

Control Air 5600

Control Air 5600 Water to Air Heat Pumps

For integration with systems running industry standard protocols

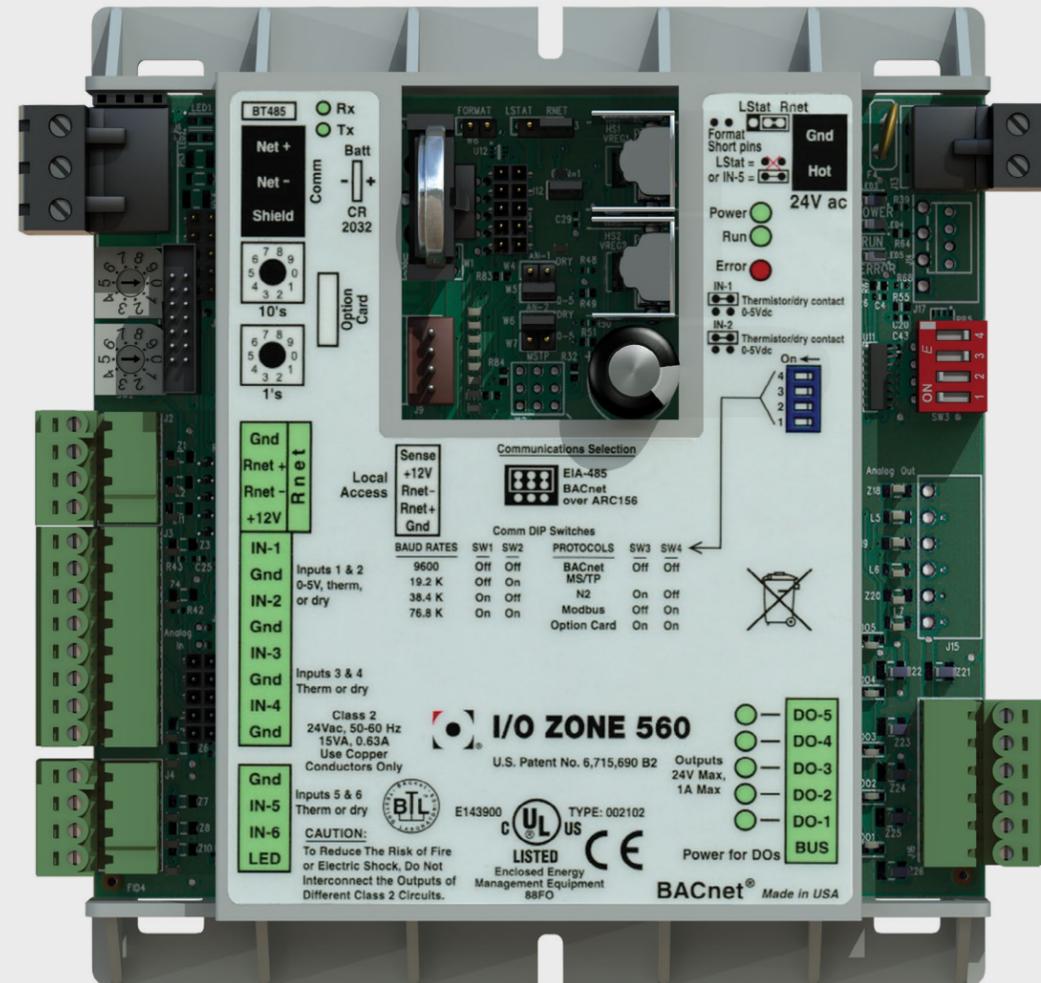


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1 Key to Symbols and General Safety Instructions

1.1 Key to Symbols

Warnings

In warnings, signal words at the beginning of a warning are used to indicate the type and seriousness of the ensuing risk if measures for minimizing danger are not taken.

The following keywords are defined and can be used in this document:

DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could result in minor to moderate injury.

NOTICE

NOTICE is used to address practices not related to personal injury.

Important information



The info symbol indicates important information where there is no risk to people or property.

1.2 General Safety Instructions

- Programming the Master BAS Building Controller is NOT provided by Bosch.
- The included sequence of operation and points list should be verified to ensure compliance with all required specification. If not meeting specification, additional custom programming costs will be incurred.
- When making selections in BST to place an order, be sure to select the necessary Bosch sensors under accessories (e.g. wall sensors, duct sensors, outdoor air sensors, etc) and any additional options or accessories that may be required.
- Extra DDC customization to interface with non Bosch sensors will incur additional special pricing.
- DDC controls by others will receive unit status alarm (error / no error) but won't be able to interpret the fault code - must use Bosch DDC to get cause of error fault codes to BAS.
- On series evap, DDC (or controls by others) is required for heating and cooling control. The controller is configured to prevent stage 2 compressor from running when in heating mode. Without controls, this feature won't work properly in heating mode as 2nd stage compressor (piped for straight cool) will cool while 1st stage is trying to heat. Circuit 1 will have HGRH & HGBP, circuit 2 will be straight cool.
- DDC controls need to be field configured per job site requirements.
- When specifying controls by others to be factory mounted all request should be submitted in writing and signed off on by both parties. Bosch will assume no responsibility for any oversights, unspoken intents, or assumptions in factory mounting any third-party controllers.
- For orders requiring special software programming a requirements specification document must be generated to notify the approving party of Bosch's comprehension of the desired sequence. It is the responsibility of the approving agency/individual to carefully review the requirements and ensure that all intended actions have been clearly stated and correctly interpreted.

2 Control Air 5600 Overview

The Bosch Control Air 5600 multi-protocol water source heat pump (WSHP) controller is used in most configure-to-order applications requiring integration of direct digital control (DDC) systems. The controller is BACnet-native and offers flexibility for integration into existing building automation systems (BAS) through a choice of widely used protocols, including BACnet MS/TP, N2, and Modbus. The Control Air 5600 can operate either in stand-alone mode or within a DDC network by integrating with a BAS.

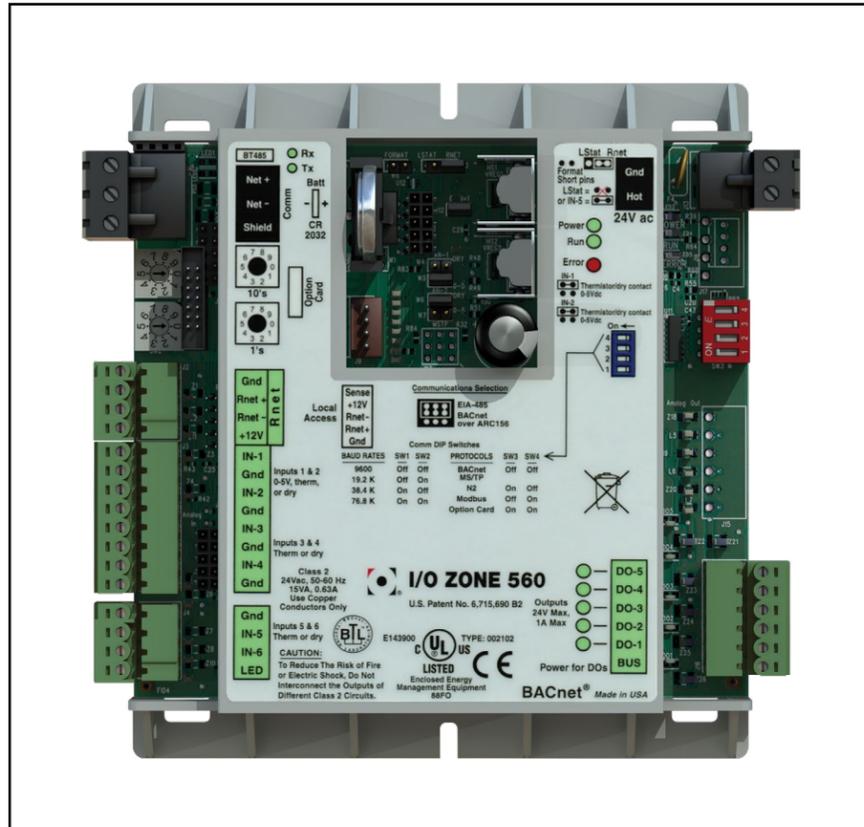


Fig. 1 Bosch Control Air 5600 Controller

The Control Air 5600 is packaged with a highly sophisticated yet easily configurable software that suits the different WSHP applications. User parameters and options relating to the physical build of the corresponding WSHP unit (e.g. number of compressors, reversing valve, reheat coil, etc) are usually programmed at the factory to facilitate a seamless integration in the field. However, commissioning of the controller in the field is required to ensure the setup exactly matches the requirements of the jobsite. User settings of the factory-standard software, such as the time, test, and balance set points, are usually set up during the installation and commissioning process.

When properly connected to a Bosch WSHP, the controller works in tandem with the onboard unit protection module (UPM) to protect the unit compressor from faults such as high/low pressure, high condensate, freeze evaporator/condensator coils, and brown-outs. The controller monitors the alarm contacts of the UPM board, then decodes and broadcasts any fault conditions that may arise over a network if one is available.

The controller also works with multi-functional ZS room sensors that, depending on model, are capable of reading not only the zone temperature, but also CO₂ and relative humidity levels. When wired correctly, the controller commands the WSHP unit to operate in heating or cooling mode and can also issue commands for additional options, such as hot gas reheat, to manage relative humidity during cooling. The operating parameters of the unit may be communicated to a BAS over the DDC network if available.

2.1 Key Features/Benefits

- ▶ Flexible and easily configured software package for options including:
 - Hot gas reheat
 - Auxiliary electric heat
 - Factory installed condenser water valve control
 - Loop pump control
 - Field supplied fresh air damper control
 - Water-side economizer
 - Boiler-less control
 - Air economizer
- ▶ Provides multi-protocol communications for seamless integration with systems running industry standard protocols such as:
 - BACnet MS/TP
 - Johnson controls N2
 - Modbus
- ▶ Ruggedly built for quality and reliability
- ▶ Stand-alone operation or networked DDC operation capable
- ▶ Removable wiring connectors for ease of field service
- ▶ Allows application parameters to be saved and recovered following power loss

3 Specification

Product Specifications	
Power	24VAC ± 10%, 50-60Hz, 20VA power consumption; single Class II source only; 100VA or less
Physical	Rugged plastic housing protects circuitry
Environmental Operating Range	0° to 130°F (-17.8° to 54.4°C); 10 to 90% relative humidity, non-condensing
Digital Outputs	Five binary outputs: Form A relay contacts rated at 1A resistive @ 24VAC; configured as dry contact, normally open
Universal Inputs	Six universal inputs. All six inputs are configurable for pulse, 10kohm @ 77°F (25°C) thermistor, or dry contact. In addition, inputs 1 and 2 are configurable for 0-5Vdc.
Standard Communication	Three-pin port configurable for ARC156 (BACnet-over-ARC156) or EIA-485 communications (BACnet MS/TP, Modbus RTU, or N2)
Ports	Rnet Port: four-pin port for interface with remote mounted CAM or ZS sensors Local Access Port: For local communication with a laptop computer running WebCTRL, Virtual CAM, or for communication with a CAM.
BACnet Support	Advanced Application Controller (B-AAC), as defined in BACnet 135-2001 Annex L Communication Ports
Status Indication	Visual (LED) status of network communication, run status, errors, power, and all digital outputs
Battery	Lithium 3V coin cell battery, CR2032, provides a minimum of 10,000 hours of data retention (based on installation in conditioned space) during power outages.
Protection	Surge and transient protection circuitry for power and communications
Listed by	FCC Part 15 - Subpart B - Class A. Pending listings at the time of publishing this document: UL 916 (PAZX), cUL C22.2 No. 205-M1983 (PAZX7), CE (1997)
Weight	0.6 Lbs. (0.27 Kg).
Overall Dimensions (W x H x D):	5-1/16" (129mm) x 5-11/16" (144mm) x 1-1/2" (38mm) (recommended panel depth)
Mounting Hole Dimensions	Two mounting holes located center line of controller with 5-9/16" (141mm) vertical spacing

Table 1

4 Physical Dimensions

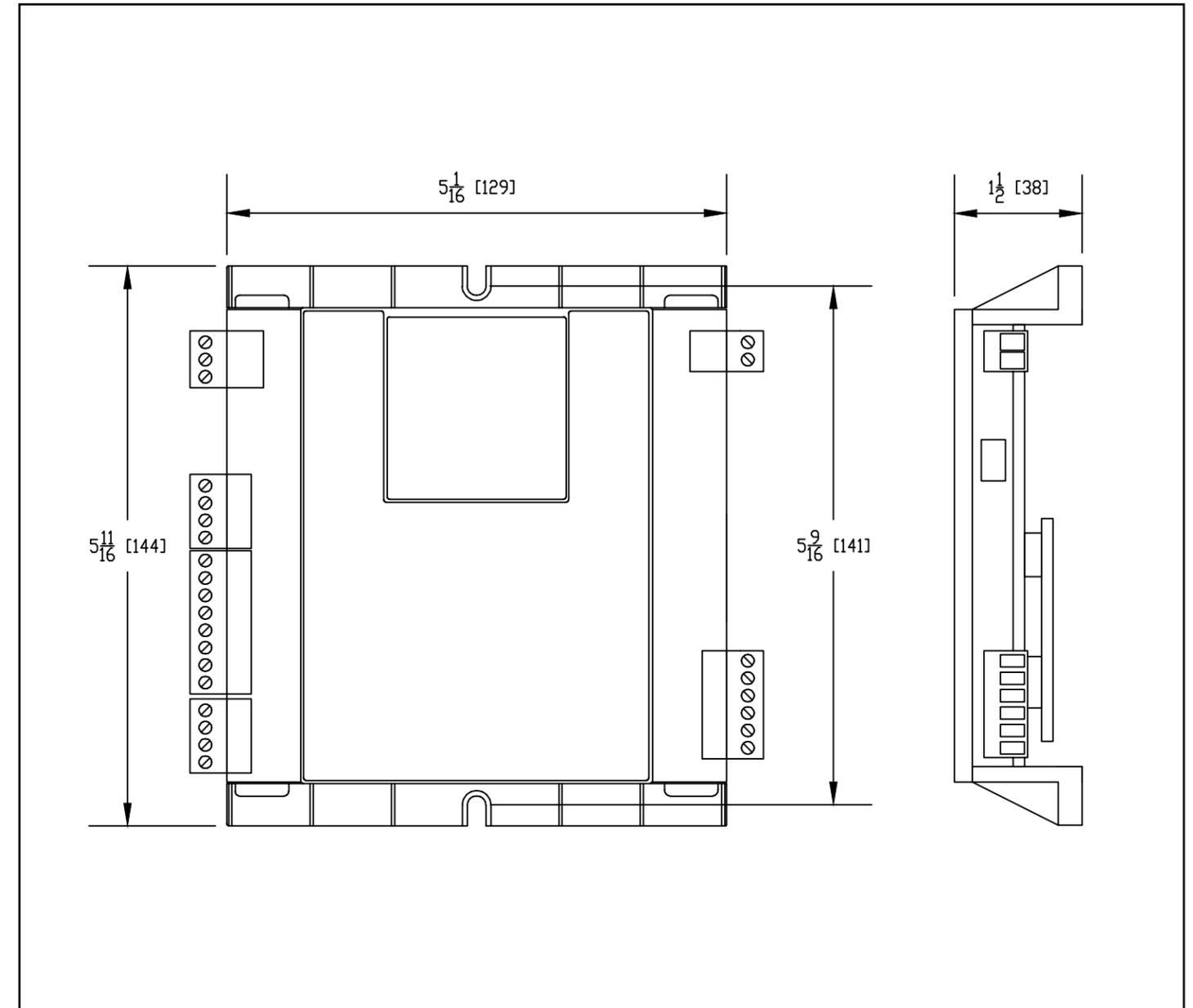


Fig. 2 Control Air 5600 Controller Dimensions in (in. (mm))

5 Controller Components and Features

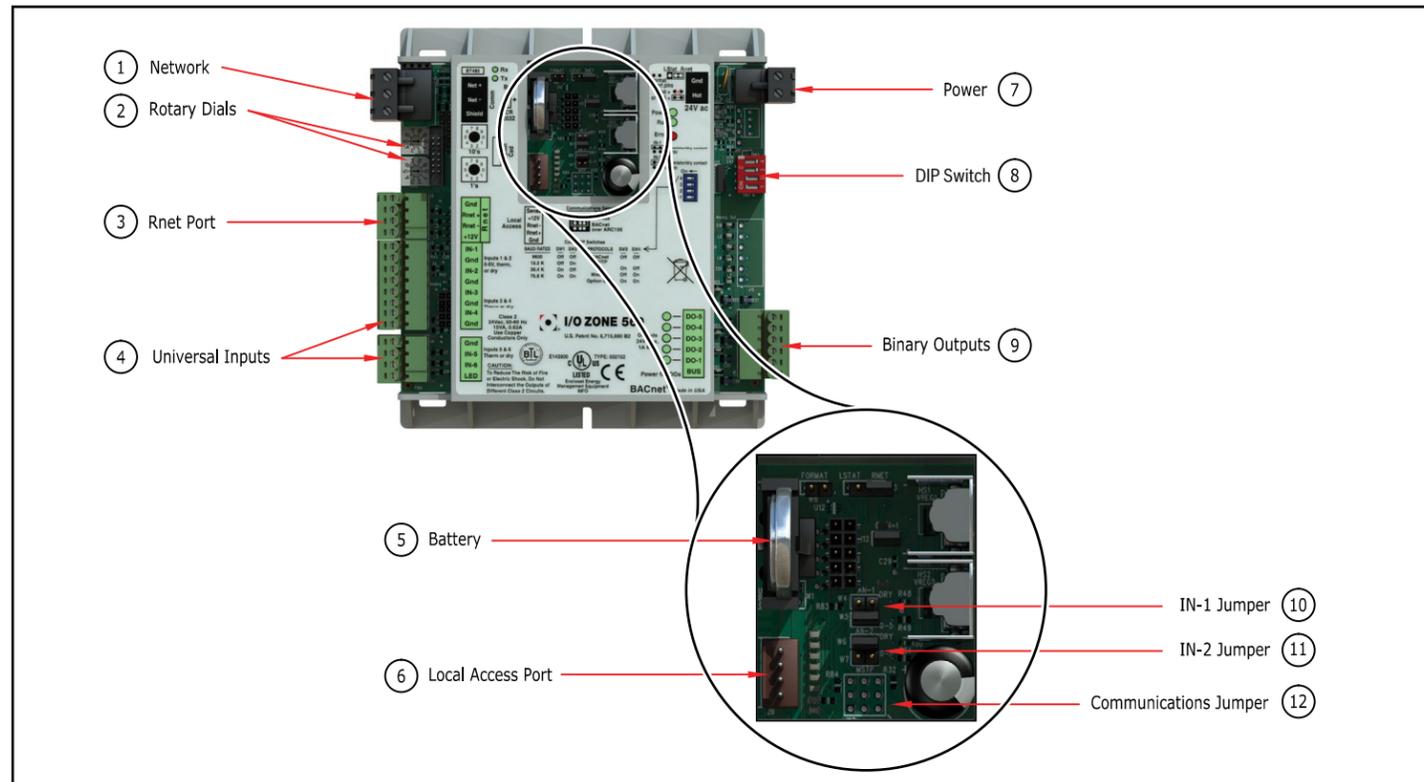


Fig. 3 Control Air 5600 Components

- 1 Network:** This block represents the communications port on the Control Air 5600. The Comm port can be configured to communicate in two ways (RS-485 or BACnet over ARC156) using the Communications Jumper. The communications wiring should be landed at the Net+, Net-, and Shield terminals, ensuring the same polarity is maintained throughout the network segment. The BAS Port Settings DIP switch is used to set the baud rate for the network, using the same baud rate for all controllers on the network. The LEDs (Rx and Tx) flash repeatedly when the controller is communicating with the network.
- 2 Rotary Dials:** The rotary dials are used to address the Control Air 5600 so it can be uniquely identified over a network. The top dial represents the tens digit while the bottom one represents the ones digit, allowing for hardware-based addressing of up to address 99. Before setting or changing the address, ensure the controller is powered off, as it only reads the address when the module is powered on. In the example shown in Fig. 4, the rotary dial is set to address 69.
- 3 Rnet Port:** The Rnet port is a four-connector block used mainly for wiring the ZS combo sensors to the Control Air 5600. It consists of two points for power (12VDC, Gnd) and two points for communication (Rnet + and Rnet -). This port may also be used to hardwire a CAM module.
- 4 Universal Inputs:** There are six universal inputs on the Control Air 5600. All inputs are capable of accepting thermistor (analog), pulse or dry contact (binary) signals, but the first two inputs (IN-1 and IN-2) are also capable of reading 0-5VDC signals; use the corresponding jumpers to select between Therm/dry and 0-5V for these inputs. Refer to the “Ports Assignment and Overview” page for further details on configuring these inputs.

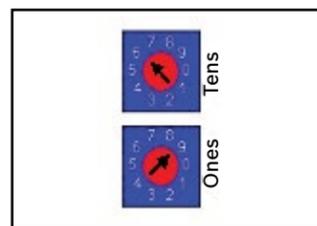


Fig. 4 Rotary Dials

Inputs		
Input	Signal Type Supported	Description
IN-1 and IN-2	0-5Vdc	Input impedance of the Control Air 5600 is approx. 30-kOhm
All	Thermistor	Precon type II (10-kOhm @ 77°F/25°C)
All	Dry Contact	3.3Vdc wetting voltage detects contact position
All	Pulse	Pulse counting up to 10 pulses per second.

Table 2

- 5 Battery:** The 10-year Lithium CR2032 3V battery retains data (e.g. control programs, modified parameters, schedules, etc) for a maximum of 10,000 hours during power outages. If the Control Air 5600 experiences RAM loss (e.g. due to low voltage on the controller or high voltage on the network), it may be reset by recycling the battery power. This operation should be performed with the controller powered off (no 24Vac power), and resolves most “bad controller” issues. All previously saved parameters are retained upon power up.
- 6 Local Access Port:** The local access port is available for system start-up, servicing and troubleshooting using a CAM Interface (handheld or virtual) or Field Assistant.
- 7 Power:** Input power for the Control Air 5600: 24Vac +/-10%, 50-60Hz; 20VA power consumption, single Class II source only, 100VA or less.
- 8 DIP Switch:** The BAS Port Settings DIP switch bank is used to set the appropriate network configuration when the Control Air 5600 is integrated into a BAS. Table 3 details the different settings available (this information is also on the Control Air 5600 label):

Available Settings					
Baud Rate Setting	Baud Rate Setting		Protocol		
	SW1	SW2		SW3	SW4
9.6kbps	Off	Off	BACnet® MS/TP	Off	Off
19.2kbps	Off	On	N2	On	Off
38.4kbps	On	Off	Modbus	Off	On
76.8kbps	On	On	Option Card	On	On

Table 3

- 9 Binary Outputs:** The Control Air 5600 has five binary outputs that can each be connected to a maximum of 24Vac/26Vdc. Each output is a dry contact (Form A) rated at 1A, 24V max. Refer to Section 7 I/O Port Assignments and Overview page for further details on configuring these outputs.
- 10 IN-1 Jumper:** This two-position jumper is used to set the input type selection for IN-1 as follows:

 - Top position is labeled W4 and configures IN-1 for dry/therm signals
 - Bottom position is labeled W5 and configures IN-1 for 0-5V signals

The jumper is default to the bottom position (W5) for 0-5V from factory.
- 11 IN-2 Jumper:** This two-position jumper is used to set the input type selection for IN-2 as follows:

 - Top position is labeled W6 and configures IN-2 for dry/therm signals
 - Bottom position is labeled W7 and configures IN-2 for 0-5V signals

The jumper is default to the top position (W6) for Dry/Therm from factory.
- 12 Communications Jumper:** This two-position jumper is used to configure the network communication mode for the Control Air 5600 as follows:

 - Top position is labeled EIA-485 and configures the Control Air 5600 for RS-485 communications for BACnet MS/TP, N2, or ModBus.
 - Bottom position is labeled BACnet over ARC156 and configures the Control Air 5600 for BACnet over ARC156 at 156kbps. This selection is a unique implementation of the industry standard ARCNET protocol and the jumper should only be set to this position if employing that protocol.

The jumper is default to the top position (EIA-485) from factory.

6 Explanation of DDC Options

AUXILIARY ELECTRIC HEAT (EH):

Used to provide a single-stage of electric heat by way of a factory-installed electric heater option, or field-installed electric heater accessory. It may be used as a supplementary source of heating for units with mechanical heating/cooling capabilities where additional heating capacity is needed to maintain space setpoint; or as the sole source of heat for straight cool units (mechanical cooling only). The configured controller output is energized to enable the heater based on unit configuration and parameter setup.

BOILER-LESS CONTROL (BLC):

This option allows a WSHP to operate safely in heating mode within systems that lack a method for heating the water loop. It can also protect the ground loop in geothermal applications. A factory-installed entering water temperature (EWT) sensor (thermistor) connects to the Control Air 5600 and works in conjunction with this feature. During a thermostat call for heating, if the EWT sensor detects that the water temperature falls below a pre-set limit (adjustable via the software), the controller disengages the compressor output(s) and sends a 24VAC signal to switch unit operation from compressor heating to an alternate heat source, typically a field-installed electric heater. This option also serves as a proactive measure to prevent coil freezing.

FAN PROVING:

This option uses an optional factory-installed current sensor* to prove fan operation prior to unit operation. The status output of the current sensor is used to establish fan operation for the unit when a proven fan call is established. If configured the Control Air 5600 disables unit compressor operation when the current in the monitored conductor drops below the rated threshold, indicating the fan is non-operational. The current sensor output may be wired directly to the controller, or to an input expansion module (IEM) connected to the controller when multiple options requiring switched inputs are involved. Please consult the applications department when including this option as an engineering add-on.

FLOW PROVING (DPS):

This option employs the use of an optional differential pressure switch (DPS) to prove water flow across a unit's water-to-refrigerant heat exchanger. If configured the software enables unit compressor operation when a pressure drop of 1.5 psi or more is detected across the water to refrigerant heat exchanger, indicating adequate water flow. This option will automatically reset and does not require a manual reset at the unit.

LOOP WATER VALVE CONTROL:

This option uses an optional factory-installed* valve to control water flow through the condenser coil. The normally closed valve includes an auxiliary end switch that may be wired to the controller to determine the status of the valve. When the Control Air 5600 is configured for this option, compressor operation is disabled until valve-open status from the valve end switch is verified.

HOT GAS REHEAT (HGRH) (ON/OFF):

Hot gas reheat (HGRH) helps actively control humidity by reheating cooled and dehumidified air back to a neutral temperature using waste heat from the compressor. Doing this allows the unit to continue to operate and remove moisture from the space after the sensible cooling set point has been satisfied. HGRH is well suited for conditioning outside ventilation air and for maintaining ideal humidity levels in schools, commercial buildings, and even homes. A binary output on the Control Air 5600 controller is used to provide the signal for activating the reheat valve when the necessary conditions are met. Relative humidity readings may be acquired from a wall-mounted ZS combo sensor, a third-party hardwired 0-5V humidity sensor, or from RH values pushed to the controller over a network.

INPUT EXPANSION MODULE (IEM):

The IEM is used when multiple options requiring binary input are desired for a single application with DDC. The IEM is connected to input #5 (IN-5) of the Control Air 5600 and is software configured to enable a trio of preset combinations that include: fan status, valve status, damper status, pump status, filter status, secondary drain pan status, differential pressure switch status, and smoke/fire detector status. The appropriate switches (binary inputs) must be field installed where applicable.

LOOP PUMP CONTROL:

The loop pump control option uses the Control Air 5600 and a factory installed current sensor to control and monitor a field or factory installed loop pump for the WSHP unit. The pump is indexed to turn on by the controller whenever there's a call for heating or cooling. The status output of the current sensor may be used to establish pump operation for the unit when a proven pump call is established. The Control Air 5600 is configured to disable the unit compressor operation when the current in the pump's monitored conductor drops below the rated threshold, indicating that the pump is not operational. The current sensor output may be wired directly to the Control Air 5600, or to an IEM connected to the Control Air 5600 when multiple options requiring switched inputs are involved. Please consult the applications department when including this option as an engineering add-on.

OUTSIDE AIR DAMPER (OAD):

An outside air damper (OAD) allows for pre-filtered outside air to enter the unit while in operation via a remote motorized damper, based on unit occupancy, fan operation, or CO₂ levels in the monitored space. A binary output on the Control Air 5600 controller is used to provide the signal for activating the damper solenoid when the necessary conditions are met. CO₂ readings may be acquired from a wall-mounted ZS combo sensor, a third-party hardwired 0-5V CO₂ sensor, or from CO₂ values pushed to the Control Air 5600 over a network. A damper end switch connected to the controller may be used to verify damper status and disable compressor operation when the damper fails.

WATER-SIDE ECONOMIZER (WSE):

An option package consisting of a water-to-air heat exchanger (economizer coil), a thermistor (EWT sensor), and a three-way diverting valve. When there is a call for cooling, the EWT sensor connected to the Control Air 5600 will monitor the entering water temperature to the unit and determine if the compressor should be used for cooling or if the water temperature is low enough to cool the entering air with the economizer coil. If the entering water temperature is below a user-adjustable setpoint, the diverting valve will be activated by the controller to divert the entering water through the economizer coil to cool the air stream. The water is then passed through the water-to-refrigerant coil in case additional cooling is required. This DDC option can only be used for cooling operations.

AIR ECONOMIZER:

This option utilizes a field-installed fresh air damper, and requires an outside air temperature (OAT) and relative humidity (RH) combo sensor. When there's a call for cooling, the OAT/RH sensor connected to the Control Air 5600 will monitor the OAT and RH levels and determine if the compressor should be used for cooling or if the outdoor air is ideal to condition the space with just the fan. If the air temperature and humidity are within a user-configurable range, the Control Air 5600 will energize the damper solenoid to open, the compressors will be turned off, and the fan will be energized to cool the space. This option is only available in the cooling mode.

* This requires a Custom Engineered to Order Option. Contact the Applications Engineering Team.

