Bosch ZS Series Zone Sensors R1

Compatible with DDC Control Air 5600, 5830, and 6120 Controllers

BOSCH

Installation & Operation Manual

Table of Contents

1 Key to Symbols and Safety Instructions 4

1.1 Key to symbols 4

1.2 Safety 4

2 Overview 5

3 Available Models 6

4 Specifications 6

5 Features 7

6 Addressing Sensors 9

7 Multiple Sensors 9

8 Formatting Sensors 9

9 ZS Push/Manager Sensors 10

9.1 Navigating the Push/Manager Sensor's Screens 10

9.2 ZS Push Sensor Display 10

9.3 To Make the Zone Warmer or Cooler Using a ZS Push/Manager 11

9.4 To Override the Schedule Using a ZS Push/Manager 11

9.5 To Lock the Sensor Buttons of a ZS Push/Manager 12

9.6 To Edit Displayed Values Using a ZS Push/Manager 12

9.7 Rnet Tags 12

10 Troubleshooting 15

10.1 Battery Reset 15

11 Wiring and Mounting 16

12 ZS Series Zone Sensor R1 Dimensions 17

13 Compatible Controllers 17

14 Electrical Schematic 18

15 Terminology 19

16 Common Abbreviations 20

17 Control Signals 21

1 Key to Symbols and Safety Instructions

1.1 Key to symbols

Warnings

Warnings in this document are identified by a warning triangle printed against a grey background. Keywords at the start of a warning indicate the type and seriousness of the ensuing risk if measures to prevent the risk are not taken.

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

- **DANGER i**ndicates a hazardous situation which, if not avoided, will result in death or serious injury.
- **WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury.
- **CAUTION** indicates a hazardous situation which, if not avoided, could result in minor to moderate injury.
- **NOTICE** is used to address practices not related to personal injury.

Important information

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

1.2 Safety

Please read safety precautions before installation

WARNING:

- Improper installation, set-up, modification, operation or maintenance of this product can cause personal injury and property damage.
- Follow these instructions precisely.
- If you require assistance or further information, contact a licensed contractor

2 Overview

The Bosch line of intelligent zone sensors provides the function and flexibility needed to manage the conditions important to the comfort and productivity of the zone occupants. The ZS series are available in a variety of zone sensing combinations to address most application needs. These combinations include temperature, relative humidity, and carbon dioxide (CO2) for indoor air quality (IAQ) improvement. They are built to be flexible, allowing for easy customization of what the user/ technician sees. Designed to work with the DDC Control Air 5600, 5830, and 6120 controllers[1], the ZS sensor line includes the ZS Base, ZS Slidebar, ZS Push, and ZS Manager[2].

