

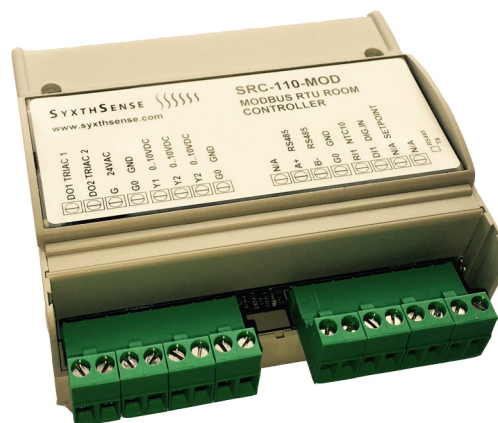
SRC-110 Series Zone Controllers with BACnet MS/TP

The SRC-110 series controllers have been designed for zone heating and cooling control. The controllers have 3 analogue 0..10Vdc outputs and two digital outputs that can be configured for heating and cooling control. The controllers can operate as Proportional Only or as Proportional + Integral Controllers.

The controller can have up to 2 heating and cooling stages. The analogue outputs can be individually configured for any of the heating/cooling stages and digital outputs can be configured as 3-point, PWM (thermic) or On/Off control.

The controllers have NTC10 input for room/flooring lead sensor and auto-detecting input for remote setpoint.

The controllers are configured through the Device Configuration Tool Software using USB connection cable.

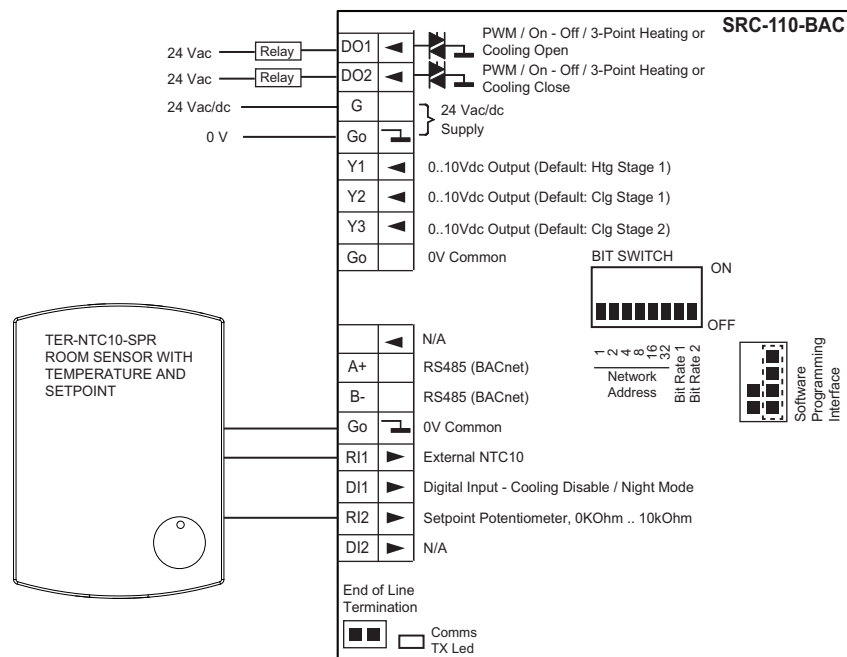


The controllers have built-in BACnet MS/TP communication for connection to BMS systems.

Model Type	Model	Description
	SRC-110-BAC	Zone (Room) Controller with Heating and Cooling Outputs, BACnet MS/TP, DIN-Rail Mounting
	SW-DCT-USB	Windows Device Configuration Tool with 1.8m USB Cable
Technical Data		
Power Supply	Power supply	24Vac/dc -10%/+15% <1VA
Signal Outputs	Analogue Outputs	3 x 0..10V < 5mA
	Digital Outputs	2 x 24Vac Triacs; 1A maximum; requires 24Vac Power Supply
Signal Inputs	Resistive Inputs	1 x External NTC10K3 Sensor 1 x 1...10KOhm Potentiometer (Optional Setpoint)
	Digital Input	1 x Digital Input, Volt-Free Contact, Impedance <1KOhm
Communication	BACnet Communications	
	Protocol	BACnet MS/TP
	Interface	RS485; maximum 63 devices
	MAC Addressing	0..63 via a bit switch; 0..247 via tool / network
Connections	Communication	9k6/19k2/38k4/76k8 Baud; Parity None/Even/Odd, 1 or 2 Stop Bits (baud rate adjustable through bit switch)
	Terminal Connections	Solid and Stranded Cable, Plug-In Connectors Maximum Size: 0.05 to 2.5mm ² (EN ISO) / 12 to 30 AWG (UL) Rising Clamp: Size 2.5 x 2.4mm
Environmental Conditions	Operating	
	Temperature	0°C...+50°C (32..122°F)
	Humidity	0...95%rh (non-cond.)
	Storage	
	Temperature	-30°C...+70°C (-22..158°F)
	Humidity	0...95%rh (non-cond.)

