the defrost interval will not be changed.

If the defrost cycle is terminated before the eighth 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 eight minutes to zero minutes.

Adaptive defrost can be disabled by setting the adaptive defrost timer setpoint to zero.

Water Source Heat Pump Operation

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 Heating Mode, auxiliary heat can be used with compressor heat to achieve the active Supply Air Heating Setpoint. Auxiliary heat can be:

- Modulating heat
- Staged forms of heat
- 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 rises above the Supply Air Temperature 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 Defrost Mode on a water source heat pump unit.

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

Electronic Expansion Valve Operation

If using electronic expansion valves with Bitzer VFD Compressors and the RSMV Module, then a coil (suction line) temperature sensor will measure the coil (suction line) temperature after each evaporator coil line for each compressor, and this sensor will be connected to an RSMV Module. This temperature will be used in conjunction with the calculated saturated refrigerant temperature to calculate the superheat of each evaporator coil. The electronic expansion valve for each coil will then be controlled to maintain the Superheat Setpoint.

Head Pressure Control

The RSM can monitor a Head Pressure Transducer and control a condenser fan to maintain a Head Pressure Setpoint.

In Cooling Mode, the condenser signal will modulate to maintain the Cooling Head Pressure Setpoint.

In Dehumidification Mode, the condenser output signal controls to the Reheat Head Pressure Setpoint. High head pressure conditions produce the same effects as in the Cooling Mode.

See the appropriate RSM Technical Guide for a more detailed sequence of operation.

Evaporative Condenser Operation

If the unit has been configured for evaporative condenser control and the outdoor air temperature is above the Evaporative/ Modulating Condenser Low Ambient Setpoint, the evaporative condenser pump relay will energize to be used as the first stage of head pressure control when the compressors are active. Modulating condenser fan control will be the second stage.

If the outdoor air temperature is below the Evaporative/ Modulating Condenser Low Ambient Setpoint, the modulating condenser fan will be used as the first stage of head pressure control, and the evaporative condenser pump relay will energize as the second stage.

If the head pressure is above the Cooling Head Pressure Setpoint by the Evaporative Head Pressure Deadband Setpoint, the second stage of head pressure control will be enabled. At this level below the Cooling Head Pressure Setpoint, the second stage of head pressure control will be disabled.

Sump Heater Operation

The sump heater relay activates if the sump temperature is below the Sump Heater Enable Temperature Setpoint. The sump heater relay deactivates once the sump temperature rises 10ºF above the Sump Heater Enable Temperature Setpoint or if the sump drain relay is active.

Sump Drain Enable Operation

If the sump temperature is below the Sump Drain Enable Setpoint for one minute, the sump pump drain relay will enable. The sump drain enable relay can be disabled in one of two ways:

1. Cycle power to the VCCX2 when the sump temp is above the Sump Drain Enable Setpoint or
2. Use BACnet point AV:94 Sump Drain Override. The building management system (BMS) needs to set AV:94 to a value of 1 and back to 0 when the sump temp is above the Sump Drain Enable Setpoint.

Waterside Economizer, Temperature Protection, and Outdoor Air Lockouts

Waterside Economizer Operation

If the unit is equipped with a waterside economizer, the following describes the operation of the waterside economizer valve, the waterside economizer bypass valve, and the condenser valve operation during the different modes.

Unit Off Mode and Unit Vent Mode

The waterside economizer, bypass, and condenser valves will be closed.

Unit Cooling Mode

If in Cooling Mode, the entering water temperature is below the entering air temperature (measured by the sensor connected to the outdoor temperature sensor input), by the entering water control deadband amount, the waterside economizer valve will modulate to maintain the Cooling Supply Air Setpoint. The bypass and condenser valves will remain closed.

If the waterside economizer valve opens to 100% and cannot maintain the Cooling Supply Air Setpoint, then the unit will enable and stage/modulate compressors to maintain the Cooling Supply Air Setpoint, while the waterside economizer valve is locked at 100%. The bypass valve will remain closed, while the condenser valve will modulate to maintain the Head Pressure Setpoint.

If the outdoor air temperature is cooler than the entering water temperature, the waterside economizer valve will remain closed, and compressor cooling will stage/modulate to maintain the Cooling Supply Air Setpoint. The bypass valve will modulate to maintain the Head Pressure Setpoint, and the condenser valve will be open.

Unit Heating Mode

The waterside economizer valve is closed, while the bypass valve and condenser valves are open.

NOTE: For waterside economizer bypass wiring, please see the *RSMD Technical Guide.*

Waterside Economizer Flush Cycle

If the economizer has been closed for 72 hours, a flush cycle will be initiated the next time the compressor is activated or at the next 6:00 AM time slot, whichever happens first. During the flush cycle, the economizer valve will open for five minutes and then close again before the compressor activates. The 72-hour timer will restart once the flush cycle is completed or the economizer has been activated and has closed again.

Temperature Protection

Temperature protection is activated when the supply air temperature rises above the high cutoff temperature (immediate) or drops below the low cutoff temperature (for 10 minutes). Both cutoff setpoints are user-adjustable. This mode shuts off the unit.

This mode is canceled when the supply air temperature drops 5ºF below the High Cutoff Temperature Setpoint or rises 5ºF above the Low Temp Cutoff Temperature Setpoint or when the unit changes back into Occupied Mode.

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

The VCCX2 Controller can be configured to broadcast building pressure, outdoor air temperature, outdoor air humidity, space temperature, space humidity, and CO_2 to any VCCX2 Controller that does not have one or more of these sensor(s). A CommLink 5 or MiniLink PD 5 is required to broadcast these values.

Alarm Detection and Reporting

The VCCX2 Controller continuously performs self diagnostics during normal operation to determine if any operating failures have occurred. These failures (alarms) can be reported to a Touch Screen System Manager, a Hand Held Modular Service Tool, or to a computer running Prism 2 software.

The following are the available alarm designations for the VCCX2 Controller:

- Bad SAT Sensor
- Bad RAT Sensor
- Bad OAT Sensor
- Bad Space Sensor
- Bad CO2 Sensor
- Missing Outdoor CFM Sensor
- Missing Exhaust CFM Sensor
- Missing Supply CFM Sensor
- Missing Return CFM Sensor
- Mechanical Cooling Failure
- Mechanical Heating Failure
- Fan Proving Alarm
- Dirty Filter Alarm
- Emergency Shutdown
- Relay Runtime
- No Economizer Feedback
- Title 24 Economizer Air Temperature Sensor Failure
- Title 24 Economizer Damper Failure
- Title 24 Economizer Excess Outdoor Air
- Title 24 Economizer Not Economizing When It Should
- Title 24 Economizer Economizing, But Shouldn’t
- High Supply Air Temperature Cutoff
- Low Supply Air Temperature Cutoff
- High Control Temperature
- Low Control Temperature
- Preheat Low Temperature
- Missing RSM #1
- Missing RSM #2
- Missing RSM #3
- Missing RSM #4
- Missing PREHEAT-X
- Missing MHGRV-X
- Missing MODGAS-X
- Missing EM1
- Missing 12RLY
- RSM 1 Operating Alarm
- RSM 2 Operating Alarm
- RSM 3 Operating Alarm
- RSM 4 Operating Alarm

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, or if the controller detects a missing E-BUS Digital Space Sensor, 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 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 half point between the Cooling and Heating Lockout Setpoints. This will allow cooling and heating to continue operating. For MUA systems, the Outdoor Air Temperature Sensor is the controlling sensor (Mode Enable Sensor). This alarm forces the MUA into Heating Mode.

Return Air Sensor Failure Alarm

This alarm is generated if the controller is configured to have a Return Air sensor, but does not detect it.

CO_2 Sensor Failure Alarm

This alarm is generated if the controller is configured to have a CO_2 Sensor, but does not detect it. Indoor Air Quality 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 return to CO_2 control.

Airflow Alarms

- Outdoor Airflow Sensor Alarm
- Supply Airflow Sensor Alarm
- Return Airflow Sensor Alarm
- Exhaust Airflow Sensor Alarm

If the controller is configured to have any of the above airflow sensors, but the controller does not detect that the sensor is connected, then the applicable alarm will occur. If the sensor is properly detected after the unit has alarmed, the alarm will be cleared.

Missing Expansion Module Alarm

- Preheat-X Board Missing
- EM1 Expansion Missing
- RSM Modules #1 - #4 Missing
- Reheat Board Missing
- ModGas Board Missing
- 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

Fixed Stage Cooling: The mechanical cooling failure alarm is generated if the supply air temperature fails to drop 5ºF (within a user-adjustable time period) from the temperature the supply air was at when the cooling was activated and the supply air temperature is not within 5ºF of the setpoint. The alarm will be cleared when the supply air temperature drops the 5ºF and sets the failure timer back to zero.

Variable Capacity Compressors (Utilizing RSMs): This alarm is not generated; instead, the user has to monitor the compressor module alarms for mechanical cooling issues.

This alarm is also not generated if using a modulating chilled water valve.

Mechanical Heating Failure

The Mechanical Heating Failure alarm occurs when the staged heating fails to raise the supply air temperature to within 5ºF of the Supply Air Heating Setpoint within the Mechanical Fail Timeout. The Mechanical Fail Timeout is reset back to zero whenever the Supply Air rises at least 5ºF as it climbs. As long as the supply air temperature continues to rise at least 5ºF within the Mechanical Fail Timeout, and eventually gets to the desired Heating Setpoint, the alarm will be cleared. On PREHEAT-X, the Heat Mode Leaving Air Setpoint is used instead of Supply Air Heating Setpoint to determine the alarm.

Supply Fan Proof of Flow Interlock Alarm

A proof of flow switch 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 (if it is not configured for outdoor temperature control or space control with high percentage outdoor air), and a fan proving alarm is generated. Fan proving needs to be configured for this alarm to occur. There is a 30 second delay for this alarm.

Return/Exhaust Fan Proving Alarm

There are configuration options for return fan proving and exhaust fan proving alarms. If the unit is configured for return fan proving, it is assumed that the return fan is wired in parallel with the supply fan relay. In this case, if the supply fan relay is energized, but the return/exhaust fan proving binary input on the VCC-X EM1 Module does not see 24 VAC, a return/exhaust fan proving alarm will occur. If the unit is configured for building pressure control of the exhaust fan, if the exhaust relay is energized, but the return/exhaust fan proving binary input on the VCC-X EM1 Module does not see 24 VAC, a return/exhaust fan proving alarm will occur.

Dirty Filter Alarm

A differential pressure switch 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.

Emergency Shutdown Alarm

A 24 VAC wet contact input is available to be used when a normally closed smoke Detector, Firestat, or other shutdown condition occurs. If this contact opens, it will initiate shutdown of the VCCX2 and will generate an alarm condition. If an Occupied relay is configured, it will remain energized. BACnet override commands are canceled if the emergency shutdown alarm is activated.

Title 24 Economizer Alarms

Failure Mode Alarms

High and Low Supply Air Temperature Alarms

If the supply air temperature rises above the user-adjustable High Supply Air Temperature Cutoff Setpoint, heating will be immediately deactivated, and a high supply air temperature cutoff alarm will be generated. The fan will continue to run. This mode and alarm will be canceled if the supply air temperature falls below the High Supply Air Temperature Cutoff Setpoint by 5ºF.

If the supply air temperature falls below the user-adjustable Low Supply Air Temperature Cutoff Setpoint, all mechanical Heating and Cooling will be immediately deactivated. If, after 10 minutes, the supply air temperature is still below this setpoint, the fan will be deactivated, the outdoor air damper will close, and a low supply air temperature cutoff alarm will be generated. This mode and alarm will be canceled if the supply air temperature rises above the Low Supply Air Temperature Cutoff Setpoint by 5ºF.

High and Low Space Temp Failure

When the space temperature rises above the Cooling Mode Enable Setpoint plus the Control Mode High Alarm Offset Setpoint for 30 seconds, the controller will generate a high control temp failure alarm. When the space temperature drops below the Heating Mode Enable Setpoint minus the control Mode Low Alarm Offset Setpoint for 30 seconds, the controller will generate a low control temp failure alarm. Both offset setpoints are user-adjustable.

Preheat Low Temperature

This alarm indicates a leaving air temperature cutoff alarm condition which is activated if the controlling leaving air temperature has dropped below 35ºF for more than two minutes. The alarm will be disabled if after a fixed delay period the leaving air temperature has risen above 35ºF.

RSM Module (1-4) Operating Alarm

This alarm indicates numerous alarm conditions. Please refer to the individual RSM Technical Guides for details.

Title 24 (FDD) Economizer Alarms

Economizer Temperature Sensor Failure

Outside 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.

VCCX2 CONTROLLER TREND LOGS	
Item Description	**Log Abbreviation (Unit)**
Date	Date (Day Month)
Time	Time (24 Hr.)
Mode of Operation	Mode (Enumerated)*
HVAC Mode	HVAC (Enumerated)*
Space Temperature	Space (ºF)
Indoor Humidity	InRH (%)
Mode Cooling Setpoint	CSP (ºF)
Mode Heating Setpoint	HSP (ºF)
Supply Air Temperature	SAT (ºF)
Supply Air Setpoint	SATSP (ºF)
Coil (Saturation) Temp Setpoint	CoilSP (ºF)
Return Air Temperature	RAT (ºF)
Return Air Humidity	RA RH (%)
Outdoor Air Temperature	OAT (ºF)
Outdoor Air Humidity	OA RH (%)
Outdoor Air Wetbulb	OA WB (ºF)
Outdoor Air Dewpoint	OA DP (ºF)
Carbon Dioxide	CO2 (PPM)
Outdoor Airflow CFM	OACFM (kCFM)
Supply Airflow CFM	SACFM (kCFM)
Return Airflow CFM	RACFM (kCFM)
Exhaust Airflow CFM	EXCFM (kCFM)
Building Pressure	BldPr (WG”)
Duct Static Pressure	Static (WG”)
MHGRV Valve Position	ReHeat
MODGAS Valve Position	ModGas
Main Fan Speed VFD Signal	FanVFD (%)
Economizer Position	Econo (%)
Modulating Heat Signal	ModHeat (%)
Building Pres. Relief VFD Signal	Relief (%)
Modulating Cooling Signal	ModCool (%)
Sensor Alarms	AlrmGrp1 (Bit String)*
Mechanical Alarms	AlrmGrp2 (Bit String)*
Temp Limit and Sump Drain Alarms	AlrmGrp3 (Bit String)*
Missing Module Alarms	AlrmGrp4 (Bit String)*
Refrigeration Module Alarms	AlrmGrp5 (Bit String)*
Binary Inputs Status	Bin IN (Bit String)*
Relays Status of VCCX2 and EM1	Main Rly (Bit String)*
Relays Status of 12 Relay Expansion Module	Exp Rly (Bit String)*

*** Bit String and Enumeration Value information and interpretation is explained in the paragraphs and tables at the end of this section.**

Table 5: VCCX2 Controller Trend Logs

RSM Trend Logs

There can be as many as four RSMVs, four RSMDs, or six RSMZs on a unit, with each RSM controlling up to two compressors and condensers. These can be referred to as modules 1, 2, 3, and 4 or as modules A, B, C, and D. Various items in the trend logs can refer to different modules and different compressor/condensers on each module. For instance:

- 1A1: Stat refers to the status of Module 1/Compressor 1
- 4D1 would be Module 4/Compressor 1.

Likewise, 1SuctTmp1 refers to the suction (saturation) temperature of Module 1/Compressor 1, while 3SucTmp2 refers to the suction (saturation) temperature of Module 3/Compressor 2. Several trend log items will use this pattern to identify the status of values related to certain modules and the compressors or condensers on those modules. See **Table 7, this page,** for RSMV/RSMD trend logs and **Table 6, this page,** for RSMZ trend logs.