7 I/O Port Assignments and Overview

Universal Inputs				
Port	Inputs Accepted	Signal Type	Jumper Position	Overview
IN-1	Digital Input Enable	Dry	Top (W4)	This input is selected when a dry contact (e.g. room occupancy sensor) is required to enable the unit, and Digital Input has been selected for Occupancy Command. Unit is placed in occupied mode upon a perceived contact closure at the input, and placed in unoccupied mode 10 minutes after the contacts open.
	Humidity Sensor	0-5VDC	Bottom (W5)	This input is used if RH readings are not desired from a ZS combo sensor or over a network. An example would be a duct mounted humidity sensor or third party humidity sensor with 0-5VDC output.
	CO ₂ Sensor	0-5VDC	Bottom (W5)	This input is used if CO ₂ readings are not desired from a ZS combo sensor or over a network. An example would be a third party CO ₂ sensor with 0-5VDC output.
	Static Pressure Sensor	0-5VDC	Bottom (W5)	This input is used for applications requiring static pressure readings.
IN-2	Zone Remote Sensor	Therm	Top (W6)	This input is used if zone temperature readings for controlling the unit are not desired from a ZS combo sensor or over a network. An example would be a third party wall or duct mounted sensor. Temperature sensor must be a Type II 10kohm @ 77°F(25°C) type sensor.
	Outdoor Air Temperature (OAT) Sensor	Therm	Top (W6)	This input is selected if outside air temperature readings are required.
	Entering Water Temperature (EWT) Sensor	Therm	Top (W6)	This input should be selected for applications where the entering water temperature needs to be monitored, or used to control options such as water-side economizer or boiler-less control. A thermistor is wired to this input from factory by default to monitor entering water temperature at the heat exchanger entering water pipe.
	Mixed Air Temperature Sensor	Therm	Top (W6)	This input is selected if mixed air temperature readings are required.
	Return Air Temperature (RAT) Sensor	Therm	Top (W6)	This input is used if zone temperature readings for controlling the unit are desired from a temperature probe placed in the return air duct. Temperature sensor must be a Type II 10kohm @ 77°F(25°C) type sensor.
	Digital Input Enable	Dry	Top (W6)	This input is selected when a dry contact (e.g. room occupancy sensor) is required to enable the unit, and Digital Input has been selected for Occupancy Command. Unit is placed in occupied mode upon a perceived contact closure at the input, and placed in unoccupied mode 10 minutes after the contacts open.
	Humidity Sensor	0-5VDC	Bottom (W7)	This input is used if RH readings are not desired from a ZS combo sensor or over a network. An example would be a duct mounted humidity sensor or third party humidity sensor with 0-5VDC output.
IN-3*	Leaving Water Temperature (LWT) Sensor	Therm	n/a	A thermistor is wired to this input from factory to monitor leaving water temperature at the heat exchanger leaving water pipe. If the water temperature rises above 135°F or drops below 40°F for more than 5 minutes while the unit is running, compressor operation is halted and an alarm is generated. These temperature trip values are user adjustable.

Table 4

* Non-configurable, factory assigned I/O parameter.

Universal Inputs				
Port	Inputs Accepted	Signal Type	Jumper Position	Overview
IN-4*	UPM Input	Pulse	n/a	The Unit Protection Module (UPM) is standard on all Bosch water source heat pumps. The alarm contacts of the UPM board are wired to the controller at this input from factory to transmit error pulse codes to the Control Air 5600. These alarm codes are then made available to view via a CAM interface, ZS Pro Sensor, or over a network if one is available. Faults include: high pressure, low pressure, high condensate, freeze stat, brown out conditions, and A2L alarm conditions.
IN-5	Dirty Filter Switch (DFS)	Dry	n/a	Selecting this option for this input provides an alternate means of alerting the end user of a dirty filter condition by way of a contact closure instead of fan runtime hours. An alarm is generated when Control Air 5600 senses a contact closure at the input.
	Entering Water Temperature Sensor (Water-side Economizer Cooling & Boiler-less Control)	Therm	n/a	This input should be the default location for an EWT sensor when the water-side economizer or boiler-less control option is selected. The temperature readings from this input are used in determining when the economizer or electric heat action is enabled and MUST be selected for the option to function properly. Default economizer EWT trip value is 55°F (user adjustable). Default boiler-less EH EWT trip value is 40°F (user adjustable).
	Differential Pressure Switch (DPS)	Dry	n/a	A differential pressure switch may be connected to this input to prove water flow across a unit's water-to-refrigerant heat exchanger. Heat pump operation is disabled until the status switch of the DPS is closed, after which if the contacts open again unit operation is ceased after 3 minutes.
	Secondary Drain Pan (SDP)	Dry	n/a	This option allows a secondary condensate pan installed on the water source heat pump to be connected to this input to monitor condensate levels when the primary drain pan fails. When a high condensate condition for the secondary drain pan is detected an open contact status is reported at the input, and the compressors are locked out until the condition is reversed. An alarm is generated when the Control Air 5600 senses an open contact at the input.
	Fan Status Switch (FSS)**	Dry	n/a	The status output from a factory installed current sensor used to monitor fan operation may be connected to this input to provide fan status during unit operation. The unit is allowed to run only when the sensor contacts are verified as closed at the input after the fan has been indexed to run. If there's no contact closure after the fan has been commanded on, the unit is not allowed to run, and an alarm is generated after 45 seconds. If the fan fails during normal unit operation the compressors are shutdown after 20 seconds and an alarm is generated.
	Valve End Switch (VES)	Dry	n/a	For units with a loop valve option, the valve end switch may be connected to this input to monitor/verify valve status during unit operation. The factory-installed zone valve is normally-closed and is indexed to open by the Control Air 5600 when there's a call for heating or cooling. If a contact closure is not detected at the input after the valve is commanded on, unit operation is disabled and an alarm is generated after a minute and a half has elapsed; this provides adequate time for the slow acting valve to fully open.
	Damper End Switch (DES)	Dry	n/a	A damper end switch may be connected at this input for units with the outside air damper option. If connected, the unit is not allowed to run until a contact closure is detected at the input after the damper has been indexed to open. Damper operation may be based on occupancy, fan operation, or zone CO ₂ levels (default trip value is 1000ppm).

Table 5

* Non-configurable, factory assigned I/O parameter.

** This requires a Custom Engineered to Order Option. Contact the Applications Engineering Team.

Universal Inputs				
Port	Inputs Accepted	Signal Type	Jumper Position	Overview
IN-5	Smoke Detector Switch (SDS)	Dry	n/a	The normally-open contacts of a field-installed smoke/fire alarm detector may be wired to this input to shut the water source heat pump unit down during an emergency. Unit operation is ceased 5 seconds after a contact closure is detected at the input.
	Pump Status Switch (PSS)	Dry	n/a	For units with a loop pump option, the status output from a factory installed current sensor used to monitor pump operation may be connected to this input to provide pump status during unit operation. The unit is allowed to run only when the sensor contacts are verified as closed at the input after the pump has been indexed to run. If there's no contact closure after the loop pump has been commanded on, the unit is not allowed to run, and an alarm is generated after 15 seconds. If the pump fails during normal unit operation the compressor(s) is shutdown after 20 seconds and an alarm is generated.
	Mixed Air Temperature Sensor	Therm	n/a	Select this configuration parameter if a mixed air temperature sensor is connected in IN-5.
	Input Expansion Module (IEM)	Dry	n/a	The input expansion module is used in this input when multiple options that require a binary input are required (up to three inputs). The combinations of these options are limited only to the seven sets of three listed below.
	Input Expansion Module (IEM) Combination			These seven sets of binary input combinations may be used with an IEM connected to this input. The three ports are labeled (A, B, C) and must be connected accordingly. In situations where not all three inputs are used, the other inputs may be disabled in the software, or the board may be jumpered if the option requires a closed contact to function properly.
	PORT 1 (A)	PORT 2 (B)	PORT 3 (C)	
	Dirty Filter Switch (DFS)	Fan Status Switch (FSS)	Valve End Switch (VES)	
	Smoke Detector Switch (SDS)	Fan Status Switch (FSS)	Valve End Switch (VES)	
	Dirty Filter Switch (DFS)	Fan Status Switch (FSS)	Differential Pressure Switch (DPS)	
	Smoke Detector Switch (SDS)	Fan Status Switch (FSS)	Dirty Filter Switch (DFS)	
Dirty Filter Switch (DFS)	Fan Status Switch (FSS)	Damper End Switch (DES)		
Smoke Detector Switch (SDS)	Fan Status Switch (FSS)	Secondary Drain Pan (SDP)		
Dirty Filter Switch (DFS)	Fan Status Switch (FSS)	Pump Status Switch (PSS)		
IN-6*	Discharge Air Temperature	Therm	n/a	

Table 6

* Non-configurable, factory assigned I/O parameter.

Binary Outputs				
Port	Outputs Accepted	Signal Type	Signal Label	Overview
BO-1*	Fan	24VAC	G	Binary Output 1 is factory reserved for the fan command (G) and is wired to the unit terminal block in the electrical box. Continuous mode is the factory default setting.
BO-2*	Reversing Valve	24VAC	O	Binary Output 2 is factory reserved for the reversing valve command (O) and is wired to the valve via the unit terminal block in the electrical box. For water source heat pump units, the output is energized during a call for cooling, and remains de-energized for heating. For straight cool units (cooling only) where no reversing valve is installed, the output is disabled and not used.
BO-3*	Compressor Stage 1	24VAC	Y1	Binary Output 3 is factory reserved for the compressor stage 1 command (Y1) and is connected to the UPM board's Y terminal via the unit terminal block in the electrical box. The Y1 output is off when zone setpoint is satisfied and within the temperature deadband (between heating and cooling setpoints). As the zone temperature rises above the cooling setpoint and demand exceeds 30%, Y1 is enabled and PID methods are employed to ensure the zone temperature is maintained within 1°F of cooling setpoint. As the zone temperature drops below the heating setpoint and demand exceeds 30%, Y1 is enabled and PID methods are employed to ensure the zone temperature is maintained within 1°F of heating setpoint.
	Compressor Stage 2	24VAC	Y2	
BO-4	Economizer	24VAC	EV	Binary Output 4 is factory defaulted for the compressor stage 2 command (Y2) and is connected to the second stage solenoid (Y2S) for 2-step, single compressors, or to the Y2 terminal for dual compressor units using the Stage 2 UPM board, via the unit terminal block in the electrical box. The Y2 output is off when zone setpoint is satisfied and within the temperature deadband (between heating and cooling setpoints). The Y2 output is energized after Y1 has been on for more than 7 minutes, and the heating/cooling demand exceeds 60%. For 1 compressor 1 stage units, Binary Output 4 may be configured for one of the following options: economizer, boilerless control, or outside air damper (On/Off).
	Fresh Air Damper (On/Off)	24VAC	D	
	Boilerless Control	24VAC	W	
BO-5	Hot Gas Reheat (On/Off)	24VAC	H	Binary Output 5 may be factory or field configured for one of the following options: hot gas reheat (On/Off), single stage auxiliary electric heat, outside air damper (On/Off), condenser water valve, circulating water pump, water-side economizer, or boiler-less control.
	Fresh Air Damper (On/Off)	24VAC	D	
	Heating Stage 1 (Aux Heat)	24VAC	W	
	Boiler-less Control (Aux Heat)	24VAC	W	
	Water-side Economizer Cooling Control	24VAC	EV	
	Circulation Water (Loop) Pump	24VAC	P	
	Condenser Water Valve	24VAC	CV	

Table 7

* Non-configurable, factory assigned I/O parameter.

All I/Os must be selected/configured in the software or over a BAS network.

8 Wiring Termination Specs

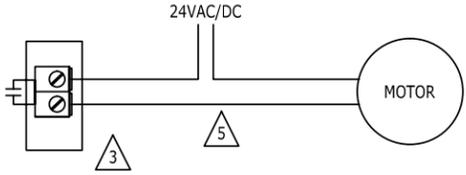
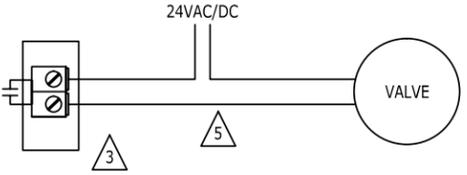
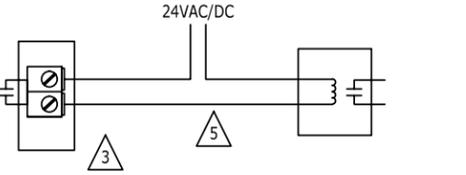
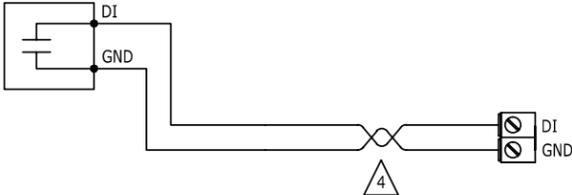
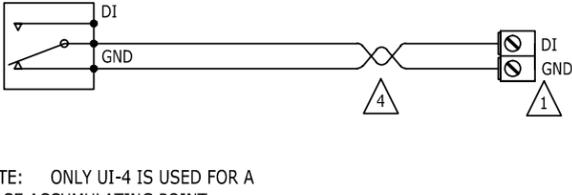
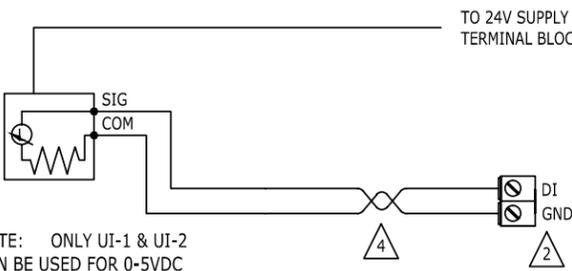
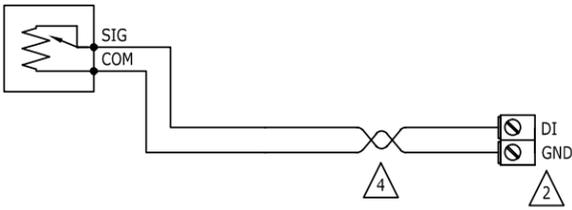
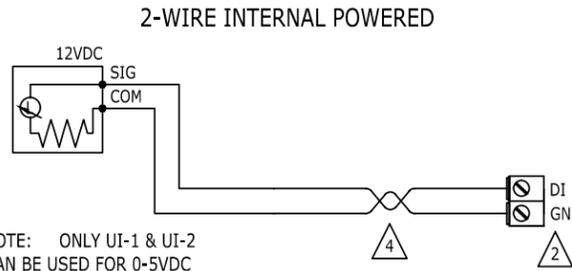
 <p>BINARY OUTPUT (BO) 1</p>	 <p>BINARY OUTPUT (BO) 2</p>	 <p>BINARY OUTPUT (BO) 3</p>	<p>NOTES:</p> <p>1 ONLY IN-4 OF THE 5600 IS USED FOR PULSE READINGS FROM THE UPM.</p> <p>2 ONLY IN-1 & IN-2 MAY BE CONFIGURED FOR 0-5V SIGNALS.</p> <p>3 5600 BO CONTACT RATINGS: 1A MAX @ 24VAC/DC CONFIGURED NORMALLY OPEN</p> <p>4 MAXIMUM RECOMMENDED CABLE LENGTH FOR INPUTS: 500'[152m] WITH 22 AWG.</p> <p>5 WHEN SIZING OUTPUT WIRING CONSIDER THE FOLLOWING:</p> <ul style="list-style-type: none"> TOTAL LOOP DISTANCE FROM POWER SUPPLY TO 5600, THEN TO THE CONTROLLED DEVICE. ACCEPTABLE VOLTAGE DROP FROM THE 5600 TO CONTROLLED DEVICE. RESISTANCE OF WIRE GAUGE USED. MAX AMPS REQUIRED BY CONTROLLED DEVICE TO OPERATE.
 <p>DIGITAL INPUT (DI) DRY CONTACT 1</p>	 <p>DIGITAL INPUT (DI) DRY CONTACT 2</p> <p>NOTE: ONLY UI-4 IS USED FOR A PULSE ACCUMULATING POINT</p>		
 <p>ANALOG INPUT (AI) 0-5 VDC</p> <p>NOTE: ONLY UI-1 & UI-2 CAN BE USED FOR 0-5VDC</p>	 <p>ANALOG INPUT (AI) 10Kohm RTD</p>	 <p>ANALOG INPUT (AI) 0-5 VDC</p> <p>NOTE: ONLY UI-1 & UI-2 CAN BE USED FOR 0-5VDC</p>	

Fig. 5

9 Electrical Schematic

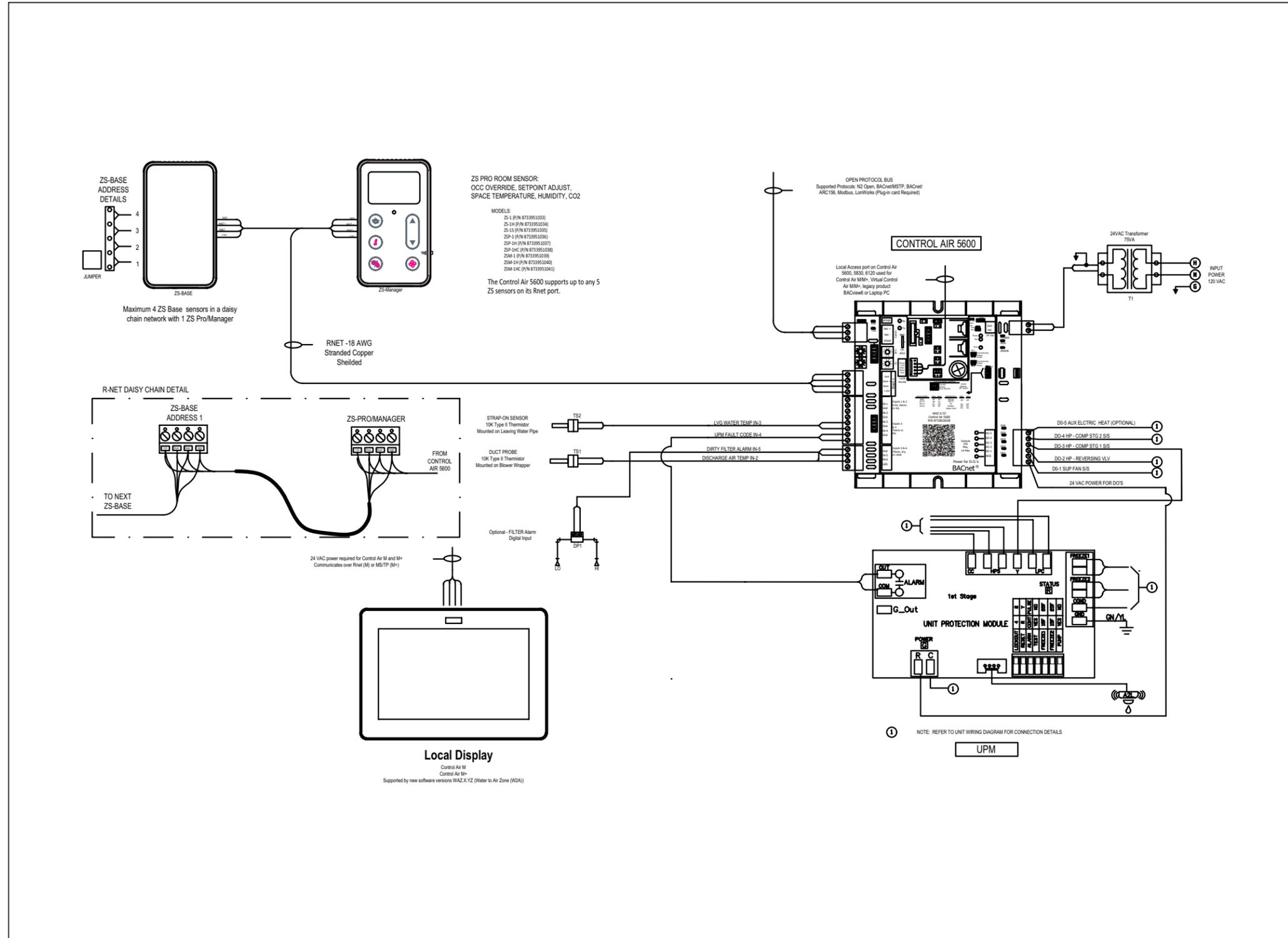
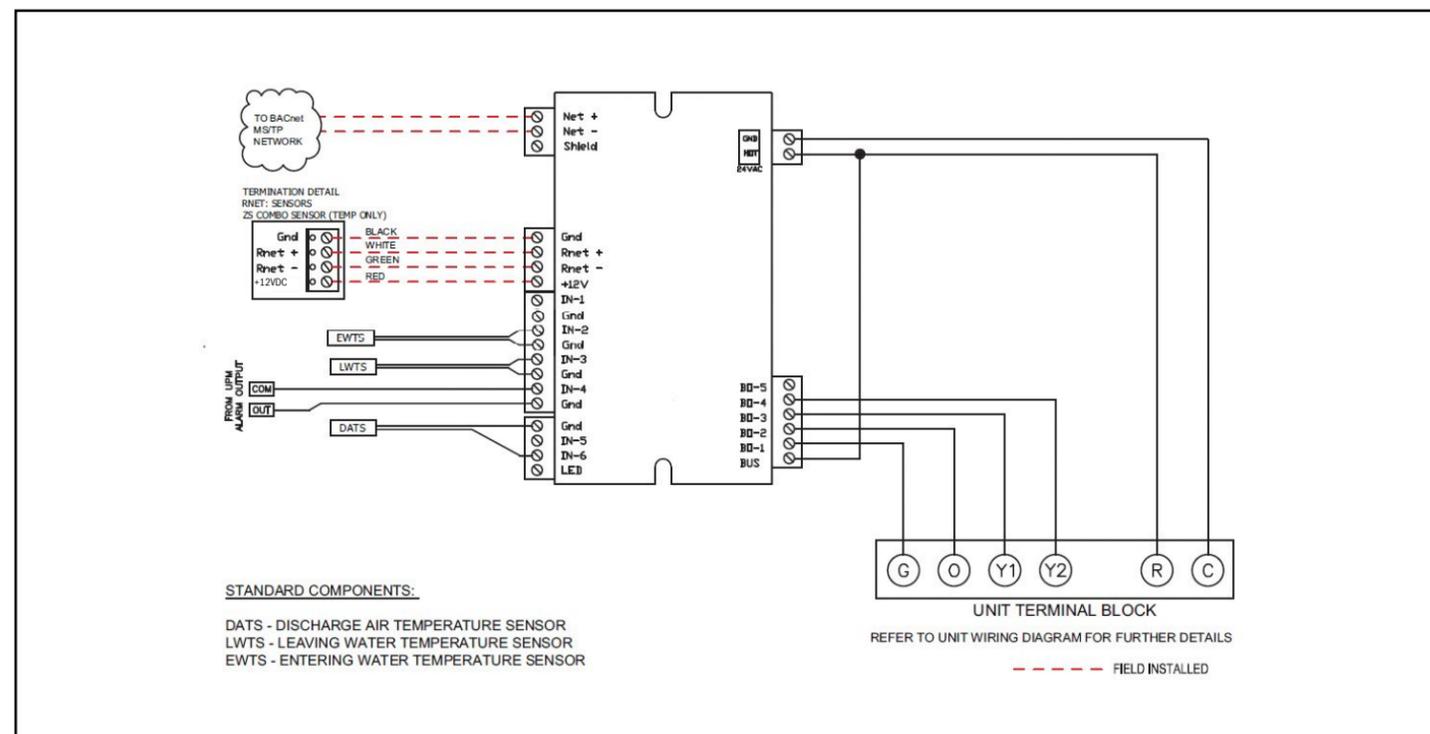


Fig. 6

11 Common Applications

11.1 Water Source Heat Pump Basic

WARNING: These diagrams are for reference purposes only. Please refer to the actual unit wiring diagram for specific details on how to wire your heat pump unit.



CAM Setup

- COMPRESSOR STAGES: [2 COMP 2 STAGES]
- UNIT OPERATION MODE: [HEAT PUMP]
- EVAP COIL CONFIGURATION: [PARALLEL]
- COMPRESSOR CONTROL: [ZONE CONTROL-ZS]
- WALL MOUNT SENSOR: [ZS SENSOR]
- BO-5 OPTIONS: [NO OPTION SELECTED]
- RNET INPUT: [ZS (TEMP ONLY)]
- INPUT 1: [NOT USED]
- INPUT 2: [EWT SENSOR]
- INPUT 5: [NOT USED]
- BAS INPUT (CO2): [DISABLE]
- BAS INPUT (RH): [DISABLE]

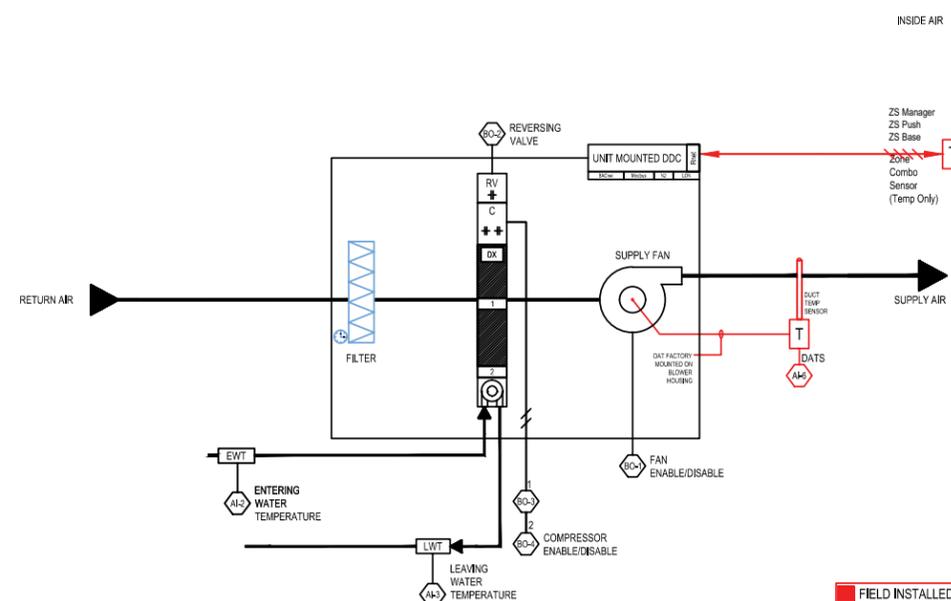


Fig. 8

11.2 Water Source Heat Pump Basic Sequence of Operation

Supply Fan Start/Stop:

The supply fan will be started according to the schedule. After the supply fan has been started the control sequence will be enabled. Fan operation is interlocked with heating and cooling operations. The fan may be configured for continuous operation during occupancy or for operation based on heat/cool calls.

Zone Control:

The compressor will cycle to maintain the zone temperature at setpoint. To prevent short cycling there will be a 7 minute delay between compressor stages. Additionally there'll be a 1 minute delay when transitioning between heat and cool modes. The compressor will run subject to internal safeties and controls provided by the UPM.

Zone temperature may be supplied by a space ZS sensor, remote mounted sensor, permanently-installed CAM, or from a network value. All setpoints are adjustable via a network, space ZS sensor Push or Manager, or with the CAM terminal. The ability to adjust setpoint from the space sensor, and the adjustment limit (default +/-3 °F) may be modified via a network or CAM.

Water Source Heat Pump Control:

When the zone temperature falls below the zone temperature setpoint the reversing valve(s) will be disabled to provide heating when the compressor is running. When the zone temperature rises above the zone temperature setpoint the reversing valve will be enabled to provide cooling when the compressor is running.

A networked "loop valve enable" point must be enabled to allow compressor operation. This point is defaulted "on" from factory in the BAS Values menu.

Night Setback:

When in "unoccupied", the unit will cycle as necessary to maintain the night setback zone temperature at setpoint. A differential prevents the unit from cycling excessively. During unoccupied operation the fan will only cycle to maintain a heat or cool setpoint.