Standards	CE Conformity	CE Directive 2004/108/EY EN61000-6-3: 2001 (Generic Emission) EN61000-6-1: 2001 (Generic Immunity).
	Degree of Protection	IP20
Housing	Housing Material	ABS Plastics, Self Extinguishing
	Mounting	DIN-Rail Mounting
	Dimensions	W106 x H97 x D38mm
	Weight	180g

Wiring Connections



DO1	24Vac Triac; PWM, On/Off; 3-Point Open
DO2	24Vac Triac; PWM, On/Off; 3-Point Close
G	24Vac/dc Power Supply
G0	0V Common
Y1	0..10Vdc Output
Y2	0..10Vdc Output
Y3	0..10Vdc Output
G0	0V Common
A+	RS485 A+ Connection (BACnet)
B-	RS485 B- Connection (BACnet)
G0	0V Common
RI1	External NTC10 Sensor
DI1	Digital Input; Disable Cooling Stage / Activate Night Mode
RI2	Setpoint Potentiometer, 0K...10KOhm
DI2	Not Applicable

Wiring Precautions

Switch off the power before any wiring is carried out.

Control Loop Operation

The controllers can have up to 2 heating stages and up to 2 cooling stages (as default one heating stage and one cooling stage), and can also carry out automatic change-over from heating to cooling via digital input / network.

This allows various control configurations:-

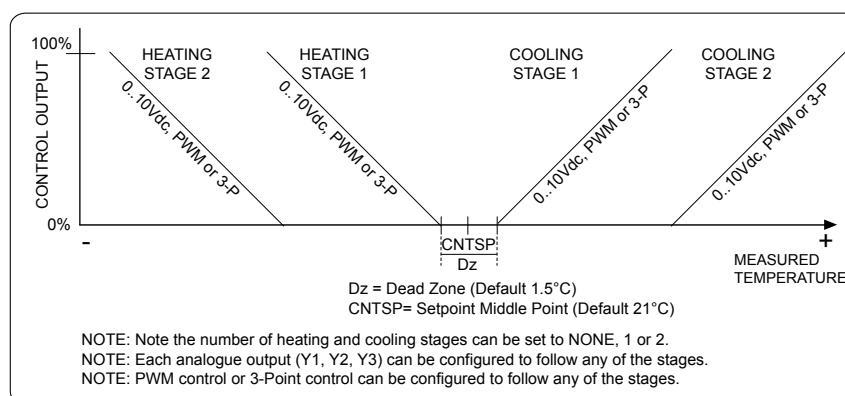
- One/Two Stage Heating Control
- One/Two Stage Cooling Control
- One/Two Stage Heating and One/Two Stage Cooling Control
- One Stage Heating/Cooling Control (Change-Over)

The controller modulates the heating and cooling demand outputs according to the calculated setpoint and the current temperature. The control can be either P-control or PI-control.

As default, heating stage 1 output is linked to Y1 for fully modulating 0..10Vdc control, cooling stage 1 is linked to analogue output Y2 and cooling stage 2 to analogue output Y3.

The controller has also two digital outputs that can be configured to work as PWM or 3-Point control. The PWM or 3-Point control can then be linked to any of the control stages (Heating Stage 1/2 or Cooling Stage 1/2) as required. As default DO1 is linked to PWM control of heating stage 1 and DO2 is linked to the PWM control of cooling stage 1.

Please note that it is possible to set the control loop outputs to direct/reverse, which reverses the control output (valve) running direction (valve drives from 100% to 0%). This can be configured individually for each stage in the Configuration Tool.



Between heating and cooling stage 1 is a control deadband. This prevent rapid switching between heating and cooling. The deadband is adjustable in the configuration parameters.

Night Mode Operation

The controller has two operation modes at night time; Night Off and Night Expanded Deadzone (Relaxed Setpoints). The mode is configured via the DCT Configuration Tool. The controller can be overridden to Night via

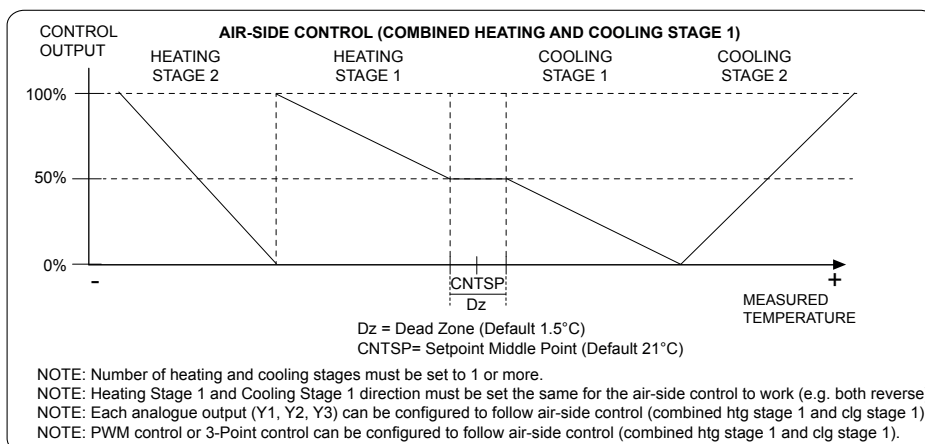
- the Digital Input, if is configured to operate in Night (Off) mode.
- via the Network (Modbus/BACnet models)

In the Night Off mode all controller outputs are switched OFF. In the Night Expanded Deadzone mode the controller operates as in the day mode diagram but the Deadzone around the setpoint is expanded to the Relaxed Deadzone setting (as default 6.0°C). The user setpoint adjustment potentiometer is disabled in the expanded Night deadzone mode.