RSMZ MODULE TREND LOGS (TYPICAL OF 4 RSM MODULES)	
Item Description	**Log Abbreviation (Unit)**
System Status	SYSState (Bit String)*
System Command	SYSCmd ((Bit String)*
A1 Compressor Modulating Position	1Comp1Perc (%)
A1 Condenser Fan Position	1CondFan (%)
A1 Discharge Pressure	1DisPrs (PSI)
A1 Discharge Line Temperature	1DisLnTmp (ºF)
A1 Suction Pressure	1SucPr (PSI)
A1 Suction Line Temperature	1SucLnTmp (ºF)
A1 Saturation Temperature	1SatTmp (ºF)
A1 Superheat	1Superheat (ºF)
A1 Expansion Valve Position	1EEV1Pos (%)
A1 Compressor Current	1CompCur (Amps)
A1 Compressor Status	1Comp1Stat (Bit String)*
A1 Compressor VFD Status	1VFDStat (Bit String)*
A1 RSM Alarms	1RSMAlrms (Bit String)*
A1 VFD Alarms 1	1VFDAlrm1 (Bit String)*
A1 VFD Alarms 2	1VFDAlrm2 (Bit String)*
A1 Subcooling Temperature	1Subcool (ºF)
*** Bit String and Enumerated Value information and interpretation is explained in the paragraphs and tables at the end of this section.**	

Table 6: RSMZ Module Trend Logs

RSMV / RSMD MODULE TREND LOGS (TYPICAL OF 4 RSM MODULES)	
Item Description	**Log Abbreviation (Unit)**
Compressor A1 Status	1A1Stat (Bit String)*
Compressor A2 Status	1A2Stat (Bit String)*
Compressor A1 Modulating Position	1Comp1 (%)
Compressor A2 Modulating Position	1Comp2 (%)
Condenser A1 Modulating Position	1Cond1 (%)
Condenser A2 Modulating Position	1Cond2 (%)
A1 Expansion Valve	1EXV1 (%)
A2 Expansion Valve	1EXV2 (%)
Condenser A1 Expansion Valve	1EXV3 (%)
Condenser A2 Expansion Valve	1EXV4 (%)
A1 Head Pressure	1HeadPr1 (PSI)
A2 Head Pressure	1HeadPr2 (PSI)
A1 Suction Pressure	1SuctPr1 (PSI)
A2 Suction Pressure	1SuctPr2 (PSI)
A1 Saturation Temperature	1SuctTmp1 (ºF)
A2 Saturation Temperature	1SuctTmp2 (ºF)
A1 Suction Line Temperature	1CoilTmp1 (ºF)
A2 Suction Line Temperature	1CoilTmp2 (ºF)
A1 Condenser Suction Temp	1CoilTmp3 (ºF)
A2 Condenser Suction Temp	1CoilTmp4 (ºF)
A1 Superheat	1SprHeat1 (ºF)
A2 Superheat	1SprHeat2 (ºF)
Condenser A1 Superheat	1SprHeat3 (ºF)
Condenser A2 Superheat	1SprHeat4 (ºF)
Superheat Setpoint	1SprHtSP (ºF)
Saturation (Suction) Setpoint	1CoilSP (ºF)
Leaving Water Temperature	1LvgWater (ºF)
A1 Discharge Temperature	1DisChg1 (ºF)
A2 Discharge Temperature	1DisChg2 (ºF)
Relay 1 Status	1Relay1 (Bit String)*
*** Bit String and Enumerated Value information and interpretation is explained in the paragraphs and tables at the end of this section.**	

Table 7: RSMV/RSMD Module Trend Logs

TREND LOG ENUMERATED VALUES		
Item Description	**Value**	**Description**
Mode	0	Unoccupied
	1	Occupied
	2	Push Button Override Active
HVAC	0	Off
	1	Vent Mode
	2	Cooling Mode
	3	Heating Mode
	4	Vent Dehumidify Mode
	5	Cool Dehumidify Mode
	6	Heat Dehumidify Mode
	7	Warm-up Mode
	8	Fan Purge Mode
	9	Defrost Mode
	10	Pushbutton Override Active

Table 8: Trend Log Enumerated Values

RSMZ TREND LOG BIT STRINGS - COMPSTAT			
Item	**Bit**	**Value**	**Description**
1Comp1Stat **2Comp1Stat** **3Comp1Stat** **3Comp2Stat** **4Comp1Stat** **5Comp1Stat** **6Comp1STat** **6Comp2Stat**	0	1	Configured
	1	2	Enabled
	2	4	Running
	3	8	Failed
	4	16	Lockout
	5	32	MinRunFlag
	6	64	MinRunPending
	7	128	MinOffFlag
	8	256	MinOffPending
	9	512	StageUpConditionsMet
	10	1024	StageDwnConditionsMet
	11	2048	StageUpFlag
	12	4096	StageDwnFlag
	13	8192	CoilTempSatisfied

Table 9: RSMZ Module Comp Status Trend Log

RSMZ TREND LOG BIT STRINGS - RSM ALARMS			
Item	**Bit**	**Value**	**Description**
1RSMAlrms **2RSMAlrms** **3RSMAlrms** **4RSMAlrms** **5RSMAlrms** **6RSMAlrms**	0	1	LowSuction
	1	2	UnsafeSuction
	2	4	TripHighDiscPSI_Comp1
	3	8	Compressor1_NotRunning
	4	16	Compressor2_NotRunning
	5	32	LowSuperheat
	6	64	HighDischargeTemperature
	7	128	DMQ_NoDetect
	8	256	ModBusSlaveCommTO
	9	512	LowSuctionComp2Off
	10	1024	TripHighDiscPSI_Comp2
	11	2048	HighSuperheat
	12	4096	HighEvapTemp

Table 10: RSMZ Module RSM Alarm Trend Log

RSMZ Trend Logs

RSMZ TREND LOG BIT STRINGS - VFD STATUS				
Item	**Bit**	**Value**	**VFD Status (Bit = 0)**	**VFD Status (Bit = 1)**
1VFDStat 2VFDStat 3VFDStat 4VFDStat 5VFDStat 6VFDStat	**0**	1	0 = Control Not Ready	1 = Control Ready
	1	2	0 = Drive Not Ready	1= Drive Ready
	2	4	0 = Coasting	1 = Enable
	3	8	0 = No Error	1 = Trip
	4	16	0 = No Error	1 = Error (no trip)
	5	32	Reserved	
	6	64	0 = No Error	1 = TripLock (must cycle power)
	7	128	0 = No Warning	1 = Warning
	8	256	0 = Speed Not Equal Reference	1 = Speed Equal Reference
	9	512	0 = Local Operation	1 = Bus Control
	10	1024	0 = Out of Frequency Limit	1 = Frequency Limit Okay
	11	2048	0 = No Operation	1 = In Operation
	12	4096	0 = Drive Okay	1 = Stopped, Auto Start
	13	8192	0 = Voltage Okay	1 = Voltage Exceeded
	14	16384	0 = Torque Okay	1 = Torque Exceeded
	15	32768	0 = Timer Okay	1 = Timer Exceeded

Table 11: RSMZ Module VFD Status Trend Log

RSMZ TREND LOG BIT STRINGS VFD ALARMS 1			
Item	**Bit**	**Value**	**VFD Status (Bit = 0)**
1VFDAlrm1 2VFDAlrm1 4VFDAlrm1 5VFDAlrm1	**0**	1	Brake Check
	1	2	Pwr. Card Temp
	2	4	Earth Fault
	3	8	Ctrl. Card Temp
	4	16	Ctrl. Word TO
	5	32	Over Current
	6	64	Torque Limit
	7	128	Motor Th Over
	8	256	Motor ETR Over
	9	512	Inverter Overld.
	10	1024	DC under Volt
	11	2048	DC over Volt
	12	4096	Short Circuit
	13	8192	Inrush Fault
	14	16384	Mains ph. Loss
	15	32768	AMA Not OK

Table 12: RSMZ Module VFD Alarm 1 Trend Log

RSMZ TREND LOG BIT STRINGS VFD ALARMS 2			
Item	**Bit**	**Value**	**VFD Status (Bit = 0)**
1VFDAlrm2 2VFDAlrm2 4VFDAlrm2 5VFDAlrm2	**0**	1	Live Zero Error
	1	2	Internal Fault
	2	4	Brake Overload
	3	8	U phase Loss
	4	16	V phase Loss
	5	32	W phaseLoss
	6	64	Fieldbus Fault
	7	128	24 V Supply Low
	8	256	Mains Failure
	9	512	1.8V Supply Low
	10	1024	Brake Resistor
	11	2048	Brake IGBT
	12	4096	Option Change
	13	8192	Drive Initialized
	14	16384	Safe Stop
	15	32768	Mech brake low

Table 13: RSMZ Module VFD Alarm 2 Trend Log

Trend Log Bit String Decoding

Bit string values allow the manipulation of binary data in useful ways. For instance, a single trend log item may need to represent multiple simultaneous true conditions. An example would be a trend log item indicating what binary inputs are currently active, what relays are currently active, or what alarms are currently active. A single bit string value can be decoded to determine which multiple conditions might be simultaneously true. This section is not intended to be a full explanation of how bit strings work, but to explain how to decode the VCCX2 trend log items that are indicated as being bit string values.

Determine Active Binary Inputs When a Trend Item Was Recorded

Binary Inputs	Bit String Values
0	No Binary Inputs Active
1	Fan Proving
2	Dirty Filter
4	Hood On/Off
8	Remote Occupied
16	Remote Cooling
32	Remote Heating
64	Remote Dehumidification
128	Emergency Shutdown

Example 1

1. If the trend log bit string value is 22 for Binary Inputs, first identify the highest value shown above that can be subtracted from 22. In this example, that would be 16 (Remote Cooling). The Remote Cooling binary input is currently active.
2. From the remainder of 6 (22 - 16 = 6), subtract the next highest possible number. That would be 4 (Hood On/Off). The Hood On/Off binary input is currently active.
3. From the remainder of 2 (6 – 4 = 2), subtract the next highest possible number which is 2 (Dirty Filter). The Dirty Filter binary input is also currently active.
4. There is no remainder (2 – 2 = 0), so there are no more inputs that are active.

With this example, from one value of 22 the formula above determined that three binary inputs were active when that trend item was recorded.

Example 2

With a value of 86, start with 64 (Remote Dehumidification). This would have left a remainder of 22 (86 – 64 = 22). Then continue as above to get the same three additional binary inputs.

With any trend log value that is designated to be a bit string value, simply identify from the trend log section in this technical guide what the bit string values are for each status condition and perform the same calculation.

The tables on the following pages provide the bits, values and descriptions for the various points on the VCCX2 Controller and associated modules.

RSMZ VFD Status Decoding

For the RSMZ VFD status, instead of just one set of bit string values, there are two. The trend log bit string value represents the values in the BIT=1 column. All other values not represented in the trend log bit string are then active in the BIT=0 column.

Example

If the trend log bit string was 5, then the following status would be true:

0 = Timer Okay
0 = Torque Okay
0 = Voltage Okay
0 = Drive Okay
0 = No Operation
0 = Out of Frequency Limit
0 = Local Operation
0 = Speed Not Equal Reference
0 = No Warning
0 = No Error
0 = No Error
1 = Enable (Bit Value = 4)
0 = Drive Not Ready
1 = Control Ready (Bit Value = 1)

Trend Log Bit String Decoding

VCCX2 TREND LOG BIT STRINGS							
Item	**Bit**	**Value**	**Description**	**Item**	**Bit**	**Value**	**Description**
Alarm Group 1	0	1	Bad Supply Sensor	**Bin IN**	0	1	Fan Proving
	1	2	Bad Return Sensor		1	2	Dirty Filter
	2	4	Bad Outdoor Air Sensor		2	4	Hood On/Off
	3	8	Bad Space Sensor		3	8	Remote Occupied
	4	16	Bad CO2 Sensor		4	16	Remote Cooling
	5	32	Bad Building Pressure Sensor		5	32	Remote Heating
	6	64	Bad Outdoor Airflow Sensor		6	64	Remote Dehum
	7	128	Bad Exhaust Airflow Sensor		7	128	Emergency Shutdown
	8	256	Bad Supply Airflow Sensor	**MainRly**	0	1	Supply Fan Relay #1
	9	512	Bad Return Airflow Sensor		1	2	VCCX2 Relay #2 Configurable
	10	1024	Missing Space Humidity Sensor Reading		2	4	VCCX2 Relay #3 Configurable
Alarm Group 2	0	1	Mechanical Cooling Alarm		3	8	VCCX2 Relay #4 Configurable
	1	2	Mechanical Heating Alarm		4	16	VCCX2 Relay #5 Configurable
	2	4	Fan Proving Alarm		5	32	VCCX2 Relay #6 Configurable
	3	8	Dirty Filter Alarm		6	64	VCCX2 Relay #7 Configurable
	4	16	Emergency Shutdown Alarm		7	128	VCCX2 Relay #8 Configurable
	5	32	Relay Run Time Notification		8	256	EM1 Relay #1 Configurable
	6	64	Bad Economizer Feedback		9	512	EM1 Relay #2 Configurable
	7	128	Title 24 Failure Mode A		10	1024	EM1 Relay #3 Configurable
	8	256	Title 24 Failure Mode B		11	2048	EM1 Relay #4 Configurable
	9	512	Title 24 Failure Mode C		12	4096	EM1 Relay #5 Configurable
	10	1024	Title 24 Failure Mode D	**ExpRly**	0	1	12 Relay Exp Relay #1 Configurable
	11	2048	Title 24 Failure Mode E		1	2	12 Relay Exp Relay #2 Configurable
Alarm Group 3	0	1	High Supply Air Temperature Cutoff		2	4	12 Relay Exp Relay #3 Configurable
	1	2	Low Supply Air Temperature Cutoff		3	8	12 Relay Exp Relay #4 Configurable
	2	4	High Control Temperature Alarm		4	16	12 Relay Exp Relay #5 Configurable
	3	8	Low Control Temperature Alarm		5	32	12 Relay Exp Relay #6 Configurable
	4	16	Preheater Alarm		6	64	12 Relay Exp Relay #7 Configurable
	5	32	Sump Drain Alarm		7	128	12 Relay Exp Relay #8 Configurable
Alarm Group 4	0	1	Missing Refrigeration Module 1		8	256	12 Relay Exp Relay #9 Configurable
	1	2	Missing Refrigeration Module 2		9	512	12 Relay Exp Relay #10 Configurable
	2	4	Missing Refrigeration Module 3		10	1024	12 Relay Exp Relay #11 Configurable
	3	8	Missing Refrigeration Module 4		11	2048	12 Relay Exp Relay #12 Configurable
	4	16	Missing Preheater Module	**1A1Stat**	0	1	System On
	5	32	Missing MHGR-(V or X) Module	**1A2Stat**	1	2	Active Alarm
	6	64	Missing MODGAS Module	**2A1Stat**	2	4	Disabled
	7	128	Missing EM1 Expansion Module	**2A2Stat**	3	8	Forced On
	8	256	Missing 12 Relay Expansion Module	**3A1Stat**	4	16	Forced Off
Alarm Group 5	0	1	Refrigeration Module #1 Alarm	**3A2Stat**	5	32	Outdoor Air Lockout
	1	2	Refrigeration Module #2 Alarm	**4A1Stat**	6	64	System Not Used
	2	4	Refrigeration Module #3 Alarm	**4A2Stat**	7	128	Min Run Pending
	3	8	Refrigeration Module #4 Alarm		8	256	Min Off Pending
					9	512	Defrost Mode

Table 14: VCCX2 Trend Log Bit Strings

VCCX2 Controller LEDs

The VCCX2 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. The VCCX2 Controller has 26 LEDs—10 used for operation and status, eight are used for relays, and eight are used for binary inputs. See **Figure 46, page 100,** for the LED locations. The LEDs associated with these inputs and outputs show what is active without using a voltmeter. The LEDs and their uses are as follows:

Operation LEDs - Factory Troubleshooting

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

APP HB - This green LED lights up and blinks continuously to indicate the application software is working properly.

OS HB - This green LED lights up and blinks continuously to indicate the operating system is working properly.

WDOG - This green LED lights up and stays lit to indicate the operating system is working properly.

Diagnostic LEDs

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

STATUS 1 - This red LED is a diagnostic blink code LED. Under normal operation, it should not be blinking. If the LED is blinking non-stop along with Status 2 LED, the controller is resetting to factory defaults.

STATUS 2 - This red LED is a diagnostic blink code LED. If the software is running, this LED should blink at a rate of one blink every 10 seconds. If there is an override, the LED blinks two times every 10 seconds. And finally, if one of the outputs is in Force Mode, the LED blinks three times every 10 seconds.

Communication LEDs

EBUS - This yellow LED blinks to signal E-BUS communications.

LOOP COMM - This yellow LED lights up and blinks continuously to indicate the VCCX2 Controller is communicating.

BACnet- This yellow LED lights up and blinks continuously to indicate BACnet communications.

Relay LEDs

RLY1 - This green LED lights up when the supply fan is enabled and will stay lit as long as the supply fan is active.

RLY2 - RLY8 - These green LEDs lights up when the relays are enabled and stays lit as long as they are active.

Binary Input LEDs

BI1 - This green LED lights up when the proof of flow contact is closed.

BI2 - This green LED lights up when the dirty filter switch is closed.

BI3 - This green LED lights up when the hood on/off switch is closed.

BI4 - This green LED lights up when the remote occupied switch is closed.

BI5 - This green LED lights up when the remote cooling contact is closed.

BI6 - This green LED lights up when the remote heating switch is closed.

BI7 - This green LED lights up when the remote dehumidification switch is closed.

BI8 - This green LED lights up when the emergency shutdown contact is closed.

VCC-X EM1 Expansion Module LEDs

The VCC-X EM1 Expansion Module is equipped with four LEDs that can be used as powerful troubleshooting tools. See **Figure 47, page 100** for LED locations. The LEDs and their uses are as follows:

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

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

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

COMM - Every time the module receives a valid E-BUS request from the VCCX2 Controller, this LED blinks on and then off, signifying that it received a valid request and responded.

Binary Input LEDs

BI1 - This green LED lights up when the return/exhaust proof of flow contact is closed.

RSM LEDs

The RSM LEDs are described in the RSM Technical Guides.