Shutdown:

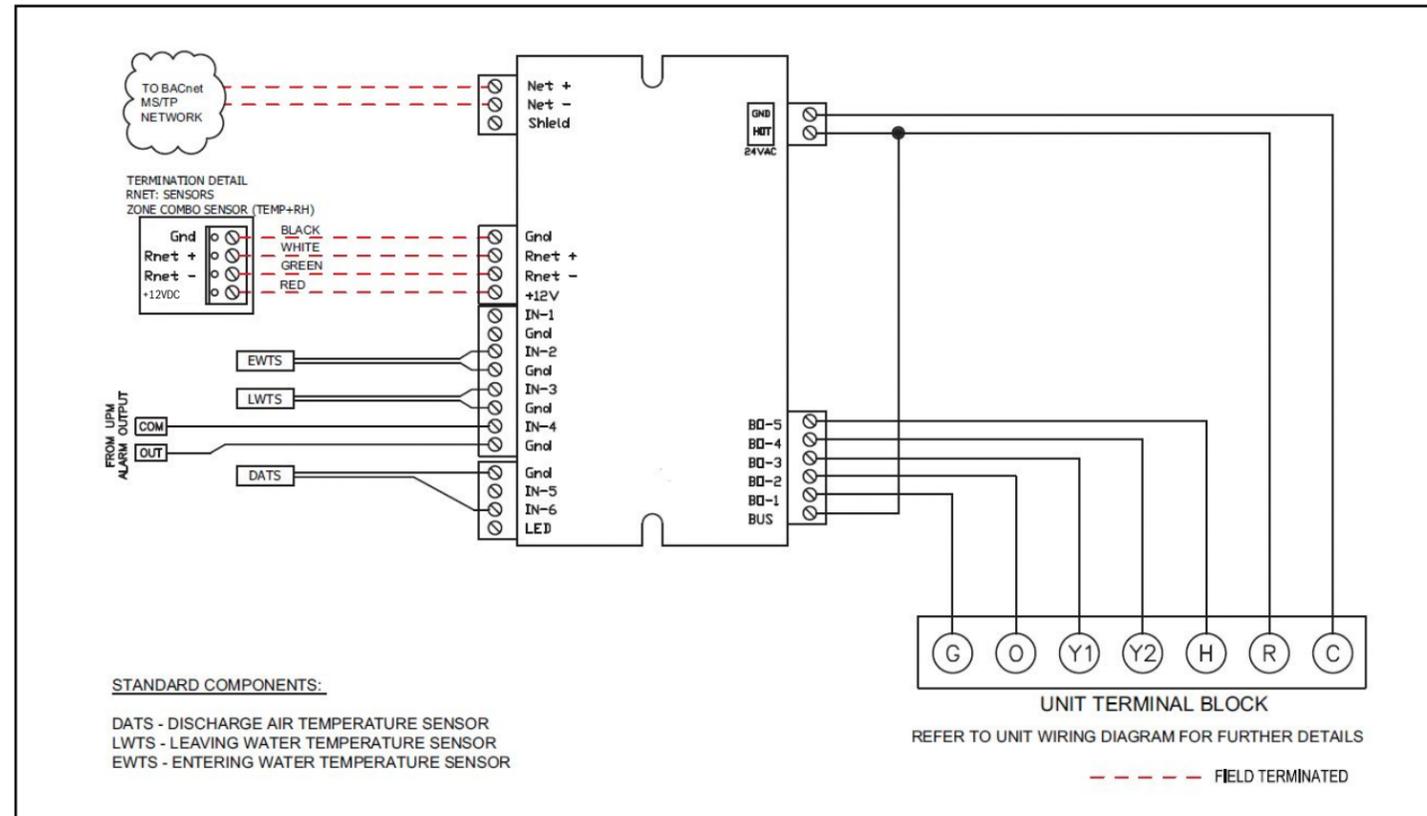
When the unit is shut down by either a stop command or system safety the unit will be set as follows:

- ▶ Supply fan will be on (user configurable)
- ▶ Compressor(s) will be off

Point Name	Hardware Points				Software Points					Show On Graphic
	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	
Zone Temperature	X				X			X		X
Heating Setpoint					X					
Cooling Setpoint					X					
Supply Fan Command				X						
Compressor Stage 1 Output				X						
Compressor Stage 2 Output				X						
Reversing Valve Command				X						
Occupied Command			X			X	X			X
Discharge Air Temperature	X									
Leaving Water Temperature	X									
Condensate Overflow									X	
Lockout Alarm									X	
Schedule										
Totals	3	0	1	4	3	1	1	1	2	2
	Total Hardware				Total Software					
	8				8					2

Table 9

11.3 Water Source Heat Pump + Hot Gas Reheat



CAM Setup

- COMPRESSOR STAGES: [2 COMP 2 STAGES]
- UNIT OPERATION MODE: [HEAT PUMP]
- EVAP COIL CONFIGURATION: [PARALLEL]
- COMPRESSOR CONTROL: [ZONE CONTROL-ZS]
- WALL MOUNT SENSOR: [ZS SENSOR/CAM]
- BO-5 OPTIONS: [HOT GAS REHEAT]
- RNET INPUT: [ZS (TEMP + RH)]
- INPUT 1: [NOT USED]
- INPUT 2: [EWT SENSOR]
- INPUT 5: [NOT USED]
- BAS INPUT (CO2): [DISABLE]
- BAS INPUT (RH): [DISABLE]

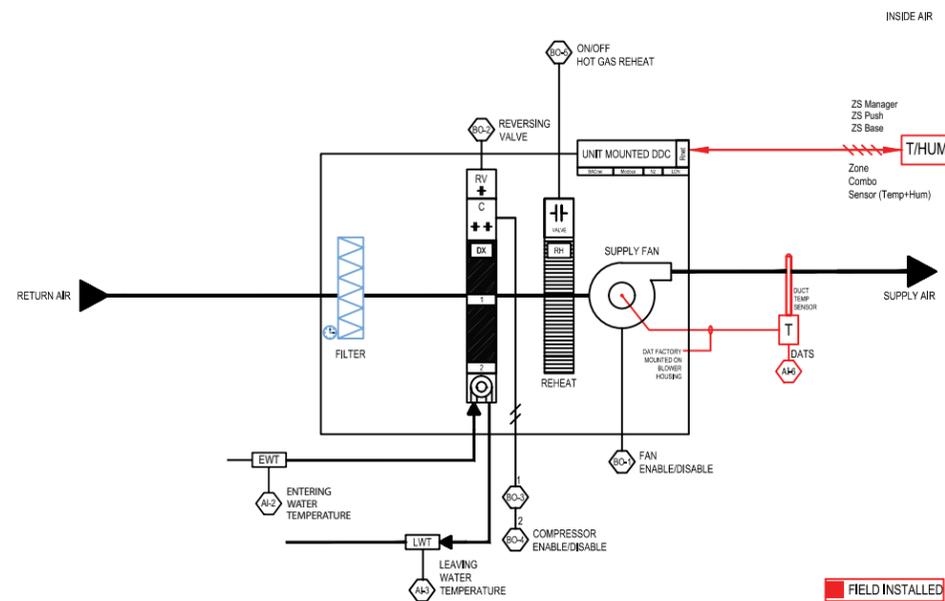


Fig. 9

11.4 Water Source Heat Pump and Hot Gas Reheat Sequence of Operation

Supply Fan Start/Stop:

The supply fan will be started according to the schedule. After the supply fan has been started the control sequence will be enabled.

Zone Control:

The compressor will cycle to maintain the zone temperature at setpoint.

Water Source Heat Pump Control:

When the zone temperature falls below the zone temperature setpoint the reversing valve(s) will be disabled to provide heating when the compressor is running. When the zone temperature rises above the zone temperature setpoint the reversing valve will be enabled to provide cooling when the compressor is running.

Night Setback:

When in “unoccupied”, the unit will cycle as necessary to maintain the night setback zone temperature at setpoint. A differential prevents the unit from cycling excessively.

Shutdown:

When the unit is shut down by either a stop command or system safety the unit will be set as follows:

- ▶ Supply fan will be on (user configurable)
- ▶ Compressor(s) will be off

Hot Gas Reheat:

Once the heat/cool setpoint has been satisfied and relative humidity is above setpoint, the unit will operate in hot-gas reheat mode to actively remove humidity from the space until the the humidity setpoint has been satisfied, or there’s another call for heating or cooling.

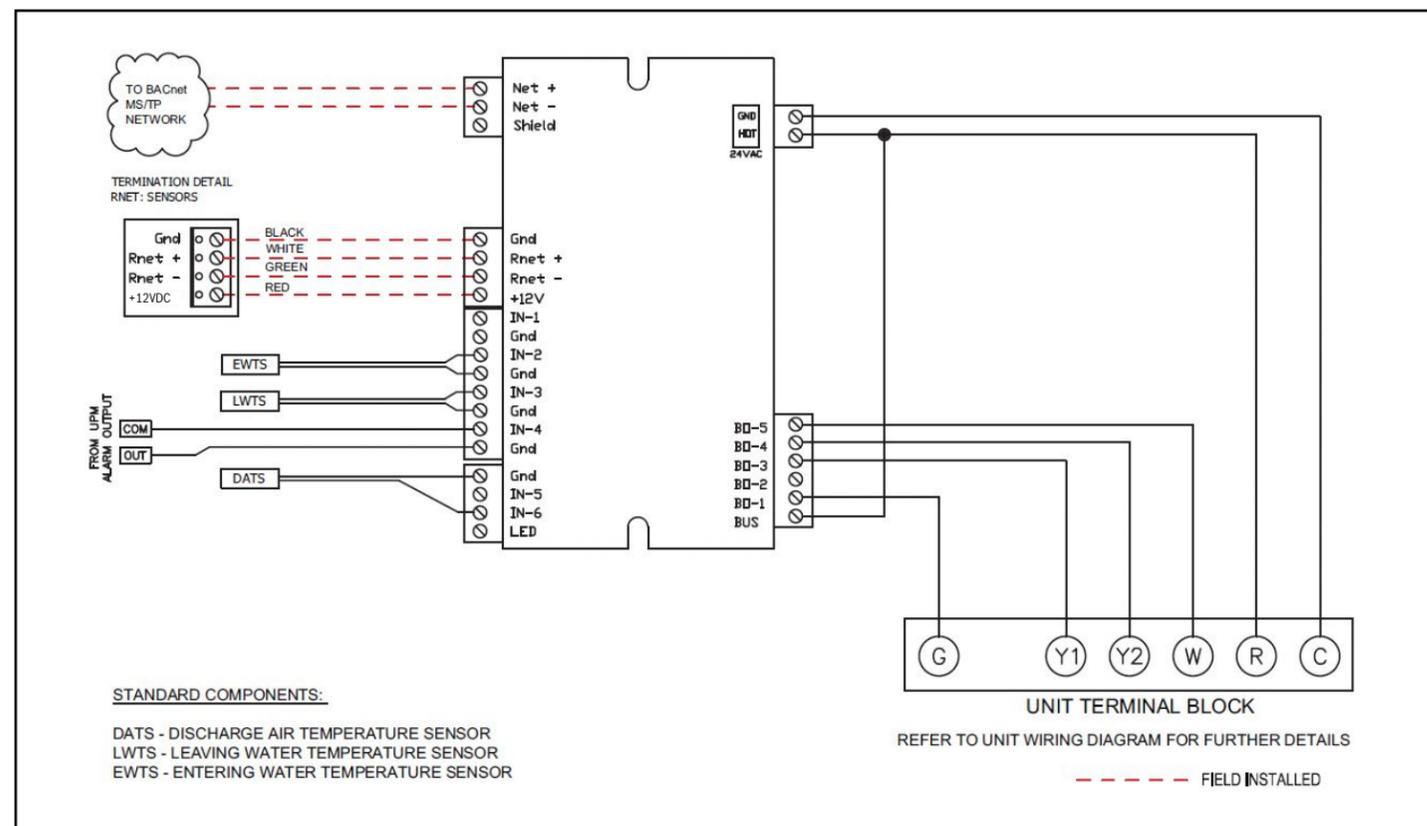
Relative humidity readings may be acquired from a space ZS Push or ZS Manager or standard sensor, 0-5V sensor in IN-1/IN-2, or over a network; software must be configured accordingly.

Humidity setpoint may be adjusted from a space ZS Push or ZS Manager, network, or CAM interface.

Point Name	Hardware Points				Software Points					Show On Graphic
	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	
Zone Temperature	X				X			X		X
Heating Setpoint					X					
Cooling Setpoint					X					
Supply Fan Command				X						
Compressor Stage 1 Output				X						
Compressor Stage 2 Output				X						
Reversing Valve Command				X						
Occupied Command			X			X	X			X
Discharge Air Temperature	X									
Leaving Water Temperature	X									
Dehumidification Setpoint					X					X
Reheat Status										
Reheat On/Off (Rh S/S)				X						X
High Return Air Humidity									X	
Condensate Overflow									X	
Lockout Alarm									X	
Schedule										
Totals	3	0	1	5	4	1	1	1	3	4
	Total Hardware				Total Software					
	9				10					4

Table 10

11.5 Straight Cool + Electric Heat



CAM Setup

- COMPRESSOR STAGES: [2 COMP 2 STAGES]
- UNIT OPERATION MODE: [STRAIGHT COOL]
- EVAP COIL CONFIGURATION: [PARALLEL]
- COMPRESSOR CONTROL: [ZONE CONTROL-ZS]
- WALL MOUNT SENSOR: [ZS SENSOR/CAM]
- BO-5 OPTIONS: [AUX ELECTRIC HEAT]
- RNET INPUT: [ZS (TEMP ONLY)]
- INPUT 1: [NOT USED]
- INPUT 2: [EWT SENSOR]
- INPUT 5: [NOT USED]
- BAS INPUT (CO2): [DISABLE]
- BAS INPUT (RH): [DISABLE]

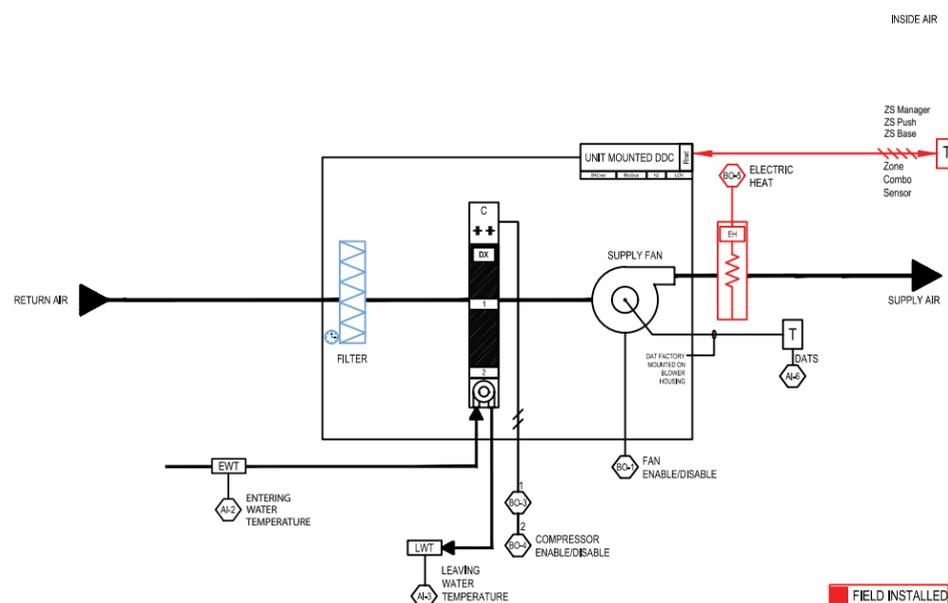


Fig. 10

11.6 Straight Cool and Electric Heat Sequence of Operation

Supply Fan Start/Stop:

The supply fan will be started according to the schedule. After the supply fan has been started the control sequence will be enabled.

Zone Control:

The compressor will cycle to maintain the zone temperature at setpoint.

Straight Cool Control:

Unit is configured for mechanical cooling only and the reversing valve is not installed. BO-2 is disabled and unused.

Night Setback:

When in “unoccupied”, the unit will cycle as necessary to maintain the night setback zone temperature at setpoint. A differential prevents the unit from cycling excessively.

Shutdown:

When the unit is shutdown by either a stop command or system safety the unit will be set as follows:

- ▶ Supply fan will be on (user configurable)
- ▶ Compressor(s) will be off

Auxiliary Electric Heat:

Electric heat (EH) option may be factory or duct mounted and must be configured by the equipment integrator. Only one stage of auxiliary electric heat is supported and may be configured for BO-4 (single stage compressor units) or BO-5 (dual stage compressor units).

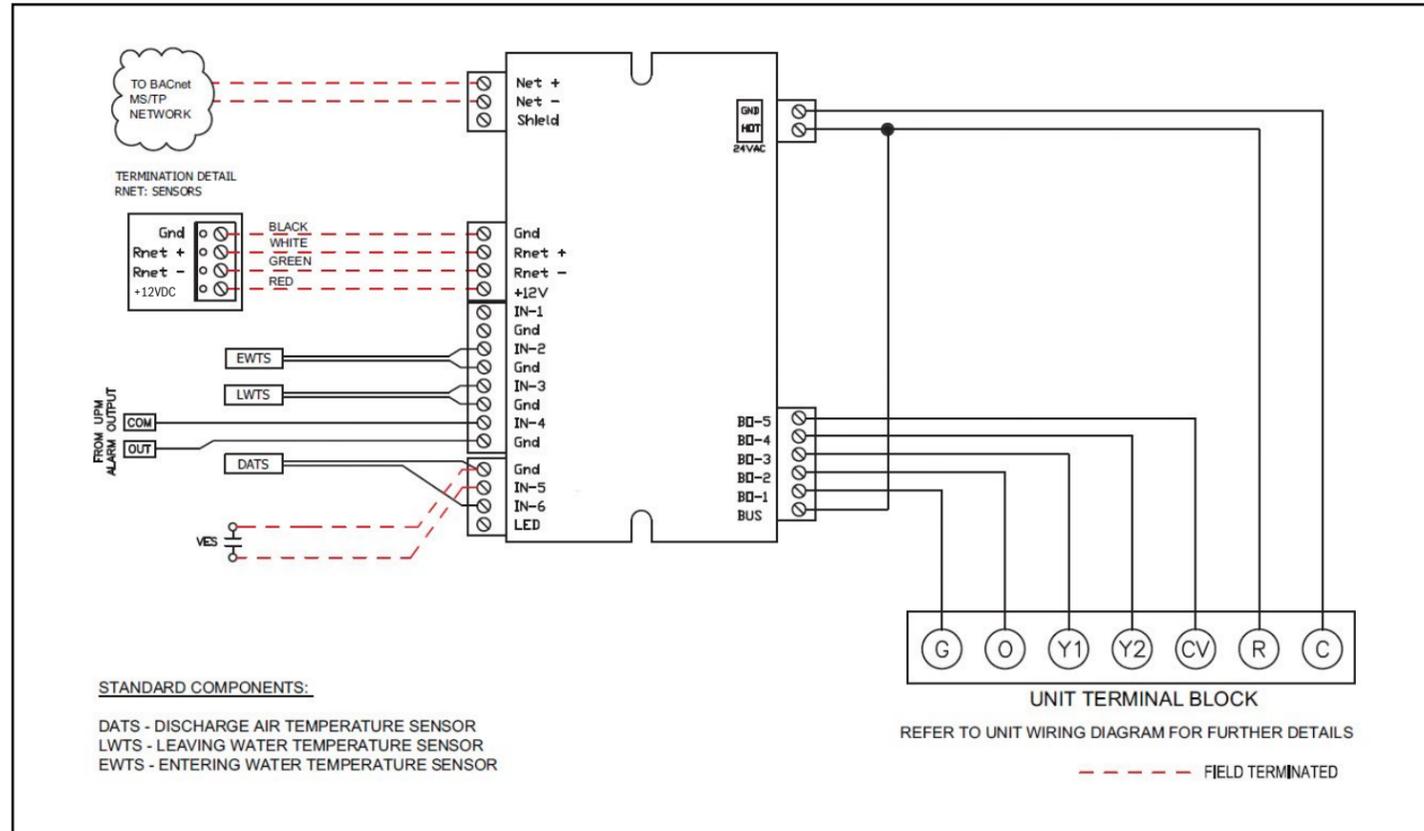
Upon a call for heating with demand greater than 90% (user configurable), the EH signal will be enabled to maintain setpoint at the configured output as follows:

- ▶ **Straight cool units:** enabled with no delay

Point Name	Water Source Heat Pump										
	Hardware Points				Software Points					Show On Graphic	
	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm		
Zone Temperature	X				X			X		X	
Heating Setpoint					X						
Cooling Setpoint					X						
Supply Fan Command				X							
Compressor Stage 1 Output				X							
Compressor Stage 2 Output				X							
Reversing Valve Command											
Occupied Command			X			X	X			X	
Discharge Air Temperature	X										
Leaving Water Temperature	X										
Entering Water Temperature	X										
Aux Electric Heat Output				X							
Condensate Overflow									X		
Lockout Alarm									X		
Schedule											
Totals	4	0	1	4	3	1	1	1	2	2	
	Total Hardware					Total Software					
	9					8					2

Table 11

11.7 Water Source Heat Pump + Condenser Water Valve



CAM Setup

- COMPRESSOR STAGES: [2 COMP 2 STAGES]
- UNIT OPERATION MODE: [HEAT PUMP]
- EVAP COIL CONFIGURATION: [PARALLEL]
- COMPRESSOR CONTROL: [ZONE CONTROL-ZS]
- WALL MOUNT SENSOR: [ZS SENSOR/CAM]
- BO-5 OPTIONS: [CONDENSER WATER VALVE]
- RNET INPUT: [ZS (TEMP ONLY)]
- INPUT 1: [NOT USED]
- INPUT 2: [EWT SENSOR]
- INPUT 5: [VALVE END SWITCH (VES)]
- BAS INPUT (CO2): [DISABLE]
- BAS INPUT (RH): [DISABLE]

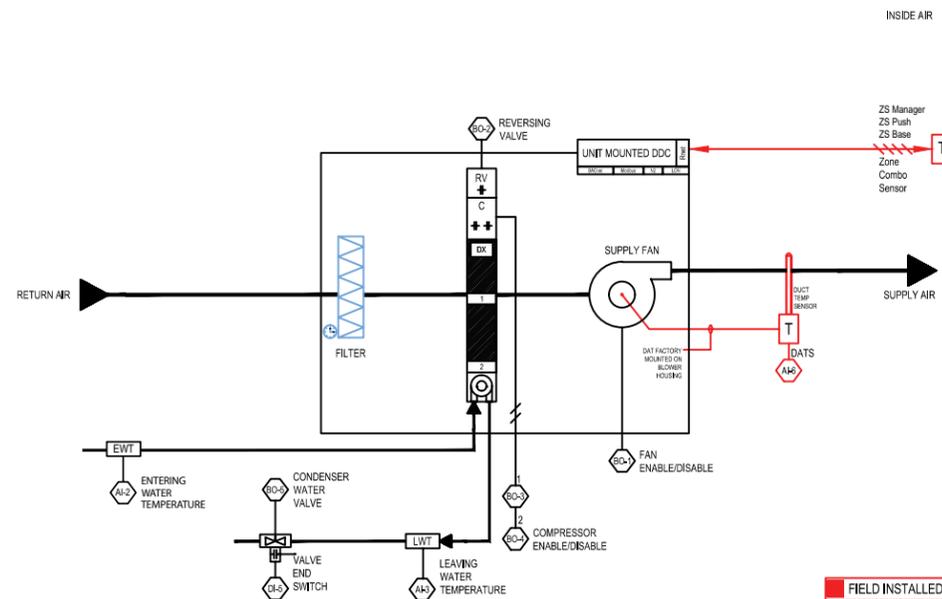


Fig. 11

11.8 Water Source Heat Pump and Condenser Water Valve Sequence of Operation

Supply Fan Start/Stop:

The supply fan will be started according to the schedule. After the supply fan has been started the control sequence will be enabled.

Zone Control:

The compressor will cycle to maintain the zone temperature at setpoint.

Water Source Heat Pump Control:

When the zone temperature falls below the zone temperature setpoint the reversing valve will be disabled to provide heating when the compressor is running. When the zone temperature rises above the zone temperature setpoint the reversing valve will be enabled to provide cooling when the compressor is running.

Night Setback:

When in "unoccupied", the unit will cycle as necessary to maintain the night setback zone temperature at setpoint.

Shutdown:

When the unit is shut down by either a stop command or system safety the unit will be set as follows:

- ▶ Supply fan will be on (user configurable)
- ▶ Compressor(s) will be off

Condenser Water Valve:

Factory installed loop valve with valve end switch (VES) option must be configured by the equipment integrator. Upon a call for compressor operation the normally closed valve is indexed to open via a 24Vac signal at BO-5. If the VES is configured, compressor operation is not enabled until valve end switch is engaged (valve fully open).

Valve open status is verified via the VES within 1.5 mins of valve enable command.

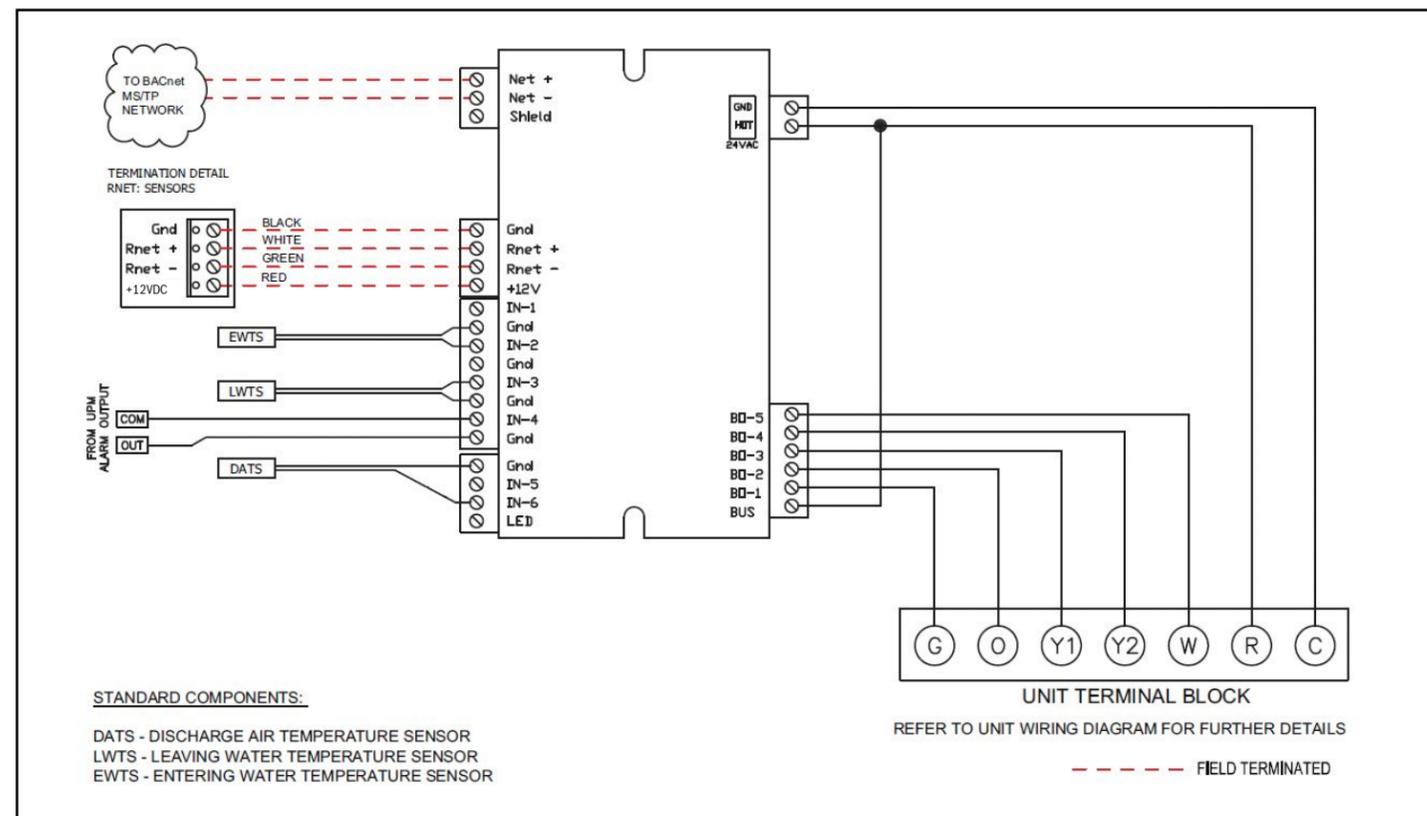
If VES contacts do not engage within the specified time, VES fail alarm is initiated. If valve opens without command from BO-5, valve in hand alarm is initiated.

Compressor operation is disabled 20 secs after VES opens (fails) when loop valve has been indexed to open.

Point Name	Hardware Points				Software Points					Show On Graphic
	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	
Zone Temperature	X				X			X		X
Heating Setpoint					X					
Cooling Setpoint					X					
Supply Fan Command				X						
Compressor Stage 1 Output				X						
Compressor Stage 2 Output				X						
Reversing Valve Command				X						
Occupied Command			X			X	X			X
Discharge Air Temperature	X				X					
Leaving Water Temperature	X				X					
Loop Valve Command				X		X				
Valve End Switch (Valve Status)			X			X				
Condensate Overflow										X
Lockout Alarm										X
Schedule										
Totals	3	0	2	5	5	3	1	1	2	2
	Total Hardware				Total Software					
	10				12					2

Table 12

11.9 Water Source Heat Pump + Boiler-less Control



CAM Setup

- COMPRESSOR STAGES: [2 COMP 2 STAGES]
- UNIT OPERATION MODE: [HEAT PUMP]
- EVAP COIL CONFIGURATION: [PARALLEL]
- COMPRESSOR CONTROL: [ZONE CONTROL-ZS]
- WALL MOUNT SENSOR: [ZS SENSOR/CAM]
- BO-5 OPTIONS: [BOILERLESS]
- RNET INPUT: [ZS (TEMP ONLY)]
- INPUT 1: [NOT USED]
- INPUT 2: [NOT USED]
- INPUT 5: [EWT SENSOR]
- BAS INPUT (CO2): [DISABLE]
- BAS INPUT (RH): [DISABLE]

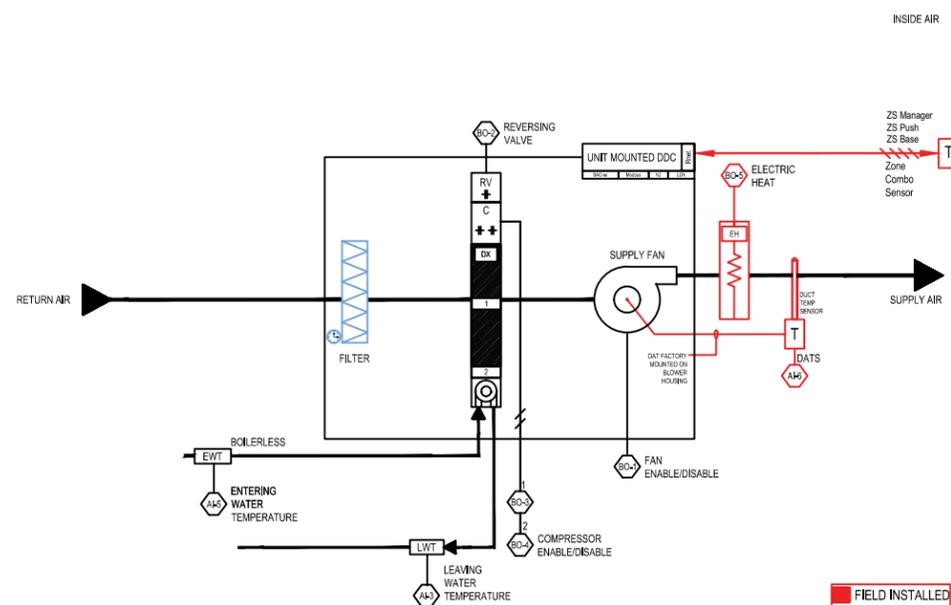


Fig. 13

11.10 Water Source Heat Pump and Boiler-less Control Sequence of Operation

Supply Fan Start/Stop:

The supply fan will be started according to the schedule. After the supply fan has been started the control sequence will be enabled.