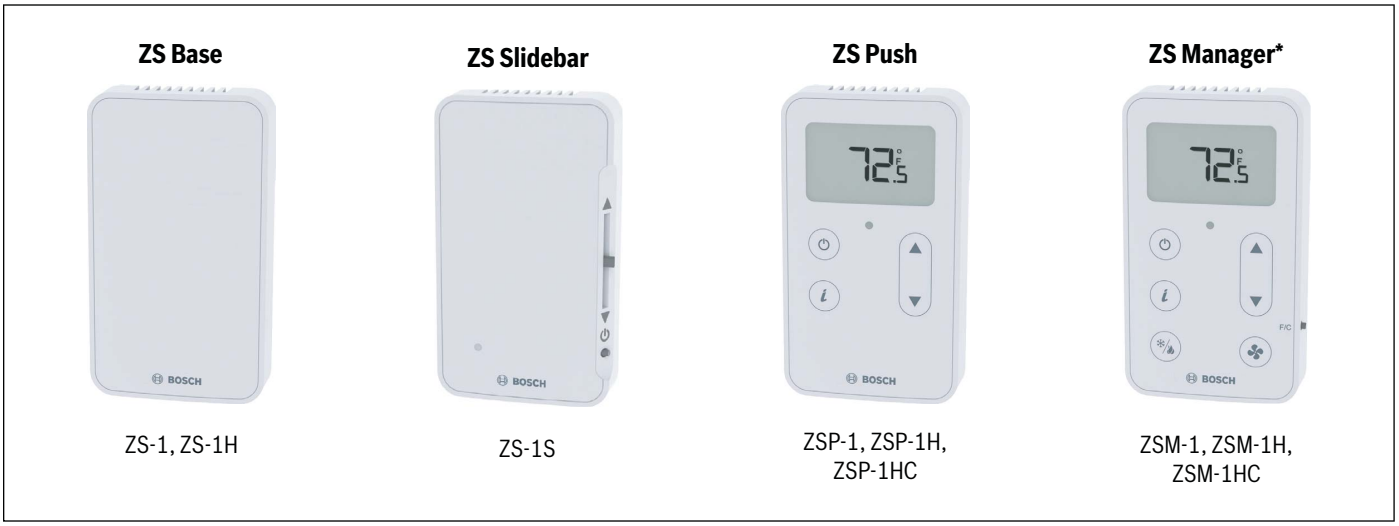


Figure 1 ZS Series Sensors

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		●			●	●		●	●
CO2						●			●
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 1

[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.

3 Available Models

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, slidebar, 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 CO2	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 CO2	8733951041

Table 2

4 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
CO2	400 to 1250 PPM 1250 to 2000 PPM	±30PPM or +/-3% of reading (greater of two) ±5% of reading plus 30 PPM

Table 3

Power Requirements	Sensor Type	Power Required
Temperature Only	All Models	12Vdc @ 8mA
Temperature/CO2/ Humidity	All Models	12 Vdc @ 15 mA (idle) to 190 mA (CO2 measurement cycle)

Table 4

Power Supply

A controller supplies the Rnet sensor network with 12 Vdc @ 210 mA.
Additional power may be required depending on the application.

Communication

115 kbps Rnet connection between sensor(s) and controller
5 sensors max per control program (5 sensors can be daisy-chained to one controller for power averaging)

Local Access Port

For connecting a laptop computer to the local equipment for maintenance and commissioning

Environmental Operating Range

32° to 122° F (0° to 50° C), 10% to 90% relative humidity, non-condensing

Mounting Dimensions

Standard 2" x 4" electrical box using provided 6/ 32" x 1/2" mounting screws

5 Features

The ZS Series Zone 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 DDC Control Air 5600, 5830, or 6120 controller[1]. A maximum of 5 ZS sensors may be daisy-chained and used for applications where averaging of multiple readings for temperature is required.

Sensor	Features
ZS Base	▶ Local access port ▶ No user control ▶ Available in: — Temperature only: ZS-1 (8733951033) — Temperature with Humidity: ZS-1H (8733951034)

Table 5

Sensor	Features
ZS Slidebar	▶ 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 ▶ Green LED to indicate occupied state ▶ Local access port ▶ Available in: — Temperature only: ZS-1S (8733951035)

Table 6

Slide the sensor's potentiometer up to make the zone warmer or down to make it cooler. The control program determines how much you can adjust the set point.(see figure# 2)

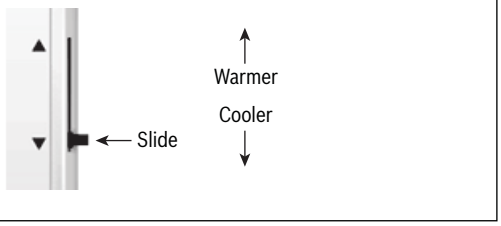


Figure 2

Sensor	Features
ZS Push 	► LCD Display ► ⏻ 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. ► *i* button to cycle through information defined in the control program (see Table 11 for more info) ► Green LED to indicate occupied state ► Local access port ► Available in: — Temperature only: ZSP-1 (8733951036) — Temperature with Humidity: ZSP-1H (8733951037) — Temperature with Humidity and CO2 : ZSP-1HC (8733951038)

Table 7

Sensor	Features
ZS Manager 	► LCD Display ► ⏻ 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. ► *i* button to cycle through information defined in the control program (see Table 11 for more info) ► 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). ► Available in: — Temperature only: ZSM-1 (8733951039) — Temperature with Humidity: ZSM-1H (8733951040) — Temperature with Humidity and CO2 : ZSM-1HC (8733951041)

Table 8

6 Addressing Sensors

When multiple ZS Series Zone Sensors (up to 5 max) are connected to the DDC 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 DDC Controller 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 Series sensors is “1”).

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

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

Table 9

Turn on as many DIP switches as needed so that their total value equals the required address. In the example shown in Figure 3, DIP switches #1 and #4 are ON (to the right position). Their values (1 + 8) total 9, so the sensor's address is 9.