VCCX2 Controller and EM1 LED Diagnostics

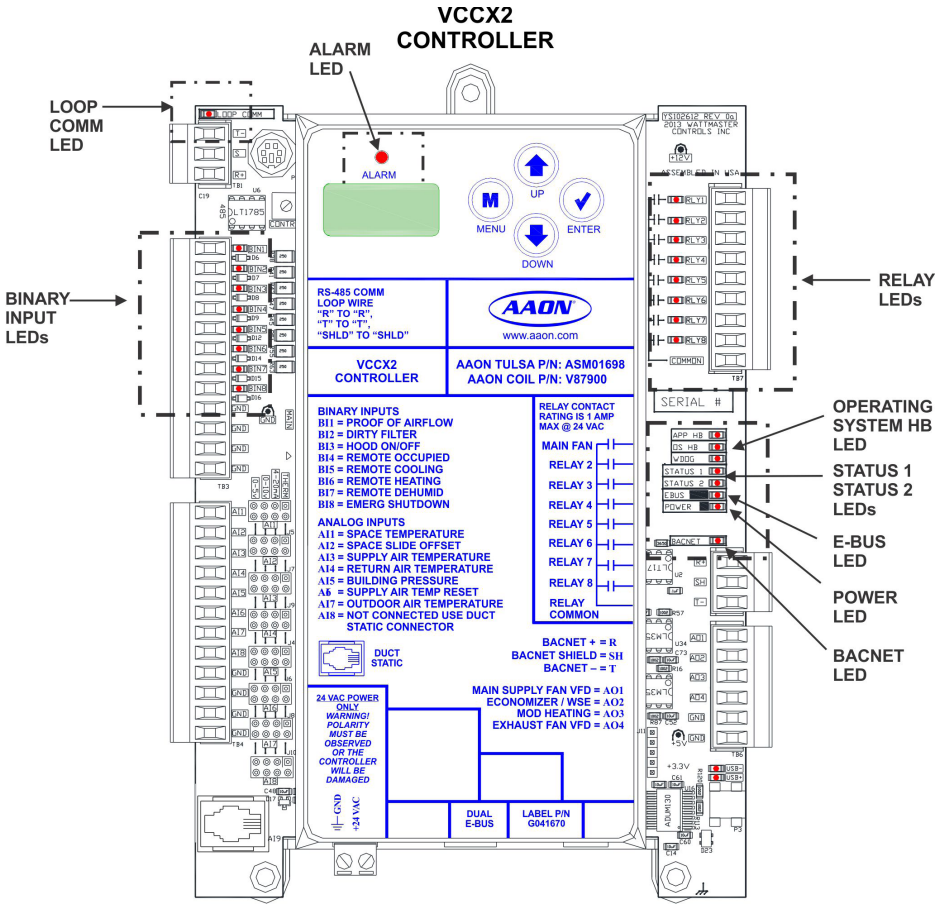


Figure 46: VCCX2 Controller LED Locations

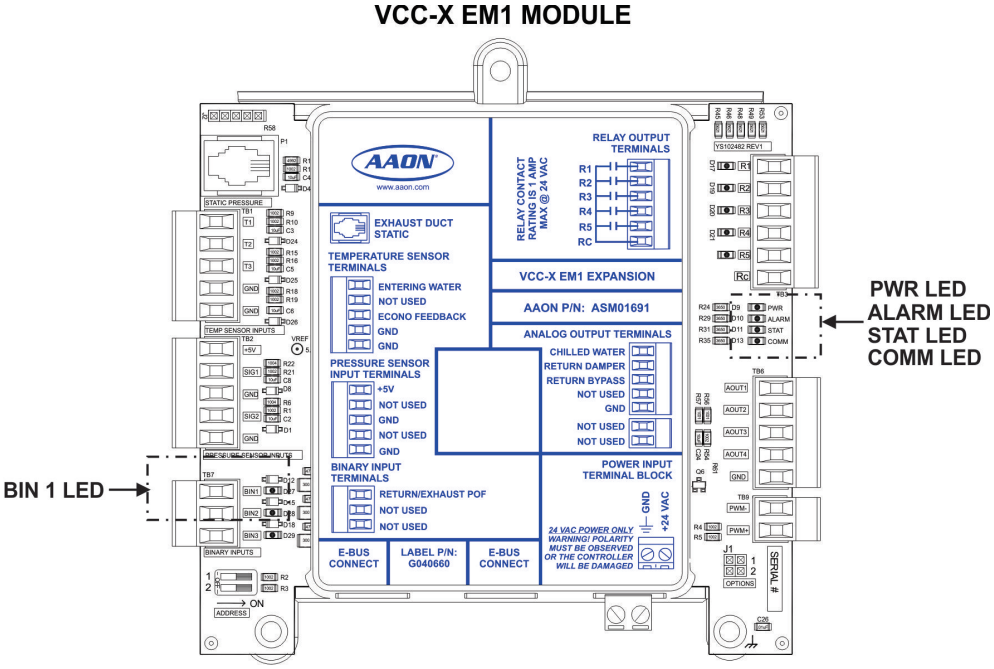


Figure 47: VCC-X EM1 Expansion Module LED Locations

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 the sensor is operating correctly per the tables. Please follow the notes and instructions that appear after the chart when checking 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.

TEMPERATURE – RESISTANCE – VOLTAGE FOR TYPE III 10 K OHM THERMISTOR SENSORS							
Temp (ºF)	Temp (ºC)	Resistance (Ohms)	Voltage @ Input (VDC)	Temp (ºF)	Temp (ºC)	Resistance (Ohms)	Voltage @ Input (VDC)
-10	-23.3	93333	4.51	**72**	22.2	11136	2.635
-5	-20.6	80531	4.45	**73**	22.8	10878	2.605
0	-17.8	69822	4.37	**74**	23.3	10625	2.576
5	-15	60552	4.29	**75**	23.9	10398	2.549
10	-12.2	52500	4.2	**76**	24.4	10158	2.52
15	-9.4	45902	4.1	**77**	25	10000	2.5
20	-6.6	40147	4.002	**78**	25.6	9711	2.464
25	-3.9	35165	3.891	**80**	26.7	9302	2.41
30	-1.1	30805	3.773	**82**	27.8	8893	2.354
35	1.7	27140	3.651	**84**	28.9	8514	2.3
40	4 4.4	23874	3.522	**86**	30	8153	2.246
45	7.2	21094	3.39	**88**	31.1	7805	2.192
50	10	18655	3.252	**90**	32.2	7472	2.139
52	11.1	17799	3.199	**95**	35	6716	2.009
54	12.2	16956	3.143	**100**	37.8	6047	1.884
56	13.3	16164	3.087	**105**	40.6	5453	1.765
58	14.4	15385	3.029	**110**	43.3	4923	1.65
60	15.6	14681	2.972	**115**	46.1	4449	1.54
62	16.7	14014	2.916	**120**	48.9	4030	1.436
64	17.8	13382	2.861	**125**	51.7	3656	1.339
66	18.9	12758	2.802	**130**	54.4	3317	1.246
68	20	12191	2.746	**135**	57.2	3015	1.159
69	20.6	11906	2.717	**140**	60	2743	1.077
70	21.1	11652	2.691	**145**	62.7	2502	1.001
71	21.7	11379	2.661	**150**	65.6	2288	0.931

Table 15: 0-5V Temperature Sensor - Voltage and Resistance for Type III Sensors

Duct Static Pressure and Building Pressure Sensor Testing

Duct Static Pressure Sensor Testing Instructions

Use the voltage column, **Table 16, this page**, 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 right side of the resistor labeled R85. Be sure to replace the jumper after checking.

Building Pressure Sensor Testing Instructions

Use the voltage column, **Table 17, this page**, 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 terminal labeled GND and the "+" lead on terminal AI5 on the VCCX2 Controller.

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 16: Duct Static Pressure/Voltage for Duct Static 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 17: Building Static Pressure/Voltage for Building Pressure Sensors

System Configuration Options

The VCCX2 Controller can be used as a stand-alone system (one VCCX2 Controller only), connected together on an interconnected system (multiple VCCX2 Controllers only) or connected together on a network system (multiple VCCX2 Controllers, VAV/Zone Controllers, or add-on controllers) to form a complete controls system that can be programmed and monitored with one or more of the available operator interfaces.

Operator Interfaces

Operator interfaces are designed to provide for programming and monitoring of VCCX2 Controller(s) and/or any VAV/Zone or add-on controller(s) connected to the system.

Stand-Alone System

The stand-alone system is used with a single VCCX2 Controller. Programming and status monitoring are accomplished by selecting and installing one or more of the operator interfaces.

Interconnected System

The interconnected system is used when there are multiple VCCX2 Controllers. With this system, connect the controllers together using AAON communications wire or 18-gauge, two-conductor, twisted pair with shield wire (Belden #82760 or equivalent). This allows for all controllers that are connected on the communications loop to be programmed and monitored from one or more of the available operator interfaces connected on the communications loop.

Networked System

For a networked single loop system, a range of one to 59 VCCX2 Controllers sharing information, connect the controllers together using AAON communications wire or 18-gauge, two-conductor, twisted pair with shield wire (Belden #82760 or equivalent). The networked single loop system requires either a MiniLink PD communication interface and/or CommLink communication interface be purchased and wired into the communications loop to the VCCX2 Controllers.

See **Figure 49, page 105,** for a typical networked single loop system layout diagram.

The networked multiple loop system is used for a system with more than 59 VCCX2 Controllers and/or are using multiple VCCX2 Controllers that are connected to VAV/Zone controllers. These groups of controllers are broken into multiple "local loops" that connect to each other via the "network loop." Each MiniLink PD handles its specific local loop's communications requirements. The CommLink communications interface handles all the communications between the individual MiniLink PDs to form the network loop. Up to 60 local loops can be connected with this configuration. This provides the capability for over 3,500 controllers to be networked.

See **Figure 50, page 106,** for a typical networked multiple loop system layout diagram.

Stand-Alone System Layout

Figure 48: Typical Stand-Alone System Layout

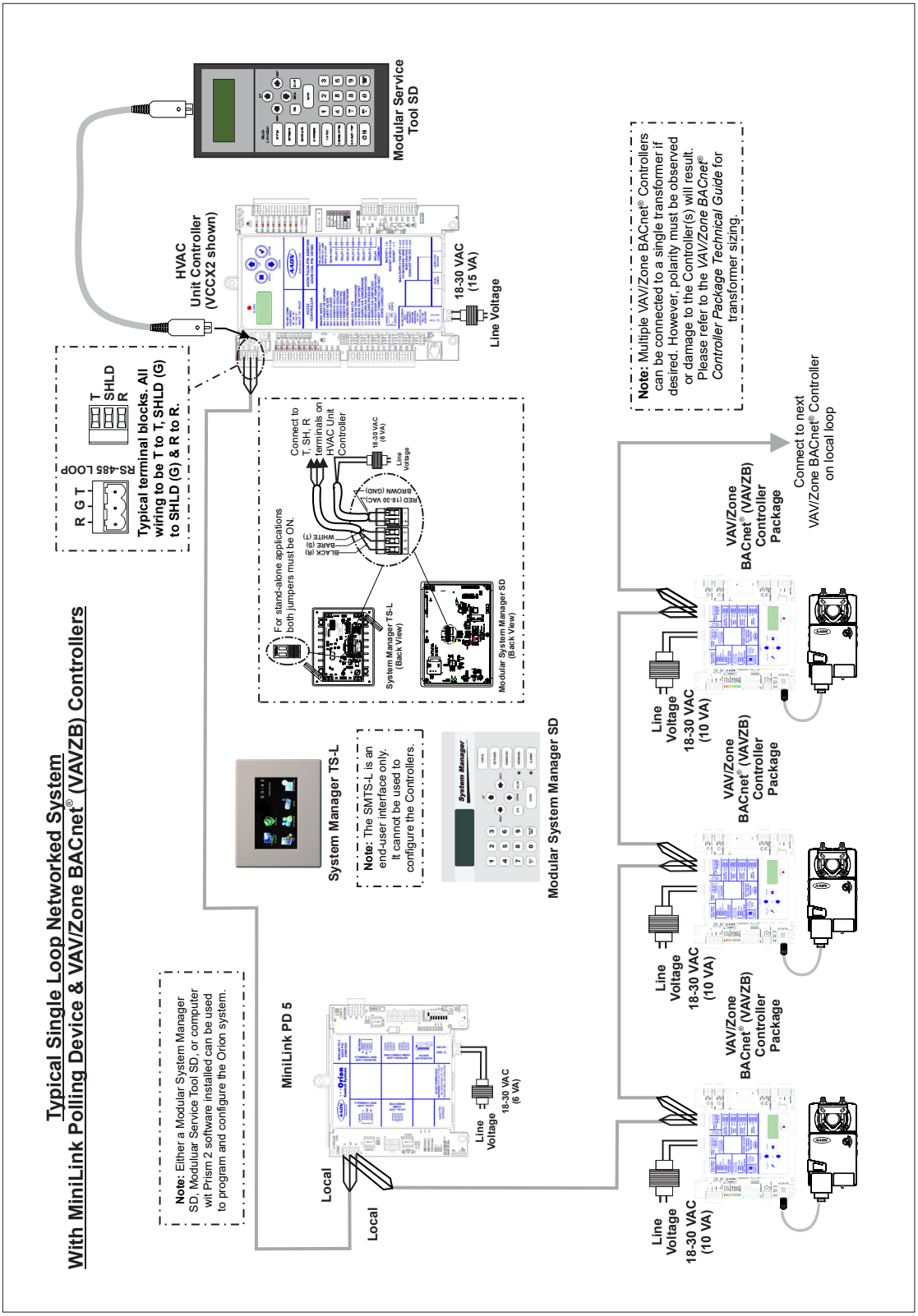


Figure 49: Typical Networked Single Loop System Layout

Networked System Multiple Loop Layout

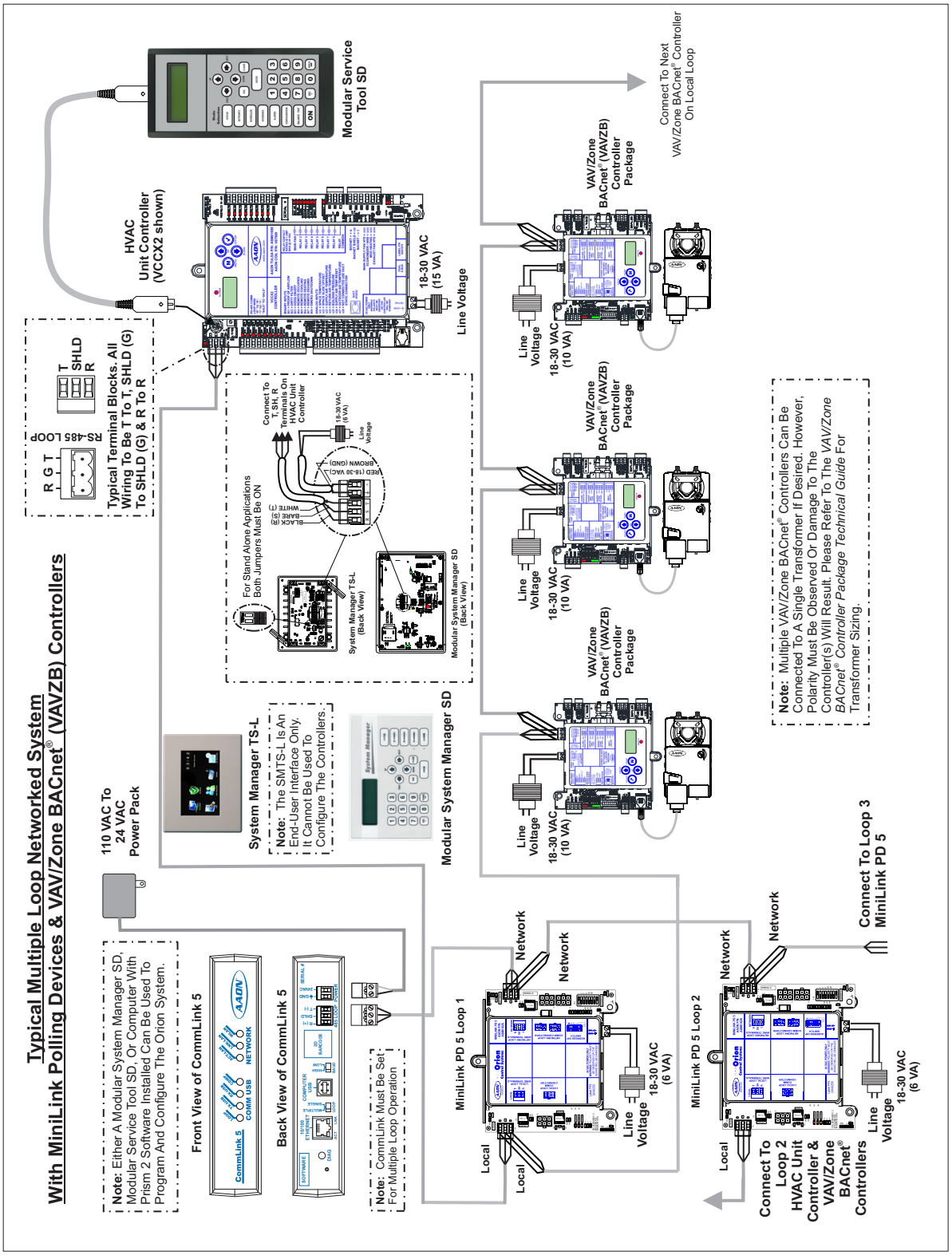


Figure 50: Typical Networked Multiple Loop System Layout

LCD Display Screen and Navigation Keys

The LCD display screens and buttons allow display status and alarms, enable force modes, and make BACnet configuration changes. See **Figure 51, this page,** and refer to **Table 18, this page,** for Navigation Key functions. The keys also have editing functions. Refer to **Table 19, this page,** for editing functions.