Zone Control:

The compressor will cycle to maintain the zone temperature at setpoint.

Water Source Heat Pump Control:

When the zone temperature falls below the zone temperature setpoint the reversing valve will be disabled to provide heating when the compressor is running. When the zone temperature rises above the zone temperature setpoint the reversing valve will be enabled to provide cooling when the compressor is running.

Night Setback:

When in “unoccupied”, the unit will cycle as necessary to maintain the night setback zone temperature at setpoint.

Shutdown:

When the unit is shut down by either a stop command or system safety the unit will be set as follows:

- ▶ Supply fan will be on (user configurable)
- ▶ Compressor(s) will be off

Boiler-less Control:

Boiler-less control (BLC) option must be configured by the equipment integrator. A factory installed entering water temperature sensor in IN-5 (IN-2 if IN-5 is unavailable) is used to enable boiler-less control.

Entering water temperature values less than 40°F (user configurable) will enable boiler-less control.

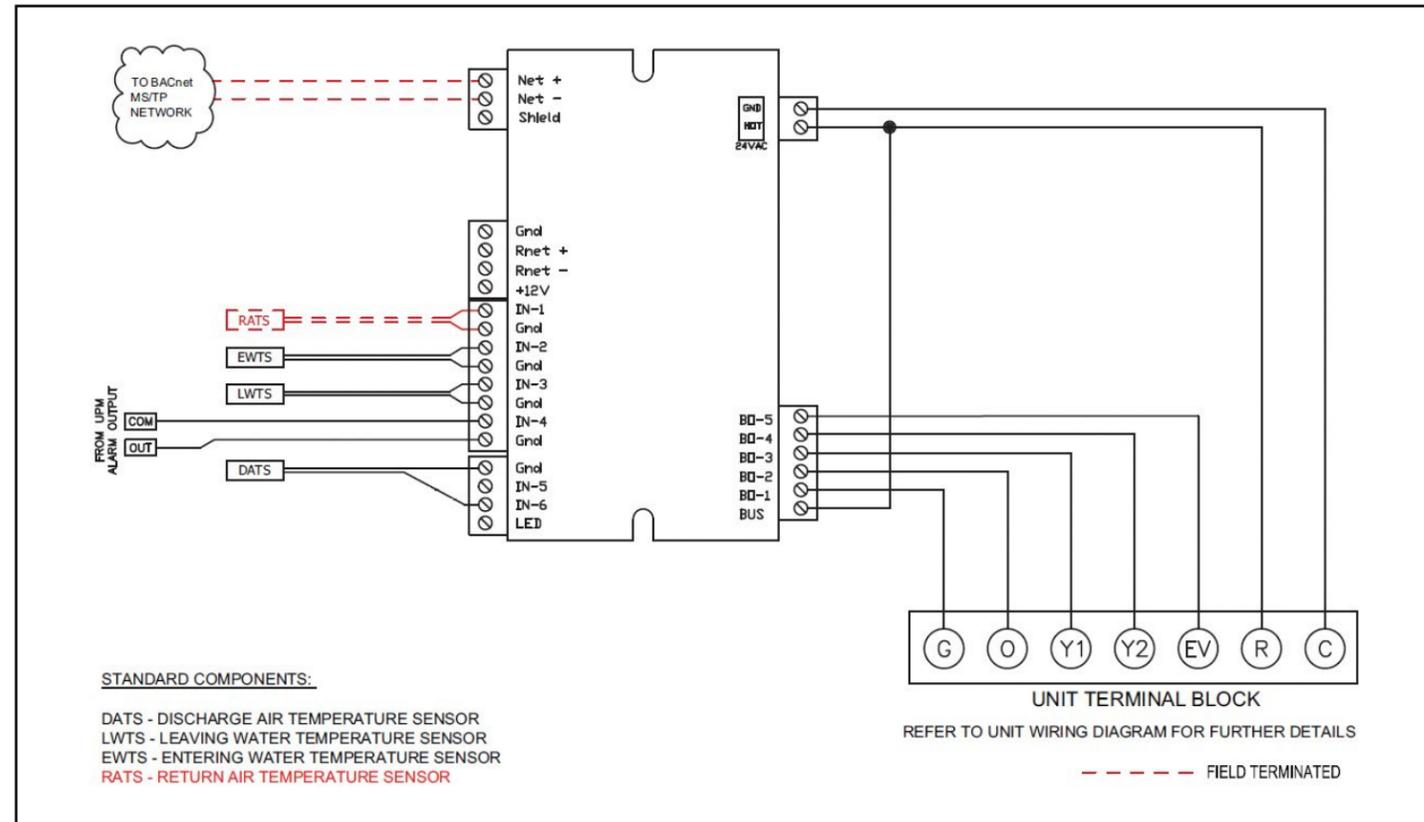
Compressor operation is disabled upon boiler-less control signal being activated.

An electric heat package must be installed for boiler-less control option. Electric heat will be enabled on binary output BO-5 when boiler-less signal is activated.

Point Name	Hardware Points				Software Points					Show On Graphic
	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	
Zone Temperature	X				X			X		X
Heating Setpoint					X					
Cooling Setpoint					X					
Supply Fan Command				X						
Compressor Stage 1 Output				X						
Compressor Stage 2 Output				X						
Reversing Valve Command				X						
Occupied Command			X			X	X			X
Discharge Air Temperature	X									
Leaving Water Temperature	X									
Entering Water Temperature	X									
Aux Electric Heat Output				X						
Condensate Overflow										X
Lockout Alarm										X
Schedule										
Totals	4	0	1	5	3	1	1	1	2	2
	Total Hardware				Total Software					
	10				8					2

Table 14

11.11 Water Source Heat Pump + Water-side Economizer



CAM Setup

- COMPRESSOR STAGES: [2 COMP 2 STAGES]
- UNIT OPERATION MODE: [HEAT PUMP]
- EVAP COIL CONFIGURATION: [PARALLEL]
- COMPRESSOR CONTROL: [ZONE CONTROL-ZS]
- WALL MOUNT SENSOR: [NONE]
- BO-5 OPTIONS: [ECONOMIZER]
- INPUT 1: [NOT USED]
- INPUT 2: [RAT SENSOR]
- INPUT 5: [EWT SENSOR]
- BAS INPUT (CO2): [DISABLE]
- BAS INPUT (RH): [DISABLE]

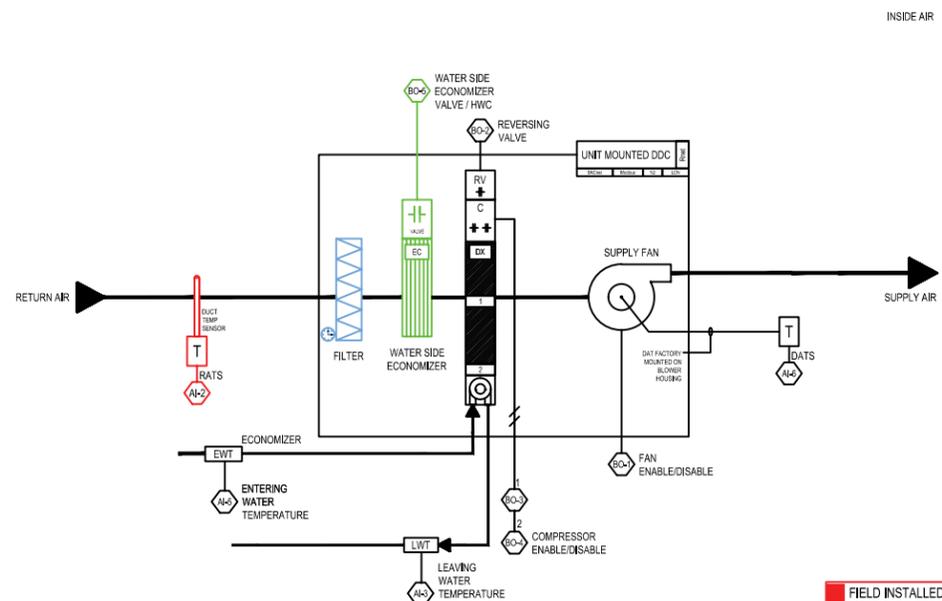


Fig. 14

11.12 Water Source Heat Pump and Water-side Economizer Sequence of Operation

Supply Fan Start/Stop:

The supply fan will be started according to the schedule. After the supply fan has been started the control sequence will be enabled.

Zone Control:

The compressor will cycle to maintain the zone temperature at setpoint. The zone temperature will come from the BAS.

Water Source Heat Pump Control:

When the zone temperature falls below the zone temperature setpoint the reversing valve will be disabled to provide heating when the compressor is running. When the zone temperature rises above the zone temperature setpoint the reversing valve will be enabled to provide cooling when the compressor is running.

Night Setback:

When in "unoccupied", the unit will cycle as necessary to maintain the night setback zone temperature at setpoint.

Shutdown:

When the unit is shut down by either a stop command or system safety the unit will be set as follows:

- ▶ Supply fan will be on (user configurable)
- ▶ Compressor(s) will be off

Water-side Economizer:

Water-side economizer (WSE) option must be configured by the equipment integrator. A factory installed entering water temperature (EWT) sensor in IN-5 (IN-2 if IEM is present) is used to enable the economizer mode during cooling operations.

Entering water temperature values below 55°F (user configurable) will enable economizer mode.

Once enabled, unit will run in economizer mode until the EWT exceeds 58°F (user configurable).

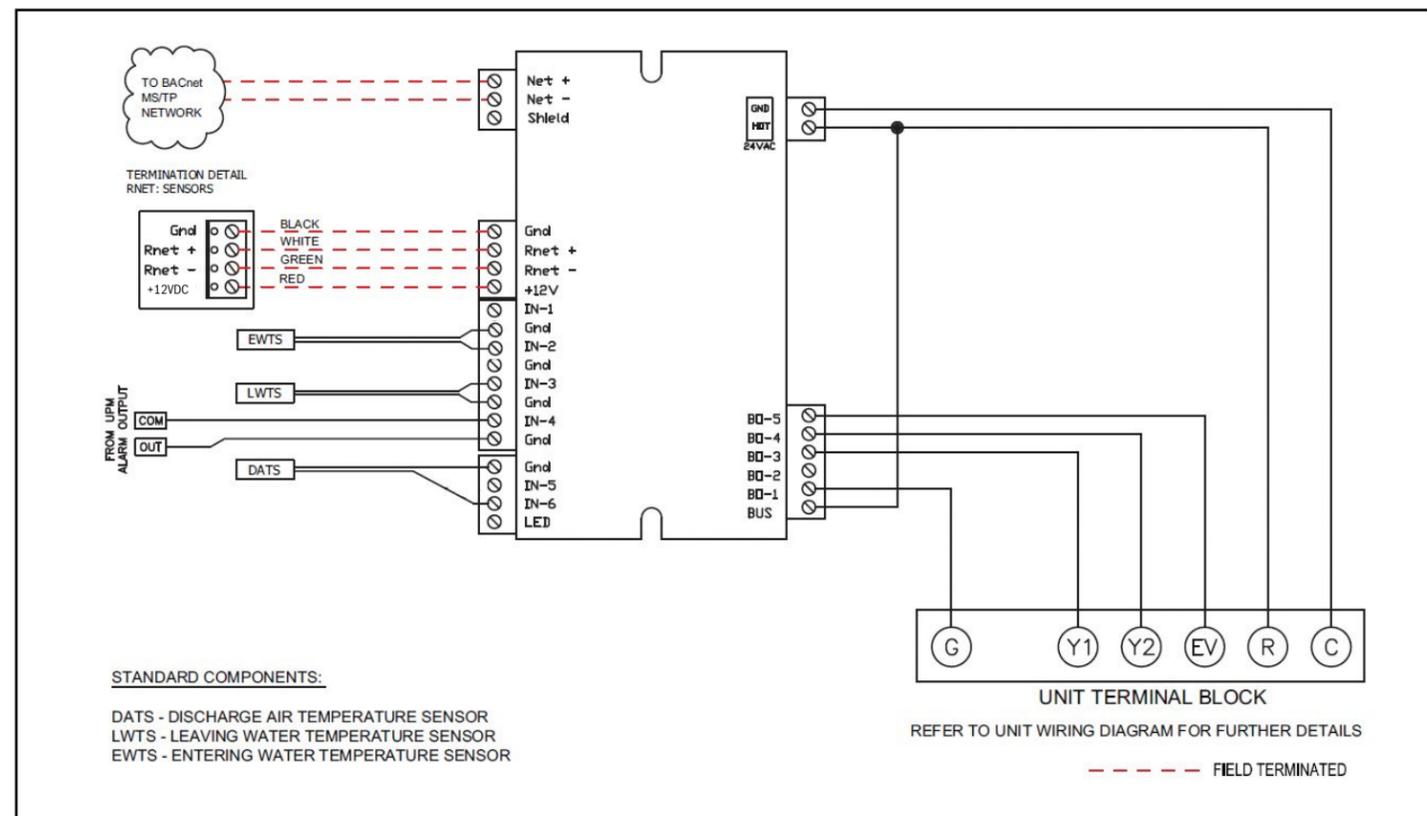
A three-way economizer valve is required for the WSE option and is connected to BO-5.

The unit will run in economizer mode for 8 minutes. If the unit has not satisfied the call for cooling then the compressor will come on. If there is a call for cooling, with demand greater than 20% and the EWT is below the required value, then the unit will go into economizer mode. After 5 mins Stage 2 will engage. After an additional 3 mins then stage 1 will engage and the unit will have both stages of compressor cooling.

Point Name	Hardware Points				Software Points					Show On Graphic
	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	
Zone Temperature	X				X			X		X
Heating Setpoint					X					
Cooling Setpoint					X					
Supply Fan Command				X						
Compressor Stage 1 Output				X						
Compressor Stage 2 Output				X						
Reversing Valve Command				X						
Occupied Command			X			X	X			X
Discharge Air Temperature	X									
Leaving Water Temperature	X									
Entering Water Temperature	X									
Economizer Valve Output				X						
Condensate Overflow									X	
Lockout Alarm									X	
Schedule										
Totals	4	0	1	5	3	1	1	1	2	2
	Total Hardware				Total Software					
	10				8					2

Table 15

11.13 Straight Cool + Water-side Economizer



CAM Setup

- COMPRESSOR STAGES: [2 COMP 2 STAGES]
- UNIT OPERATION MODE: [STRAIGHT COOL]
- EVAP COIL CONFIGURATION: [PARALLEL]
- COMPRESSOR CONTROL: [ZONE CONTROL-ZS]
- WALL MOUNT SENSOR: [ZS SENSOR/CAM]
- BO-5 OPTIONS: [ECONOMIZER]
- RNET INPUT: [ZS (TEMP ONLY)]
- INPUT 1: [NOT USED]
- INPUT 2: [EWT SENSOR]
- INPUT 5: [NOT USED]
- BAS INPUT (CO2): [DISABLE]
- BAS INPUT (RH): [DISABLE]

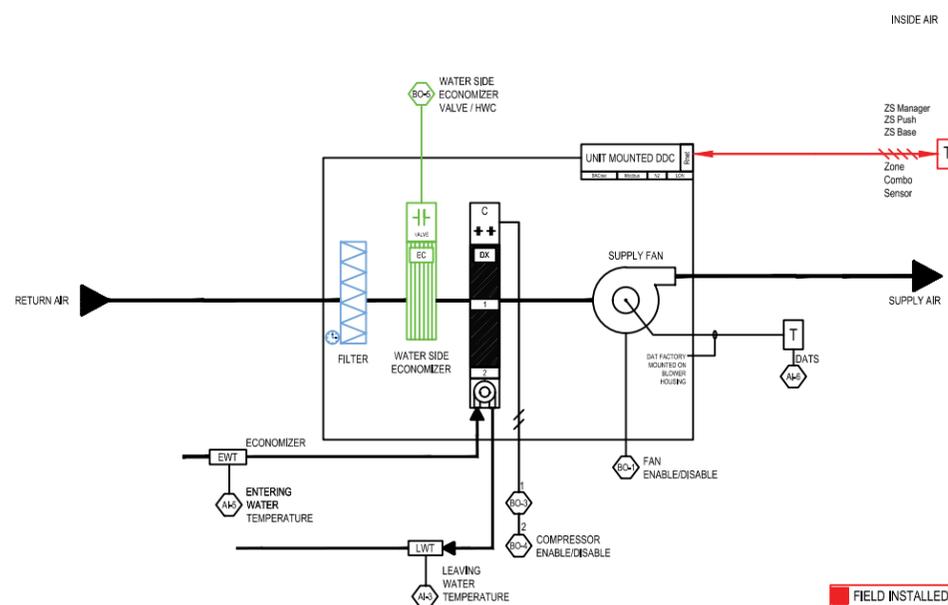


Fig. 15

11.14 Straight Cool and Water-side Economizer Water Source Heat Pump Sequence of Operation

Supply Fan Start/Stop:

The supply fan will be started according to the schedule. After the supply fan has been started the control sequence will be enabled.

Zone Control:

The compressor will cycle to maintain the zone temperature at setpoint.

Straight Cool Control:

Unit is configured for mechanical cooling only and the reversing valve is not installed. BO-2 is disabled and unused.

Night Setback:

When in "unoccupied", the unit will cycle as necessary to maintain the night setback zone temperature at setpoint.

Shutdown:

When the unit is shut down by either a stop command or system safety the unit will be set as follows:

- ▶ Supply fan will be on (user configurable)
- ▶ Compressor(s) will be off

Water-side Economizer:

Water-side economizer (WSE) option must be configured by the equipment integrator. A factory installed entering water temperature (EWT) sensor in IN-5 (IN-2 if IEM is present) is used to enable the economizer mode during cooling operations.

Entering water temperature values below 55°F (user configurable) will enable economizer mode.

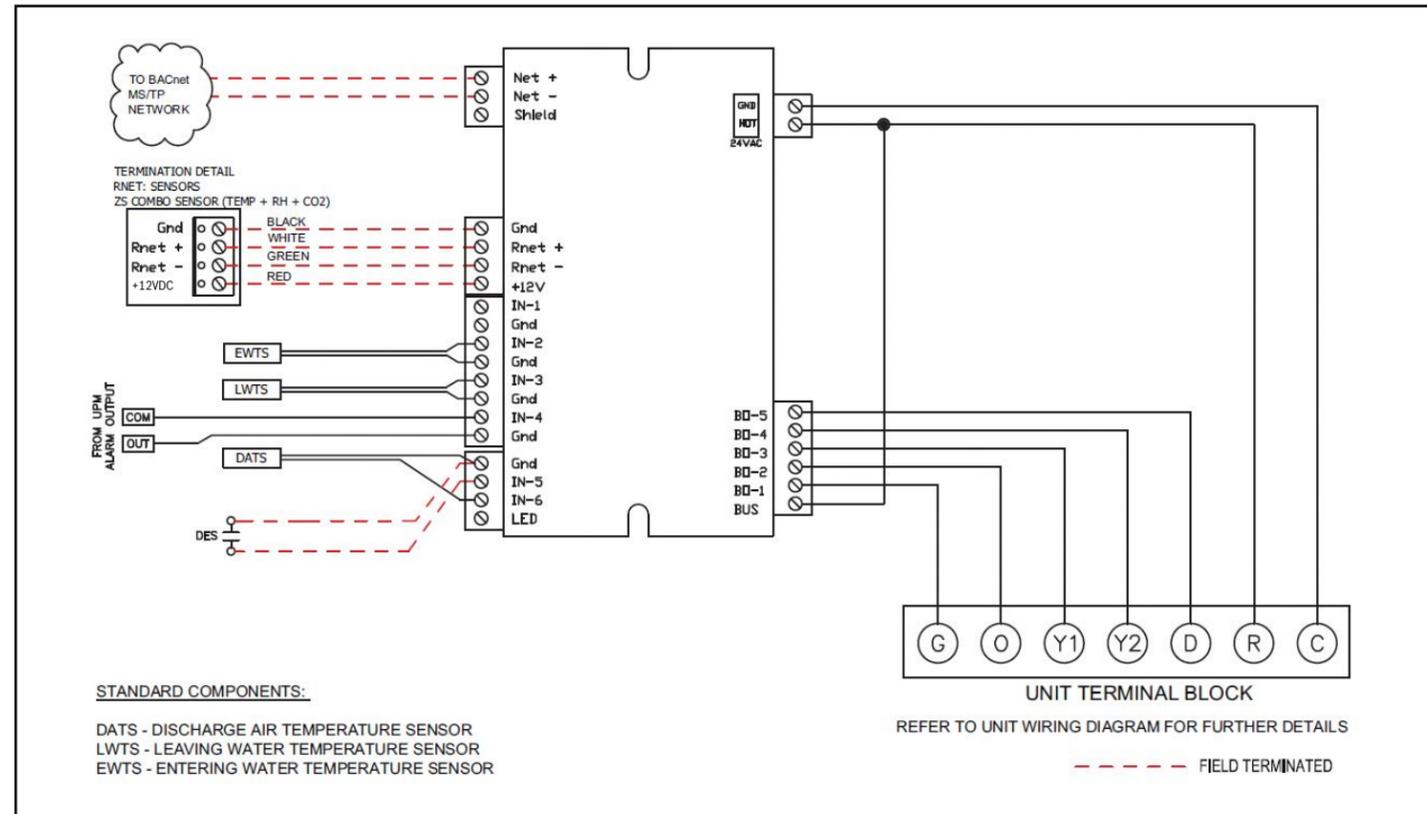
A three-way economizer valve is required for the WSE option and is connected to BO-5.

The unit will run in economizer mode for 8 minutes. If the unit has not satisfied the call for cooling then the compressor will come on. If there is a call for cooling, with demand greater than 20% and the EWT is below the required value, then the unit will go into economizer mode. After 5 mins Stage 2 will engage. After an additional 3 mins then stage 1 will engage and the unit will have both stages of compressor cooling.

Point Name	Hardware Points				Software Points					Show On Graphic
	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	
Zone Temperature	X				X			X		X
Heating Setpoint					X					
Cooling Setpoint					X					
Supply Fan Command				X						
Compressor Stage 1 Output				X						
Compressor Stage 2 Output				X						
Reversing Valve Command										
Occupied Command			X			X	X			X
Discharge Air Temperature	X									
Leaving Water Temperature	X									
Entering Water Temperature	X									
Economizer Valve Output				X						
Condensate Overflow									X	
Lockout Alarm									X	
Schedule										
Totals	4	0	1	4	3	1	1	1	2	2
	Total Hardware				Total Software					
	9				8					2

Table 16

11.15 Water Source Heat Pump, Damper + CO₂



CAM Setup

- COMPRESSOR STAGES: [2 COMP 2 STAGES]
- UNIT OPERATION MODE: [HEAT PUMP]
- EVAP COIL CONFIGURATION: [PARALLEL]
- COMPRESSOR CONTROL: [ZONE CONTROL-ZS]
- WALL MOUNT SENSOR: [ZS SENSOR/CAM]
- BO-5 OPTIONS: [FRESH AIR DAMPER]
- RNET INPUT: [ZS (TEMP + CO₂)]
- INPUT 1: [NOT USED]
- INPUT 2: [EWT SENSOR]
- INPUT 5: [DAMPER END SWITCH (DES)]
- BAS INPUT (CO₂): [DISABLE]
- BAS INPUT (RH): [DISABLE]
- DAMPER OPEN WHEN CO₂ IS: [1000 0]PPM

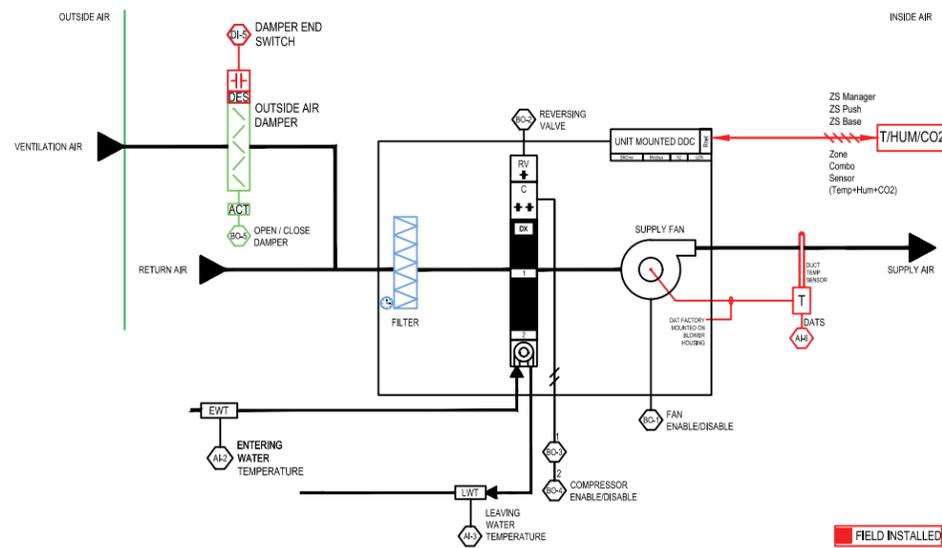


Fig. 16

11.16 Water Source Heat Pump, Damper and CO₂ Sequence of Operation

Supply Fan Start/Stop:

The supply fan will be started according to the schedule. After the supply fan has been started the control sequence will be enabled.

Zone Control:

The compressor will cycle to maintain the zone temperature at setpoint.

Water Source Heat Pump Control:

When the zone temperature falls below the zone temperature setpoint the reversing valve will be disabled to provide heating when the compressor is running. When the zone temperature rises above the zone temperature setpoint the reversing valve will be enabled to provide cooling when the compressor is running.

Night Setback:

When in "unoccupied", the unit will cycle as necessary to maintain the night setback zone temperature at setpoint.

Shutdown:

When the unit is shut down by either a stop command or system safety the unit will be set as follows:

- ▶ Supply fan will be on (user configurable)
- ▶ Compressor(s) will be off

Outside Air Damper:

Field installed outside air damper with damper end switch (DES) option must be configured by the equipment integrator. Damper may be indexed to open based on:

- ▶ **Occupancy:** damper opens 10 secs after unit enters occupied mode, and closes 2 mins after unit leaves occupied mode.
- ▶ **Fan operation:** damper opens 10 secs after fan is energized and running, and closes 2 mins after fan is de-energized and remains off.
- ▶ **CO₂ levels:** damper opens if zone CO₂ levels exceed 1000ppm (user configurable) and closes 2 mins after CO₂ levels fall and stay below trip value.
- ▶ **Air Economizer:** damper opens upon a call for cooling, if the outside air temperature and humidity fall within a user configured range (default: 50°F to 60°F OAT & 40%RH to 50%RH OARH). Compressor operation is disabled and only the fan is used to condition the space. If space setpoint is not satisfied within 7 minutes of fan only operation, the first stage of compressor cooling is enabled.

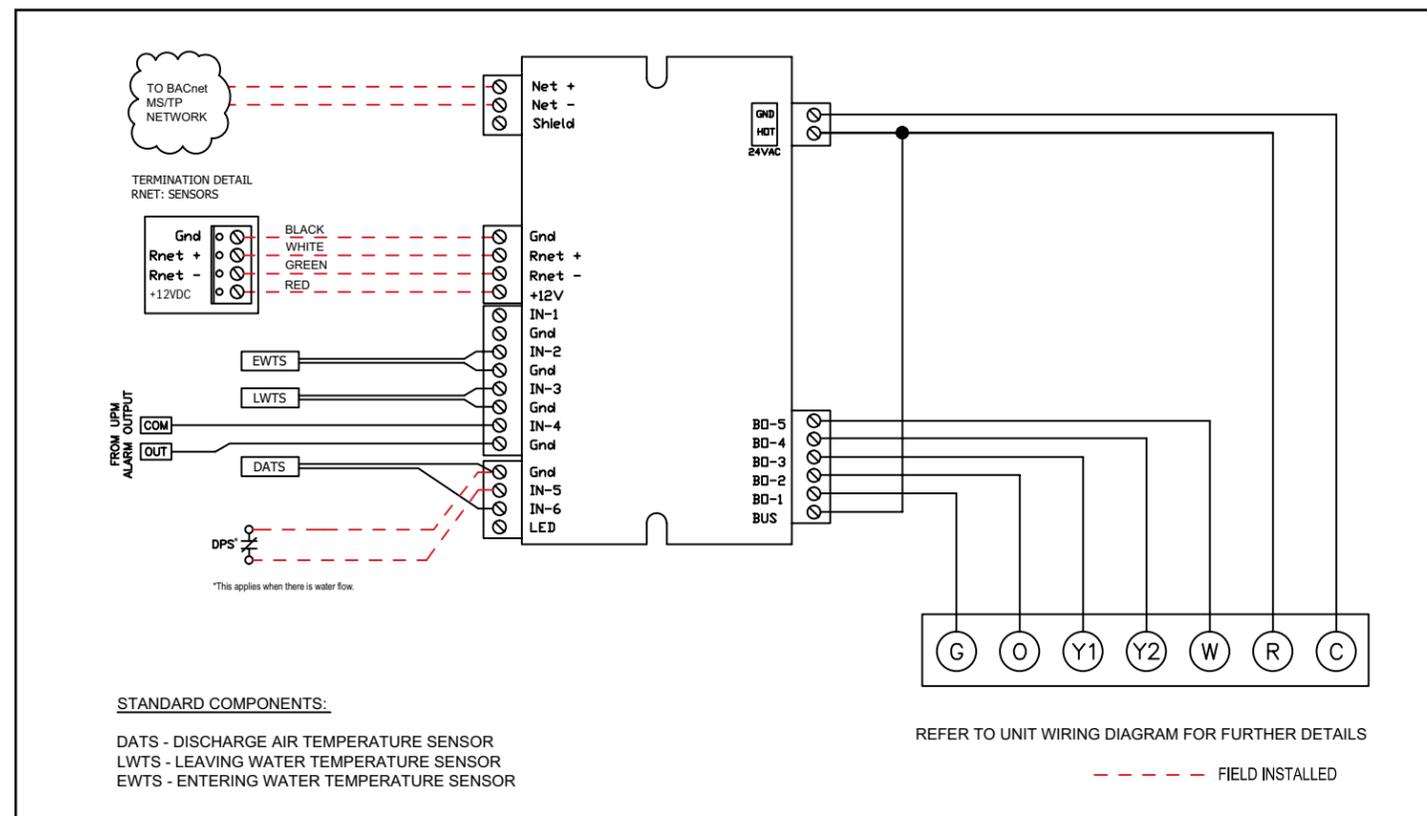
When DES is configured, compressor operation is not enabled until the switch is engaged (damper fully open).