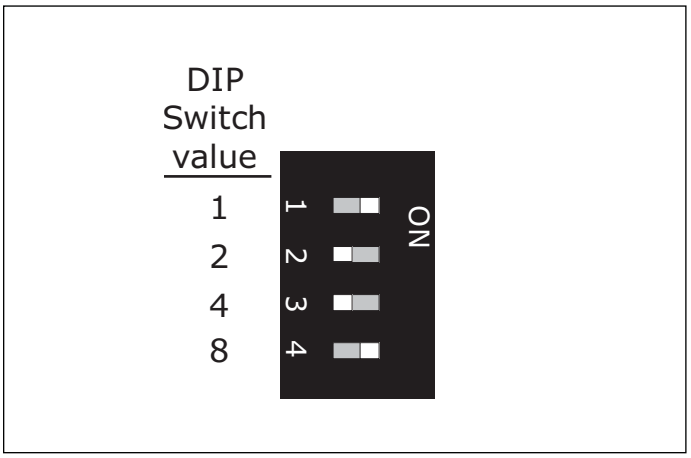


Figure 3

While the DIP switches may be used to address the sensor for any value from 0 to 14, the DDC Control Air 5600, 5830, and 6120 controllers ONLY recognize values from 1 to 5, and any other address will result in the sensor(s) not functioning properly.

7 Multiple Sensors

Multiple ZS Series Zone Sensors on an Rnet must be configured in the software (using *Control Air M or M+ interface or legacy BACview) in order for the DDC Control Air 5600, 5830, and 6120 to function as required.

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

8 Formatting Sensors

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

1. Download the controller that the sensor is connected to with new software using Apploader.

OR

2. Perform the following steps:
   a. Remove the wiring connector from the sensor
   b. Note the current position of the DIP switches
   c. Set all DIP switches to the ON position
   d. Reattach the wiring connector to format
   e. After approximately 3 seconds, remove the wiring connector
   f. Set the DIP switches back to their original position
   g. Reattach the wiring connector

* To be released in 2018

9 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)

9.1 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.

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* button. Tap the button to cycle through various information.
Diagnostic	You hold the *i* button for 3 seconds. Tap the button to cycle through various information to troubleshoot the system.

Table 10

9.2 ZS Push 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 CO2 .
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 11

9.3 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 4)

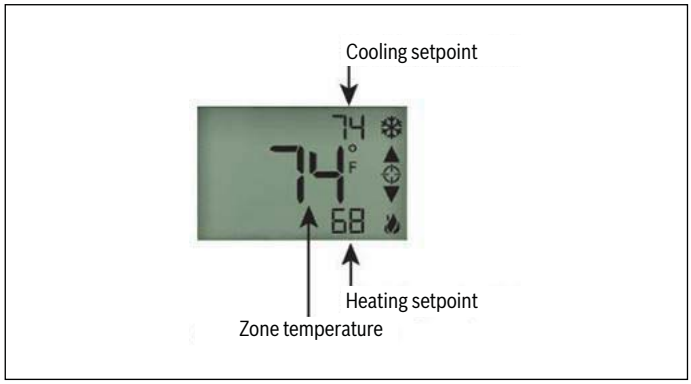


Figure 4

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

9.4 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 5)

Figure 5

Force to an Occupied 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.

9.5 To Lock the Sensor Buttons of a ZS Push/Manager

Simultaneously press and hold the 2 buttons shown below (see Figure 6) for 5 seconds to lock the sensor's buttons. The display shows a lock icon to indicate the locked state.

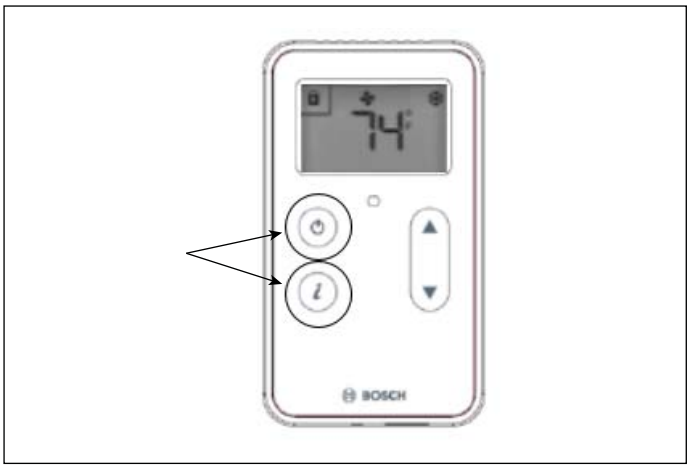


Figure 6

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

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.