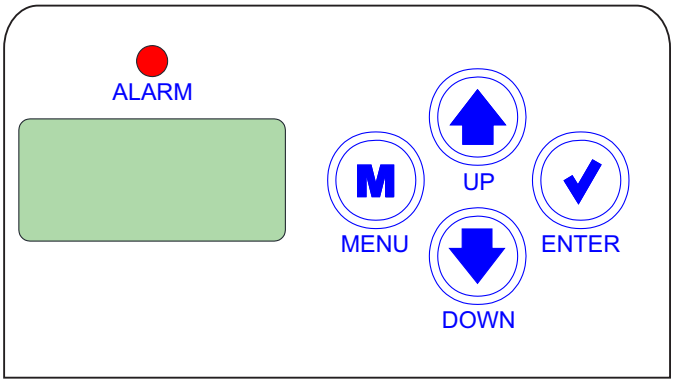


Figure 51: LCD Display and Navigation Keys

Navigation Key	Key Function
MENU M	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.

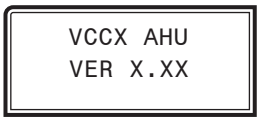
Table 18: Navigation Key Functions

Editing Key	Key Function
UP or DOWN	Use the UP or DOWN key to enter editing mode on a user-adjustable screen. Edit Mode is indicated by the underscore appearing on the screen. **NOTE:** Entering Edit Mode will also adjust the value up one (UP key) or down one (DOWN key), so the value may have to be readjusted.
ENTER	Use the ENTER key to move through the digits in the screen when editing a numeric value. An extended press of the ENTER key saves the edits no matter the location of the editing cursor within the digits. Press the ENTER key to save a non-numeric value - such as Hi Speed Network.
MENU M	The MENU key cancels editing when in Edit Mode. The screen being edited will return to its original value and the underscore will disappear. A second press of the MENU key will returns the screen to the Main Menu.

Table 19: Editing Key Functions

Main Screens Map

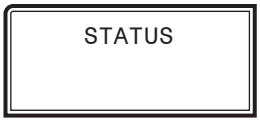
Refer to the following map when navigating through the *Main* screens. The first screen is an initialization screen. To scroll through the rest of the screens, press the **<MENU>** button.



Press M to go to *Settings* screen.

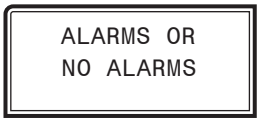
Press ✓ to scroll through the *Settings* screens.

Press M to go to the *Status* screen.



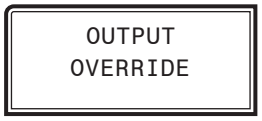
Press ✓ to scroll through the *Status* screens.

Press M to go to the *Alarms* screen.



Press ✓ to scroll through the *Alarms*.

Press M to go to the *Output Override* screen.



Press ✓ to scroll through the *Output Override* screens.

Press M to go to the *Air Balance* screen.

Press ✓ to scroll through the *Air Balance* screens.

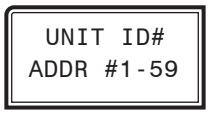
Press M to go to the *Factory Test Mode* screen.

NOTE: This screen is for AAON factory use only.

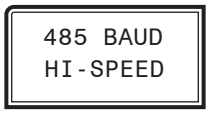
Press M to return to the first *Main Menu* screen.

Settings Screens

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



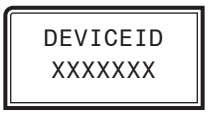
UNIT ADDRESS
Unit address. Valid range is 1-59. **Default is 59.**



BAUD RATE SPEED
485 baud rate speed. Valid range is Lo-Speed or Hi-Speed.
Default is Hi-Speed.

BACnet - CURRENT MAC ADDRESS
Valid range is 0 to 127. **Default is 1**.

The **<ENTER>** key moves the cursor between the digit fields starting with the ones field. Once the cursor is under a field, use the **<UP>** and **<DOWN>** arrow keys to select a number between 0 and 9.



BACnet - CURRENT DEVICE ID
A Device ID of up to 7 digits can be entered.

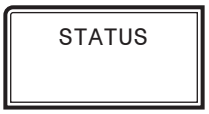
The **<ENTER>** key moves the cursor between the digit fields starting with the ones field. Once the cursor is under a field, use the **<UP>** and **<DOWN>** arrow keys to select a number between 0 and 9.

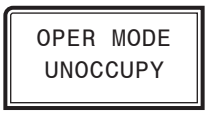
BACnet - CURRENT BAUD RATE
9600, 19200, 38400, 57600, 76800. **Default is 38400.**

E-BUS COMMUNICATIONS
Hi Speed or Lo Speed. **Default is Hi Speed.**

Status Screens

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

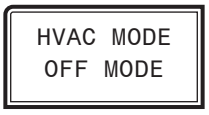




OPERATION MODE

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

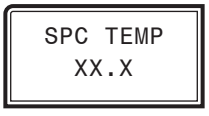
- UNOCCUPY (Unoccupied)
- OCCUPIED
- OVERRIDE
- HOL UNOC (Holiday Unoccupied)
- HOL OCC (Holiday Occupied)
- FRC OCC (Force Occupied)
- FRC UNOC (Force Unoccupied)
- REM OCC (Remote Occupied)
- ZONE HEAT
- ZONE COOL
- ZONE OVR (Zone Override)



HVAC MODE

This screen displays the current HVAC Mode. Options are:

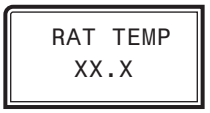
- OFF MODE
- VENT MODE
- COOL MODE
- HEAT MODE
- VENT RH
- COOL RH
- HEAT RH
- WARMUP
- PURGE
- DEFROST
- COOLDOWN



SPACE TEMPERATURE
40ºF to 200ºF or 5ºC to 93ºC.

SPACE HUMIDITY
0.00% - 100%

SUPPLY AIR TEMPERATURE
40ºF to 200ºF or 5ºC to 93ºC.



RETURN AIR TEMPERATURE
40ºF to 200ºF or 5ºC to 93ºC.

OUTDOOR AIR TEMPERATURE
40ºF to 200ºF or 5ºC to 93ºC.

OUTDOOR AIR HUMIDITY

CO2 LEVEL
0.00 PPM to 9000 PPM

Alarm Screens

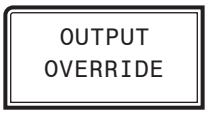
If there are no Alarms, the *Alarm* screen will display "No Alarms." If there are alarms present, the screen will display, "Alarms." Press **<ENTER>** to scroll through the alarms or let the alarms automatically scroll on the screen. For alarm definitions and troubleshooting, see **pages 89-92**.

ALARM SCREENS	
Alarm	**Description**
NO ALARMS	No alarms are present
SAT SENSOR	Supply Air Temperature Sensor failure alarm
RAT SENSOR	Return Air Temperature Sensor failure alarm
OAT SENSOR	Outdoor Air Temperature Sensor failure alarm
SPC SENSOR	Space Temperature Sensor failure alarm
CO2 SENSOR	CO_2 Sensor failure alarm
BLDGPRES SENSOR	Building Pressure Sensor failure alarm
OA CFM SENSOR	Outdoor air airflow alarm
EX CFM SENSOR	Exhaust air airflow alarm
SA CFM SENSOR	Supply air airflow alarm
RA CFM SENSOR	Return air airflow alarm
COOLING FAILURE	Mechanical cooling failure alarm
HEATING FAILURE	Mechanical heating failure alarm
FAN POF FAILURE	Proof of flow interlock alarm
DIRTY FILTER	Dirty filter alarm
EMERG SHUTDOWN	Emergency shutdown alarm
ECONO FAILURE	Title 24 Economizer alarms
HI SAT ALARM	High supply temperature cutoff alarm
LO SAT ALARM	Low supply temperature cutoff alarm
CONTROL TEMP HI	High control temperature failure
CONTROL TEMP LO	Low control temperature failure
REHEAT ALARM	Reheat board missing alarm
MODGAS ALARM	MODGAS board missing alarm
PREHEAT ALARM	PREHEAT board missing alarm
MODULE 1 ALARM	Refrigerant Module #1 operating alarm
MODULE 2 ALARM	Refrigerant Module #2 operating alarm
MODULE 3 ALARM	Refrigerant Module #3 operating alarm
MODULE 4 ALARM	Refrigerant Module #4 operating alarm
EM1 MISSING	Missing Expansion Module alarm
12 RELAY MISSING	Missing E-BUS 12 Relay Module alarm
UNKNOWN ALARM	This screen should never display. But if it does, it means the controller doesn't know what the alarm is.

Table 20: Alarm Screens

Output Override Screens

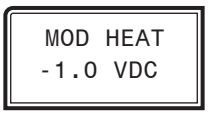
Refer to the following map when navigating through the *Output Override* screens. From the *Output Override* screen, press **<ENTER>.**



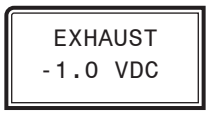
VCCX2 CONTROLLER RELAYS 1-8
Press the **<UP>** button to change the value.
Default is AUTO.

SUPPLY FAN VFD
0.0 to 10.0 = Active Force Mode.
Press the **<UP>** and **<DOWN>** buttons to increase and decrease the value. **Default is -1.0 = AUTO.**

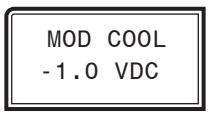
OUTDOOR AIR DAMPER
0.0 to 10.0 = Active Force Mode.
Press the **<UP>** and **<DOWN>** buttons to increase and decrease the value. **Default is -1.0 = AUTO.**



MODULATING HEATING
0.0 to 10.0 = Active Force Mode.
Press the **<UP>** and **<DOWN>** buttons to increase and decrease the value. **Default is -1.0 = AUTO.**

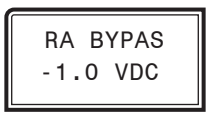


EXHAUST FAN
0.0 to 10.0 = Active Force Mode.
Press the **<UP>** and **<DOWN>** buttons to increase and decrease the value. **Default is -1.0 = AUTO**.



MODULATING COOLING
0.0 to 10.0 = Active Force Mode.
Press the **<UP>** and **<DOWN>** buttons to increase and decrease the value. **Default is -1.0 = AUTO.**

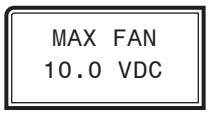
RETURN AIR DAMPER
0.0 to 10.0 = Active Force Mode.
Press the **<UP>** and **<DOWN>** buttons to increase and decrease the value. **Default is -1.0 = AUTO.**



RETURN AIR BYPASS
0.0 to 10.0 = Active Force Mode.
Press the **<UP>** and **<DOWN>** buttons to increase and decrease the value. **Default is -1.0 = AUTO.**

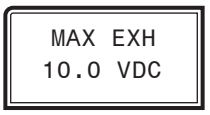
Air Balance Screens

Refer to the following map when navigating through the *Air Balance* screens. From the *Air Balance* screen, press **<ENTER>.**



MAXIMUM FAN VOLTAGE
0.0 to 10.0 VDC
Press the **<UP>** and **<DOWN>** buttons to increase and decrease the value. **Default is 10.0.**

MINIMUM FAN VOLTAGE
0.0 to 10.0 VDC
Press the **<UP>** and **<DOWN>** buttons to increase and decrease the value. **Default is 0.0.**



MAXIMUM EXHAUST VOLTAGE
0.0 to 10.0 VDC
Press the **<UP>** and **<DOWN>** buttons to increase and decrease the value. **Default is 10.0.**

MINIMUM EXHAUST VOLTAGE
0.0 to 10.0 VDC
Press the **<UP>** and **<DOWN>** buttons to increase and decrease the value. **Default is 10.0.**

VCCX2 BACnet Connection to MS/TP Network

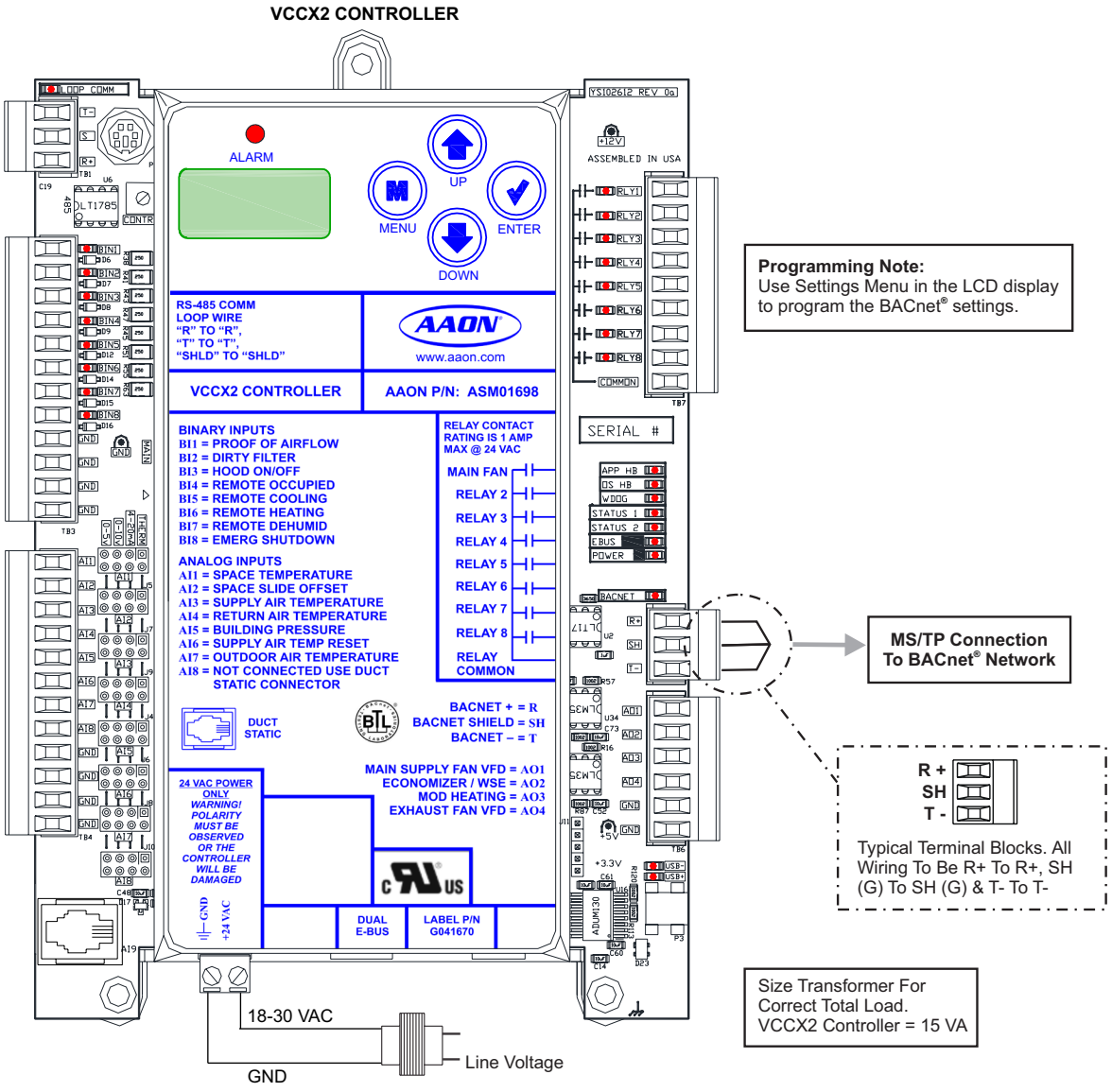


Figure 52: VCCX2 BACnet Connection to MS/TP Network

NOTE: Objects labeled AI and BI are read-only. Objects labeled AV are read/write. The only sensor values that can be written to are AV points 72 and 73 and 76 through 79.