Compressor operation is disabled 20 secs after DES fails when damper has been indexed to open.

Water Source Heat Pump										
Point Name	Hardware Points				Software Points					Show On Graphic
	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	
Zone Temperature	X				X			X		X
Heating Setpoint					X					
Cooling Setpoint					X					
Supply Fan Command				X						
Compressor Stage 1 Output				X						
Compressor Stage 2 Output				X						
Reversing Valve Command				X						
Occupied Command			X			X	X			X
Discharge Air Temperature	X				X					
Leaving Water Temperature	X				X					
Outside Air Damper Command				X		X				
Damper End Switch			X			X				
Condensate Overflow									X	
Lockout Alarm									X	
Schedule										
Totals	3	0	2	5	5	3	1	1	2	2
	Total Hardware				Total Software					
	10				12					2

Table 17

11.17 Water Source Heat Pump, Boiler-less Control + Differential Pressure Switch



CAM Setup

- COMPRESSOR STAGES: [2 COMP 2 STAGES]
- UNIT OPERATION MODE: [HEAT PUMP]
- EVAP COIL CONFIGURATION: [PARALLEL]
- COMPRESSOR CONTROL: [ZONE CONTROL-ZS]
- WALL MOUNT SENSOR: [ZS SENSOR/CAM]
- BO-5 OPTIONS: [BOILERLESS]
- RNET INPUT: [ZS (TEMP ONLY)]
- INPUT 1: [NOT USED]
- INPUT 2: [EWT SENSOR]
- INPUT 5: [DIFF PRESSURE SWITCH (DPS)]
- BAS INPUT (CO2): [DISABLE]
- BAS INPUT (RH): [DISABLE]

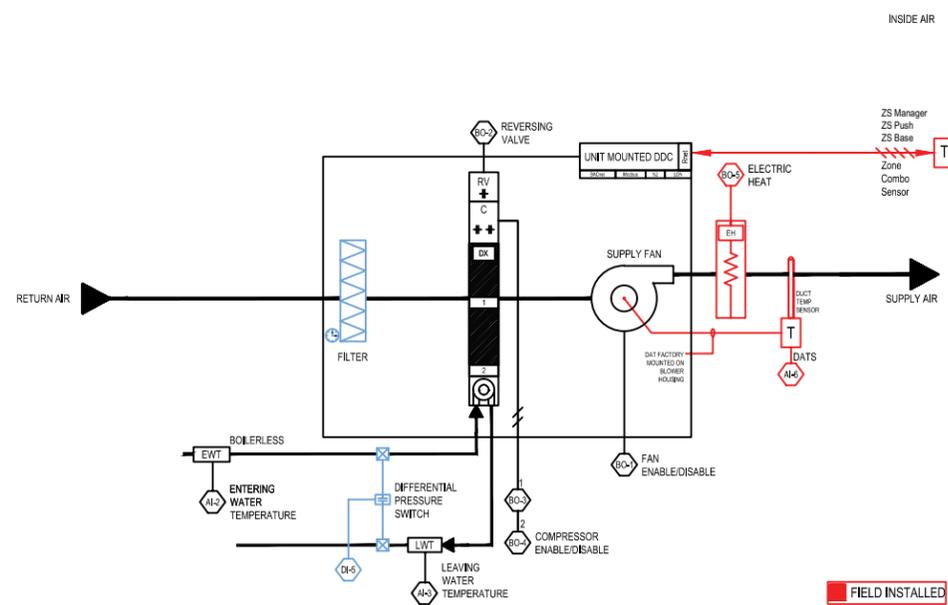


Fig. 17

11.18 Water Source Heat Pump, Boiler-less Control and Differential Pressure Switch Sequence of Operation

Supply Fan Start/Stop:

The supply fan will be started according to the schedule. After the supply fan has been started the control sequence will be enabled.

Zone Control:

The compressor will cycle to maintain the zone temperature at setpoint.

Water Source Heat Pump Control:

When the zone temperature falls below the zone temperature setpoint the reversing valve will be disabled to provide heating when the compressor is running. When the zone temperature rises above the zone temperature setpoint the reversing valve will be enabled to provide cooling when the compressor is running.

Night Setback:

When in "unoccupied", the unit will cycle as necessary to maintain the night setback zone temperature at setpoint.

Shutdown:

When the unit is shut down by either a stop command or system safety the unit will be set as follows:

- Supply fan will be on (user configurable)
- Compressor(s) will be off

Boiler-less Control:

Boiler-less control (BLC) option must be configured by the equipment integrator. A factory installed entering water temp sensor in IN-5 (IN-2 if IN-5 is unavailable) is used to enable boiler-less control.

Entering water temperature values less than 40°F (user configurable) will enable boiler-less control.

Compressor operation is disabled upon boiler-less control signal being activated.

An electric heat package must be installed for boiler-less control option. Electric heat will be enabled on output BO-5 when boiler-less signal is activated.

Differential Pressure Switch:

Differential pressure switch (DPS) option must be configured by the equipment integrator. A factory installed differential pressure switch is tied in to the controller at the configured input (IN-5 or IEM) and used to prove flow prior to unit compressor operation.

If the DPS opens during normal heating/cooling operation, compressor operation is ceased after 15 secs and an alarm is generated.

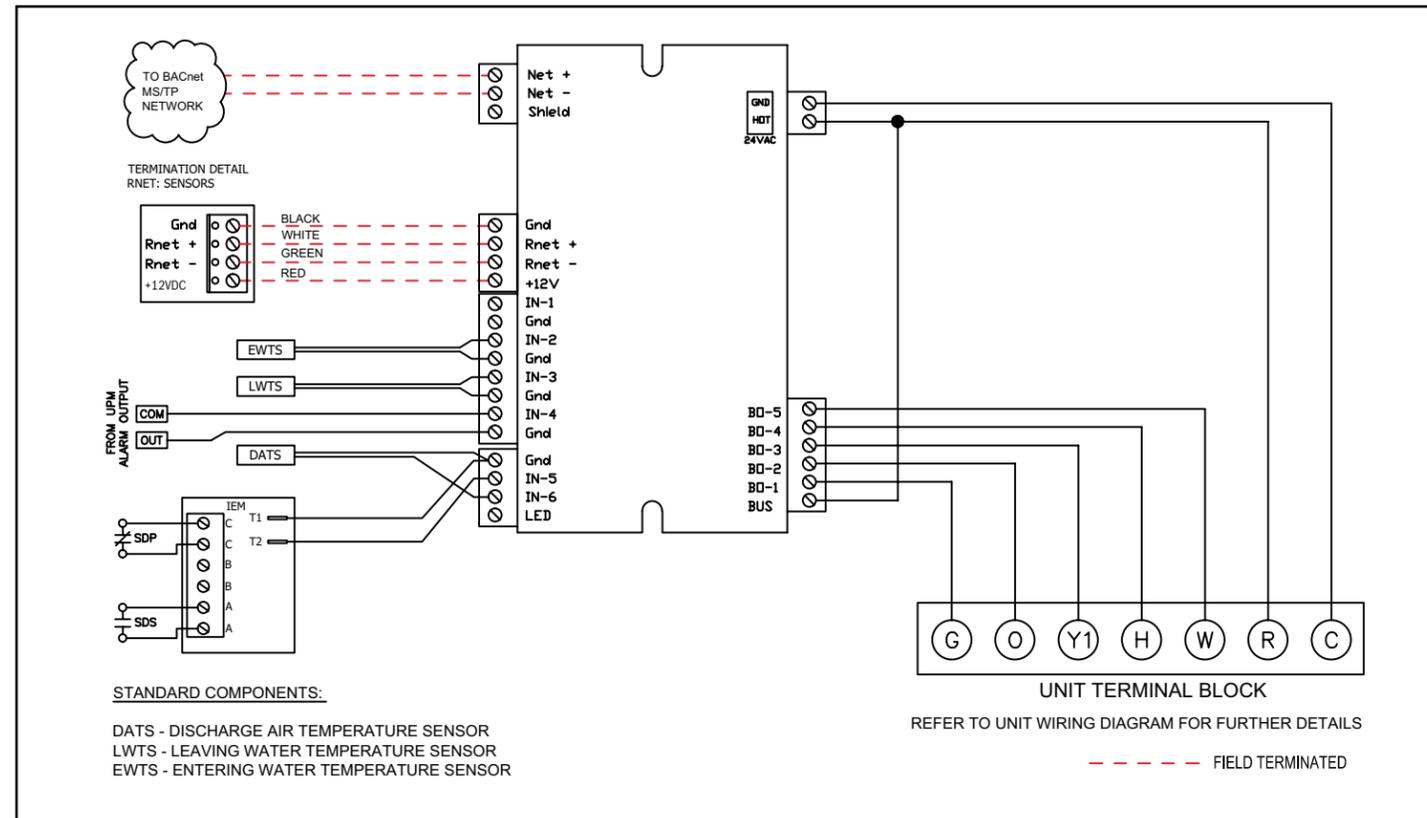
Once the switch re-closes, a time delay prevents unit compressor operation until 3 mins has elapsed to ensure flow is fully re-established.

The DPS will close once the required water flow is established. This does not require a manual reset at the unit.

Point Name	Hardware Points				Software Points					Show On Graphic
	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	
Zone Temperature	X				X			X		X
Heating Setpoint					X					X
Cooling Setpoint					X					X
Supply Fan Command				X						X
Compressor Stage 1 Output				X						X
Compressor Stage 2 Output				X						X
Reversing Valve Command				X						X
Occupied Command			X			X	X			X
Discharge Air Temperature	X									X
Leaving Water Temperature	X									X
Entering Water Temperature	X									
Aux Electric Heat Output				X						
Differential Pressure Switch (DPS)			X							
Condensate Overflow										X
Lockout Alarm										X
Schedule										
Totals	4	0	2	5	3	1	1	1	2	10
	Total Hardware				Total Software					
	11				8					10

Table 18

11.19 Water Source Heat Pump, Boiler-less Control, Hot Gas Reheat + (Smoke Detector Switch-Secondary Drain Pan)



CAM Setup

- COMPRESSOR STAGES: [1 COMP 1 STAGE]
- UNIT OPERATION MODE: [HEAT PUMP]
- EVAP COIL CONFIGURATION: [PARALLEL]
- COMPRESSOR CONTROL: [ZONE CONTROL-ZS]
- WALL MOUNT SENSOR: [ZS SENSOR/CAM]
- BO-4 OPTIONS: [BOILERLESS CONTROL]
- BO-5 OPTIONS: [HOT GAS REHEAT]
- RNET INPUT: [ZS (TEMP + RH)]
- INPUT 1: [NOT USED]
- INPUT 2: [EWT SENSOR]
- INPUT 5: [INPUT EXPANSION MODULE (IEM)]
- IEM CONFIGURATION: [SDS, FSS, SDP]
- BAS INPUT (CO2): [DISABLE]
- BAS INPUT (RH): [DISABLE]
- ENABLE FAN STATUS ON IEM?: [NO]

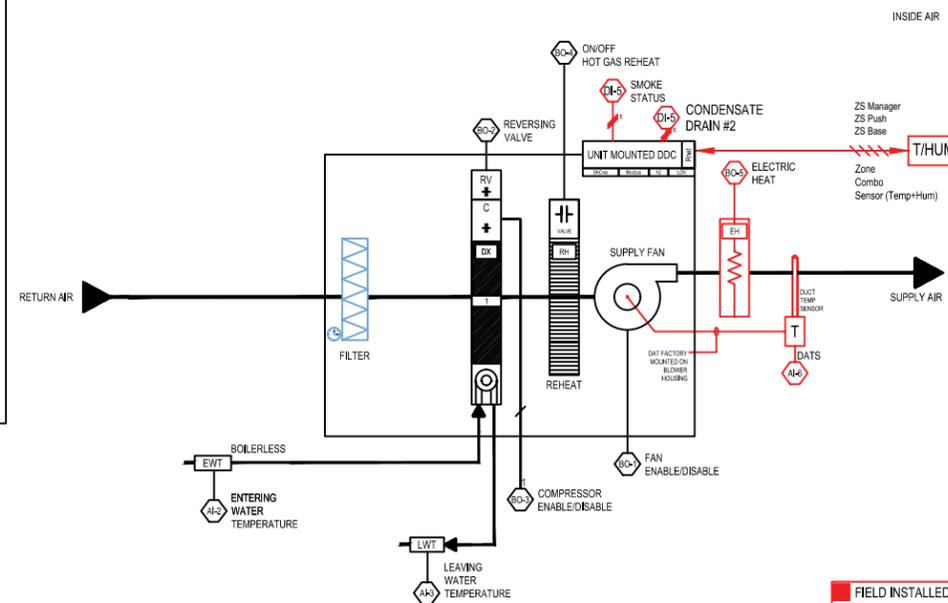


Fig. 18

11.20 Water Source Heat Pump, Boiler-less Control, Hot Gas Reheat and (Smoke Detector Switch-Secondary Drain Pan) Sequence of Operation

Supply Fan Start/Stop:

The supply fan will be started according to the schedule. After the supply fan has been started the control sequence will be enabled.

Zone Control:

The compressor will cycle to maintain the zone temperature at setpoint.

Water Source Heat Pump Control:

When the zone temperature falls below the zone temperature setpoint the reversing valve will be disabled to provide heating when the compressor is running. When the zone temperature rises above the zone temperature setpoint the reversing valve will be enabled to provide cooling when the compressor is running.

Night Setback:

When in "unoccupied", the unit will cycle as necessary to maintain the night setback zone temperature at setpoint.

Smoke Detector Switch:

A field installed smoke detector provides a contact closure at the configured input (IN-5 or IEM) during a smoke event, and will initiate emergency shutdown procedures after 5 seconds.

When the unit is shut down by the smoke detector the unit will be set as follows:

- ▶ Supply fan will be off (user configurable)
- ▶ Compressor(s) will be off

The unit may be configured to operate the fan during a smoke event for specific safety applications; system integrator must determine the appropriate fan behavior.

Secondary Drain Pan:

The Secondary Condensate Drain Pan (SDP) option must be configured by the equipment integrator. A field installed SDP is tied in to the controller at the configured input (IN-5 or IEM) and used to monitor condensate levels. If an open contact is detected at the controller input for more than 10 secs during normal heating/cooling operation, compressor operation is ceased and an alarm is generated. Normal compressor operation is restored once a contact closure is reestablished at the input.

Boiler-less Control:

Boiler-less control (BLC) option must be configured by the equipment integrator. A factory installed entering water temp sensor in IN-5 (IN-2 if IN-5 is unavailable) is used to enable boiler-less control. Entering water temperature values less than 40°F (user configurable) will enable boiler-less control.

Compressor operation is disabled upon boiler-less control signal being activated. An electric heat package must be installed for boiler-less control option. Electric heat will be enabled on output BO-5 when boiler-less signal is activated.

Hot Gas Reheat:

Once the heat/cool setpoint has been satisfied and relative humidity is above setpoint, the unit will operate in hot-gas reheat mode to actively remove humidity from the space until the the humidity setpoint has been satisfied, or there's another call for heating or cooling.

Point Name	Hardware Points				Software Points				Show On Graphic	
	AI	AO	BI	BO	AV	BV	Sched	Trend		Alarm
Zone Temperature	X				X			X		X
Heating Setpoint					X			X		X
Cooling Setpoint					X			X		X
Supply Fan Command				X				X		X
Compressor Stage 1 Output				X				X		X
Compressor Stage 2 Output								X		X
Reversing Valve Command				X				X		X
Occupied Command			X			X	X	X		X
Discharge Air Temperature	X									X
Leaving Water Temperature	X									X
Entering Water Temperature	X									
Aux Electric Heat Output				X						
Dehumidification Setpoint					X			X		X
Reheat Status										
Reheat On/Off (Rh S/S)				X				X		X
High Return Air Humidity									X	
Zone Humidity	X				X			X		X
Smoke Detector Status			X						X	
Condensate Overflow									X	X
Secondary Condensate Overflow			X						X	
Lockout Alarm									X	X
Schedule										
Totals	5	0	3	5	5	1	1	11	5	15
	Total Hardware				Total Software					
	13				23					15

Table 19

12 Water-To-Air Sequence of Operation

1. Unit Start-Up

Program will check schedule status for either occupied or unoccupied mode to determine setpoint range. Different run conditions may determine the occupancy mode.

Run Conditions: the water source heat pump may have external or internal control sources to determine occupancy and initiate heating or cooling.

External Control Sources:

- Digital Input** - a contact closure (in IN-1 or IN-2) is used to enable unit operation. Once enabled, unit will run until setpoint is satisfied, or 10 minutes has elapsed since contacts opened.
- BAS** - a network point is used to command the unit into occupied or unoccupied mode. Software may be configured to keep unit operational when network connection is lost. This is the default option configured from the Factory.
- Manual On** - the water source heat pump is placed in continuous occupied mode and will operate until setpoint is satisfied. Software may be configured to manually place the unit in unoccupied mode.
- Override** - for units with ZS wall-mounted sensors, unit operation may be temporarily overridden into occupied mode using a push button on the sensor. Software may be configured to disallow sensor override from the space. Time for override is in increments of 30 mins, with a max of 3 hours allowed.

Internal Control Sources:

- Local Schedule** - the internal scheduler uses the local time and user-defined schedule to determine occupancy. Default schedule is:

MON - FRI	8:00AM - 5:00PM	OCCUPIED MODE
SAT	7:00AM - 3:00PM	OCCUPIED MODE
SUN	10:00AM - 1:00PM	OCCUPIED MODE

Unit is in unoccupied mode outside the above stated hours.

Default occupied schedule setpoints:

- ▶ 74°F cooling setpoint (adjustable)
- ▶ 70°F heating setpoint (adjustable)

Default unoccupied schedule setpoints:

- ▶ 90°F cooling setpoint (adjustable)
- ▶ 55°F heating setpoint (adjustable)

The internal schedule may only be modified using a CAM interface.

2. Temperature Source Selection

The program will check for a valid source of temperature to control the unit. The software may be configured for the following three (3) available sources: ZS sensor (default), Remote sensor, BAS sensor.

- ZS Sensor** - the program will check for a valid 4-wire communicating ZS sensor at the Rnet port of the controller during the first 30 secs after start-up. If a valid sensor is not detected the unit will remain nonoperational in its default unoccupied state, an alarm is generated, and the program defaults to -60°F for the zone temperature. This is the default option configured from the Factory.
- Remote Sensor** - the program will check for a valid 2-wire, 10k-ohm @ 77°F thermistor type sensor at IN-2 of the controller during the first 30 secs after start-up. If a valid sensor is not detected the unit will remain nonoperational in its default unoccupied state, an alarm is generated, and the program defaults to -60°F for the zone temperature.
- BAS Sensor** - the program will check for a network value pushed from the Building Automation System (BAS) to control the unit. If no value is written to the network point the program defaults to 74°F, otherwise the last reported temperature value is used to control the unit. Refer to the Integration Points List for network points.

3. Setpoint Management

The registered zone temperature will be checked against the current setpoint range (Default: 70°F - 74°F occupied, 55°F - 90°F unoccupied).

Manual offsets in the software or temperature adjustments from the ZS sensor will be taken into account when determining the actual (effective) setpoint range; for example, if the setpoint is increased in the space by +2°F, then the occupied setpoint range becomes 72°F - 76°F, and if the setpoint is decreased in the space by -2°F, then the occupied setpoint range becomes 68°F - 72°F. Adjustment limits may be used to manage the allowed setpoint changes from the wall sensor (default limit is +/- 3°F)

Upon a transition from occupied to unoccupied mode all setpoint adjustments are removed and reset to 0°F.

The software may also be configured to disable the ability to change setpoints in the space.

4. Heating / Cooling Operation

The setpoints are compared to the effective zone temperature from the selected source. Demand, based on a PID algorithm, is used to determine when to energize the unit in either heating or cooling mode. The PID algorithm calculates the demand value as a percentage (%) based on the difference between the zone temperature and the heat/cool setpoints.

Supply Fan - The supply fan will be started according to the schedule and is configured for continuous operation during the occupied mode. The program may be configured to interlock fan operation with heating or cooling operations (Auto mode). For this configuration the fan will be started if the PID demand for heating or cooling is greater than 10%, and stopped when the demand falls below 5%. After the supply fan has been started the control sequence will be enabled.

Compressors - the first stage of compressor operation (heating or cooling) is enabled at 30% PID demand, and disabled at 20% PID demand. Once enabled the compressor will cycle to maintain the zone temperature at setpoint unless commanded off by a safety condition (e.g. smoke alarm, high/low leaving water temperature, etc.) or unit option (e.g. economizer, boilerless, loop valve, etc.). The reversing valve is indexed on during cooling and indexed off during heating.

The stage one compressor will have a minimum off time of 3 minutes, and a minimum on time of 7 minutes.

The second stage of compressor operation (heating or cooling) is enabled at 60% PID demand, and disabled at 40% PID demand. In addition, stage two compressor operation is only enabled after compressor stage 1 has been running for 7 minutes.

Once enabled the compressor will cycle to maintain the zone temperature at setpoint unless commanded off by a safety condition (e.g. smoke alarm, high/low leaving water temperature, etc.) or unit option (e.g. economizer, boilerless, loop valve, etc.).

To prevent short-cycling, the stage two compressor has a minimum off time of 5 minutes and no minimum on time.

There'll be a 1-minute delay when transitioning between heat and cool modes. The compressor will run subject to internal safeties and controls provided by the UPM.

A networked "loop valve enable" point must be enabled to allow compressor operation. This point is defaulted "on" from factory. When the zone is satisfied, the PID demand percentage will begin to decrease. Once demand falls below the thresholds described (20% for stage 1, 40% for stage 2) the compressors will be disabled. In addition, compressor stage 1 will be disabled 10 seconds after compressor stage 2 is disabled.

Night Setback - when in "unoccupied", the compressors will cycle as necessary to maintain the night setback zone temperature at setpoint. A differential prevents the unit from cycling excessively. During unoccupied operation the fan will only cycle to maintain a heat or cool setpoint.

5. Unit Shutdown/Lockout:

When the system is shut down by a smoke alert or emergency shutdown (network point) the unit will be set as follows:

- ▶ Supply fan will be off
- ▶ Reversing valve will be de-energized (off)
- ▶ Compressor(s) will be off
- ▶ HGRH valve will be de-energized

When the system is locked out by a stop command or UPM safety condition, the unit will be set as follows:

- ▶ Supply fan will be on (configurable)
- ▶ Reversing valve will be de-energized (off)
- ▶ Compressor(s) will be off
- ▶ HGRH valve will be de-energized

The following system conditions will result in a stop command and a subsequent unit lockout:

- ▶ Leaving water temp high condition
- ▶ Leaving water temp low condition
- ▶ UPM reset command
- ▶ Secondary drain pan (high condensate) alarm
- ▶ Smoke event alarm
- ▶ Differential pressure switch (DPS) alarm

The following UPM safety conditions result in a unit lockout:

- ▶ High Pressure condition
- ▶ Low Pressure condition
- ▶ Evaporator Coil Freeze condition
- ▶ Condenser Coil Freeze condition
- ▶ Brown-out condition
- ▶ Condensate Overflow condition
- ▶ Refrigerant Leak Fault

The supply fan may be configured to turn off (de-energize) when the unit is locked out.

6. Options

Auxiliary Electric Heat:

Electric heat (EH) option may be factory or field installed and must be configured by the equipment integrator. Only one stage of auxiliary electric heat is supported and is configured for BO-5 for both single stage and dual stage compressor units.

Upon a call for heating with demand greater than 90% (user configurable), the EH signal will be enabled to maintain setpoint at the configured output as follows:

- ▶ **Straight cool units:** enabled with no delay
- ▶ **Single stage heat pump units:** enabled 5 mins after first stage of mechanical heat if demand is still above 90%.
- ▶ **Dual stage heat pump units:** enabled 5 mins after second stage of mechanical heat if demand is still above 90%.

Hot Gas Reheat:

Once the heat/cool setpoint has been satisfied and relative humidity is above setpoint, the unit will operate in hot-gas reheat mode to actively remove humidity from the space until the the humidity setpoint has been satisfied, or there's another call for heating or cooling.

Relative humidity readings may be acquired from an appropriate ZS Sensor Push, ZS Manager, or Standard sensor, CAM, third-party 0-5Vdc sensor connected in IN-1 or IN-2 of the controller, or over a network; software must be configured accordingly.

Humidity setpoint may be adjusted from a space ZS Sensor Push, ZS Manager, network, or CAM interface.

Boiler-less Control:

Boiler-less control (BLC) option must be configured by the equipment integrator. A factory installed entering water temperature sensor in IN-5 (IN-2 if IN-5 is unavailable) is used to enable boiler-less control.

Entering water temperature values less than 40°F (user configurable) will enable boiler-less control.

Compressor operation is disabled upon boiler-less control signal being activated.

An electric heat package must be installed for boiler-less control option. Electric heat will be enabled on binary output BO-5 when boiler-less signal is activated.

Water-side Economizer:

Water-side economizer (WSE) option must be configured by the equipment integrator. A factory installed entering water temperature (EWT) sensor in IN-5 (IN-2 if IEM is present) is used to enable the economizer mode during cooling operations.

Entering water temperature values below 55°F (user configurable) will enable economizer mode.

Once enabled, unit will run in economizer mode until the EWT exceeds 58°F (user configurable).

A three-way economizer valve is required for the WSE option and is connected to BO-5.

Condenser Water Valve:

Factory installed loop valve with valve end switch (VES) option must be configured by the equipment integrator. Upon a call for compressor operation the normally closed valve is indexed to open via BO-5. Compressor operation is not enabled until valve end switch is engaged (valve fully open).

Valve open status is verified via the VES within 1.5 mins of valve enable command.

If VES contacts do not engage within the specified time, VES fail alarm is initiated. If valve opens without command from BO-5, valve in hand alarm is initiated.

Compressor operation is disabled 20 secs after VES opens (fails) when loop valve has been indexed to open.

Dirty Filter Switch:

A field installed status switch is used to provide a contact closure at the configured input (IN-5 or IEM) when the filter is ready to be serviced.

An alarm is generated immediately after the switch closes, and is available on a ZS Sensor Push, CAM interface, ZS Manager or over a network.

Smoke Detector Switch:

A field installed smoke detector provides a contact closure at the configured input (IN-5 or IEM) during a smoke event, and will initiate emergency shutdown procedures after 5 seconds (no time delay if network point is used for shutdown instead of switch).

When the unit is shutdown by the smoke detector the unit will be set as follows:

- ▶ Supply fan will be on (user configurable)
- ▶ Compressor(s) will be off

The unit may be configured to operate the fan during a smoke event for specific safety applications; system integrator must determine the appropriate fan behavior.

Fan Status Switch:

The status output from a factory-installed current sensor provides a contact closure at the configured input (IN-5 or IEM) to prove fan operation.

The fan command output is disabled if a contact closure is not detected 35 secs after the unit fan is indexed on by the controller.

Differential Pressure Switch:

Differential pressure switch (DPS) option must be configured by the equipment integrator. A factory installed differential pressure switch is tied in to the controller at the configured input (IN-5 or IEM) and used to prove flow prior to unit compressor operation.

If the DPS opens during normal heating/cooling operation, compressor operation is ceased after 15 secs and an alarm is generated.

Once the switch re-closes, a time delay prevents unit compressor operation until 3 mins has elapsed to ensure flow is fully re-established.

Secondary Condensate Drain Pan:

The secondary condensate drain pan (SDP) option must be configured by the equipment integrator. A field installed SDP is tied in to the controller at the configured input (IN-5 or IEM) and used to monitor condensate levels.

If an open contact is detected at the controller input for more than 10 secs during normal heating/cooling operation, compressor operation is ceased and an alarm is generated.

Normal compressor operation is restored once a contact closure is re-established at the input.

Outside Air Damper:

Field installed fresh air damper with damper end switch (DES) option must be configured by the equipment integrator. Damper may be indexed to open based on:

- ▶ Occupancy: damper opens 10 secs after unit enters occupied mode, and closes 2 mins after unit leaves occupied mode.
- ▶ Fan Operation: damper opens 10 secs after fan is energized and running, and closes 2 mins after fan is de-energized and remains off.
- ▶ CO₂ Levels: damper opens if zone CO₂ levels exceed 1000ppm (user configurable) and closes 2 mins after CO₂ levels fall and stay below trip value.
- ▶ Air Economizer: damper opens upon a call for cooling. If the outside air temperature and humidity fall within a user configured range (default: 50°F to 60°F OAT & 40%RH to 50%RH OARH), compressor operation is disabled and only the fan is used to condition the space. If space setpoint is not satisfied within 7 minutes of fan only operation, compressor operation is enabled to provide additional stage(s) of cooling.

When DES is configured, compressor operation is not enabled until the switch is engaged (damper fully open).

Compressor operation is disabled 20 secs after DES fails when damper has been indexed to open.