9.6 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.

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

9.7 Rnet Tags

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

- 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.(see Figure 7)

Figure 7

Next page is a list of information provided by the ZS Push/Manager Sensor when the 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 12

* If there's an active alarm(s) condition, pressing the info button once will first display the alarm page(s) 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 (see figure 8).

Figure 8

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

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	FHP560 Input/Output in MANUAL lock position
30	Wired Sensor Failure for ZS Sensor, DAT Sensor, LWT Sensor, Humidity Sensor or CO2 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 CO2 Condition
100	Differential Pressure Switch (DPS) Open Condition

Table 13

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

Alarm Display Information	Rnet Tag Number	Active Text
Filter Change Status	1027	FILTER
Low Zone Temp Alarm	1026	Lo ZTp
High Zone CO2 Alarm	1043	HI CO2
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 H2O
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 14

10 Troubleshooting

The following technical issues may be resolved as described below:

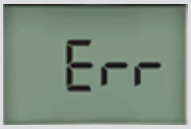
If Display Shows.	Then...
Nothing	The sensor has no power. Verify 24Vac power to the DDC controller and 12Vdc power to the sensor.
	The sensor is not communicating with the network. Verify the following: ▶ Addressing setup may be incorrect. The DIP switches at the back of the sensor must be set to 1 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 under the "Wiring and Mounting" section of this document, and that all conductors are secure and continuous. ▶ The DDC Control Air 5600, 5830, or 6120 controllers software may be corrupted. Verify controller operating status and perform battery reset if needed (see Section 10.1 Battery Reset). ▶ Control program may not support ZS Series Zone Sensors. Use a Control Air M, M+, or legacy BACview interface to verify that software version for the DDC controller is dated 06/2015 or later. The DDC Control Air 6120 (FLEX) will have ZS support capability by end of 2018.
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 Section 8 Formatting Sensors).
Bogus values (-999) displayed for RH and/ or CO2	The sensor hardware is not capable of reading RH and/or CO2 values. Perform the following steps to omit bogus values from the sensor screen: ▶ If connecting sensor to the DDC 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 15

10.1 Battery Reset

If the software becomes corrupted the controller may be reset to the last saved/ archived version by performing the following:

1. Remove the 24Vac power from the controller.
2. Pull the 3V CR2032 onboard battery from the controller.
3. Replace the onboard battery after approx 10 seconds.
4. Reconnect the unit 24Vac power.

11 Wiring and Mounting

The Rnet cable is wired to the controller at the Rnet connector. The shield wire (if available) and the ground wire should be inserted into the controller's GND terminal.

1. Turn off the controller's power.
2. Pull the back plate off the ZS Sensor. You may need to turn the setscrews in the bottom of the sensor clockwise until you can remove the back plate.
3. Pull the Rnet communication cable through the slit in the insulated backing material.(See Figure 9)