BACnet Properties for the VCCX2 Controller Analog Inputs

Parameter	Object	Description	Notes
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 130.**
Control Status	AI: 3	Current occupied/ unoccupied status	See Control Status Bits **on page 130.**
HVAC Mode	AI: 4	Current operational status	See HVAC Mode Bits on **page 130.**
Control Temperature	AI: 5	Current value of the Control Temperature Sensor	
Mode Cooling Setpoint	AI: 6	Cooling Mode Enable Setpoint Mirror (adjusted by the Space Sensor slide adjustment and/or night setback offsets)	
Mode Heating Setpoint	AI: 7	Heating Mode Enable Setpoint Mirror (adjusted by the Space Sensor slide adjustment and/or night setback offsets)	
Sensor Slide Adjust Effect	AI: 8	Amount of current sensor slide adjust	
Supply Air Temperature	AI: 9	Current value of the Supply Air Temperature Sensor	
Supply Air Setpoint	AI: 10	Current Supply Air Temperature Cooling or Heating Setpoint if there is no reset source. Current calculated Supply Air Temperature Setpoint with reset source	
Controlling Coil Temp Setpoint	AI: 11	This is the current calculated coil suction temperature target during Dehumidification Mode	
Space Temperature	AI: 12	Current value of the Space Temperature Sensor	
Space Humidity	AI: 13	Current value of the space humidity	
Return Air Temperature	AI: 14	Current value of the Return Temperature Sensor	
Return Air Humidity	AI: 15	Current value of the return air humidity	
Outdoor Air Temperature	AI: 16	Current value of the Outdoor Air Temperature Sensor	
Outdoor Air Humidity	AI: 17	Current value of the Outdoor Humidity Sensor	
Outdoor Air Wetbulb	AI: 18	Current calculated outdoor wetbulb temperature	

BACnet Properties for the VCCX2 Controller Analog Inputs

Parameter	Object	Description	Notes
Outdoor Air Dewpoint	AI: 19	Current calculated outdoor air dewpoint temperature	
Supply Air Setpoint Reset Voltage	AI: 20	Supply Air Temp Setpoint reset input signal	
Duct Static Pressure	AI: 21	Current duct static pressure	
Duct Static Control Signal	AI: 22	Current duct static control signal (fan VFD)	
Building Pressure	AI: 23	Current value of the Building Pressure Sensor	
Building Pressure Control Signal	AI: 24	Current Building Pressure control signal	
Outdoor Airflow	AI: 25	Current outdoor airflow measurement	
Supply Airflow	AI: 26	Current supply airflow measurement	
Return Airflow	AI: 27	Current return airflow measurement	
Exhaust Airflow	AI: 28	Current exhaust airflow measurement	
Carbon Dioxide	AI: 29	Current indoor CO_2 level	
Desired Economizer Position	AI: 30	Current modulating signal to the economizer damper	
Economizer Feedback Position	AI: 31	Title 24 current position of feedback from economizer actuator	
Return Damper Position	AI: 32	Current signal to the return air damper if using return air bypass	
Return Bypass Position	AI: 33	Current signal to the Return Air Bypass Damper if using return air bypass	
Modulating Cooling Position	AI: 34	Current percentage of the modulating chilled water signal	
Modulating Heat Position	AI: 35	Current percentage of the modulating heating signal (hot water or SCR heat)	
Preheater Leaving Air Temp #1	AI: 36	Current preheater leaving air temperature #1	
Preheater Leaving Air Temp #2	AI: 37	Current preheater leaving air temperature #2	
Preheater Entering Air Temp	AI: 38	Current entering air temp for the Preheater	
Preheater Setpoint Reset Voltage	AI: 39	Current voltage reset input value for the Preheater	
Preheater SCR Output Signal	AI: 40	Current modulating heat signal for the Preheater	

VCCX2 BACnet Parameters - Analog Inputs

BACnet Properties for the VCCX2 Controller Analog Inputs			
Parameter	**Object**	**Description**	**Notes**
Preheater PWM Output Signal	AI: 41	Current PWM output signal for Preheater	
Mod Hot Gas Reheat Valve Position	AI: 42	Current position of MHGRV Modulating Hot Gas Reheat Valve	
Mod Gas Heat Valve Position	AI: 43	Current position of MODGAS Modulating Gas Valve Control	
A1 Compressor Signal	AI: 44	Current Compressor A1 modulating cooling signal	
A2 Compressor Signal	AI: 45	Current Compressor A2 modulating cooling signal	
A1 Condenser Signal	AI: 46	Current A1 condenser signal	
A2 Condenser Signal	AI: 47	Current A2 condenser signal or WSE Bypass Valve signal	
A1 Suction Pressure	AI: 48	Current Compressor A1 suction pressure	
A2 Suction Pressure	AI: 49	Current Compressor A2 suction pressure	
A1 Head Pressure	AI: 50	Current Compressor A1 head pressure	
A2 Head Pressure	AI: 51	Current Compressor A2 head pressure	
A1 Saturation Temperature	AI: 52	Current Compressor A1 coil saturation temperature	
A2 Saturation Temperature	AI: 53	Current Compressor A2 coil saturation temperature	
A1 Suction Line Temperature	AI: 54	Current Compressor A1 suction line temperature	
A2 Suction Line Temperature	AI: 55	Current Compressor A2 suction line temperature	
A1 Condenser Suction Temp (Heat Pump)	AI: 56	Current Compressor A1 suction line temperature (heat pump)	
A2 Condenser Suction Temp (Heat Pump)	AI: 57	Current Compressor A2 suction line temperature (heat pump)	
A1 Superheat Temperature	AI: 58	Current Compressor A1 superheat temperature	
A2 Superheat Temperature	AI: 59	Current Compressor A2 superheat temperature	
Condenser A1 Superheat (Heat Pump)	AI: 60	Current Compressor A1 superheat temperature (heat pump)	
Condenser A2 Superheat (Heat Pump)	AI: 61	Current Compressor A2 superheat temperature (heat pump)	
A1 Expansion Valve Position	AI: 62	Current position of Compressor A1 Expansion Valve	

BACnet Properties for the VCCX2 Controller Analog Inputs			
Parameter	**Object**	**Description**	**Notes**
A2 Expansion Valve Position	AI: 63	Current position of Compressor A2 Expansion Valve	
Condenser A1 Expansion Valve Position	AI: 64	Current position of Condenser A1 Expansion Valve	
Condenser A2 Expansion Valve Position	AI: 65	Current position of Condenser A2 Expansion Valve	
A1 Discharge Temperature	AI: 66	Current Compressor A1 discharge temperature	
A2 Discharge Temperature	AI: 67	Current Compressor A2 discharge temperature	
A1 Leaving Water Temp	AI: 68	Current A1 leaving water temperature for WSHP	
B1 Compressor Signal	AI: 69	Current Compressor B1 modulating cooling signal	
B2 Compressor Signal	AI: 70	Current Compressor B2 modulating cooling signal	
B1 Condenser Signal	AI: 71	Current B1 condenser signal	
B2 Condenser Signal	AI: 72	Current B2 condenser signal or WSE Bypass Valve signal	
B1 Suction Pressure	AI: 73	Current Compressor B1 suction pressure	
B2 Suction Pressure	AI: 74	Current Compressor B2 suction pressure	
B1 Head Pressure	AI: 75	Current Compressor B1 head pressure	
B2 Head Pressure	AI: 76	Current Compressor B2 head pressure	
B1 Saturation Temperature	AI: 77	Current Compressor B1 coil saturation temperature	
B2 Saturation Temperature	AI: 78	Current Compressor B2 coil saturation temperature	
B1 Suction Line Temperature	AI: 79	Current Compressor B1 suction line temperature	
B2 Suction Line Temperature	AI: 80	Current Compressor B2 suction line temperature	
B1 Condenser Suction Temp (Heat Pump)	AI: 81	Current Compressor B1 suction line temperature (heat pump)	
B2 Condenser Suction Temp (Heat Pump)	AI: 82	Current Compressor B2 suction lIne temperature (heat pump)	
B1 Superheat Temperature	AI: 83	Current Compressor B1 superheat temperature	
B2 Superheat Temperature	AI: 84	Current Compressor B2 superheat temperature	
Condenser B1 Superheat (Heat Pump)	AI: 85	Current Compressor B1 superheat temperature (heat pump)	

VCCX2 BACnet Parameters - Analog Inputs

BACnet Properties for the VCCX2 Controller Analog Inputs			
Parameter	**Object**	**Description**	**Notes**
Condenser B2 Superheat (Heat Pump)	AI: 86	Current Compressor B2 superheat temperature (heat pump)	
B1 Expansion Valve Position	AI: 87	Current position of Compressor B1 Expansion Valve	
B2 Expansion Valve Position	AI: 88	Current position of Compressor B2 Expansion Valve	
Condenser B1 Expansion Valve Position	AI: 89	Current position of Condenser B1 Expansion Valve	
Condenser B2 Expansion Valve Position	AI: 90	Current position of Condenser B2 Expansion Valve	
B1 Discharge Temperature	AI: 91	Current Compressor B1 discharge temperature	
B2 Discharge Temperature	AI: 92	Current Compressor B2 discharge temperature	
B1 Leaving Water Temp	AI: 93	Current B1 leaving water temperature for WSHP	
C1 Compressor Signal	AI: 94	Current Compressor C1 modulating cooling signal	
C2 Compressor Signal	AI: 95	Current Compressor C2 modulating cooling signal	
C1 Condenser Signal	AI: 96	Current C1 condenser signal	
C2 Condenser Signal	AI: 97	Current C2 condenser signal or WSE Bypass Valve signal	
C1 Suction Pressure	AI: 98	Current compressor C1 suction pressure	
C2 Suction Pressure	AI: 99	Current compressor C2 suction pressure	
C1 Head Pressure	AI: 100	Current compressor C1 head pressure	
C2 Head Pressure	AI: 101	Current compressor C2 head pressure	
C1 Saturation Temperature	AI: 102	Current compressor C1 coil saturation temperature	
C2 Saturation Temperature	AI: 103	Current compressor C2 coil saturation temperature	
C1 Suction Line Temperature	AI: 104	Current compressor C1 suction line temperature	
C2 Suction Line Temperature	AI: 105	Current compressor C2 suction line temperature	
C1 Condenser Suction Temp (Heat Pump)	AI: 106	Current compressor C1 suction line temperature (heat pump)	
C2 Condenser Suction Temp (Heat Pump)	AI: 107	Current compressor C2 suction line temperature (heat pump)	
C1 Superheat Temperature	AI: 108	Current compressor C1 superheat temperature	

BACnet Properties for the VCCX2 Controller Analog Inputs			
Parameter	**Object**	**Description**	**Notes**
C2 Superheat Temperature	AI: 109	Current compressor C2 superheat temperature	
Condenser C1 Superheat (Heat Pump)	AI: 110	Current compressor C1 superheat temperature (heat pump)	
Condenser C2 Superheat (Heat Pump)	AI: 111	Current compressor C2 superheat temperature (heat pump)	
C1 Expansion Valve Position	AI: 112	Current position of compressor C1 Expansion Valve	
C2 Expansion Valve Position	AI: 113	Current position of compressor C2 Expansion Valve	
Condenser C1 Expansion Valve Position	AI: 114	Current position of condenser C1 Expansion Valve	
Condenser C2 Expansion Valve Position	AI: 115	Current position of condenser C2 Expansion Valve	
C1 Discharge Temperature	AI: 116	Current compressor C1 discharge temperature	
C2 Discharge Temperature	AI: 117	Current compressor C2 discharge temperature	
C1 Leaving Water Temp	AI: 118	Current C1 leaving sater temperature for WSHP	
D1 Compressor Signal	AI: 119	Current compressor D1 modulating cooling signal	
D2 Compressor Signal	AI: 120	Current compressor D2 modulating cooling signal	
D1 Condenser Signal	AI: 121	Current D1 condenser signal	
D2 Condenser Signal	AI: 122	Current D2 condenser signal or WSE Bypass Valve Signal	
D1 Suction Pressure	AI: 123	Current compressor D1 suction pressure	
D2 Suction Pressure	AI: 124	Current compressor D2 suction pressure	
D1 Head Pressure	AI: 125	Current compressor D1 head pressure	
D2 Head Pressure	AI: 126	Current Compressor D2 Head Pressure	
D1 Saturation Temperature	AI: 127	Current Compressor D1 coil saturation temperature	
D2 Saturation Temperature	AI: 128	Current Compressor D2 coil saturation temperature	
D1 Suction Line Temperature	AI: 129	Current Compressor D1 suction line temperature	
D2 Suction Line Temperature	AI: 130	Current Compressor D2 suction line temperature	
D1 Condenser Suction Temp (Heat Pump)	AI: 131	Current Compressor D1 suction line temperature (heat pump)	

VCCX2 BACnet Parameters - Analog Inputs

BACnet Properties for the VCCX2 Controller Analog Inputs			
Parameter	**Object**	**Description**	**Notes**
D2 Condenser Suction Temp (Heat Pump)	AI: 132	Current compressor D2 suction line temperature (heat pump)	
D1 Superheat Temperature	AI: 133	Current compressor D1 superheat temperature	
D2 Superheat Temperature	AI: 134	Current compressor D2 superheat temperature	
Condenser D1 Superheat (Heat Pump)	AI: 135	Current compressor D1 superheat temperature (heat pump)	
Condenser D2 Superheat (Heat Pump)	AI: 136	Current compressor D2 superheat temperature (heat pump)	
D1 Expansion Valve Position	AI: 137	Current position of compressor D1 Expansion Valve	
D2 Expansion Valve Position	AI: 138	Current position of compressor D2 Expansion Valve	
Condenser D1 Expansion Valve Position	AI: 139	Current position of condenser D1 Expansion Valve	
Condenser D2 Expansion Valve Position	AI: 140	Current position of condenser D2 Expansion Valve	
D1 Discharge Temperature	AI: 141	Current compressor D1 discharge temperature	
D2 Discharge Temperature	AI: 142	Current compressor D2 discharge temperature	
D1 Leaving Water Temp	AI: 143	Current D1 leaving water temperature for WSHP	
Alarm Status	AI: 144	Indicates an alarm condition	0 = No Alarms, 1 = Alarm(s) Present
Outdoor Enthalpy	AI: 145	Current outdoor enthalpy	
Plenum Pressure	AI: 146	Reserved	
Return Fan Speed	AI: 147	Reserved	
Plenum Calculated Setpoint	AI: 148	Reserved	
Return Air Enthalpy Status	AI: 149	Current value of return air enthalpy	
Current Duct Static Setpoint	AI: 150	Current status of the Duct Static Setpoint	
RSMZ 1 Condenser Fan	AI: 151	Current RSMZ 1 condenser fan signal	
RSMZ 1 VFD Comp Perc	AI: 152	Current RSMZ 1 VFD compressor percentage	
RSMZ 1 Discharge Pressure	AI: 153	Current RSMZ 1 discharge pressure	
RSMZ 1 Suction Pressure	AI: 154	Current RSMZ 1 suction pressure	

BACnet Properties for the VCCX2 Controller Analog Inputs			
Parameter	**Object**	**Description**	**Notes**
RSMZ 1 Suction Line Temp	AI: 155	Current RSMZ 1 suction line temperature	
RSMZ 1 Saturation Temp	AI: 156	Current RSMZ 1 saturation temperature	
RSMZ 1 Superheat	AI: 157	Current RSMZ 1 superheat temperature	
RSMZ 1 EEV Position	AI: 158	Current RSMZ 1 EEV valve position	
RSMZ 1 Warnings	AI: 159	Current RSMZ 1 warnings	See RSMZ Warnings Bits on **page 131.**
RSMZ 1 Comp VFD Alarms 1	AI: 160	Current RSMZ 1 comp VFD alarms 1	See RSMZ Alarms 1 Bits on **page 131.**
RSMZ 1 Comp VFD Alarms 2	AI: 161	Current RSMZ 1 comp VFD alarms 2	See RSMZ Alarms 2 Bits on **page 132.**
RSMZ 1 Comp VFD Drive Status	AI: 162	Current RSMZ 1 comp VFD drive status	See RSMZ Drive Status Bits **page 132**
RSMZ 1 Compressor Current	AI: 163	Current reading in Amps that the RSMZ 1 compressor is using	
RSMZ 1 Discharge Line Temp	AI: 164	Current RSMZ 1 discharge line temperature	
RSMZ 1 Faults	AI: 165	Current RSMZ 1 faults	See RSMZ Faults Bits on **page 131.**
RSMZ 1 Lockouts	AI: 166	Current RSMZ 1 lockouts	See RSMZ Lockouts Bits on **page 131.**
RSMZ 2 Condenser Fan	AI: 167	Current RSMZ 2 condenser fan signal	
RSMZ 2 VFD Comp Perc	AI: 168	Current RSMZ 2 VFD compressor percentage	
RSMZ 2 Discharge Pressure	AI: 169	Current RSMZ 2 discharge pressure	
RSMZ 2 Suction Pressure	AI: 170	Current RSMZ 2 suction pressure	
RSMZ 2 Suction Line Temp	AI: 171	Current RSMZ 2 suction line temperature	
RSMZ 2 Saturation Temp	AI: 172	Current RSMZ 2 saturation temperature	
RSMZ 2 Superheat	AI: 173	Current RSMZ 2 superheat temperature	
RSMZ 2 EEV Position	AI: 174	Current RSMZ 2 EEV valve position	
RSMZ 2 Warnings	AI: 175	Current RSMZ 2 warnings	See RSMZ Warnings Bits on **page 131.**