13 Integration Points List – Water-To-Air Standard Software

Integration Points											
Point Description Name	BACnet		MODBUS		N2		LON		Read Only	Description	
	Name	Type ID	Object Type	Register	Type	ID	SNVT #	Name			SNVT
1	Control Source	ctrl_sourc_e_1	AV:15	Holding Register (Float)	40023	Internal Float	12	3	nviCtrlSource	SNVT_count_inc(9)	Control Source for Occupancy Setup 0 = Digital Input Enable (e.g. Room Occupancy Sensor) 1 = Keypad Schedule 2 = BAS Occupancy Command (Default) 3 = Factory Use Only 4 = Manual On-Continuous
2	Occupancy Command (BAS)	occupancy_cmd_1	BV:1	Coil	1	Binary Output	1	12	nviOccupancyCommand	SNVT_switch(95)	BAS Occupancy Command 0 = Unoccupied (Default) 1 = Occupied (Enables Unit Operation)
3	BAS Smoke Input / Emergency Shutdown	bas_smok_e_1	BV:75	Coil	00013	Binary Data	73	59	nviBasSmoke	SNVT_switch(95)	Smoke Detector or Emergency Shutdown Alarm Network Input 0 = Normal (Default)
4	Zone Mode Status	zone_mode_e_stat_1	MSV:4	Input Register (Signed)	30060	Internal Integer	4	56	nvoZoneModeStat	SNVT_count_inc(9)	Zone Mode status 1 = Auto (Default) 2 = Heat 3 = Cool 5 = Off
5	Unit Mode Status	mode_status_1	AV:24	Input Register (Float)	30027	Internal Float	34	25	nvoModeStatus	SNVT_count_inc(9)	Unit Mode Status 0 = Straight Cool 2 = Heat pump (Default)
6	Set Zone Mode	zone_mode_1	MSV:3	Holding Register (Signed)	40124	Internal Integer	3	55	nviZoneMode	SNVT_count_inc(9)	Setup Zone Mode 1 = Auto (Default) 2 = Heat 3 = Cool 5 = Off
7	Compressor Control Mode	comp_mode_1	AV:64	Holding Register (Float)	40013	Internal Float	8	-	-	-	Compressor Mode Setup 0 = Zone Control - ZS (Default) 1 = Discharge Air Control 2 = Zone Control - BAS Sensor 3 = Zone Control - Remote Sensor
8	Analog Output 3 Options Configuration	ao3_cfg_s_el_1	AV:108	Holding Register (Float)	40111	Internal Float	73	60	nviAo3CfgSel	SNVT_count_inc(9)	Options Configuration - Controller Analog Output #3 (AO-3) 0 = Not Used (Default) 1 = Modulating Outdoor Air Damper Control
9	Analog Output 2 Options Configuration	ao2_cfg_s_el_1	AV:83	Holding Register (Float)	40089	Internal Float	65	52	nviAo2CfgSel	SNVT_count_inc(9)	Options Configuration - Controller Analog Output #2 (AO-2) 0 = Not Used (Default) 1 = Modulating Hot Gas Reheat Valve Control
10	Analog Output 1 Options Configuration	ao1_cfg_s_el_1	AV:82	Holding Register (Float)	40087	Internal Float	64	51	nviAo1CfgSel	SNVT_count_inc(9)	Options Configuration - Controller Analog Output #1 (AO-1) 0 = Not Used (Default) 1 = Variable Frequency Drive Signal Control 2 = Mixed Air SCR Preheat Control 3 = SCR Controlled Aux Electric Heat
11	Output 5 Options Configuration	bo5_cfg_s_el_1	AV:113	Holding Register (Float)	40101	Internal Float	78	-	-	-	Options Configuration - Controller Binary Output #5 (BO-5) 0 = Not Used (Default) 1 = Hot Gas Reheat for Humidity Control 2 = Auxiliary Electric Heat Control 3 = Fresh Air Damper Control 4 = Condenser Water Valve (Loop Valve) Control 6 = Water-Side Economizer Control 7 = Boilerless Electric Heat Control

Table 20

Integration Points											
Point Description Name	BACnet		MODBUS		N2		LON		Read Only	Description	
	Name	Type ID	Object Type	Register	Type	ID	SNVT #	Name			SNVT
12	Output 4 Options Configuration	bo4_cfg_s_el_1	AV:112	Holding Register (Float)	40099	Internal Float	77	-	-	-	Options Configuration - Controller Binary Output #4 (BO-4);if #155 = "1" 0 = Not Used (Default) 1 = Economizer Valve 2 = Boilerless Control 3 = Fresh Air Damper Control
13	Input 1 Configuration	in1_cfg_s_el_1	AV:110	Holding Register (Float)	40095	Internal Float	75	-	-	-	Controller Input #1 (IN-1) Configuration Setup 0 = Not Used (Default) 2 = Digital Input Enable (e.g. Room Occupancy Sensor) 3 = RH Probe Sensor
14	Input 2 Configuration	in2_cfg_s_el_1	AV:111	Holding Register (Float)	40097	Internal Float	76	-	-	-	Controller Input #2 (IN-2) Configuration Setup 0 = Not Used 1 = Zone Remote Sensor 2 = Outdoor Air Temperature Sensor 3 = Entering Water Temperature Sensor (Default) 4 = Mixed Air Temperature Sensor 5 = Relative Humidity Sensor (Probe) 6 = Digital Enable (e.g. Room Occupancy Sensor) 7 = Return Air Temperature Sensor
15	DI5 Mode (Digital Input 5)	di5_mode_1	AV:60	Holding Register (Float)	40015	Internal Float	10	-	-	-	Controller Input #5 (IN-5) Configuration Setup 0 = Dirty Filter Switch 1 = Entering Water Temp Sensor - Economizer/Boilerless 2 = Differential Pressure Switch 3 = Secondary Condensate Pan 4 = Fan Status Switch 5 = Valve End Switch 6 = Damper End Switch 7 = Smoke Detector Switch 8 = Pump Status Switch 9 = Mixed Air Temp Sensor - Mixed Air Control 10 = Input Expansion Module (IEM) 11 = Not Used (Default)
16	Fan Response for Comp Lockout	lckout_res_p_1	BV:7	Coil	00004	Binary Data	33	48	nviLckoutResp	SNVT_switch(95)	Configures Fan Response during Compressor Lockout by system 0 = Do not lock fan upon compressor lockout (Default) 1 = Lock fan upon compressor lockout
17	ZS Sensor Enable	zs_sensor_en_1	AV:41	Holding Register (Float)	40077	Internal Float	60	-	-	-	Used to configure controller to recognize a connected ZS Sensor(s) 0 = No ZS Sensors 1 = ZS Sensors Enabled (Default)
18	Equipment Touch RH	eq_rh_1	AV:1904	Select..	0	0	0	-	-	-	
19	Equipment Touch Temp	eq_temp_1	AV:1902	Select..	0	0	0	-	-	-	
Zone Control Setup & Status	ZS Sensor Combo Selector	zs_sen_combo_sel_1	AV:40	Holding Register (Float)	40075	Internal Float	59	-	-	-	ZS Sensor Combination Selection (sensor must be compatible to selection) 0 = Temp Only 1 = RH Only 2 = CO2 Only 3 = Temp + RH 4 = Temp + CO2 5 = RH + CO2 6 = Temp + RH + CO2 (Default) 7 = No ZS Sensor

Table 21

Integration Points												
Point Description Name	BACnet		MODBUS		N2		LON			Read Only	Description	
	Name	Type ID	Object Type	Register	Type	ID	SNVT #	Name	SNVT			
20	ZS Sensor Combo Selector	zs_sen_combo_sel_1	AV:40	Holding Register (Float)	40075	Internal Float	59	-	-	-	ZS Sensor Combination Selection (sensor must be compatible to selection) 0 = Temp Only 1 = RH Only 2 = CO2 Only 3 = Temp + RH 4 = Temp + CO2 5 = RH + CO2 6 = Temp + RH + CO2 (Default) 7 = No ZS Sensor	
21	ZS Sensor Setpoint Adjustment Limit	stpt_adj_lim_1	AV:42	Holding Register (Float)	40081	Internal Float	61	-	-	-	Used to set the allowable range of setpoint manipulation from a ZS sensor in the space Default: +/- 3 °F	
22	Sensor Override Enable/Disable	enable_pu_sh_button_1	BV:95	Coil	00010	Binary Data	70	-	-	-	Used to enable or disable ZS Plus/Pro Sensor Override in the space 0 = ZS Sensor Override NOT Allowed 1 = ZS Sensor Override Allowed (Default)	
23	Override Status	override_status_1	BV:94	Discrete Input	10072	Binary Data	69	-	-	-	Reports status of override button on ZS Plus/Pro Sensor 0 = Normal 1 = ZS Sensor in Override Mode	
24	Override Time Remaining	tlo_rem_1	AV:115	Input Register (Float)	30047	Internal Float	82	58	nvoTlo-Rem	SNVT_count_inc(9)	Reports time remaining since ZS Plus/Pro sensor in the space was placed in manual override mode	
25	Setpoint	occ_clg_stpt_1	AV:4	Holding Register (Float)	40103	Internal Float	52	9	nviOcc-ClgStpt	SNVT_temp_p(10 5)	Occupied Cooling Setpoint Setup in °F Default: 74 °F	
26	Setpoint	occ_htg_stpt_1	AV:2	Holding Register (Float)	40105	Internal Float	53	10	nviOccHtgStpt	SNVT_temp_p(10 5)	Occupied Heating Setpoint Setup in °F Default: 70 °F	
27	Setpoint	unocc_clg_stpt_1	AV:1	Holding Register (Float)	40131	Internal Float	66	13	nviUnocc-ClgStpt	SNVT_temp_p(10 5)	Unoccupied Cooling Setpoint Setup in °F Default: 90 °F	
28	Setpoint	unocc_htg_stpt_1	AV:3	Holding Register (Float)	40133	Internal Float	67	14	nviUnoccHtgStpt	SNVT_temp_p(10 5)	Unoccupied Heating Setpoint Setup in °F Default: 55 °F	
29	Effective Cooling Setpoint	eff_clg_stpt_1	AV:5	Holding Register (Float)	40039	Internal Float	20	4	nvoEff-ClgStpt	SNVT_temp_p(10 5)	Effective Cooling Setpoint (after setpoint adjustment applied) in °F	
30	Effective Heating Setpoint	eff_htg_stpt_1	AV:6	Holding Register (Float)	40045	Internal Float	23	5	nvoEffHtgStpt	SNVT_temp_p(10 5)	Effective Heating Setpoint (after setpoint adjustment applied) in °F	
31	Zone Temperature	eff_zone_temp_1	AV:7	Holding Register (Float)	40057	Internal Float	29	38	nviContFan	SNVT_switch(95)	Effective Zone Temperature Status in °F	

Table 22

Integration Points													
Point Description Name	BACnet		MODBUS		N2		LON			Read Only	Description		
	Name	Type ID	Object Type	Register	Type	ID	SNVT #	Name	SNVT				
Zone Control Setup & Status	32	Night Setback (NSB) Status	nsb_status_1	BV:22	Discrete Input	10013	Binary input	13	8	nvoNsb-Status	SNVT_switch(95)	✓	Night Setback Status 0 = Night Setback disabled 1 = Night Setback enabled
	33	High ZS Zone Sensor Temperature Alarm	ztmp_hi_1	BV:26	Discrete Input	10062	Binary input	62	-	-	-	✓	Zone Temperature Alarm (High) 0 = Normal 1 = High Zone Temperature(Default: 10 °F Above Setpoint)
	34	Low ZS Zone Sensor Temperature Alarm	ztmp_lo_1	BV:27	Discrete Input	10063	Binary input	63	-	-	-	✓	Zone Temperature Alarm (Low) 0 = Normal 1 = Low Zone Temperature(Default: 10 °F Below Setpoint)
	35	ZS Zone Sensor Hardware Failure Alarm	zone_sen_1	BV:28	Discrete Input	10058	Binary input	58	-	-	-	✓	Zone Sensor Failure Alarm 0 = Normal 1 = Sensor Failure (Check: ZS Sensor Hardware)
REM	36	Effect Zone Remote Temperature	eff_remzone_temp_1	AV:9	Input Register (Float)	30019	Internal Float	25	-	-	-	✓	Reports the Effective Temperature from a Zone Remote Temp Sensor after an offsets have been applied
	37	Remote Temp or Return Air Temp Value	zone_rem_sen_val_1	AV:31	Input Register (Float)	30035	Internal Float	58	-	-	-	✓	Reports the Return Air Temperature or Zone Remote Temperature at the Sensor
	38	System Status	sys_status_1	AV:16	Input Register (Float)	30031	Internal Float	54	28	nvoSys-Status	SNVT_count_inc(9)	✓	General System Status 0 = Unoccupied 1 = Occupied 2 = Fan Only 3 = Heating 4 = Cooling 5 = Transition to Cool 6 = Transition to Heat 7 = Air Economizer 8 = Unit Locked 9 = Aux Heat 10 = Re-Heat 11 = Manual Re-Heat 12 = Transition to Re-Heat 13 = Free Cooling 14 = Transition to Free Cooling 15 = Water-Side Economizer
	39	Cooling Demand Percentage	clg_pct_1	AV:13	Holding	40025	Internal	13	-	-	-	✓	Cooling Status in Demand Percent, %
	40	Heating Demand Percentage	htg_pct_1	AV:12	Holding	40073	Internal	37	-	-	-	✓	Heating Capacity in %
	41	Leaving Water Temperature (LWT)	eff_lwt_1	AV:11	Input Register (Float)	30015	Internal Float	21	23	nvoEff-Lwt	SNVT_temp_p(10 5)	✓	Effective Leaving Water Temperature Status in °F

Table 23

Integration Points												
	Point Description Name	BACnet		MODBUS		N2		LON			Read Only	Description
		Name	Type ID	Object Type	Register	Type	ID	SNVT #	Name	SNVT		
42	Effect Disch Air Temp	eff_dat_1	AV:10	Input Register (Float)	30011	Internal Float	18	21	nvoEffDat	SNVT_temp_p(105)	✓	Discharge Air Temperature (DAT) in °F
43	Outdoor Air Temperature (OAT)	eff_oat_1	AV:75	Holding Register (Float)	40055	Internal Float	28	6	nvoEf-fOat	SNVT_temp_p(105)	✓	Effective Outdoor Temperature Status in °F
44	Discharged Air Temperature Setpoint	dat_stpt_1	AV:30	Holding Register (Float)	40017	Internal Float	11	18	nvi-DatStpt	SNVT_temp_p(105)		Discharged Air Temperature Setpoint Setup in °F Default: 65 °F
45	Temperature Reset Source	rst_temp_source_1	AV:8	Holding Register (Float)	40083	Internal Float	62	-	-	-		Temperature Reset Source Selection 0 = Outside Air Temperature Reset (Default) 1 = Mixed Air (or Return Air) Temperature Reset
46	Outside Air Temperature Sensor Source Status	oat_sel_st_a_1	AV:78	Input Register (Float)	30029	Internal Float	43	-	-	-	✓	Outside Air Temperature Sensor Source Status 1 = BAS OAT Sensor 2 = Hard-Wired OAT Sensor (Default)
47	Temperature Reset Mode	oat_rst_m_ode_1	AV:71	Holding Register (Float)	40037	Internal Float	41	-	-	-		Outside Air Temperature Reset Setup 0 = Single 1 = Multiple (Default)
48	Single Reset/Free Cooling Reset Temperature	oat_reset1_1	AV:69	Holding Register (Float)	40027	Internal Float	35	-	-	-		Outside Air Temperature (Free Cooling Temperature) Operation in °F or Single Reset Temperature Default: 50 °F
49	Part Cool Reset Temperature	oat_reset2_1	AV:72	Holding Register (Float)	40029	Internal Float	36	-	-	-		Outside Air Temperature (Stage 1 Cooling Temperature) Operation in °F Default: 60 °F
50	Full Cool Reset Temperature	oat_reset3_1	AV:74	Holding Register (Float)	40033	Internal Float	38	-	-	-		Outside Air Temperature (Stage 2 Cooling Temperature) Operation in °F Default: 75 °F
51	Heating Reset Temperature	oat_reset_ht_1	AV:92	Holding Register (Float)	40035	Internal Float	39	-	-	-		Outside Air Temperature Reset Mixed Air (Stage 1 Heating) Operation in °F Default: 40 °F
52	Outside Air Temperature Sensor	oat_sel_1	AV:73	Holding Register (Float)	40041	Internal Float	42	-	-	-		Outside Air Temperature Sensor Source Setup 1 = BAS OAT Sensor 2 = Hard-Wired OAT Sensor (Default)
53	Outside Air Temperature Sensor Failure	oat_sen_1	BV:87	Discrete Input	10046	Binary Data	48	-	-	-	✓	Outside Air Temperature Alarm (Sensor) 0 = Normal 1 = Sensor Failure (Check Sensor Hardware)
54	Hot Gas Reheat Modulating Valve Status	eff_hgr_mod_vlv1_1	AV:28	Input Register (Float)	30005	Internal Float	14	19	nvoEffHgr-ModVlv 1	SNVT_lev_p(81)	✓	Effective Hot Gas Reheat Modulating Valve Output Status

Table 24

Integration Points													
	Point Description Name	BACnet		MODBUS		N2		LON			Read Only	Description	
		Name	Type ID	Object Type	Register	Type	ID	SNVT #	Name	SNVT			
Discharge Air Control Setup & Status	55	Compressor Enabled Stages	enabled_cl_stages_1	AV:68	Input Register (Float)	30023	Internal Float	27	-	-	✓	Compressor Stages Enabled 0 = No Stages Enabled 1 = 1 Stage Enabled 2 = 2 Stages Enabled	
	56	Supply Air Setpoint Differential	dat_stpt_diff_1	AV:58	Holding Register (Float)	40067	Internal Float	51	-	-		Supply Air Temperature Setpoint Differential Setup Default: 2.0 °F	
	57	Supply Air High Differential Trip	sat_hi_trip_1	AV:63	Holding Register (Float)	40063	Internal Float	50	-	-		Supply Air Temperature High Trip Differential Setpoint Setup Default: 2.0 °F	
	58	Supply Air Low Differential Trip	sat_lo_trip_1	AV:77	Holding Register (Float)	40061	Internal Float	49	-	-		Supply Air Temperature Low Trip Differential Setpoint Setup Default: 2.0 °F	
	59	High Cooling Supply Air Temperature in DAC	csat_hi_1	BV:86	Discrete Input	10016	Binary Data	17	-	-	✓	High Cooling Supply Air Temperature during Discharge Air Control Alarm 0 = Normal 1 = Alarm Active	
	60	Low Heating Supply Air Temperature in DAC	hsat_lo_1	BV:149	Discrete Input	10037	Binary Data	38	-	-	✓	Heating Supply Air Temp Alarm (Low) 0 = Normal 1 = Active (Default: <80 °F)	
ZTR	61	Effective Discharge Air Temperature Setpoint	eff_dat_st_pt_1	AV:67	Input Register (Float)	30049	Internal Float	83	-	-	✓	Effective Discharged Air Temperature Setpoint in °F after any resets are applied (for Discharge Air Control with Zone Temp Reset)	
	62	Effective ZS Sensor Temperature	zs_reset_1	AV:116	Input Register (Float)	30051	Internal Float	84	-	-	✓	Effective Zone Temperature reading from ZS sensor after any offsets have been applied (for Discharge Air Control with Zone Temp Reset)	
	63	Occupancy Status	occ_status_1	BV:21	Discrete Input	10014	Binary input	14	11	nvoOccStatus	SNVT_switch(95)	✓	Occupancy Status 0 = Unoccupied 1 = Occupied
	64	Fan Output Cmd	fan_cmd_1	BV:17	Discrete Input	10011	Binary input	11	7	nvoFanCmd	SNVT_switch(95)	✓	Fan Output Status (G) 0 = Fan Output Off 1 = Fan Output On
	65	Reversing Valve Output Status	rev_vlv_c_md_1	BV:15	Discrete Input	10050	Binary Data	54	-	-	✓	Reversing Valve Output Status 0 = Reversing Valve De-energized 1 = Reversing Valve Energized	
	66	Comp Stage1 Output Cmd	cmp_stg1_cmd_1	BV:11	Discrete Input	10008	Binary Data	8	33	nvoCmpStg1Cmd	SNVT_switch(95)	✓	Compressor Stage 1 Output Status 0 = Compressor 1 Off 1 = Compressor 1 On
	67	Comp Stage2 Output Cmd	cmp_stg2_cmd_1	BV:12	Discrete Input	10009	Binary Data	9	34	nvoCmpStg2Cmd	SNVT_switch(95)	✓	Compressor Stage 2 Output Status 0 = Compressor 2 Off 1 = Compressor 2 On
	68	Compressor Stages	cmp_stgs_1	AV:14	Input Register (Float)	30001	Internal Float	7	16	nvoCmpStgs	SNVT_count_inc(9)	✓	Reports Configuration Status of Compressor Stages 1 = 1 Compressor 1 Stage 2 = 2 Compressor 2 Stages 5 = 1 Compressor 2 Stages
	69	Compressor Status	comp_stat_e_1	AV:120	Input Register (Float)	30053	Internal Float	90	47	nvoCompState	SNVT_count_inc(9)	✓	Reports compressor state for heat pump units: 0 = Normal/Off 1 = Compressor Locked 2 = Compressor Overridden ON 3 = Compressor Shutdown/Alarm

Table 25

Integration Points													
	Point Description Name	BACnet		MODBUS		N2		LON			Read Only	Description	
		Name	Type ID	Object Type	Register	Type	ID	SNVT #	Name	SNVT			
Alarms	70	Alarm Status	alm_status_1	BV:24	Discrete Input	10002	Binary Data	2	-	-	-	✓	Network Status indicating alarm condition in unit (see ""Current Alarm"" for more information) 0 = System Normal 1 = System in Alarm
	71	Current Alarm Condition Status	current_alarm_1	AV:17	Input Register (Float)	30003	Internal Float	9	17	nvoCurrentAlarm	SNVT_count_inc(9)	✓	Alarm Status of unit: 0 = No Alarm, 1-10 = UPM Fault Code (See UPM Alarms below) 20 = Output Overridden via Keypad 30 = Sensor Failure 40 = Leaving Water Temp Alarm 50 = Zone Temp Alarm 60 = Discharge Air Temperature Alarm 70 = Filter Alarm/Compressors 1 & 2 Runtime 80 = Zone Humidity Alarm 90 = High CO2 Level Alarm 100 = Differential Pressure Switch (DPS) Alarm
	72	High Leaving Water Temperature	lvg_hi_1	BV:32	Discrete Input	10041	Binary Data	43	-	-	-	✓	High Leaving Water Temperature Alarm (LWT) 0 = Normal 1 = Alarm (Default: >135 °F)
	73	Low Leaving Water Temperature	lvg_lo_1	BV:33	Discrete Input	10042	Binary Data	44	-	-	-	✓	Low Leaving Water Temperature (LWT) 0 = Normal 1 = Alarm (Default: <40 °F)
	74	High Discharge Air Temperature	dat_hi_1	BV:29	Discrete Input	10021	Binary Data	22	-	-	-	✓	Discharge Air Temperature Sensor Alarm (High Threshold - Cooling) 0 = Normal 1 = Alarm (Default: >70 °F)
	75	Discharge Air Temperature Alarm	dat_lo_1	BV:30	Discrete Input	10022	Binary Data	23	-	-	-	✓	Discharge Air Temperature Sensor Alarm (Low Threshold - Heating) 0 = Normal 1 = Low DAT Alarm (Default: <75 °F)
	76	UPM Safety - High Pressure Alarm	hp1_2st_1	BV:5	Discrete Input	10035	Binary Data	36	44	nvoHp12st	SNVT_switch(95)	✓	UPM High Pressure Alarm Status 0 = Normal 1 = High Pressure Alarm (UPM-I code = 1; UPM-II codes = 1,3)
	77	UPM Safety - Low Pressure Alarm	lp1_2st_1	BV:4	Discrete Input	10039	Binary Data	41	46	nvoLp12st	SNVT_switch(95)	✓	UPM Low Pressure Alarm Status 0 = Normal 1 = Low Pressure Alarm (UPM-I code = 2; UPM-II codes = 2,4)
	78	UPM Safety - Condenser Coil Freeze Alarm	frz_2st_1	BV:8	Discrete Input	10030	Binary Data	31	42	nvoFrz2st	SNVT_switch(95)	✓	UPM Condenser Coil Freeze Alarm Status 0 = Normal 1 = Condenser Freeze Alarm(UPM-I code = 3; UPM-II codes= 5,9)
	79	UPM Safety - High Condensate Alarm	con_2st_1	BV:9	Discrete Input	10010	Binary Data	12	37	nvoCon2st	SNVT_switch(95)	✓	UPM Condensate Drain Alarm Status 0 = Normal 1 = Condensate Overflow Alarm(UPM-I code = 4; UPM-II code = 6)

Table 26

Integration Points													
	Point Description Name	BACnet		MODBUS		N2		LON			Read Only	Description	
		Name	Type ID	Object Type	Register	Type	ID	SNVT #	Name	SNVT			
Alarms	80	UPM Safety - Brownout Alarm	brn_2st_1	BV:10	Discrete Input	10004	Binary Data	4	32	nvoBrn2st	SNVT_switch(95)	✓	UPM Brownout Alarm Status 0 = Normal 1 = Brownout Alarm (UPM-I code = 5; UPM-II code = 7)
	81	UPM Safety - Evaporator Coil Freeze Alarm	frz_evap_2st_1	BV:90	Discrete Input	10031	Binary Data	32	43	nvoFrzEvap2st	SNVT_switch(95)	✓	UPM Evaporator Coil Freeze Alarm Status 0 = Normal 1 = Evaporator Freeze Alarm (UPM-I code = 6; UPM-II codes = 8,10)
	82	UPM Safety - A2L Alarm	a2l_2st_1	BV:104	Discrete Input	10104	Binary Data	104	N/A	N/A	N/A	N/A	UPM A2L Alarm Status 0 = Normal 1 = A2L Alarm (UPM-I code = 7; UPM-II codes = 11)
	83	UPM Safety Communication Alarm	comm_2st_1	BV:106	Discrete Input	10106	Binary Data	106	N/A	N/A	N/A	N/A	UPM Communication Alarm Status 0 = Normal 1 = Communication Alarm (UPM-II codes = 12)*
	84	UPM Reset	upm_rst_1	BV:25	Coil	00009	Binary Data	61	50	nviUpmRst	SNVT_switch(95)	✓	UPM Reset (Momentary On/Off) 0 = Reset Off (Default) 1 = Reset On
	85	UPM Input Alarm	upm_input_1	BV:39	Discrete Input	10064	Binary Data	60	-	-	-	✓	UPM Input Failure Alarm 0 = UPM Connected 1 = UPM Connection Failure(Check Alarm Hardware Configuration)
	86	Leaving Water Temperature Sensor Failure	lvg_sen_1	BV:34	Discrete Input	10043	Binary Data	45	-	-	-	✓	Leaving Water Temperature Alarm (Sensor) 0 = Normal 1 = Sensor Failure (Check Sensor Hardware)
	87	Discharge Air Temperature Sensor	da_sen_1	BV:31	Discrete Input	10018	Binary Data	19	-	-	-	✓	Discharge Air Temperature Sensor Alarm 0 = Sensor Normal 1 = Sensor Failure Alarm (Check Sensor Hardware Configuration)
	88	Digital Override Lock Alarm	do_lock_1	BV:37	Discrete Input	10023	Binary Data	24	-	-	-	✓	Digital Override Lock Alarm 0 = Normal 1 = Digital Override Enabled Alarm
	89	Inputs Override Status	input_lock_1	BV:38	Discrete Input	10038	Binary Data	39	-	-	-	✓	Software Input Lock 0 = Normal 1 = Software Lock Enabled
90	Duplicate Input 1&2 Alarm	dup_in12_1	BV:2	Discrete Input	10001	Binary Data	1	-	-	-	✓	Duplicated Sensor Configuration for IN-1 and IN-2 Alarm 0 = Normal 1 = Alarm (Check input configuration for conflicts)	

Table 27

Integration Points												
Point Description Name	BACnet		MODBUS		N2		LON			Read Only	Description	
	Name	Type ID	Object Type	Register	Type	ID	SNVT #	Name	SNVT			
91	Compressor 1 Runtime	comp1_rnt_m_1	BV:35	Discrete Input	10006	Binary Data	6	-	-	-	✓	Fan Mode 1 = Auto (cycle with compressor) 4 = On (Default)
92	Compressor 2 Runtime	comp2_rnt_m_1	BV:36	Discrete Input	10007	Binary Data	7	-	-	-	✓	Compressor 2 Runtime Alarm Status 0 = Normal 1 = Timer Has Expired (Default: >8760 Hours)
93	Compressor 1 Runtime Reset	cmp1_rnt_m_rst_1	BV:13	Coil	00002	Binary Data	10	35	nviCmp1RntmRst	SNVT_switch(95)		Compressor 1 Runtime Reset. Momentary On/Off required. 0 = Reset Off (Default) 1 = Reset On
94	Compressor 2 Runtime Reset	cmp2_rnt_m_rst_1	BV:14	Coil	00003	Binary Data	11	36	nviCmp2RntmRst	SNVT_switch(95)		Compressor 2 Runtime Reset. Momentary On/Off required. 0 = Reset Off (Default) 1 = Reset On
95	High Remote Temperature Alarm	zrem_hi_1	BV:41	Discrete Input	10060	Binary input	60	-	-	-	✓	Remote Sensor Zone Temperature Alarm (High) 0 = Normal 1 = High Zone Temperature(Default: 10 °F Above Setpoint)
96	Low Remote Temperature Alarm	zrem_lo_1	BV:42	Discrete Input	10061	Binary input	61	-	-	-	✓	Remote Sensor Zone Temperature Alarm (Low) 0 = Normal 1 = Low Zone Temperature(Default: 10 °F Below Setpoint)
97	Remote Temperature Sensor Hardware Failure Alarm	"zrem_sen_1"	BV:43	Discrete Input	10059	Binary input	59	-	-	-	✓	Remote Temperature Zone Sensor Failure Alarm 0 = Normal 1 = Sensor Failure (Check Remote Sensor Hardware)
98	Entering Water Temperature Sensor Alarm	ewt_sen_1	BV:80	Discrete Input	10026	Binary Data	27	26	nvoEwtSen	SNVT_switch(95)	✓	Entering Water Temperature Sensor Alarm 0 = Normal 1 = Sensor Failure Alarm (Check Hardware)
99	Air Economizer Status	aecon_stat_us_1	BV:6	Discrete Input	10032	Binary Data	13	-	-	-	✓	Air Economizer Option Status 0 = Inactive 1 = Active
100	OAT high limit for Air Econ	oat_hi_lim_aecon_1	AV:100	Holding Register (Float)	40113	Internal Float	86	-	-	-		Air Economizer Option: range setting for Outside Air Temperature (High Limit) i °F Default: 60 °F
101	OAT low limit for Air Econ	oat_lo_lim_aecon_1	AV:117	Holding Register (Float)	40115	Internal Float	87	-	-	-		Air Economizer Option: range setting for Outside Air Temperature (Low Limit) i°F Default: 50 °F
102	Outdoor RH high limit for Air Econ	rh_hi_lim_aecon_1	AV:118	Holding Register (Float)	40117	Internal Float	88	-	-	-		Air Economizer Option: range setting for Outside Air Relative Humidity (High Limit) in % Default: 50 %
103	Outdoor RH low limit for Air Econ	rh_lo_lim_aecon_1	AV:119	Holding Register (Float)	40119	Internal Float	89	-	-	-		Air Economizer Option: range setting for Outside Air Relative Humidity (Low Limit) in % Default: 40 %