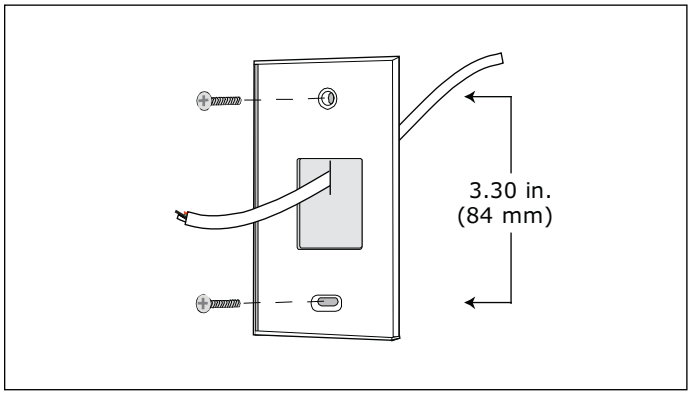


Figure 9

4. Use 2 screws to mount the back plate 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.(See Figure 10)

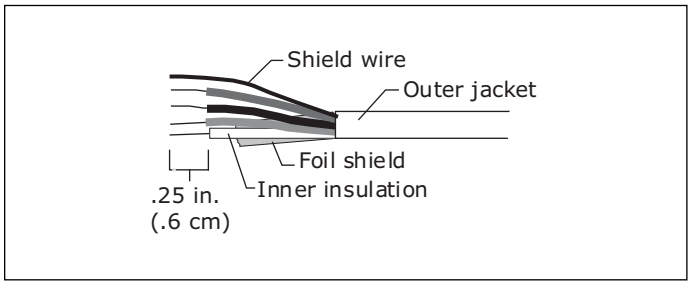


Figure 10

6. 6. Strip about.25 inch (.6 cm) of the inner insulation from each wire.
7. If wiring 1 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.
8. Insert the other 4 wires into the ZS Sensor's screw terminal connector. If wiring 2 cables, insert like colored wires into each terminal.

Connect this Wire	To this Terminal
RED	+12v
GREEN	Rnet-
WHITE	Rnet+
BLACK	Gnd

Table 16 Recommended Wiring Scheme for Rnet

CAUTION:

- Allow no more than .06 inch (1.5mm) of bare communication wire contacts to avoid touching the cable's foil shield wire, or a metal surface other than the terminal block. The device may not communicate correctly otherwise. (See Figure 11)

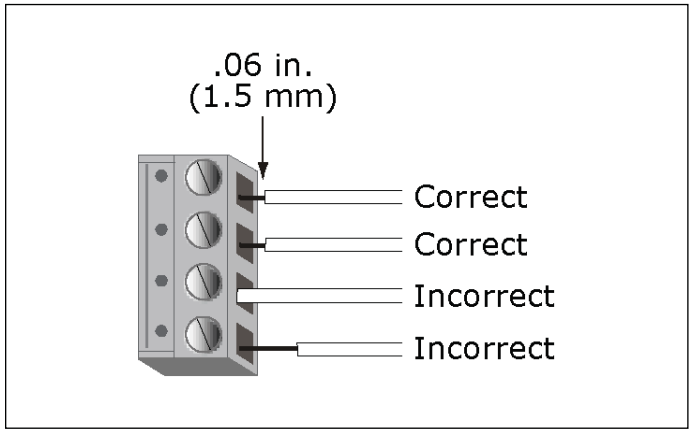


Figure 11

9. Attach the sensor's cover and circuit board to the mounted back plate, inserting the top first.
10. Turn the setscrews one full turn counterclockwise so that the cover can not be removed.

Use the same polarity throughout the Rnet.