VCCX2 BACnet Parameters - Analog Inputs

BACnet Properties for the VCCX2 Controller Analog Inputs			
Parameter	**Object**	**Description**	**Notes**
RSMZ 2 Comp VFD Alarms 1	AI: 176	Current RSMZ 2 comp VFD alarms 1	See RSMZ Alarms 1 Bits on **page 131.**
RSMZ 2 Comp VFD Alarms 2	AI: 177	Current RSMZ 2 comp VFD alarms 2	See RSMZ Alarms 2 Bits on **page 132.**
RSMZ 2 Comp VFD Drive Status	AI: 178	Current RSMZ 2 comp VFD drive status	See RSMZ Drive Status Bits on **page 132.**
RSMZ 2 Compressor Current	AI: 179	Current reading in Amps that the RSMZ 2 compressor is using	
RSMZ 2 Discharge Line Temp	AI: 180	Current RSMZ 2 discharge line temperature	
RSMZ 2 Faults	AI: 181	Current RSMZ 2 faults	See RSMZ Faults Bits on **page 131.**
RSMZ 2 Lockouts	AI: 182	Current RSMZ 2 lockouts	See RSMZ Lockouts Bits on **page 131.**
RSMZ 3 Condenser Fan	AI: 183	Current RSMZ 3 condenser fan signal	
RSMZ 3 Reheat Valve 1	AI: 184	Current RSMZ 3 reheat valve 1 position	
RSMZ 3 Discharge Pressure	AI: 185	Current RSMZ 3 discharge pressure	
RSMZ 3 Suction Pressure	AI: 186	Current RSMZ 3 suction pressure	
RSMZ 3 Suction Line Temp	AI: 187	Current RSMZ 3 suction line temperature	
RSMZ 3 Saturation Temp	AI: 188	Current RSMZ 3 saturation temperature	
RSMZ 3 Superheat	AI: 189	Current RSMZ 3 superheat temperature	
RSMZ 3 EEV Position	AI: 190	Current RSMZ 3 EEV valve position	
RSMZ 3 Suction Pressure 2	AI: 191	Current RSMZ 3 suction pressure 2	
RSMZ 3 Suction Line Temp 2	AI: 192	Current RSMZ 3 suction line temperature 2	
RSMZ 3 Saturation Temp 2	AI: 193	Current RSMZ 3 saturation temperature 2	
RSMZ 3 Superheat 2	AI: 194	Current RSMZ 3 superheat temperature 2	
RSMZ 3 EEV Position 2	AI: 195	Current RSMZ 3 EEV valve position 2	
RSMZ 3 Warnings	AI: 196	Current RSMZ 3 warnings	See RSMZ Warnings Bits on **page 131.**

BACnet Properties for the VCCX2 Controller Analog Inputs			
Parameter	**Object**	**Description**	**Notes**
RSMZ 3 Discharge Line Temp	AI: 197	Current RSMZ 3 discharge line temperature	
RSMZ 3 Faults	AI: 198	Current RSMZ 3 faults	See RSMZ Faults Bits on **page 131.**
RSMZ 3 Lockouts	AI: 199	Current RSMZ 3 lockouts	See RSMZ Lockouts Bits on **page 131.**
RSMZ 4 Condenser Fan	AI: 200	Current RSMZ 4 condenser fan signal	
RSMZ 4 VFD Comp Perc	AI: 201	Current RSMZ 4 VFD compressor percentage	
RSMZ 4 Discharge Pressure	AI: 202	Current RSMZ 4 discharge pressure	
RSMZ 4 Suction Pressure	AI: 203	Current RSMZ 4 suction pressure	
RSMZ 4 Suction Line Temp	AI: 204	Current RSMZ 4 suction line temperature	
RSMZ 4 Saturation Temp	AI: 205	Current RSMZ 4 saturation temperature	
RSMZ 4 Superheat	AI: 206	Current RSMZ 4 superheat temperature	
RSMZ 4 EEV Position	AI: 207	Current RSMZ 4 EEV valve position	
RSMZ 4 Warnings	AI: 208	Current RSMZ 4 warnings	See RSMZ Warnings Bits on **page 131.**
RSMZ 4 Comp VFD Alarms 1	AI: 209	Current RSMZ 4 comp VFD alarms 1	See RSMZ Alarms 1 Bits on **page 131**.
RSMZ 4 Comp VFD Alarms 2	AI: 210	Current RSMZ 4 comp VFD alarms 2	See RSMZ Alarms 2 Bits on **page 132**.
RSMZ 4 Comp VFD Drive Status	AI: 211	Current RSMZ 4 comp VFD drive status	See RSMZ Drive Status Bits on **page 132**.
RSMZ 4 Comp VFD Compressor Current	AI: 212	Current reading in Amps that the RSMZ 4 compressor is using	
RSMZ 4 Discharge Line Temp	AI: 213	Current RSMZ 4 discharge line temperature	
RSMZ 4 Faults	AI: 214	Current RSMZ 4 faults	See RSMZ Faults Bits on **page 131**.
RSMZ 4 Lockouts	AI: 215	Current RSMZ 4 lockouts	See RSMZ Lockouts Bits on **page 131**.
RSMZ 5 Condenser Fan	AI: 216	Current RSMZ 5 condenser fan signal	
RSMZ 5 VFD Comp Perc	AI: 217	Current RSMZ 5 VFD compressor percentage	

VCCX2 BACnet Parameters - Analog Inputs

BACnet Properties for the VCCX2 Controller Analog Inputs			
Parameter	**Object**	**Description**	**Notes**
RSMZ 5 Discharge Pressure	AI: 218	Current RSMZ 5 discharge pressure	
RSMZ 5 Suction Pressure	AI: 219	Current RSMZ 5 suction pressure	
RSMZ 5 Suction Line Temp	AI: 220	Current RSMZ 5 suction line temperature	
RSMZ 5 Saturation Temp	AI: 221	Current RSMZ 5 saturation temperature	
RSMZ 5 Superheat	AI: 222	Current RSMZ5 superheat temperature	
RSMZ 5 EEV Position	AI: 223	Current RSMZ 5 EEV Valve position	
RSMZ 5 Warnings	AI: 224	Current RSMZ 5 warnings	See RSMZ Warnings Bits on **page 131.**
RSMZ 5 Comp VFD Alarms 1	AI: 225	Current RSMZ 5 Comp VFD alarms 1	See RSMZ Alarms 1 Bits on **page 131.**
RSMZ 5 Comp VFD Alarms 2	AI: 226	Current RSMZ 5 Comp VFD alarms 2	See RSMZ Alarms 2 Bits on **page 132.**
RSMZ 5 Comp VFD Drive Status	AI: 227	Current RSMZ 5 Comp VFD drive status	See RSMZ Drive Status Bits on **page 132.**
RSMZ 5 Compressor Current	AI: 228	Current reading in Amps that the RSMZ 5 compressor is using	
RSMZ 5 Discharge Line Temp	AI: 229	Current RSMZ 5 discharge line temperature	
RSMZ 5 Faults	AI: 230	Current RSMZ 5 faults	See RSMZ Faults Bits on **page 131.**
RSMZ 5 Lockouts	AI: 231	Current RSMZ 5 lockouts	See RSMZ Lockouts Bits on **page 131.**
RSMZ 6 Condenser Fan	AI: 232	Current RSMZ 6 condenser fan signal	
RSMZ 6 Reheat Valve 1	AI: 233	Current RSMZ 6 Reheat Valve 1 position	
RSMZ 6 Discharge Pressure	AI: 234	Current RSMZ 6 discharge pressure	
RSMZ 6 Suction Pressure	AI: 235	Current RSMZ 6 suction pressure	
RSMZ 6 Suction Line Temp	AI: 236	Current RSMZ 6 suction line temperature	
RSMZ 6 Saturation Temp	AI: 237	Current RSMZ 6 saturation temperature	
RSMZ 6 Superheat	AI: 238	Current RSMZ 6 superheat temperature	

BACnet Properties for the VCCX2 Controller Analog Inputs			
Parameter	**Object**	**Description**	**Notes**
RSMZ 6 EEV Position	AI: 239	Current RSMZ 6 EEV Valve position	
RSMZ 6 Suction Pressure 2	AI: 240	Current RSMZ 6 suction pressure 2	
RSMZ 6 Suction Line Temp 2	AI: 241	Current RSMZ 6 suction lIne temperature 2	
RSMZ 6 Saturation Temp 2	AI: 242	Current RSMZ 6 saturation temperature 2	
RSMZ 6 Superheat 2	AI: 243	Current RSMZ 6 superheat temperature 2	
RSMZ 6 EEV Position 2	AI: 244	Current RSMZ 6 EEV valve position 2	
RSMZ 6 Warnings	AI: 245	Current RSMZ 6 warnings	See RSMZ Warnings Bits on **page 131.**
RSMZ 6 Discharge Line Temp	AI: 246	Current RSMZ 6 discharge line temperature	
RSMZ 6 Faults	AI: 247	Current RSMZ 6 faults	See RSMZ Faults Bits on **page 131.**
RSMZ 6 Lockouts	AI: 248	Current RSMZ 6 lockouts	See RSMZ Lockouts Bits on **page 131.**
SUB 1 Sub Cool 1	AI: 249	Current Subcooling Module 1 Sub Cool 1 reading	
SUB 1 Sub Cool 2	AI: 254	Current Subcooling Module 1 Sub Cool 2 reading	
SUB 1 Sub Cool 3	AI: 255	Current Subcooling Module 1 Sub Cool 3 reading	
SUB 1 Pressure 1	AI: 256	Current Subcooling Module 1 liquid line pressure 1 reading	
SUB 1 Pressure 2	AI: 257	Current Subcooling Module 1 liquid line pressure 2 reading	
SUB 1 Pressure 3	AI: 258	Current Subcooling Module 1 liquid line pressure 3 reading	
SUB 1 Saturation 1	AI: 259	Subcooling Module 1 saturation temperature 1 reading	
SUB 1 Saturation 2	AI: 260	Subcooling Module 1 saturation temperature 2 reading	
SUB 1 Saturation 3	AI: 261	Subcooling Module 1 saturation temperature 3 reading	
SUB 1 Line Temp 1	AI: 262	Subcooling Module 1 liquid line temperature 1 reading	
SUB 1 Line Temp 2	AI: 263	Subcooling Module 1 liquid line temperature 2 reading	
SUB 1 Line Temp 3	AI: 264	Subcooling Module 1 liquid line temperature 3 reading	
SUB 2 Sub Cool 1	AI: 265	Current Subcooling Module 2 Sub Cool 1 reading	

BACnet Properties for the VCCX2 Controller Analog Inputs			
Parameter	**Object**	**Description**	**Notes**
SUB 2 Sub Cool 2	AI: 266	Current Subcooling Module 2 Sub Cool 2 reading	
SUB 2 Sub Cool 3	AI: 267	Current Subcooling Module 2 Sub Cool 3 reading	
SUB 2 Pressure 1	AI: 268	Current Subcooling Module 2 liquid line pressure 1 reading	
SUB 2 Pressure 2	AI: 269	Subcooling Module 2 liquid line pressure 2 reading	
SUB 2 Pressure 3	AI: 270	Subcooling Module 2 liquid line pressure 3 reading	
SUB 2 Saturation 1	AI: 271	Subcooling Module 2 saturation temperature 1 reading	
SUB 2 Saturation 2	AI: 272	Subcooling Module 2 saturation temperature 2 reading	
SUB 2 Saturation 3	AI: 273	Subcooling Module 2 saturation temperature 3 reading	
SUB 2 Line Temp 1	AI: 274	Subcooling Module 2 liquid line temperature 1 reading	
SUB 2 Line Temp 2	AI: 275	Subcooling Module 2 liquid line temperature 2 reading	
SUB 2 Line Temp 3	AI: 276	Subcooling Module 2 liquid line temperature 3 reading	
Enter Water Pump	AI: 277	Current status of entering water temperature	
Return Plenum Pressure Status	AI: 278	Current value of the Return Plenum Pressure Sensor	
Return Plenum Control Signal	AI: 279	Current Return Plenum Control Signal. (Motorized Exhaust Damper)	

VCCX2 BACnet Parameters - Analog Values

BACnet Properties for the VCCX2 Controller Analog Values				
Parameter	Object	Description	Limits	
			Low	High
Occupied Cooling Setpoint	AV: 1	If the control temperature rises one deadband above this setpoint, the control will activate the cooling demand. This setpoint does not determine the mode in Occupied operation if the unit is configured for Supply Air Cooling or Supply Air Tempering.	1°F (-17.2°C)	110°F (43.3°C)
Occupied Heating Setpoint	AV: 2	If the control temperature drops one deadband below this setpoint, the control will activate the heating demand. This setpoint does not determine the mode in Occupied operation if the unit is configured for Supply Air Cooling or Supply Air Tempering.	1°F (-17.2°C)	110°F (43.3°C)
Hood On Cooling Setpoint	AV: 3	This is the Cooling Mode Enable Setpoint used only in Hood On Mode or space temperature control of high percentage outdoor air units or VAV tempering	1°F (-17.2°C)	110°F (43.3°C)
Hood On Heating Setpoint	AV: 4	This is the Heating Mode Enable Setpoint used only in Hood On Mode or space temperature control of high percentage outdoor air units or VAV tempering	1°F (-17.2°C)	110°F (43.3°C)
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°F (0°C)	30°F (16.6°C)
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°F (0°C)	30°F (16.6°C)
Mode Select Deadband	AV: 7	This value is added to and subtracted from the HVAC Mode Setpoints to create a control deadband range	0°F (0°C)	10°F (5.5°C)

BACnet Properties for the VCCX2 Controller Analog Values				
Parameter	Object	Description	Limits	
			Low	High
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 Reset Limit.	35°F (1.7°C)	70°F (21.1°C)
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 Reset Limit.	35°F (1.7°C)	70°F (21.1°C)
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°F (-1.1°C)	80°F (26.6°C)
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°F (4.5°C)	240°F (115.5°C)
Max SAT Cooling Setpoint Reset Limit	AV: 12	If Supply Air Reset is configured this is the High SAT Cooling Reset value	0°F (-17.7°C)	100°F (37.7°C)
Max SAT Heating Setpoint Reset Limit	AV: 13	If Supply Air Reset is configured this is the High SAT Heating Reset value	0°F (-17.7°C)	250°F (121.1°C)
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°F (0.6°C)	30°F (16.6°C)
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°F (0.6°C)	50°F (27.7°C)
Warm-Up Target Temperature (See AV: 89 for Cool-Down Target Temperature)	AV: 16	If Morning Warm-Up is configured, then upon entering Occupied Mode, the Warm-Up Mode will be activated if the return air is below this temperature by one degree	50°F (10°C)	90°F (32.2°C)

VCCX2 BACnet Parameters - Analog Values

BACnet Properties for the VCCX2 Controller Analog Values				
Parameter	Object	Description	Limits	
			Low	High
Warm-Up Mode Supply Air Setpoint	AV: 17	During Morning Warm-Up, the supply air temperature will be controlled to this setpoint	40°F (4.5°C)	240°F (115.5°C)
Cool-Down Mode Supply Air Setpoint	AV: 18	During Morning Cool-Down, the supply air temperature will be controlled to this setpoint	30°F (-1.1°C)	80°F (26.6°C)
Mechanical Cooling Outdoor Air Lockout	AV: 19	Mechanical Cooling will be locked out when the outdoor air temperature is below this setpoint	-30°F (-34.4°C)	100°F (37.7°C)
Mechanical Heating Outdoor Air Lockout	AV: 20	Mechanical Heating will be locked out when the outdoor air temperature is above this setpoint	-30°F (-34.4°C)	150°F (65.5°C)
Low Supply Temp Cutoff Alarm	AV: 21	Cooling will be disabled if the supply air temperature falls below this value. See sequence for more details.	0°F (-17.7°C)	100°F (37.7°C)
High Supply Temp Cutoff Alarm	AV: 22	Heating will be disabled if the supply air temperature rises above this value. See sequence for more details.	0°F (-17.7°C)	250°F (121.1°C)
Preheater Cooling Mode Setpoint	AV: 23	If the Preheater is enabled, and the unit is in the Cooling Mode, this setpoint will be sent to the Preheat-X Module to control leaving air temperature	35°F (1.7°C)	90°F (32.2°C)
Preheater Venting Mode Setpoint	AV: 24	If the Preheater is enabled, and the unit is in the Vent Mode, this setpoint will be sent to the Preheat-X Module to control leaving air temperature	35°F (1.7°C)	90°F (32.2°C)
Preheater Heating Mode Setpoint	AV: 25	If the Preheater is enabled, and the unit is in the Heating Mode, this setpoint will be sent to the Preheat-X Module to control leaving air temperature	35°F (1.7°C)	90°F (32.2°C)
Outdoor Air Dewpoint Setpoint	AV: 26	On an MUA unit, if the outdoor air dewpoint rises above this setpoint, Dehumidification is initiated	35°F (1.7°C)	80°F (26.6°C)
Economizer Enable Setpoint	AV: 27	The economizer is enabled if the outdoor drybulb, dewpoint, or wetbulb temperature falls below this setpoint	-30°F (-34.4°C)	80°F (26.6°C)
Heat Wheel Defrost Enable Setpoint	AV: 28	The unit will go into Heat Wheel Defrost if the outdoor air is below this setpoint	0°F (-17.7°C)	50°F (10°C)