Table 28

Integration Points												
Point Description Name	BACnet		MODBUS		N2		LON			Read Only	Description	
	Name	Type ID	Object Type	Register	Type	ID	SNVT #	Name	SNVT			
104	Boilerless Status	htg_econ_1	BV:91	Discrete Input	10034	Binary Data	35	30	nvoHtgEcon	SNVT_switch(95)	✓	Boilerless Control Status 0 = Off 1 = On (Electric Heating)
105	Economizer Cooling Command	clg_econ_1	BV:92	Discrete Input	10015	Binary Data	16	-	-	-	✓	Cooling Economizer Status 0 = On 1 = Off
106	Entering Water Temperature	eff_ewt_1	AV:62	Input Register (Float)	30013	Internal Float	19	22	nvoEffEwt	SNVT_temp_p(105)	✓	Water Side Economizer Effective Entering Water Temperature in °F
107	Condenser Water Valve Output	cwv_cmd_1	BV:79	Discrete Input	10017	Binary Data	18	-	-	-	✓	Condenser Water Valve Status 0 = Closed 1 = Open
108	Valve End Switch Status	ves_status_1	BV:68	Discrete Input	10065	Binary Data	62	-	-	-	✓	Valve End Switch Status 0 = Off 1 = Valve End Switch Detected
109	Valve Switch Hand	ves_hand_1	BV:150	Discrete Input	10066	Binary Data	63	-	-	-	✓	Valve End Switch Hand Mode Condenser Water Valve engaged but not commanded by controller.
110	Valve End Switch Alarm	ves_fail_1	BV:151	Discrete Input	10067	Binary Data	64	-	-	-	✓	Valve End Switch Fail Alarm 0 = Normal 1 = Active
111	Differential Pressure Switch (DPS) Alarm	dps_alarm_1	BV:77	Discrete Input	10024	Binary Data	25	-	-	-	✓	Differential Pressure Switch Alarm 0 = Normal 1 = Alarm
112	Aux Heat Output Cmd	aux_htg_cmd_1	BV:20	Discrete Input	10003	Binary Data	3	31	nvoAuxHtgCmd	SNVT_switch(95)	✓	Auxiliary Heat Output Status 0 = Aux Heat Off 1 = Aux Heat On
113	Pre-Heat Output Override	pre_htg_ovrde_1	AV:175	Holding Register (Float)	40049	Internal Float	45	-	-	-		Pre-Heat Output Override Allow/Do not Allow 0 = Do not allow override (Default) 1 = allow override
114	SCR Electric Heat Output	mat_pid_1	AV:121	Input Register (Float)	30055	Internal	91	-	-	-	✓	SCR controlled Electric Heat Output in %
115	Filter Service Alarm	filter_1	BV:40	Discrete Input	10029	Binary Data	30	-	-	-	✓	Filter Alarm 0 = Off 1 = Service Filter Alarm
116	Reset Fan Runtime	fan_rntm_rst_1	BV:19	Coil	00007	Binary Data	52	-	-	-		Reset Fan Runtime. Momentary On/Off required for reset 0 = Reset Off (Default) 1 = Reset On

Table 29

Integration Points												
	Point Description Name	BACnet		MODBUS		N2		LON			Read Only	Description
		Name	Type ID	Object Type	Register	Type	ID	SNVT #	Name	SNVT		
Fan Status	117	Set Fan Mode	fan_mode_1	MSV:2	Holding Register (Signed)	40123	Internal Integer	2	54	nviFanMode	SNVT_count_inc(9)	Set Fan Mode 1 = Auto (Cycl with Compressor) 4 = On (Default)
	118	Fan Mode Status	fan_mode_stat_1	MSV:1	Input Register (Signed)	30059	Internal Integer	1	53	nvoFanModeStat	SNVT_count_inc(9)	Fan Mode Status 1 = Auto (Cycl with Compressor) 4 = On (Default)
	119	Fan Running Status	fan_status_1	BV:66	Discrete Input	10028	Binary Data	29	41	nvoFanStatus	SNVT_switch(95)	Fan Running Status 0 = Off 1 = On - Fan Running
	120	Fan Hand Mode Alarm	saf_hand_1	BV:83	Discrete Input	10027	Binary Data	28	-	-	-	Fan Hand Mode Alarm Fan is running but not being commanded by controller.
	121	Supply Air Fan Switch Failure	saf_switch_fail_1	BV:82	Discrete Input	10052	Binary Data	56	-	-	-	Supply Air Fan Status Alarm 0 = Normal 1 = Alarm (Check Fan Hardware)
Hot Gas Reheat	122	Zone Humidity	eff_zone_humid_1	AV:20	Input Register (Float)	30021	Internal Float	26	24	nvoEffZoneHumid	SNVT_lev_percent(81)	Effective Zone Humidity in Percent RH (%)
	123	Occupied Zone Humidity Setpoint	occ_zhumid_stpt_1	AV:21	Holding Register (Float)	40043	Internal Float	44	-	-	-	Occupied Humidity Setpoint Setup in % Default: 55%, Minimum: 20%, Maximum: 95%
	124	Zone Humidity Setpoint Differential	zhumid_stpt_diff_1	AV:22	Holding Register (Float)	40071	Internal Float	57	-	-	-	Zone Humidity Setpoint Differential Setup in RH % Default: 2%, Minimum: 1%, Maximum: 5%
	125	Hot Gas ReHeat Valve Status	eff_hgrv_cmd_1	BV:44	Discrete Input	10025	Binary Data	26	-	-	-	Hot Gas ReHeat Valve Status (Start/Stop) 0 = Valve Off 1 = Valve On
	126	High Humidity Alarm	zhumid_hi_1	BV:45	Discrete Input	10068	Binary Data	65	-	-	-	Zone Humidity Alarm (High) 0 = Normal 1 = High Humidity (Default: 10% above Setpoint)
	127	Low Humidity Alarm	zhumid_lo_1	BV:46	Discrete Input	10069	Binary Data	66	-	-	-	Zone Humidity Alarm (Low) 0 = Normal 1 = Low Humidity (Default: 30% below Setpoint)
	128	Humidity Sensor Hardware Failure Alarm	zhumid_sen_1	BV:47	Discrete Input	10070	Binary Data	67	-	-	-	Zone Humidity Sensor Alarm 0 = Normal 1 = Sensor Failure (Check RH Sensor Hardware Configuration)

Table 30

Integration Points												
	Point Description Name	BACnet		MODBUS		N2		LON			Read Only	Description
		Name	Type ID	Object Type	Register	Type	ID	SNVT #	Name	SNVT		
Input Expansion Module	129	Input Expansion Module Mode	iem_mode_1	AV:50	Holding Register (Float)	40085	Internal Float	63	-	-	-	IEM in Controller Input #5 (IN-5) Configuration Setup 0 = Dirty Filter Switch, Fan Status Switch, Valve End Switch (Default) 1 = Smoke Detector Switch, Fan Status Switch, Valve End Switch 2 = Dirty Filter Switch, Fan Status Switch, Differential Pressure Switch 3 = Smoke Detector Switch, Fan Status Switch, Dirty Filter Switch 4 = Dirty Filter Switch, Fan Status Switch, Damper End Switch 5 = Smoke Detector Switch, Fan Status Switch, Secondary Drain Pan 6 = Dirty Filter Switch, Fan Status Switch, Pump Status
	130	Enable/Disable Fan Status Switch in IEM	allow_fan_alarm_1	BV:67	Coil	00011	Binary Data	71	-	-	-	Must be set to enable Fan Status Switch when using IEM in IN-5 0 = FSS on IEM disabled (Default)
	131	Enable/Disable Valve Switch in IEM	allow_ves_alarm_1	BV:69	Coil	00012	Binary Data	72	-	-	-	Must be set to enable Valve End Switch when using IEM in IN-5 0 = VES on IEM disabled (Default)
Mixed Air Control	132	Smoke Alarm Enable/Disable	smoke_alarm_1	BV:71	Coil	00014	Binary Data	74	-	-	-	Must be set to enable Smoke Detector Switch when using IEM in IN-5 0 = SDS on IEM disabled (Default) 1 = SDS on IEM Enabled
	133	Mixed Air Temperature (MAT)	eff_mat_1	AV:87	Input Register (Float)	30017	Internal	22	-	-	-	Effective Mixed Air Temperature in °F
	134	Mix Air Temperature Source Status	mat_sel_status_1	AV:84	Input Register (Float)	30025	Internal Float	30	-	-	-	Mixed Air Temperature Sensor Source Status 0 = BAS MAT 1 = Wired MAT
	135	Mixed Air Temperature Sensor	mat_sel_1	AV:85	Holding Register (Float)	40019	Internal Float	31	-	-	-	Mixed Air Temperature Sensor Source Setup 0 = BAS MAT Sensor 1 = Hard-Wired MAT Sensor (Default)
	136	Mixed Air Temperature Setpoint	mat_stpt_1	AV:90	Holding Register (Float)	40021	Internal Float	32	-	-	-	Mixed Air Temperature Setpoint Default: 42 °F, Minimum: 40°F, Maximum: 60°F
	137	Electric Preheat Output	ma_preheat_1	AV:61	Input Register (Float)	30041	Internal Float	85	-	-	-	SCR Electric Preheat Output for Mixed Air Control Option in V
	138	Low Mixed Air Temperature	mat_low_1	BV:89	Discrete Input	10044	Binary Data	46	-	-	-	Mixed Air Low Temperature Alarm (Low) 0 = Normal 1 = Alarm (Default: <38 °F)
	139	Mix Air Temperature Sensor Failure	mat_sen_1	BV:88	Discrete Input	10045	Binary Data	47	-	-	-	Mixed Air Low Temperature Alarm (Sensor) 0 = Normal 1 = Sensor Failure (Check Sensor Hardware)

Table 31

Integration Points													
	Point Description Name	BACnet		MODBUS		N2		LON			Read Only	Description	
		Name	Type ID	Object Type	Register	Type	ID	SNVT #	Name	SNVT			
Pump	140	Circulation Pump Output Command	pump_cm_d_1	BV:3	Discrete Input	10005	Binary Data	5	-	-	-	✓	Loop Water Pump Status 0 = Pump Running 1 = Pump Off
	141	Circulation Pump Switch Failure Alarm	pss_fail_1	BV:56	Discrete Input	10047	Binary Data	49	-	-	-	✓	Pump Status Switch Fail Alarm 0 = Normal 1 = Active
	142	Pump Switch Status	pump_stat us_1	BV:57	Discrete Input	10048	Binary Data	50	-	-	-	✓	Pump Switch Status 0 = Off 1 = Pump Switch Detected
	143	Circulation Pump Switch In Hand Alarm	pss_hand_1	BV:58	Discrete Input	10049	Binary Data	51	-	-	-	✓	Pump Status Switch Hand Mode Pump running but not being commanded by controller.
SDP	144	Secondary Condensate Pump Alarm	conpump_1	BV:50	Discrete Input	10012	Binary Data	14	-	-	-	-	Secondary Condensate Pump Alarm 0 = Normal 1 = Alarm Active
Smoke	145	Smoke Event Alarm Notification	smoke_1	BV:81	Discrete Input	10054	Binary Data	58	49	nvoSmoke	SNVT_switch(95)	✓	Smoke Detector Alarm 0 = Normal 1 = Alarm
	146	Smoke Event Status	smoke_status_1	BV:70	Discrete Input	10055	Binary Data	59	-	-	-	✓	Smoke Alarm Status 0 = Normal 1 = Smoke Detector Active
Demand Controlled Ventilation	147	Zone CO2 Level	eff_zn_co2_lev_1	AV:25	Holding Register (Float)	40065	Internal Float	33	-	-	-	✓	Effective Zone CO2 Levels in PPM
	148	Zone CO2 High Trip	zn_co2_hi_trip_1	AV:27	Holding Register (Float)	40135	Internal Float	68	-	-	-	-	Set level of CO2 reported as a High Level Alarm Default: 1200 PPM
	149	CO2 Hardware Failure Alarm	zn_co2_fail_1	BV:51	Discrete Input	10056	Binary Input	56	-	-	-	✓	CO2 Zone Sensor Alarm (Sensor) 0 = Normal 1 = Sensor Failure (Check CO2 Hardware Configuration)
	150	High CO2 Alarm	zn_co2_hi_1	BV:48	Discrete Input	10057	Binary Input	57	-	-	-	✓	CO2 Zone Sensor Alarm (High) 0 = Normal 1 = High CO2 Level (Default: >1200 PPM)
	151	Damper Option Selection	dmp_opt_sel_1	AV:107	Holding Register (Float)	40093	Internal Float	72	-	-	-	-	Used to configure how on/off damper is enabled when not enabled by CO2 0 = Damper Opens when Fan Runs (Default) 1 = Damper Opens when Occupied 2 = Damper Opens for Free Cooling (Air Economizer)
	152	Damper Command	damper_cmd_1	BV:49	Discrete Input	10020	Binary Data	21	39	nvoDamperCmd	SNVT_switch(95)	✓	Damper Position Output Status 0 = Closed 1 = Open
	153	Damper End Switch	des_status_1	BV:93	Discrete Input	10019	Binary Data	20	-	-	-	✓	Damper End Switch Status 0 = Damper Closed 1 = Damper Open
	154	Modulating Damper Position	eff_dpr_pos_screen_1	AV:81	Holding Register (Float)	40047	Internal Float	24	-	-	-	✓	Effective Outside Air Modulating Damper Position in %
	155	Minimum Damper Position	min_mdpr_pos_1	AV:79	Holding Register (Float)	40079	Internal Float	40	-	-	-	-	Minimum Modulating Damper Position Setup Default = 10% Open
	156	Damper Occupancy Selection	mdpr_occ_sel_1	AV:97	Holding Register (Float)	40031	Internal Float	16	-	-	-	-	Modulating Damper Occupancy Selection Setup 0 = Disabled 1 = Occupied (Default) 2 = Unoccupied 3 = Any Occupancy

Table 32

Integration Points													
	Point Description Name	BACnet		MODBUS		N2		LON			Read Only	Description	
		Name	Type ID	Object Type	Register	Type	ID	SNVT #	Name	SNVT			
VFD	157	Static Air Fan Speed	eff_sa_fan_speed_1	AV:55	Input Register (Float)	30007	Internal Float	15	20	nvoEffSaFanSpeed	SNVT_lev_percent(81)	✓	Effective Static Air Fan Speed in %
	158	Supply Air Duct Static Pressure	eff_sa_sta_press_1	AV:53	Input Register (Float)	30009	"Internal Float"	17	-	-	-	✓	Effective Static Air Pressure Sensor Status in "H2O"
	159	Static Press Setpoint	sta_press_stpt_1	AV:52	Holding Register (Float)	40053	Internal Float	47	27	nviStaPressStpt	SNVT_press_p(113)	-	Static Pressure Setpoint in inches of H2O Setup Default: 1.00 "H2O"
	160	Supply Air Fan Minimum Speed	saf_min_speed_1	AV:59	Holding Register (Float)	40059	"Internal Float"	48	-	-	-	-	Minimum VFD Fan Speed Setpoint Setup Default: 40%
	161	Supply Air Static Pressure High Trip	sa_sta_hi_trip_1	AV:54	Holding Register (Float)	40051	"Internal Float"	46	-	-	-	-	High Static Air Pressure Alarm Trip Setpoint inches of H2O Default: 2.75 "H2O"
	162	Static Air Pressure Sensor Hardware Alarm	sas_sen_1	BV:65	Register (Float)	10051	Binary Data	55	-	-	-	✓	Static Air Pressure Sensor Alarm (Sensor) 0 = Normal 1 = Sensor Failure (Check Static Pressure Hardware Configuration)"
	163	High Static Pressure Alarm	sas_hi_1	BV:64	Discrete Input	10053	Binary Data	57	-	-	-	✓	Static Air Pressure Alarm (High) 0 = Normal 1 = High Static Pressure (Default: > 2.75" H2O)
	164	Unit Mode	unit_mode_1	AV:23	Holding Register (Float)	40069	Internal Float	56	29	nviUnitMode	SNVT_count_inc(9)	-	Unit Mode Setup 0 = Cooling only 2 = Heat Pump (Default)
	165	Compressor Stages Selection	stages_1	AV:114	Holding Register (Float)	40107	Internal Float	79	-	-	-	-	*Selected Compressor Stages 1 = 1 Compressor 1 Stage (UPM-I Alarm Codes Used) 2 = 2 Compressor 2 Stages (UPM-II Alarm Codes Used) 5 = 1 Compressor 2 Stages (UPM-I Alarm Codes Used) (Default)
	166	Evaporator Coil Configuration Selection	coil_cfg_1	AV:94	Register (Float)	40011	Internal Float	6	-	-	-	-	Coil Configuration Setup 0 = Parallel (Default) 1 = Series
	167	BAS Loop Enable/Disable	loop_enabled_1	BV:23	Coil	00006	Binary Data	40	45	nviLoopEnabled	SNVT_switch(95)	-	Loop Status 0 = Disable Heat/Cool 1 = Allow Heat/Cool Operation (Default)
	168	BAS Relative Humidity Enable/Disable	rh_bas_sel_1	AV:51	Holding Register (Float)	40109	Internal Float	80	57	nviRhBasSel	SNVT_count_inc(9)	-	RH Sensor Source Selection 0 = BAS RH Sensor 1 = Hard-Wired RH Sensor (Default)
	169	CO2 BAS Enable/Disable	co2_bas_ena_1	AV:106	Holding Register (Float)	40091	Internal Float	71	-	-	-	-	*CO2 Sensor Source Selection 0 = BAS CO2 Sensor 1 = Hard-Wired CO2 Sensor (Default)*
BAS Values	170	BAS CO2 Sensor Value	bas_co2_val_1	AV:49	Holding Register (Float)	40001	Internal Float	1	1	nviBasCo2Val	SNVT_ppm(29)	-	*BAS CO2 Sensor Value in PPM Default: 1001 PPM*
	171	BAS Mixed Air Temp	bas_mat_1	AV:86	Holding Register (Float)	40003	"Internal Float"	2	-	-	-	-	*BAS Mixed Air Temperature Value in °F Default: 66.5 °F*
	172	BAS Outside Air Temperature	effective_oat_1	AV:29	Holding Register (Float)	40005	"Internal Float"	3	0	nviEffectiveOAT	*SNVT_temp_p(105)*	-	*Effective Outside Air Temperature in °F Default: 60 °F*
	173	BAS RH Sensor Value	bas_rh_sen_val_1	AV:56	Holding Register (Float)	40007	Internal Float	4	15	nviBasRhSenVal	SNVT_lev_percent(81)	-	*RH Sensor Value Supplied by BAS in % Default: 56 %RH*
	174	BAS Temperature Sensor Value	bas_sen_val_1	AV:19	Holding Register (Float)	40009	Internal Float	5	2	nviBasSenVal	SNVT_temp_p(105)	-	*BAS Zone Temperature Sensor Value in °F Default: 74 °F*

Table 33

14 ZS Combination Sensors

14.1 ZS Sensor Overview

The Bosch line of intelligent zone sensors provides the function and flexibility you need to manage the conditions important to the comfort and productivity of the zone occupants. The ZS sensors are available in a variety of zone sensing combinations to address most application needs. These combinations include temperature, relative humidity, and indoor air quality (carbon dioxide). They are built to be flexible, allowing for easy customization of what the user/technician sees. Designed to work with the Control Air 5600 controller, the ZS sensor line includes the ZS Standard, ZS Plus, and ZS Pro.

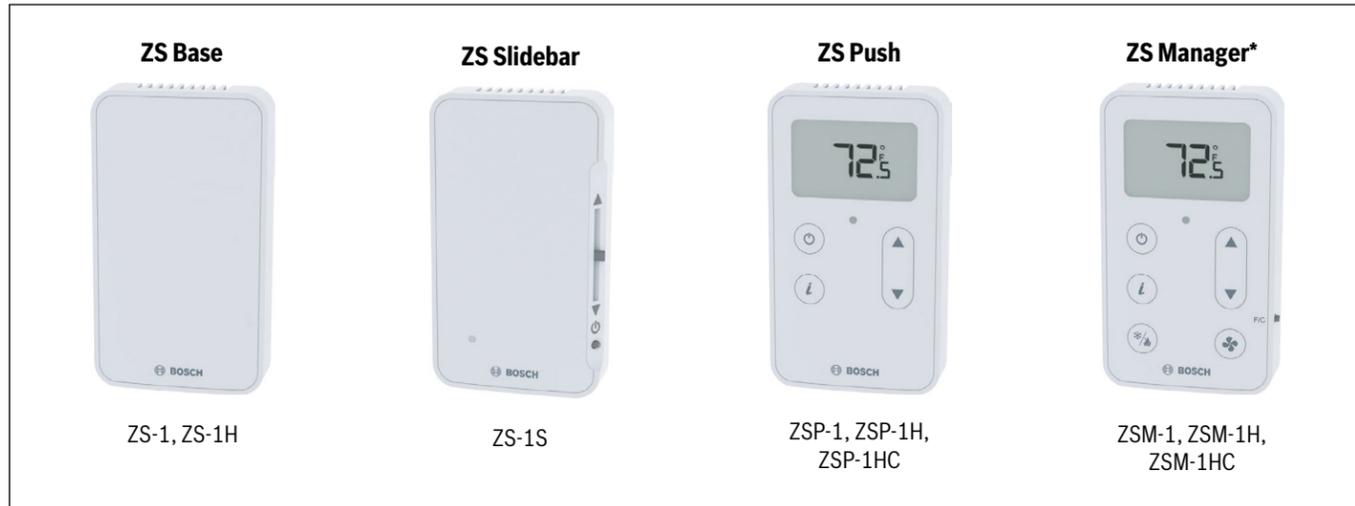


Fig. 19 ZS Sensors

Features	Model								
	ZS-1	ZS-1H	ZS-1S	ZSP-1	ZSP-1H	ZSP-1HC	ZSM-1	ZSM-1H	ZSM-1HC
Part Number	8733951033	8733951034	8733951035	8733951036	8733951037	8733951038	8733951039	8733951040	8733951041
Temperature	•	•	•	•	•	•	•	•	•
Humidity		•			•	•		•	•
CO ₂						•			•
Neutral color	•	•	•	•	•	•	•	•	•
Addressable/supports daisy-chaining	•	•	•	•	•	•	•	•	•
Hidden communication port	•	•	•	•	•	•	•	•	•
Mounts on standard 2" x 4" electrical box	•	•	•	•	•	•	•	•	•
Occupancy status indicator			•	•	•	•	•	•	•
Push-button occupancy override			•	•	•	•	•	•	•
Set-point adjust			•	•	•	•	•	•	•
Large, easy-to-read LCD				•	•	•	•	•	•
Alarm indicator				•	•	•	•	•	•
Fan Mode Control (ON/AUTO)							•	•	•
System Mode Control (HEAT/COOL/AUTO/OFF)							•	•	•
°F to °C conversion button**							•	•	•

Table 34

1 Previously known as FHP560, I/O Zone 583, and FLEX 6126 respectively.

2 Previously known as ZS Base, ZS Plus, ZS Pro and ZS Pro-F respectively.

* Available only by special request if ordered in 2018.

** Readout only.

Sensor Model	Description	Bosch Part Number
ZS-1	Base zone temperature sensor, no options	8733951033
ZS-1H	Base zone temperature sensor, with humidity	8733951034
ZS-1S	Zone temperature sensor with override button, sidebar, occupied LED	8733951035
ZSP-1	Zone temperature sensor, push button with LCD display, no options	8733951036
ZSP-1H	Zone temperature sensor, push button with LCD display, with humidity	8733951037
ZSP-1HC	Zone temperature sensor, push button with LCD display, with humidity and CO ₂	8733951038
ZSM-1	Zone temperature sensor, manager with LCD display, no options	8733951039
ZSM-1H	Zone temperature sensor, manager with LCD display, with humidity	8733951040
ZSM-1HC	Zone temperature sensor, manager with LCD display, with humidity and CO ₂	8733951041

Table 35

14.2 ZS Sensor Specifications

Sensing Element	Range	Accuracy
Temperature (on non-humidity models)	-4°F to 122°F (-20° C to 50° C)	±0.35° F (0.2° C)
Temperature (on humidity models)	50° F to 104° F (10° C to 40° C)	±0.5° F (0.3° C)
Humidity	10% to 90%	±1.8% typical
CO ₂	400 to 1250 PPM 1250 to 2000 PPM	±30PPM or +/-3% of reading (greater of two) ±5% of reading plus 30 PPM

Table 36

Power Requirements	Sensor Type	Power Required
Temperature only	All models	12Vdc @ 8mA
Temperature/CO ₂ /Humidity	All models	12 Vdc @ 15 mA (idle) to 190 mA (CO ₂ measurement cycle)

Table 37

14.3 ZS Sensor Dimensions

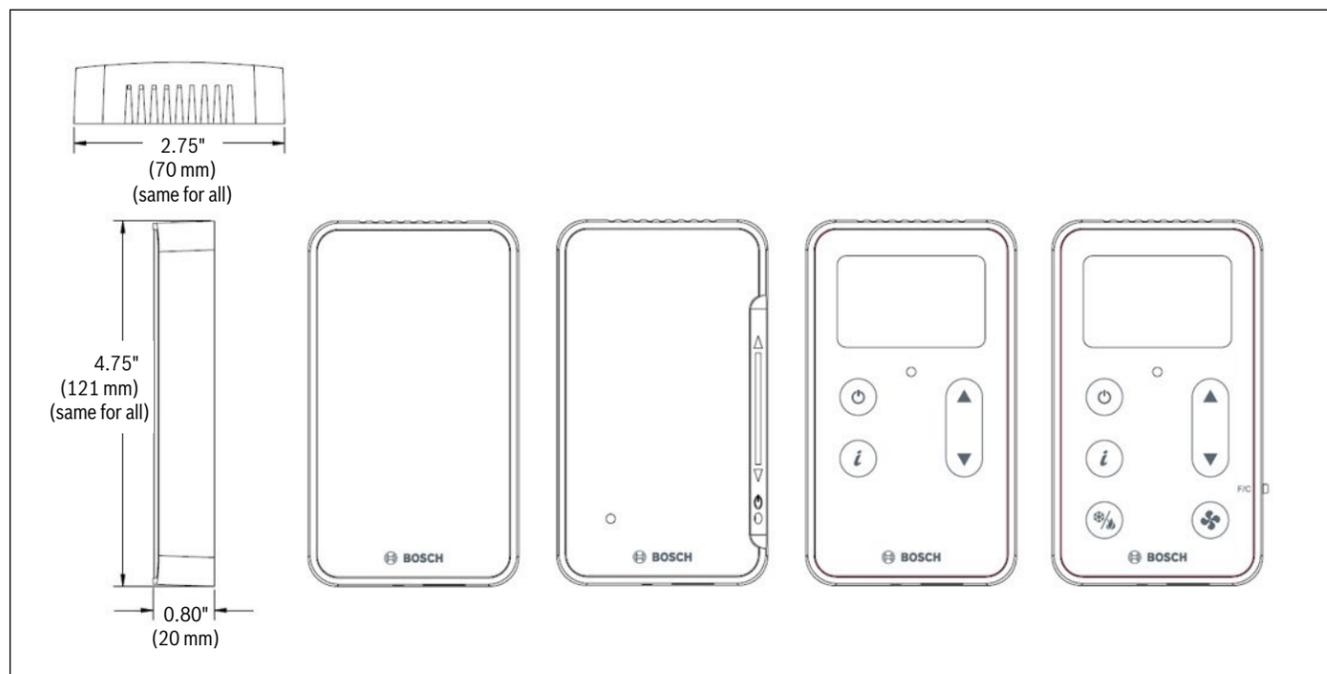


Fig. 20 ZS Sensor Dimensions (in. (mm))

14.4 ZS Sensor Features

The ZS combo sensors are thermistor-based, communicating temperature sensors that may optionally sense humidity or CO₂. The ZS Sensors are field installed and are wired to the Rnet port of the Control Air 5600 controller. A maximum of five ZS sensors may be daisy-chained and used for applications where multiple readings for temperature, humidity or CO₂ are required.

Sensor	Features
<p>ZS Base</p>	<ul style="list-style-type: none"> ▶ Local access port ▶ No user control <p>Available in:</p> <ul style="list-style-type: none"> ▶ Temperature only: ZS-1 (8733951033) ▶ Temperature with Humidity: ZS-1H (8733951034)

Table 38 ZS Base

Sensor	Features
<p>ZS Slidebar</p>	<ul style="list-style-type: none"> ▶ Slide potentiometer for temperature setpoint adjustment to make the zone warmer or cooler ▶ button to override the schedule and put the zone in an occupied state <ul style="list-style-type: none"> ▶ Green LED to indicate occupied state ▶ Local access port <p>Available in:</p> <ul style="list-style-type: none"> ▶ Temperature only: ZS-1S (8733951035)

Table 39 ZS Slidebar

Sensor	Features
<p>ZS Push</p>	<ul style="list-style-type: none"> ▶ button to override the schedule and put the zone in an occupied state, or force the zone to an unoccupied state ▶ and buttons to change any editable property, such as the temperature or humidity set-point. ▶ button to cycle through information defined in the control program (see Table 50 for more info) <ul style="list-style-type: none"> ▶ Green LED to indicate occupied state ▶ Local access port <p>Available in:</p> <ul style="list-style-type: none"> ▶ Temperature only: ZSP-1 (8733951036) ▶ Temperature with Humidity: ZSP-1H (8733951037) ▶ Temperature with Humidity and CO₂ : ZSP-1HC (8733951038)

Table 40 ZS Push

Sensor	Features
<p>ZS Manager</p>	<ul style="list-style-type: none"> ▶ button to override the schedule and put the zone in an occupied state, or force the zone to an unoccupied state ▶ and buttons to change any editable property, such as the temperature or humidity set-point. ▶ button to cycle through information defined in the control program (see Table 45 for more info) <ul style="list-style-type: none"> ▶ Green LED to indicate occupied state ▶ Local access port ▶ button to select different system modes (Heat/Cool/Auto/Off). ▶ button to select between two modes of fan operation (Auto/On). <p>Available in:</p> <ul style="list-style-type: none"> ▶ Temperature only: ZSM-1 (8733951039) ▶ Temperature with Humidity: ZSM-1H (8733951040) ▶ Temperature with Humidity and CO₂ : ZSM-1HC (8733951041)

Table 41 ZS Manager

14.5 Addressing Sensors

When multiple ZS combo sensors (up to 5 max) are connected to the Control Air 5600 controller, each sensor on the Rnet must have a unique address associated with it, and the addresses have to be sequential. If the sensors are not addressed sequentially the Control Air 5600 reads any gaps as faulty sensors and a sensor wiring alarm is generated.