12 ZS Series Zone Sensor R1 Dimensions

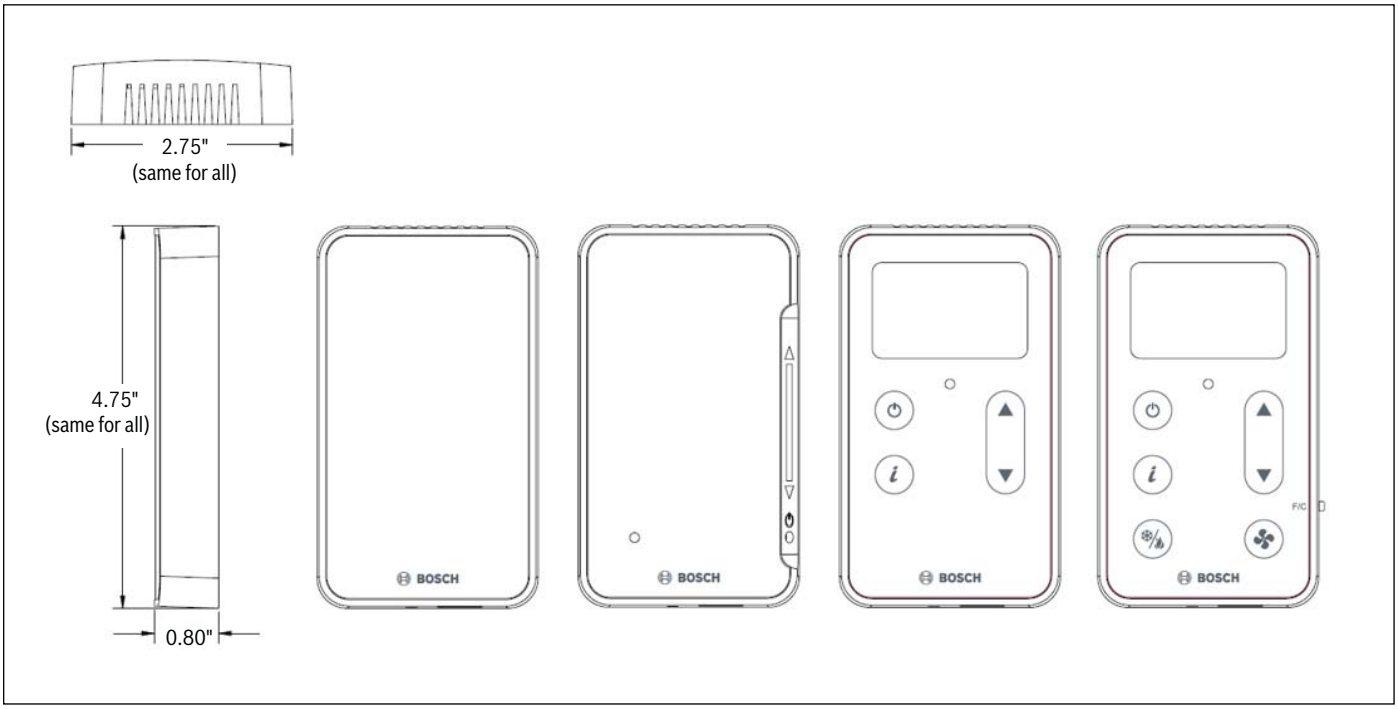


Figure 12

13 Compatible Controllers

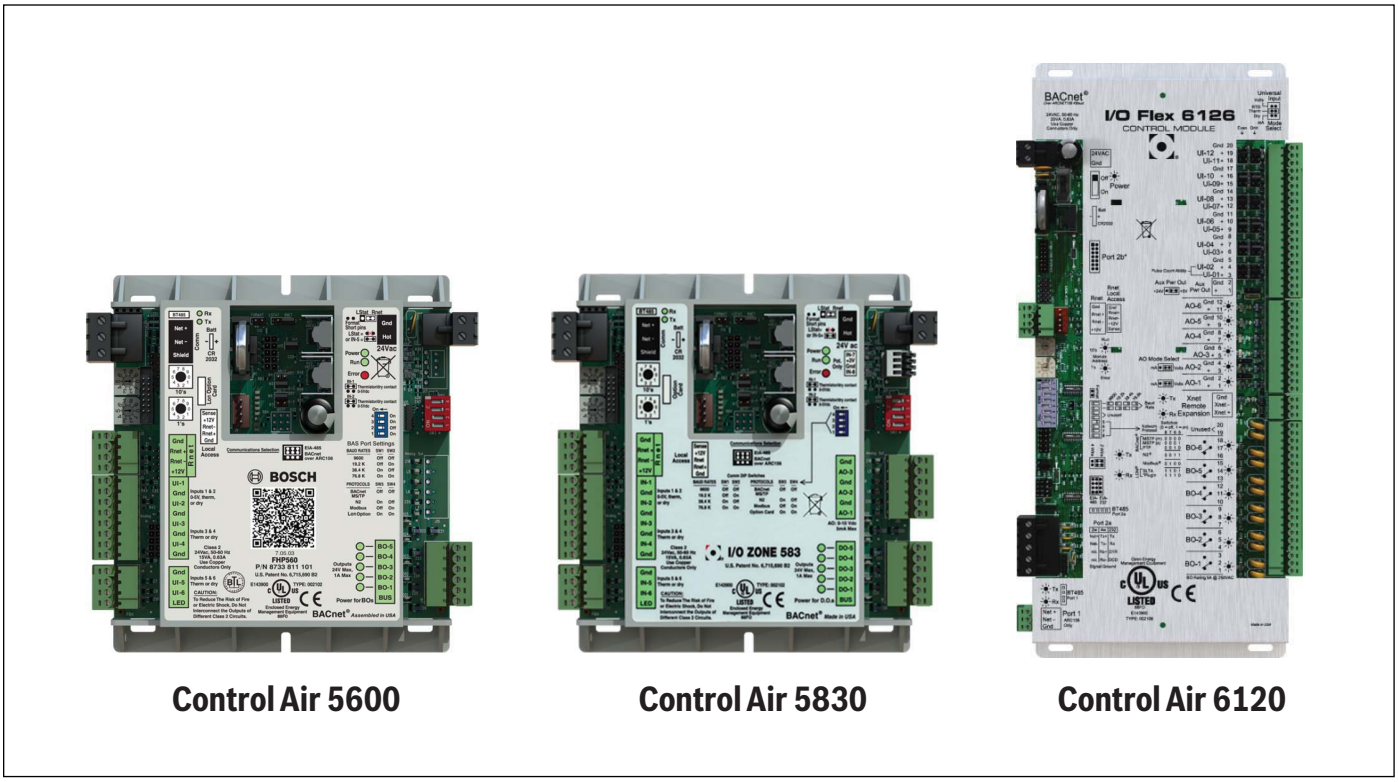


Figure 13

14 Electrical Schematic

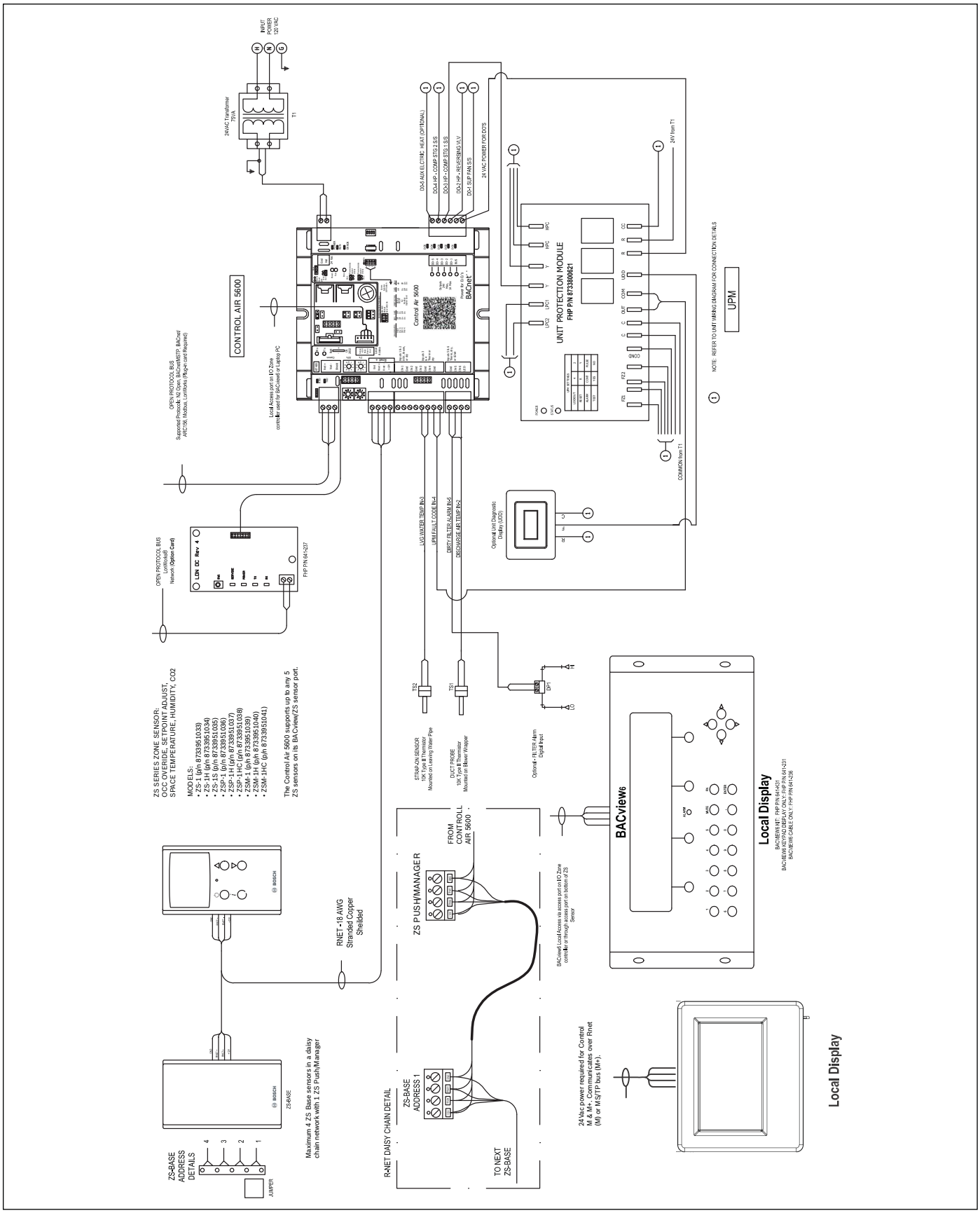


Figure 14

15 Terminology

PSC - Permanent-split capacitor motor

EER - Energy Efficiency Ratio

COP - Coefficient of Performance. The COP provides a measure of performance for heat pumps that is analogous to thermal efficiency for power cycles.