BACnet Properties for the VCCX2 Controller Analog Values				
Parameter	Object	Description	Limits	
			Low	High
PreHeat Enable Setpoint	AV: 29	If the supply fan is energized this is the temperature at which the preheat relay will activate or the Preheat-X will activate. Operates only in the Occupied Mode.	-30°F (-34.4°C)	70°F (21.1°C)
Sensor Slide Offset Max Effect	AV: 30	If the space sensor has the optional slide adjustment feature, this is the maximum amount the slide can adjust the current heating and cooling setpoints up or down with full deflection of the slide	0°F (0°C)	10°F (5.5°C)
Space Sensor Calibration Offset	AV: 31	If the Space Temperature Sensor is reading incorrectly, use this option to enter an offset temperature to adjust the sensor's temperature	-100°F (-55.5°C)	100°F (55.5°C)
Supply Air Sensor Calibration Offset	AV: 32	If the Supply Air Temperature Sensor is reading incorrectly, use this option to enter an offset temperature to adjust the sensor's temperature	-100°F (-55.5°C)	100°F (55.5°C)
Return Air Sensor Calibration Offset	AV: 33	If the Return Temperature Sensor is reading incorrectly, use this option to enter an offset temperature to adjust the sensor's temperature	-100°F (-55.5°C)	100°F (55.5°C)
Outdoor Air Sensor Calibration Offset	AV: 34	If the Outdoor Temperature Sensor is reading incorrectly, use this option to enter an offset temperature to adjust the sensor's temperature	-100°F (-55.5°C)	100°F (55.5°C)
Carbon Dioxide Sensor Calibration Offset	AV: 35	If the CO_2 Sensor is reading incorrectly, use this option to enter an offset value to adjust the sensor's CO_2 reading	-500	500
Low Ambient Protection Setpoint	AV: 36	Temperature at which the low ambient Relay will activate in the Occupied or Unoccupied Mode	-30°F (-34.4°C)	70°F (21.1°C)
SAT Cool Setpoint Reset Source Low Limit	AV: 37	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°F (-34.4°C)	150°F (65.5°C)

VCCX2 BACnet Parameters - Analog Values

BACnet Properties for the VCCX2 Controller Analog Values				
Parameter	Object	Description	Limits	
			Low	High
SAT Cool Setpoint Reset Source High Limit	AV: 38	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)	0°F (-17.7°C)	150°F (65.5°C)
SAT Heat Setpoint Reset Source Low Limit	AV: 39	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°F (-34.4°C)	150°F (65.5°C)
SAT Heat Setpoint Reset Source High Limit	AV: 40	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)	0°F (-17.7°C)	150°F (65.5°C)
Control Temperature High Alarm Offset	AV: 41	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°F (0°C)	50°F (27.7°C)
Control Temperature Low Alarm Offset	AV: 42	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°F (0°C)	50°F (27.7°C)
Heat Pump Compressor Heat Lockout	AV: 43	Compressor Heat will be locked out below this setpoint	-30°F (-34.4°C)	100°F (37.7°C)
Maximum Main Fan VFD in SZ VAV Heating Mode	AV: 44	In Single Zone VAV configuration, this is the max fan speed the VFD can modulate up to in Heat Mode	0	100
Minimum Main Fan VFD in Cooling Mode	AV: 45	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

BACnet Properties for the VCCX2 Controller Analog Values				
Parameter	Object	Description	Limits	
			Low	High
Minimum Main Fan VFD in Heating Mode	AV: 46	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: 47	Speed at which the VFD will operate in the Vent Mode in Single Zone VAV	0	100
Maximum Economizer in Heating Mode	AV: 48	Max position the economizer damper can open to in supply air tempering during Heating Mode. Takes priority over max position in high CO_2.	0	100
Minimum Economizer Position	AV: 49	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 CO2 Reset Limit	AV: 50	The maximum value the economizer minimum position can be reset up to during CO_2 override	0	100
Minimum Carbon Dioxide Setpoint	AV: 51	This is the threshold CO_2 level at which the Economizer Min Damper Position Setpoint will begin to be reset higher	0	2000
Maximum Carbon Dioxide Setpoint	AV: 52	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
Indoor Humidity Setpoint Low Reset Limit	AV: 53	On indoor controlled (non MUA) units, this is the Humidity Setpoint at which the unit leaves Dehumidification. During Coil Temp Reset, this is the lowest space RH value that corr esponds to the High Coil Temp Setpoint.	0	100

VCCX2 BACnet Parameters - Analog Values

BACnet Properties for the VCCX2 Controller Analog Values				
Parameter	Object	Description	Limits	
			Low	High
Indoor Humidity Setpoint High Reset Limit	AV: 54	On indoor controlled (non MUA) units, this is the Humidity Setpoint at which the unit initiates Dehumidification. During Coil Temp Reset, this is the highest space RH value that corresponds to the Low Coil Temp Setpoint.	0	100
Duct Static Pressure Setpoint	AV: 55	Current Static Pressure Setpoint	0.1	3
Duct Static Pressure Control Deadband	AV: 56	Value above and below the Duct Static Pressure Setpoint where no control change occurs	0.01	0.5
Building Pressure Control Setpoint	AV: 57	Building Pressure Setpoint or Exhaust Duct Static Pressure Setpoint	-0.2	3
Building Pressure Control Deadband	AV: 58	Value above and below the Building Pressure Setpoint or the Exhaust Duct Static Pressure Setpoint where no control change occurs	0.01	0.5
Minimum Outdoor CFM Requirement	AV: 59	Minimum Outdoor Airflow CFM Setpoint	0.10K	200K
Outdoor CFM Control Deadband	AV: 60	Controls rate of change for damper signal. As outdoor air CFM moves further from setpoint within this window, the damper makes a larger change.	10	1000
Single Zone VAV Fan Speed Integral	AV: 61	The integral constant for Single Zone VAV fan control	0	10
Relay Run-time Hours Warning Limit	AV: 62	If any configured relay's run time exceeds this number of hours of operation, a warning alarm is generated so that periodic maintenance can be performed	0	30000
Cooling Mode Head Pressure Setpoint	AV: 63	Head Pressure Setpoint in the Cooling Mode	250	450
Dehum Mode Head Pressure Setpoint	AV: 64	Head Pressure Setpoint in the Dehumidification Mode	250	450
Superheat Setpoint	AV: 65	Superheat Setpoint	1°F (1°C)	30°F (17°C)
Maximum Outdoor CFM Requirement	AV: 66	Maximum Outdoor Airflow CFM Setpoint in High CO_2	0.10K	200K

BACnet Properties for the VCCX2 Controller Analog Values				
Parameter	Object	Description	Limits	
			Low	High
Schedule Force	AV: 67	0 = Auto (uses controller's schedule) 1 = Forced Occupied 2 = Forced Unoccupied	0	2
HVAC Mode Override	AV: 68	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.	0	6
Fan VFD Override	AV: 69	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: 70	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. NOTE: If economizer is enabled and a value less than 100% is written, compressors will disable.	0%	100%
			Auto=65535	
Supply Setpoint Override	AV: 71	This will override whatever setpoint the supply air temperature is currently being controlled to. Zero = no override.	0°F (-17.7°C)	200°F (93.3°C)
Space Temperature Value	AV: 72	If the controller is configured for this operation, the user can write a Space Sensor value	0°F (-17.7°C)	120°F (48.8°C)
Space Humidity Value	AV: 73	If the controller is configured for this operation, the user can write a Space Humidity Sensor value	0	100
Indoor RH Calibration Offset	AV: 74	If the Space Humidity Sensor is reading incorrectly, use this option to enter an offset humidity to adjust the sensor's humidity	-1	1
Relief Fan VFD	AV: 75	Override to force the VFD to this percentage speed. Configuring "Auto" will restore normal unit control of the VFD speed.	0%	100%
			Auto=65535	
Relief Pressure Value	AV: 76	If the controller is configured for this operation, the user can write Building Pressure Sensor value	-0.5	0.5

VCCX2 BACnet Parameters - Analog Values

BACnet Properties for the VCCX2 Controller Analog Values				
Parameter	Object	Description	Limits	
			Low	High
Carbon Dioxide Value	AV: 77	If the controller is configured for this operation, the user can write a CO_2 Sensor value	0	3000
Outdoor Air Temperature Value	AV: 78	If the controller is configured for this operation, the user can write an Outdoor Sensor value	-40°F (-40°C)	150°F (65.5°C)
Outdoor Air Humidity Value	AV: 79	If the controller is configured for this operation, the user can write an Outdoor Humidity Sensor value	0	100
High Level Enthalpy (Reserved)	AV: 80	Reserved	10	50
Low Level Enthalpy (Reserved)	AV: 81	Reserved	10	50
Max Plenum Pressure Setpoint Reset Limit	AV: 82	Reserved	0.1	1.4
Min Plenum Pressure Setpoint Reset Limit	AV: 83	Reserved	0.1	1.4
Enthalpy Enable Setpoint	AV: 84	If configured for comparative enthalpy economizer control, the outdoor air enthalpy must be below this setpoint by the enthalpy enable deadband before the outdoor air/return air enthalpy comparison will be utilized to enable the economizer	25 BTU/ lb.	35 BTU/ lb.
Enthalpy Enable Deadband	AV: 85	The outdoor air enthalpy must be below the Enthalpy Enable Setpoint by this amount, and the outdoor air enthalpy must be below the return air enthalpy by this amount to utilize the economizer	0.3 BTU/ lb.	1.5 BTU/ lb.
Maximum Static Setpoint Reset Limit	AV: 86	As the most open VAV damper rises above 80%, the static setpoint will reset up to this maximum limit	0.01 “WG	3.00 “WG
Minimum Static Setpoint Reset Limit	AV: 87	As the most open VAV damper drops below 80%, the static setpoint will reset down to this minimum reset limit	0.01 “WG	3.00 “WG

BACnet Properties for the VCCX2 Controller Analog Values				
Parameter	Object	Description	Limits	
			Low	High
Static Setpoint Reset Interval	AV: 88	The Reset Interval is how often the setpoint reset calculation occurs. This must be an infrequent event so the default is 15 minutes.	10 min	60 min
Cool-Down Target Temperature (See AV:16 for Warm-Up Target Temperature)	AV: 89	If Morning Cool-Down is configured then upon entering occupied mode, the Cool-Down Mode will be activated if the return air is above this temperature by one degree	50°F (10°C)	90°F (32.2°C)
Warm-Up Override	AV: 90	Commands the unit into Morning Warm-Up Mode. 1 = Command Warm-Up Mode		
Cool Down Override	AV: 91	Commands the unit into Morning Cool-Down Mode. 1 = Command Cool-Down Mode		
Return Air High Limit Protection (for Voting Units or CV Units Only)	AV: 92	If the return air temperature goes above this limit, the unit will revert to return air control. NOTE: This point only applies when the building management system is writing a space temperature value to the VCCX2 and that value is lost.	60	100
Return Air Low Limit Protection (for Voting Units or CV Units Only)	AV: 93	If the return air temperature goes below this limit, the unit will revert to return air control. NOTE: This point only applies when the building management system is writing a space temperature value to the VCCX2 and that value is lost.	45	70
Sump Drain Override	AV: 94	Setting this value to 1 turns the sump drain relay on. Setting this value to 0 sets the relay operation to Auto. 1=On 0=Auto		
Return Plenum Pressure Setpoint	AV: 95	Current Return Plenum Pressure Setpoint	-0.2 “WG	0.2 “WG
Return Plenum Pressure Deadband	AV: 96	Value above and below the Return Plenum Pressure Setpoint where no control change occurs	0.01 “WG	0.1 “WG
Dehum Lockout Setpoint	AV: 97	If outdoor air temperature is below this setpoint Dehumidification Mode will be locked out	-30°F (-34.4°C)	60°F (15.6°C)

VCCX2 BACnet Parameters - Binary Inputs

BACnet Properties for the VCCX2 Controller Binary Inputs		
Parameter	**Object**	**Description**
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
Aux Heat Enabled Status	BI: 4	Heat pump auxiliary heat enabled
Emergency Heat Enabled Status	BI: 5	Shows the emergency heat is enabled based on the compressor heating lockout
Fan Proof of Airflow Status	BI: 6	Proof of airflow binary input status
Exhaust Hood On/Off Status	BI: 7	Exhaust hood on/off binary input status
Remote Forced Occupied Status	BI: 8	Remote Forced Occupied Mode binary input status
Remote Forced Cooling Status	BI: 9	Remote Forced Cooling Mode binary input status
Remote Forced Heating Status	BI: 10	Remote Forced Heating Mode binary input status
Remote Force Dehum Status	BI: 11	Remote Force Dehumidification Mode binary input status
Bad Supply Air Sensor	BI: 12	Alarm that indicates a failure of the Supply Air Sensor
Bad Return Air Sensor	BI: 13	Alarm that indicates a failure of the Return Air Sensor
Bad Outdoor Air Sensor	BI: 14	Failure of the Outdoor Air Temperature Sensor
Bad Space Temp Sensor	BI: 15	Failure of the Space Temperature Sensor. If Space is the controlling sensor, the unit will shut down.
Bad Carbon Dioxide Sensor	BI: 16	Failure of the CO_2 Sensor
Bad Building Pressure Sensor	BI: 17	Alarm indicating missing or failed Building Pressure Sensor
Bad Outdoor Airflow Sensor	BI: 18	An Outdoor Airflow Sensor is configured, but not detected
Bad Exhaust Airflow Sensor	BI: 19	An Exhaust Airflow Sensor is configured, but not detected
Bad Supply Airflow Sensor	BI: 20	A Supply Airflow Sensor is configured, but not detected
Bad Return Airflow Sensor	BI: 21	A Return Airflow Sensor is configured, but not detected
Mechanical Cooling Alarm	BI: 22	Compressor relays are enabled but the supply air temperature has not fallen 5°F w/in a user-adjustable time period. This does not apply to Modulating Cooling.

BACnet Properties for the VCCX2 Controller Binary Inputs		
Parameter	**Object**	**Description**
Mechanical Heating Alarm	BI: 23	Heating Mode has been initiated but the supply air temperature has not risen 5°F w/in a user-adjustable time period. Alarms on the MODGAS-X and Preheat-X Module will generate this alarm. This alarm does not apply to SCR Heat, Modulating Hot Water or Steam Heating.
Fan Proving Alarm	BI: 24	Alarm that indicates an airflow failure from the main fan. Heating and Cooling will be disabled.
Dirty Filter Alarm	BI: 25	Alarm that indicates the filters are dirty
Emergency Shutdown Alarm	BI: 26	Alarm that indicates that Emergency Shutdown has been activated. Will shut the unit down.
Relay Runtime Warning	BI: 27	Indicates when any of the configured relays exceeds a configured number of hours of runtime. Can be used to schedule service, etc.
Economizer Missing Alarm	BI: 28	Title 24 operation indicates missing economizer feedback
Economizer Title 24 Failure A	BI: 29	Title 24 Air Temperature Sensor failure
Economizer Title 24 Failure B	BI: 30	Title 24 not economizing when it should
Economizer Title 24 Failure C	BI: 31	Title 24 economizing when it should not
Economizer Title 24 Failure D	BI: 32	Title 24 damper not modulating
Economizer Title 24 Failure E	BI: 33	Title 24 excess outdoor air
High Supply Temp Cutoff	BI: 34	The supply air has risen above the High SAT Cutoff Setpoint. Heating stages will deactivate and the fan continues to run. This alarm is generated.
Low Supply Temp Cutoff	BI: 35	The supply air has fallen below the Low SAT Cutoff Setpoint. Cooling stages will deactivate. After 10 minutes, the fan will deactivate and this alarm is generated.
High Control Mode Alarm	BI: 36	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: 37	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.
Missing Refrigerant Module #1	BI: 38	Refrigerant Module #1 is bad or missing
Missing Refrigerant Module #2	BI: 39	Refrigerant Module #2 is bad or missing
Missing Refrigerant Module #3	BI: 40	Refrigerant Module #3 is bad or missing
Missing Refrigerant Module #4	BI: 41	Refrigerant Module #4 is bad or missing