The DIP switches located at the back of the sensor (next to the Rnet connector block) may be used to set an address from 1 to 5 (the factory default address for all Bosch branded ZS sensors is "1").

There are four DIP switches (numbered 1 through 4) used to address the ZS sensors. Each DIP switch has a value assigned to it for addressing the sensors as shown in the Table 46:

DIP Switches	
DIP Switch Number	DIP Switch Value
1	1
2	2
3	4
4	8

Table 42

Turn on as many DIP switches as needed so that their total value equals the required address. In the below example (see Fig. 24), DIP switches #1 and #4 are ON (to the right position). Their values (1 + 8) total 9, so the sensor's address is 9.

i While the DIP switches may be used to address the sensor for any value from 0 to 14, the Control Air 5600 ONLY recognizes values from 1 to 5, and any other address will result in the sensor(s) not functioning properly.

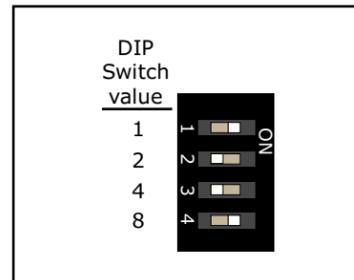


Fig. 21 DIP Switch Values

14.6 Configuring Multiple Sensors

Multiple ZS combo sensors on an Rnet must be configured in the software (using a CAM interface) in order for the Control Air 5600 to function as required.

Any combination of sensing capabilities may be used (temperature, relative humidity, CO₂), and the effective value used to control the unit may be configured as the minimum, maximum, or average of all the individual values.

14.7 Formatting Sensors

Formatting a sensor clears its flash memory. To format a sensor perform one of the two below:

- Download the controller that the sensor is connected to with new software.
- Perform the following steps:
 - Remove the wiring connector from the sensor
 - Note the current position of the DIP switches
 - Set all DIP switches to the ON position
 - Reattach the wiring connector to format
 - After approximately 3 seconds, remove the wiring connector
 - Set the DIP switches back to their original position
 - Reattach the wiring connector

14.8 ZS Sensor Wiring Specification

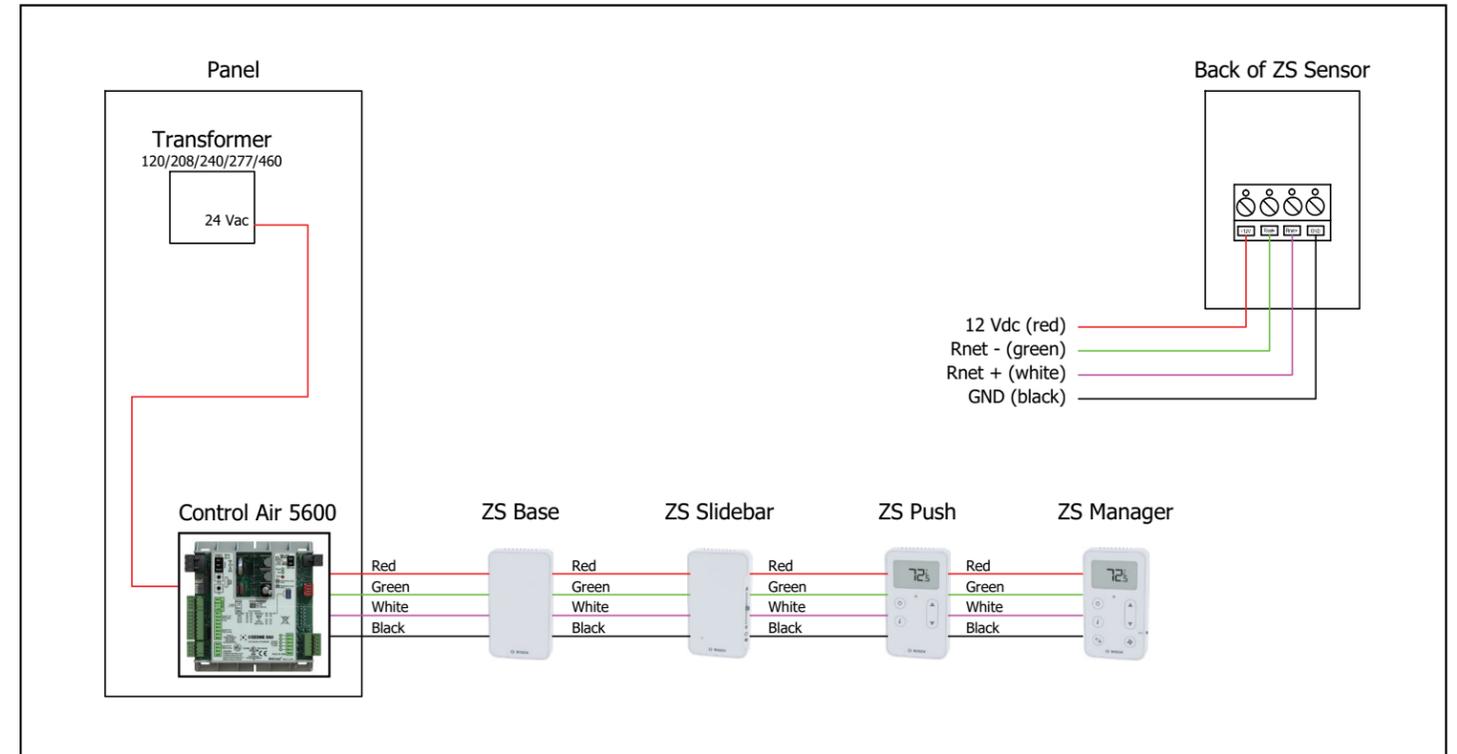


Fig. 22 ZS Wiring Diagram

i Use the specified type of wire and cable for maximum signal integrity.

Rnet Wiring Specifications		
Description	4 conductor, shielded or unshielded, CMP, plenum rated cable	
Conductor	22 AWG (7x0096) bare copper if Rnet has only sensors 18 AWG (7x0152) bare copper if Rnet has a BACview device	
Maximum length	500 feet (152 meters)	
Insulation	Low-smoke PVC (or equivalent)	
Color code	Black, white, green, red	
Shielding	If shielded, Aluminium/Mylar shield (100% coverage) with TC drain wire, terminated at controller	
UL temperature rating	32-167°F (0-75°C)	
Voltage	300 VAC, power limited	
Listing	UL: NEC CL2P, or better	
Power Requirements	Power Required	Sensor Type
Temperature only	12Vdc @ 8mA	All Models
Temperature/CO₂/Humidity	12Vdc @ 15mA (idle) to 190mA (CO ₂ measurement cycle)	All Models

Table 43

14.9 Wiring and Mounting a ZS Sensor



WARNING

The Rnet cable is wired to the controller. Before wiring and mounting sensor, the shield wire and the ground wire should be inserted into the controller's GND terminal.

1. Turn off the controller's power.
2. Pull the backplate off the ZS sensor. You may need to turn the setscrews in the bottom of the sensor clockwise until you can remove the backplate.
3. Pull the Rnet communication cable through the slit in the insulated backing material.

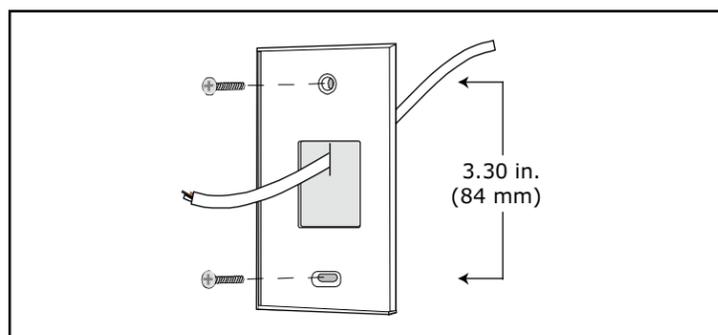


Fig. 23

4. Use two screws to mount the backplate to the wall or outlet box.
5. Partially cut, then bend and pull off the outer jacket of the Rnet cable(s). Do not nick the inner insulation (Fig. 27).

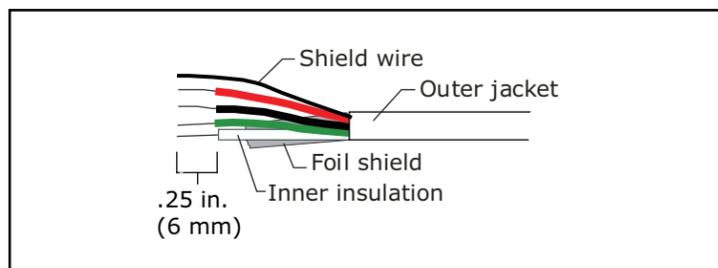


Fig. 24

6. Strip about .25 inch (6 mm) of the inner insulation from each wire.
7. If wiring one cable to the ZS sensor, cut the shield wire off at the outer jacket, then wrap the cable with tape at the outer jacket to cover the end of the shield wire.
If wiring two cables in a daisy-chain configuration, twist together the shield wires, then wrap the shield wires with tape.
8. Insert the other four wires into the ZS sensor's screw terminal connector. If wiring two cables, insert like-colored wires into each terminal.

Recommended Rnet Wiring Scheme	
Connect this wire:	To this terminal:
Red	+12V
Green	Rnet-
White	Rnet+
Black	Gnd

Table 44



CAUTION

Allow no more than .06 inch (1.5 mm) bare communication wire to protrude. If bare communication wire contacts the cable's foil shield, shield wire, or a metal surface other than the terminal block, the device may not communicate correctly.

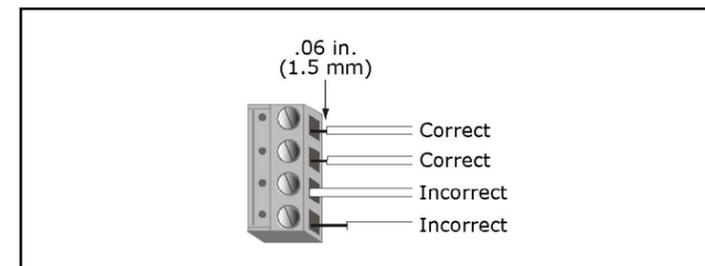


Fig. 25

9. Attach the sensor's cover and circuit board to the mounted backplate, inserting the top first.
10. Turn the setscrews one full turn counterclockwise so that the cover cannot be removed.
11. Turn on the controller's power.



Use the same polarity throughout the Rnet.

14.10 Electrical Schematic

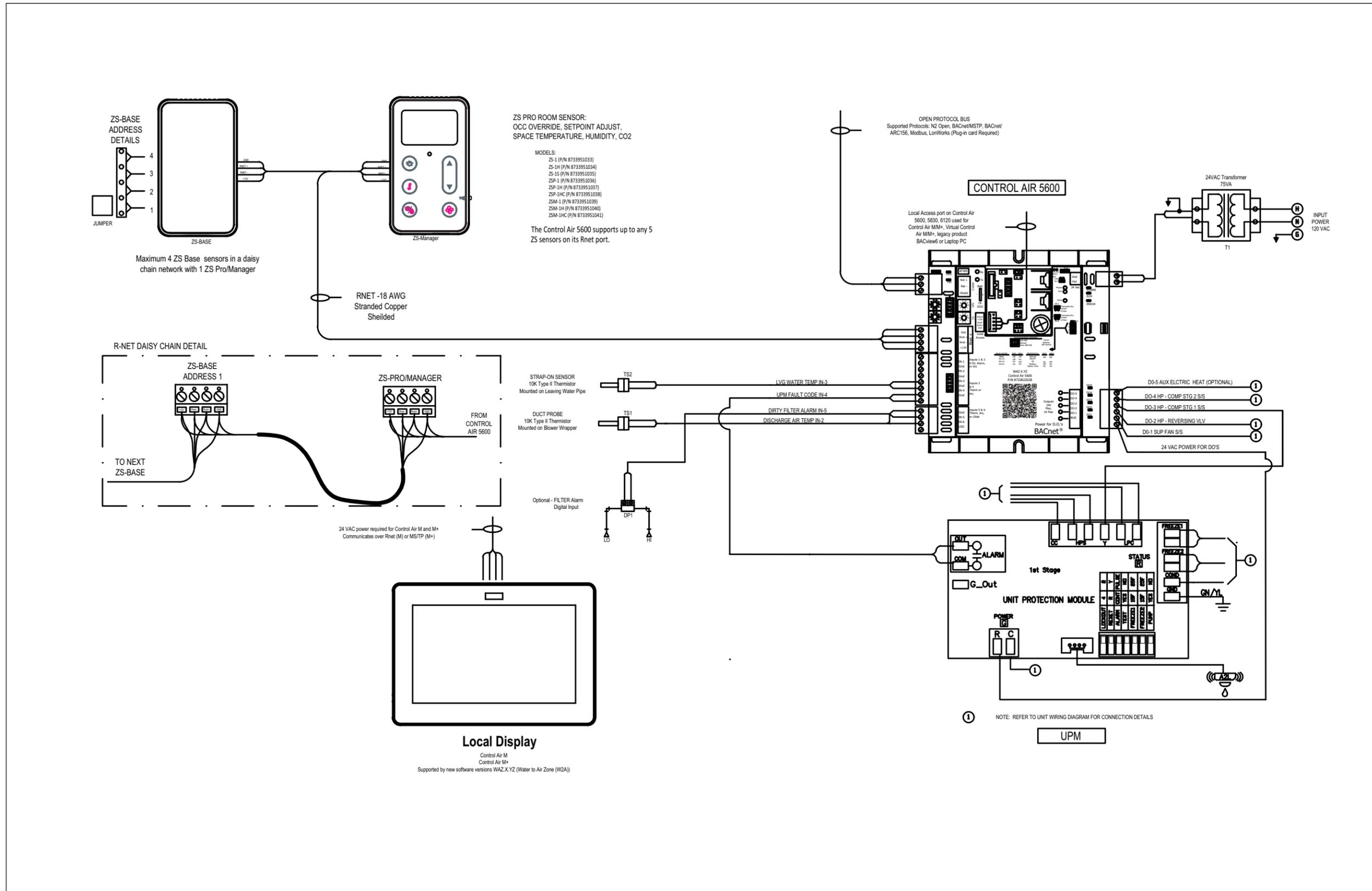


Fig. 26

14.11 ZS Push/Manager Sensors

The ZS Push and Manager series sensors can be ordered as temperature only, temperature with relative humidity, or temperature with relative humidity and CO₂. They are the most versatile of the the four sensor models, and are designed to work with the DDC Control Air 5600, 5830, and 6120 controllers.

The ZS Push and Manager series sensor allows the user to:

- ▶ View information in the display such as zone temperature, setpoints, outside air temperature, and equipment status
- ▶ Make the zone warmer or cooler by adjusting the setpoint. By default the DDC Control Air 5600, 5830, or 6120 only allows a temperature change of 3 degrees in either direction (cooler or warmer) but this value can be changed using the Control Air M or M+ interface, legacy BACview, or from the BAS
- ▶ Adjust humidity setpoint when unit is equipped with hot gas reheat to control relative humidity in the space
- ▶ Override the schedule to put the zone in an occupied state (in increments of 30 minutes with a maximum override time of 3 hours)
- ▶ Force the zone to an unoccupied state
- ▶ See that the zone is in an occupied state when the green LED is lit.
- ▶ Alert residents in plain text of error and fault messages that require specific actions (e.g. change filter required). See Table 13
- ▶ See that the fan is running when the fan symbol is displayed on the screen
- ▶ Set system and fan modes (only on ZS Manager)

Navigating the Push/Manager Sensor's Screens

The control program determines what screens you see, what information is in each screen, and what you can adjust. The type of sensor also determines what you see. For example, if the sensor reads temperature, humidity, and CO₂, the Home screen will cycle through the current values.

ZS Push/Manager Sensor Screens	
This screen:	Displays when:
Home	The sensor has had no user interaction for 5 seconds.
Set-point adjustment	You press the ▲ or ▼ button.
Information	You press the <i>i</i> button. Tap the button to cycle through various information.
Diagnostic	You hold the <i>i</i> button for 3 seconds. Tap the button to cycle through various information to troubleshoot the system.

Table 45

ZS Push/Manager Sensor Display	
This item:	Indicates:
F or C	The temperature is Fahrenheit or Celsius.
%	The value shown is percent relative humidity.
	The value shown is outside air temperature or humidity.
	Cooling
	Heating
	The zone's fan is running.
	The fan mode is set to On.
	The value(s) in the display, typically setpoints, are editable using the ▲ and ▼ buttons. If the control program specifies that the value is not editable, you will see ⊕ without arrows.
	The sensor is in a timed override.
	The equipment is running in an energy-saving mode, or other mode defined in the control program.
	An alarm condition exists. The Information screen or Diagnostic screen will provide details on the alarm.
	A maintenance condition exists. The Information screen or Diagnostic screen will provide details on the maintenance condition.
	The sensor's buttons are locked either because the control program specifies it or because a user locked them at the sensor. See Figure 6 on how to unlock.
OCC	The displayed setpoint is an occupied setpoint.
UnOCC	The displayed setpoint is an unoccupied setpoint.
CO₂	The value shown is CO ₂ .
A number in the bottom left corner	Rnet Tag: A value in the control program that does not have an associated icon. For example, 501 represents the zone mode status.

Table 46

To make the zone warmer or cooler using a ZS Push/Manager:

1. From the Home screen, press the ▲ or ▼ button to show the Setpoint Adjustment screen. The screen shows the following: (Figure 30)

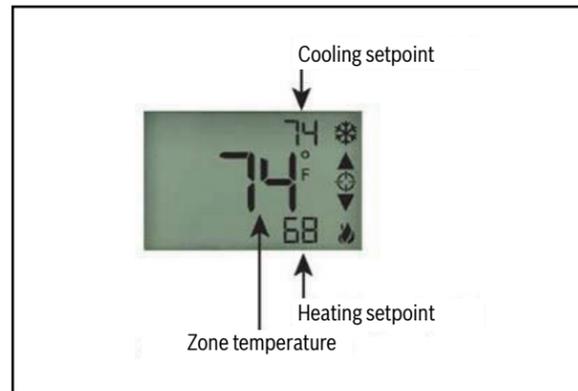


Fig. 27

2. Press the ▲ or ▼ button to adjust the zone temperature setpoint. The control program determines how much you can adjust the setpoint and is default to +/- 3°F. The DDC Control Air 5600, 5830, or 6120 control program allows this adjustment value to be changed either using a Control Air M or M+ interface, legacy BACview, or from an available BAS. The maximum allowable setpoint adjustment from the space is +/- 9°F.
3. Any setpoint adjustments made during an occupied session are cleared each time the unit transitions from occupied mode to unoccupied mode, and the setpoint adjustment remains at 0 until the next manual adjustments in the space.
4. Wait a few seconds until the display returns to the home screen before you press any other buttons.

To override the schedule using a ZS Push/Manager:

Timed Override to an Occupied State

1. Press the ⏸ button one time to override the schedule and put the zone in an occupied state for a length of time specified in the control program.
2. Press the ⏸ button repeatedly to incrementally increase the time. The time increases in increments of 30 minutes and the maximum length of time that the override may be scheduled is 180 minutes (3 hours).
3. To cancel an override and return control to the schedule, press the ⏸ button twice.
4. Wait a few seconds until the display returns to the home screen before you press any other buttons.

During the override, the bottom of the display shows the time (minutes) remaining in the override and an hourglass to indicate the override state. (See Figure 31)



Fig. 28

Force to an Unoccupied State

1. Press and hold the ⏸ button for 3 seconds to force the zone to an unoccupied state.
2. To cancel the force to unoccupied and return control to the schedule, press the ⏸ button again.

To lock the sensor buttons of a ZS Push/Manager:

1. Simultaneously press and hold the two buttons shown below (see Figure 32) for 5 seconds to lock the sensor's buttons. The display shows a lock icon to indicate the locked state.

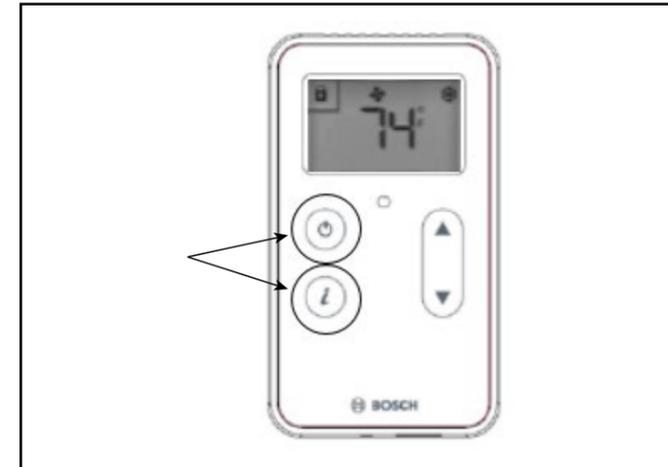


Fig. 29

2. Press and hold the two buttons again for 5 seconds to unlock the buttons.

i If you press the ⏸ button slightly before the i button, the sensor will go into an override state instead of locking the buttons. But, if you press the i button first, the buttons will lock.

To edit displayed values using a ZS Push/Manager:

If the display shows a value other than a zone temperature setpoint with ⬆⬇⬆ to the right of it, the value is editable from the sensor.

An example is the screen for the zone humidity setpoint. Access this screen by pressing the info button several times (approx 7 times) until the humidity setpoint is visible (Rnet tag 406), then follow the steps below to change the value as needed (max of 95%rh, min of 20%rh):

1. Press the ▲ or ▼ button to adjust the value.
2. Wait until the display returns to the home screen before you press any other buttons.

i If the control program specifies that the value is not editable, you will see ⬆⬇⬆ without arrows.

14.12 Rnet Tags

Rnet tags are numbers that identify types of system values, and determine how the ZS sensor will display those values. For example:

- ▶ The Rnet tag number 100 indicates Fan Status. The sensor will display a fan icon when the microblock is active.
- ▶ The Rnet tag number 416 indicates Air Flow Setpoint. Values such as this that do not have an icon will display the Rnet tag number in the lower left corner of the sensor's display.



Fig. 30

Below is a list of information provided by the ZS Pro combo sensor when the info button is pressed:

Information Displayed When Info Button is Pressed					
Press info button this number of times	Information Displayed	Rnet Tag Number	Read Only	Inactive Text	Active Text
1*	Occupied cooling setpoint	n/a	✓		
2	Occupied heating setpoint	n/a	✓		
3	Unoccupied cooling setpoint	n/a	✓		
4	Unoccupied heating setpoint	n/a	✓		
5	Effective cooling setpoint	n/a	✓		
6	Effective heating setpoint	n/a	✓		
7	Occupied zone humidity setpoint	406	✓		
8	Outdoor air temperature (OAT)	300	✓		
9	AUX heat output command	1102	✓	Off	On
10	Effective discharge air temperature (DAT)	304	✓		
11	Leaving water temperature (LWT)	319	✓		
12	Current alarm condition/code	1300	✓		
13	Zone mode status	501	✓		
14	Compressor stage 1 status	1100	✓	C1 Off	C1 On
15	Compressor stage 2 status	1101	✓	C2 Off	C2 On
16	Economizer mode status	116	✓	Econ Off	Econ On

Table 47

* If there's an active alarm(s) condition, pressing the info button once will first display the alarm page including the corresponding Rnet tag and a short text, before resuming the regular cycle of functions.

Alarm conditions are indicated by the bell symbol appearing on the Pro sensor display:

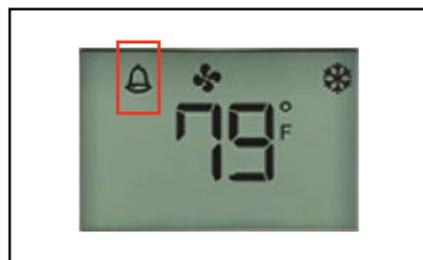


Fig. 31

The following is a description of the available alarm codes on the Current Alarm Condition/Code screen (Rnet tag 1300):

Available Alarm Codes	
Alarm Code	Description
0	System normal - no alarms
1	UPM code for high pressure on circuit #1 fault
2	UPM code for low pressure on circuit #1 fault
3	UPM code for high pressure on circuit #2 fault
4	UPM code for low pressure on circuit #2 fault
5	UPM code for water coil freeze on circuit #1 fault
6	UPM code for high condensate fault
7	UPM code for brownout fault
8	UPM code for air coil freeze on circuit #1 fault
9	UPM code for water coil freeze on circuit #2 fault
10	UPM code for air coil freeze on circuit #2 fault
20	Control Air 5600 input/output in MANUAL lock position
30	Wired sensor failure for ZS sensor, DAT sensor, LWT sensor, humidity sensor or CO ₂ sensor
40	High or low leaving water temperature (LWT) condition
50	High or low zone temperature condition
60	High or low discharge air temperature (DAT) condition
70	Filter or compressor runtime alert
80	High or low zone humidity condition
90	High zone CO ₂ condition
100	Differential pressure switch (DPS) open condition

Table 48

If an alarm is generated for any of the below conditions, pressing the info button will show a short "active text" and Rnet tag:

Alarm Active Text and Rnet Tag Number:		
Alarm Display Information	Rnet Tag Number	Active Text
Filter Change Status	1027	FILTER
Low Zone Temp Alarm	1026	Lo ZTp
High Zone CO ₂ Alarm	1043	Hi CO ₂
High Zone Humidity Alarm	1044	Hi RH
Low Zone Humidity Alarm	1045	Lo RH
Compressor1 Runtime Alarm	1050	C1 RT
Compressor2 Runtime Alarm	1051	C2 RT
High Discharge Air Temp Alarm	1028	Hi DAT
Low Discharge Air Temp Alarm	1029	Lo DAT
Manual I/O Lock Alarm	1116	IO OVRD
Wired Sensor Failure Alarm	1115	SEN Conn
High Leaving Water Temp Alarm	1113	Load H2O
Low Leaving Water Temp Alarm	1114	Load H ₂ O
High Zone Temp Alarm	1025	Hi ZTp
DPS Lock Alarm	1117	DPS
UPM General High Pressure Alarm	1118	HP Fault
UPM General Low Pressure Alarm	1119	LP Fault
UPM General Freezestat Alarm	1120	Frz stat
UPM Brownout BRN Alarm	1109	Brn Out
UPM Condensate COND Alarm	1108	Hi Cond

Table 49

15 Troubleshooting

15.1 Control Air 5600 Troubleshooting

Most technical issues regarding the Control Air 5600 may be resolved by following these steps:

1. Ensure the jumpers located in the cut-out of the controller are set correctly:
 - a. IN-1/IN-2 jumpers are used to assign Dry/Therm or 0-5Vdc status per input and should be set accordingly.
 - b. The communications selection jumper must be in the top position for all jobs, except when BACnet over ARC156 is used.
2. Ensure DIP switches are set properly to match the communication protocol (N2, Modbus, BACnet over MS/TP) and baud rates.
3. Ensure rotary dials on a network are unique and set properly; 10's digit using top dial, 1's digit using bottom dial.
4. Ensure all wiring is secure and up to code per the wiring diagram(s) and specifications.
5. If the software becomes corrupted the controller may be reset to the last saved/archived version by performing the following:
 - a. Remove the 24Vac power from the controller
 - b. Pull the 3V CR2032 onboard battery from the controller
 - c. Replace the onboard battery after approx 60 seconds
 - d. Reconnect the unit 24Vac power

15.2 ZS Sensors Troubleshooting

The following technical issues may be resolved as described below when using ZS sensors:

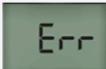
ZS Sensor Troubleshooting	
If the display shows:	Then:
Nothing	The sensor has no power. Verify 24Vac power to the controller and 12Vdc power to the sensor.
	<p>The sensor is not communicating with the network. Verify the following:</p> <ul style="list-style-type: none"> ▶ Addressing setup may be incorrect. The DIP switches at the back of the sensor must be set to 1 if connecting only one sensor to the controller, or 1 through 5 in sequential order if daisy-chaining multiple sensors to the controller. ▶ Wiring connections may be inaccurate. Verify sensor is wired as specified on pages 38 and 39 of this document, and that all conductors are secure and continuous. ▶ The Control Air 5600 controller software may be corrupted. Verify controller operating status and perform battery reset if needed. ▶ Control program may not support ZS Sensors. Use a CAM interface to verify that software version for Control Air 5600 controller is 7.05.XX (where XX is 03 for the standard version, i.e. 7.05.03).
Characters that seem out of place or jumbled	The sensor has a memory problem. Try formatting the sensor per the instructions provided in this document (see page 38).
Bogus values (-999) displayed for RH and/or CO₂	<p>The sensor hardware is not set up to read RH and/or CO₂ values. Perform the following steps to omit bogus values from the sensor screen:</p> <ul style="list-style-type: none"> ▶ If connecting sensor to the controller for the very first time, ensure that the sensor is connected to the controller R-net port then apply power (24Vac) to the controller. ▶ Configuration to eliminate bogus values begins and is completed approximately 45 seconds later. ▶ With sensor still connected to the controller, remove the unit 24Vac power from the controller for about 5 seconds, and then reconnect power.

Table 50

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