ECM - Electronically Commutated Motor.

UPM - Unit Protection Module

WLHP - Water Loop Heat Pump

GLHP - Ground Loop Heat Pump

RLA - Running Load Amps

LRA - Locked Rotor Amps

FLA - Full Load Amps

NPA - Name Plate Amps

HP - Heat Pump

Suction Pressure - Pressure entering compressor

Discharge Pressure - Pressure leaving compressor

(R/A) - Return Air

Recovery - Means the collection and storage of fluorinated greenhouse gases from products, including containers, and equipment during maintenance or servicing or prior to the disposal of the products or equipment;

Recycling - Means the reuse of a recovered fluorinated greenhouse gas following a basic cleaning process;

Reclamation - Means the reprocessing of a recovered fluorinated greenhouse gas in order to match the equivalent performance of a virgin substance, taking into account its intended use;

Decommissioning - Means the final shut-down and removal from operation or usage of a product or piece of equipment containing fluorinated greenhouse gases;

Repair - Means the restoration of damaged or leaking products or equipment that contain, or whose functioning relies upon, fluorinated greenhouse gases, involving a part containing or designed to contain such gases;

Conditioned space - Space within a building provided with heated or cooled air, or both (or surfaces); and, where required, with humidification or dehumidification means, to maintain conditions for an acceptable thermal environment.

16 Common Abbreviations

Abbreviation	Description
AFMS	Air Flow Measuring Station
AC	Air Conditioning
ACU	Air Conditioning Unit
AHU	Air Handling Unit
AI	Analog Input
AO	Analog Output
AUTO	Automatic
AUX	Auxiliary
BAS	Building Automation System
C	Common (24Vac)
CHW	Chilled Water
COND	Condenser
COMP	Compressor
CW	Condenser Water
CWP	Circulating Water Pump
DA	Discharge Air
DDC	Direct Digital Control
DES	Damper End Switch
DFS	Dirty Filter Switch
DI	Digital Input
DO	Digital Output
DPS	Differential Pressure Switch
DX	Direct Expansion
EA	Exhaust Air
EF	Exhaust Fan
EVAP	Evaporator
EW	Entering Water
F	Fahrenheit
FM	Flow Meter
FSS	Fan Status Switch
HGRH	Hot Gas Re-Heat
HP	Heat Pump
HW	Hot Water
IEM	Input Expansion Module
LP	Loop Pump

Table 17

Abbreviation	Description
LW	Leaving Water
MA	Mixed Air
MAX	Maximum
MIN	Minimum
MINS	Minutes
MISC	Miscellaneous
MOD	Modulating
NC	Normally Closed
NO	Normally Open
OA	Outdoor Air
OAD	Outdoor Air Damper
OCC	Occupancy
R	Hot (24Vac)
RA	Return Air
RF	Return Fan
RH	Relative Humidity
RV	Reversing Valve
SA	Supply Air
SCR	Silicon Controlled Rectifier
SDP	Secondary Drain Pan
SDS	Smoke Detector Switch
SECS	Seconds
SF	Supply Fan
SOO	Sequence of Operation
SP	Static Pressure
S/S	Start/Stop
STG	Stage
TEMP	Temperature
UI	Universal Input
UPM	Unit Protection Module
VAV	Variable Air Volume
VES	Valve End Switch
VFD	Variable Frequency Drive
VLV	Valve
WSE	Water Side Economizer
WSHP	Water Source Heat Pump

Table 18

17 Control Signals

Signal	Description
G	Fan Signal
O	Reversing Valve Signal
Y1	Compressor Stage 1 Signal
Y2	Compressor Stage 2 Signal
W	Electric Heat Signal
H	Reheat Signal
EV	Economizer Valve Signal
CV	Condenser Valve Signal
P	Pump Signal

Table 19

NOTES:

NOTES:

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