VCCX2 BACnet Parameters - Binary Inputs

BACnet Properties for the VCCX2 Controller Binary Inputs		
Parameter	**Object**	**Description**
Missing Preheater Board	BI: 42	Preheater Module is bad or missing
Missing Reheat Board	BI: 43	The MHGR board is configured but not detected
Missing Mod Gas Board	BI: 44	The MODGAS board is configured but not detected
Missing EM1 Board	BI: 45	EM1 Expansion Board is bad or missing
Missing 12 Relay Expansion Board	BI: 46	The 12 Relay Expansion Board is configured but not detected
On Board Relay 1 Main Fan	BI: 47	Current status of Main Fan Relay #1 on main board
On Board Relay 2	BI: 48	Current status of Configurable Relay #2 on main board
On Board Relay 3	BI: 49	Current Status of Configurable Relay #3 on Main Board
On Board Relay 4	BI: 50	Current status of Configurable Relay #4 on main board
On Board Relay 5	BI: 51	Current status of Configurable Relay #5 on main board
On Board Relay 6	BI: 52	Current status of Configurable Relay #6 on main board
On Board Relay 7	BI: 53	Current status of Configurable Relay #7 on main board
On Board Relay 8	BI: 54	Current status of Configurable Relay #8 on main board
Expansion Board EM1 Relay 1	BI: 55	Current status of Configurable Relay #1 on EM1 board
Expansion Board EM1 Relay 2	BI: 56	Current status of Configurable Relay #2 on EM1 board
Expansion Board EM1 Relay 3	BI: 57	Current status of Configurable Relay #3 on EM1 board
Expansion Board EM1 Relay 4	BI: 58	Current status of Configurable Relay #4 on EM1 board
Expansion Board EM1 Relay 5	BI: 59	Current status of Configurable Relay #5 on EM1 board
12 Relay Expansion Board Relay 1	BI: 60	Current status of Configurable Relay #1 on 12 Relay Board
12 Relay Expansion Board Relay 2	BI: 61	Current status of Configurable Relay #2 on 12 Relay Board
12 Relay Expansion Board Relay 3	BI: 62	Current status of Configurable Relay #3 on 12 Relay Board
12 Relay Expansion Board Relay 4	BI: 63	Current status of Configurable Relay #4 on 12 Relay Board
12 Relay Expansion Board Relay 5	BI: 64	Current status of Configurable Relay #5 on 12 Relay Board
12 Relay Expansion Board Relay 6	BI: 65	Current status of Configurable Relay #6 on 12 Relay Board
12 Relay Expansion Board Relay 7	BI: 66	Current status of Configurable Relay #7 on 12 Relay Board
12 Relay Expansion Board Relay 8	BI: 67	Current status of Configurable Relay #8 on 12 Relay Board
12 Relay Expansion Board Relay 9	BI: 68	Current status of Configurable Relay #9 on 12 Relay Board

BACnet Properties for the VCCX2 Controller Binary Inputs		
Parameter	**Object**	**Description**
12 Relay Expansion Board Relay 10	BI: 69	Current status of Configurable Relay #10 on 12 Relay Board
12 Relay Expansion Board Relay 11	BI: 70	Current status of Configurable Relay #11 on 12 Relay Board
12 Relay Expansion Board Relay 12	BI: 71	Current status of Configurable Relay #12 on 12 Relay Board
Preheater Enable Status	BI: 72	Status of Preheater Enable Input
Preheater Emergency Shutdown	BI: 73	Status of Preheater Emergency Shutdown Input
Preheater Spare Binary Input #3	BI: 74	Status of Preheater Binary Input #3
MODGAS Enable Status	BI: 75	Status of MODGAS Module
MHGR Enable Status	BI: 76	Status of MHGRV Module
A1 Compressor Enable	BI: 77	Current status of enable signal to Compressor A1
A2 Compressor Enable	BI: 78	Current status of enable signal to Compressor A2
A1 Compressor Alarms	BI: 79	Indicates an RSM alarm is present on the A1 circuit
A2 Compressor Alarms	BI: 80	Indicates an RSM alarm is present on the A2 circuit
A1-2 Defrost Switch	BI: 81	Outside coil A1/A2 temp switch for Defrost Mode
A1-2 Water Proof of Flow	BI: 82	A1/A2 Water Proof of Flow switch
A1-4 Emergency Shutdown (RSMD)	BI: 83	Emergency Shutdown Input on module A
Refrigerant Module 1 Relay 1	BI: 84	Current status of Compressor A1 enable relay
Refrigerant Module 1 Relay 2	BI: 85	Current status of Compressor A2 enable relay
Refrigerant Module 1 Relay 3	BI: 86	Current status of Condenser 1 enable relay
Refrigerant Module 1 Relay 4	BI: 87	Current status of Relay #4
Refrigerant Module 1 Relay 5	BI: 88	Current status of Relay #5
B1 Compressor Enable	BI: 89	Current status of enable signal to Compressor B1
B2 Compressor Enable	BI: 90	Current status of enable signal to Compressor B2
B1 Compressor Alarms	BI: 91	Indicates an RSM alarm is present on the B1 circuit
B2 Compressor Alarms	BI: 92	Indicates an RSM alarm is present on the B2 circuit
B1-2 Defrost Switch	BI: 93	Outside coil B1/B2 temp switch for Defrost Mode
B1-2 Water Proof of Flow	BI: 94	B1/B2 switch for Water Proof of Flow
B1-4 Emergency Shutdown (RSMD)	BI: 95	Emergency Shutdown Input on module B
Refrigerant Module 2 Relay 1	BI: 96	Current status of Compressor 1 enable relay.

VCCX2 BACnet Parameters - Binary Inputs

BACnet Properties for the VCCX2 Controller Binary Inputs		
Parameter	**Object**	**Description**
Refrigerant Module 2 Relay 2	BI: 97	Current status of Compressor 2 enable relay
Refrigerant Module 2 Relay 3	BI: 98	Current status of Condenser 1 enable relay
Refrigerant Module 2 Relay 4	BI: 99	Current status of Relay #4
Refrigerant Module 2 Relay 5	BI: 100	Current status of Relay #5
C1 Compressor Enable	BI: 101	Current status of enable signal to Compressor C1
C2 Compressor Enable	BI: 102	Current status of enable signal to Compressor C2
C1 Compressor Alarms	BI: 103	Indicates an RSM alarm is present on the C1 circuit
C2 Compressor Alarms	BI: 104	Indicates an RSM alarm is present on the C2 circuit
C1-2 Defrost Switch	BI: 105	Outside coil C1/C2 temp switch for Defrost Mode
C1-2 Water Proof of Flow	BI: 106	C1/C2 switch for Water Proof of Flow
C1-4 Emergency Shutdown (RSMD)	BI: 107	Emergency Shutdown input on module C
Refrigerant Module 3 Relay 1	BI: 108	Current status of Compressor 1 enable relay
Refrigerant Module 3 Relay 2	BI: 109	Current status of Compressor 2 enable relay
Refrigerant Module 3 Relay 3	BI: 110	Current status Condenser 1 enable relay
Refrigerant Module 3 Relay 4	BI: 111	Current status of Relay #4
Refrigerant Module 3 Relay 5	BI: 112	Current status of Relay #5
D1 Compressor Enable	BI: 113	Current status of enable signal to compressor D1
D2 Compressor Enable	BI: 114	Current status of enable signal to Compressor D2
D1 Compressor Alarms	BI: 115	Indicates an RSM alarm is present on the D1 circuit.
D2 Compressor Alarms	BI: 116	Indicates an RSM alarm is present on the D2 circuit.
D1-2 Defrost Switch	BI: 117	Outside coil D1/D2 temp switch for Defrost Mode
D1-2 Water Proof of Flow	BI: 118	D1/D2 switch for Water Proof of Flow
D1-4 Emergency Shutdown (RSMD)	BI: 119	Emergency Shutdown Input on module D
Refrigerant Module 4 Relay 1	BI: 120	Current status of Compressor 1 enable relay
Refrigerant Module 4 Relay 2	BI: 121	Current status of Compressor 2 enable relay
Refrigerant Module 4 Relay 3	BI: 122	Current status of Condenser 1 enable relay
Refrigerant Module 4 Relay 4	BI: 123	Current status of Relay #4

BACnet Properties for the VCCX2 Controller Binary Inputs		
Parameter	**Object**	**Description**
Refrigerant Module 4 Relay 5	BI: 124	Current status of Relay #5
Preheater Alarm	BI: 125	Preheater Alarm indicator
Return Fan Proving Alarm	BI: 126	Exhaust Fan / Return Fan Proof of Flow alarm
Compressor Running A	BI: 127	Current run status of Compressor A
Compressor Running B	BI: 128	Current run status of Compressor B
Compressor Running C	BI: 129	Current run status of Compressor C
Compressor Running C2	BI: 130	Current run status of Compressor C2
Compressor Running D	BI: 131	Current run status of Compressor D
Compressor Running E	BI: 132	Current run status of Compressor E
Compressor Running E2	BI: 133	Current run status of Compressor E2
Compressor Running F	BI: 134	Current run status of Compressor F
Compressor Running F2	BI: 135	Current run status of Compressor F2
Return Fan Proving Status	BI: 136	Proof of Return Fan Airflow binary input status
IAQ Mode Active	BI: 137	Indicates that Indoor Air Quality Mode is active
Heat Wheel Defrost Active	BI: 138	Indicates Heat Wheel Defrost is active.

VCCX2 BACnet Bitfields

VCCX2 BACnet Property Identifier

BACNETPropertyIdentifier :

VccxControlModeBits ::= ENUMERATED {

Supply Air Cooling Only	(0),
Supply Air Tempering	(1),
Outdoor Temperature Control	(2),
Return Air Constant Volume Mode	(3),
Space Temp Constant Volume Mode	(4),
Space Temp w/ High OA Content	(5),
Single Zone VAV	(6)

}

VccxControlStatusBits ::= ENUMERATED {

Unoccupied	(0)
Occupied	(1),
Override Mode	(2),
Holiday Unoccupied	(3),
Holiday Occupied	(4),
Forced Occupied	(5),
Forced Unoccupied	(6),
Remote Contact Occupied	(7)
Reserved	(8)
Reserved	(9)
Reserved	(10)
OA Damper Calibration	(11)

}

VccxHVACModeStatusBits ::= 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),
Purge Mode	(8),
Defrost Mode	(9),
Cool Down Mode	(10)

}

VCCX2 RSMZ BACnet Property Identifier

BACNETPropertyIdentifier :

RSMZWarningsStatusBits ::= ENUMERATED {

Low Suction Pressure	(0),
Low Suction No Start	(1),
High Discharge Pressure Level 1	(2),
High Discharge Pressure Level 2	(3),
Discharge Pressure Sensor Not Detected	(4),
VFD Compressor Alarm	(5),
High Superheat	(6),
High Discharge Temperature	(7),
Comp 1 False Active	(8),
Comp 2 False Active	(9),
Reserved	(10),
Discharge Line Temp Sensor Not Detected	(11)

}

RSMZFaultsStatusBits ::= ENUMERATED {

Low Suction Pressure	(0)
Unsafe Suction Pressure	(1),
Trip High Discharge Pressure Comp 1	(2),
Compressor 1 Not Running	(3),
Compressor 2 Not Running	(4),
Low Superheat	(5),
High Discharge Temperature	(6),
EEV Not Detected	(7),
MODBUS Slave Comm Timeout	(8),
Low Suction Pressure Comp 2	(9),
Trip High Discharge Pressure Comp 2	(10),
High Superheat	(11),
High Evap Temperature	(12)
Emergency Shutdown	(13),

}

RSMZLockoutsStatusBits ::= ENUMERATED {

Suction Pressure System Lockout	(0),
Oil Boost Lockout	(1),
High Discharge Pressure System Lockout	(2),
Low Superheat System Lockout	(3),
High Superheat System Lockout	(4),
High Evap Temperature System Lockout	(5),
High Discharge Temp System Lockout	(6)

}

RSMZAlarms1StatusBits ::= ENUMERATED {

Brake Check	(0)
Pwr. Card Temp	(1),
Earth Fault	(2),
Ctrl.Card Temp	(3),
Ctrl. Word TO	(4),
Over Current	(5),
Torque Limit	(6),
Motor Th Over	(7),
Motor ETR Over	(8),
Inverter Overld	(9),
DC Under Volt	(10),
DC Over Volt	(11),
Short Circuit	(12),
Inrush Fault	(13),
Mains Ph. Loss	(14),
AMA Not OK	(15),
Live Zero Error	(16),
Internal Fault	(17),
Brake Overload	(18),
U Phase Loss	(19),
V Phase Loss	(20),
W Phase Loss	(21),
Fieldbus Fault	(22),
24 V Supply Low	(23),
Mains Failure	(24),
1.8V Supply Low	(25),
Brake Resistor	(26),
Brake IGBT	(27),
Option Change	(28),
Drive Initialized	(29),
Safe Stop	(30),
Mech. Brake Low	(31)

}

VCCX2 BACnet Bitfields

RSMZAlarms2StatusBits ::= ENUMERATED {

Service Trip Read/Write	(0)
Service Trip (Reserved)	(1),
Service Trip Type Code/Spare Part	(2),
Service Trip (Reserved)	(3),
Service Trip (Reserved)	(4),
Reserved	(5),
Reserved	(6),
Reserved	(7),
Reserved	(8),
Discharge High	(9),
Start Failed	(10),
Speed Limit	(11),
External Interlock	(12),
Illegal Option Combi.	(13),
No Safety Option	(14),
Reserved	(15),
Reserved	(16),
KTY Error	(17),
Fans Error	(18),
ECB Error	(19),
Reserved	(20),
Reserved	(21),
Reserved	(22),
Reserved	(23),
Reserved	(24),
Current Limit	(25),
Reserved	(26),
Reserved	(27),
Reserved	(28),
Encoder Loss	(29),
PTC Thermistor	(30),
Dangerous Failure	(31)

}

RSMZDriveStatusBits ::= ENUMERATED {

Control_Ready (0=Control Not Ready; 1=Control Ready)	(0)
Drive_Ready (0=Drive Not Ready; 1=Drive Ready)	(1),
Enable (0=Coasting; 1=Enable)	(2),
Trip_Error (0=No Error; 1=Trip)	(3),
ErrorNoTrip (0=No Error; 1=Error (no trip))	(4),
Reserved	(5),
Triplock_Error (0=No Error; 1=TripLock (must power cycle))	(6),
Warning (0=No Warning; 1=Warning)	(7),
SpeedEqualsReference (0=Speed; !=Reference; 1=Speed=Reference)	(8),
BusControl (0=Local Operation; 1=Bus Control)	(9),
FreqLimitOkay (0=Out of Frequency Limit; 1=Frequency Limit Okay)	(10),
InOperation (0=No Operation; 1=In Operation)	(11),
Stopped_AutoStart (0=Drive OK; 1=Stopped,, Auto Start)	(12),
VoltageExceeded (0=Voltage Okay; 1=Voltage Exceeded)	(13),
TorqueExceeded (0=Torque Okay; 1=Torque Exceeded)	(14),
TimerExceeded (0=Timer Okay; 1=Timer Exceeded)	(15)

}

BACnet Protocol Implementation Conformance Statement

Date:	December 2017
Vendor:	AAON, Inc.
Product:	VCCX2 Controller
Product Model Number:	ASM01698
Product Version:	1.13
Product Description:	HVAC Unit Controller
BACnet Protocol Revision:	Revision 12 (ANSI/ASHRAE Standard 135-2010)

BACnet Protocol Implementation Conformance Statement

K.1.2 BIBB – Data Sharing-ReadProperty-B (DS-RP-B)
K.1.4 BIBB – Data Sharing-ReadPropertyMultiple-B (DS-RPM-B)
K.1.8 BIBB – Data Sharing-WriteProperty-B (DS-WP-B)
K.5.2 BIBB – Device Management-DynamicDeviceBinding-B (DM-DDB-B)
K.5.4 BIBB – Device Management-DynamicObjectBinding-B (DM-DOB-B)
K.5.6 BIBB – Device Management-DeviceCommunicationControl-B (DM-DCC-B)

BACnet Standardized Device Profile

L.4 BACnet Application Specific Controller (B-ASC)

Standard Object Types Supported

Analog Input:	Optional properties supported: Description
Analog Value:	Optional properties supported: Description
Binary Input:	Optional properties supported: Description, Inactive_Text, Active_Text
Binary Value:	Optional properties supported: Description, Inactive_Text, Active_Text
Device Object:	Optional properties supported: Description, Location
Multi-state Input:	Optional properties supported: Description, State_Text
Multi-state Value:	Optional properties supported: Description, State_Text

For all supported objects, device does not support CreateObject or DeleteObject.
There are no proprietary objects.

Data Link Layer Options

MS/TP Master: Supported Baud rates: 9.6K, 19.2K, 38.4K, 57.6K, 76.8K

Segmentation Support

Neither segmented requests nor segmented responses are supported.

VCCX2 Controller Technical Guide

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AAON Controls Support: 866-918-1100
Monday through Friday, 7:00 AM to 5:00 PM
Central Standard Time

Controls Support website:
www.aaon.com/aaon-controls-technical-support

AAON Factory Technical Support: 918-382-6450
techsupport@aaon.com

NOTE: Before calling Technical Support, please have the model and serial number of the unit available.

PARTS: For replacement parts, please contact your local AAON Representative.

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