Air-Side Control Logic

Air-side control is implemented by combining the Heating Stage1 and Cooling Stage 1 demands. As such to use air-side the number of heating stages must be set to 1 or more and the number of cooling

stages must be set to 1 or more. In normal operation the stage direction for heating stage 1 and cooling stage 1 should be set the same.



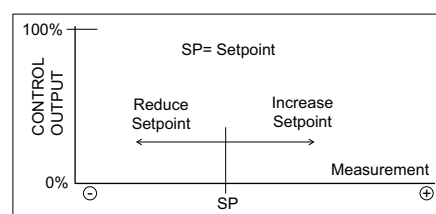
Note: The effective proportional band of the Air-side control is twice that of the Heating2 and Cooling2 stages due to the fact there is only one proportional band setting for all stages.

Sensor Input

The controller uses NTC10 sensor for the control. Connect sensor such as TER-NTC10 room sensor or TEKY-NTC10 flying lead sensor to this input.

Remote Setpoint Adjustment Input

It is possible to connect the controller to a remote setpoint unit, typically to TER-NTC10-SPR room sensor. The remote setpoint uses 0..10kOhm potentiometer. This is auto-detected by the application. By rotating the setpoint knob on the remote sensor it is possible to adjust the current temperature control setpoint +/-3°C. The adjustment shifts temperature setpoint up and down. Via the configuration tool it is possible to adjust the setpoint centre, and the min and max adjustments of the setpoint.



Digital Output (Triac) Operating Modes

The digital outputs (24Vac Triacs that switch 24Vac to 0V) can operate as 3-point control for heating, as PWM control (pulse width modulation control) or as On/Off control. The type of the control is selected via the configuration parameters. If the 3-point actuator mode is selected, the controller modulates the DO1 on when valve is required to be opened and DO2 when the valve is required to be closed. The 3-point operation can be configured to follow any of the stages. It is also possible to reverse the output operation by reversing the corresponding loop output.

When the 3-point output is driven fully open or closed, the output is driven against the edge for a "run on" period (default 6 seconds) and this will be repeated every 10 minutes. The run on time time adjustable via the configuration parameters and this behaviour can be disabled completely by setting the run on time to 0.

If PWM actuator is used the duty cycle is 30 seconds as default (configurable via the tool). E.g. if the output is at 50% then the output is ON for 15 seconds and OFF for 15 seconds.

If the PWM mode has been set to On/Off, then the corresponding digital output is switched ON at the Max Level (default 100%) and are switched OFF at the Min level (default 0%).

Digital Input Modes; Cooling Disable / Night Mode / Heating-Cooling Change-Over

If the Digital Input has been configured as Cooling Disable, by closing the digital input contact (volt-free), the cooling modes are disabled and the cooling stage outputs are set to 0%.

If the Digital Input has been configured as Night mode, by closing the input contact, all outputs are disabled in the Night Off mode, and in the Expanded Deadzone mode the Deadzone is expanded to the Night Deadzone setting. If the digital input has been configured to Night Normally Closed mode, the input operates in reverse to the Night Mode.

If the Digital Input is set to Change-Over, when the input is open the Heating Stage 1 is active, if the digital input is closed e.g. by an external thermostat, the Cooling Stage 1 is active. To activate this mode on the outputs, select Change-Over option for the DO1, DO2 or 3-Point Modes.

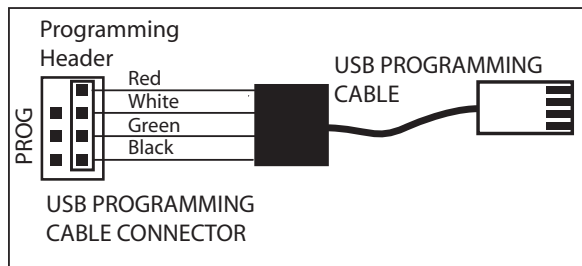
Digital input can also be configured to "None" in which case it is used for network monitoring only.

AntiJAM Valve Exercise Function

If the AntiJAM function is enabled the controller monitors for inactivity. If the control outputs have been fully closed or fully open more than the AntiJAM period, the controller will open/close the outputs to by 30% (or ON/OFF in case of ON-OFF mode) for a short period of time. The AntiJAM function is enabled through the configuration parameters or via the DCT configuration tool by selecting the required AntiJAM period by days.

Software Configuration Tool

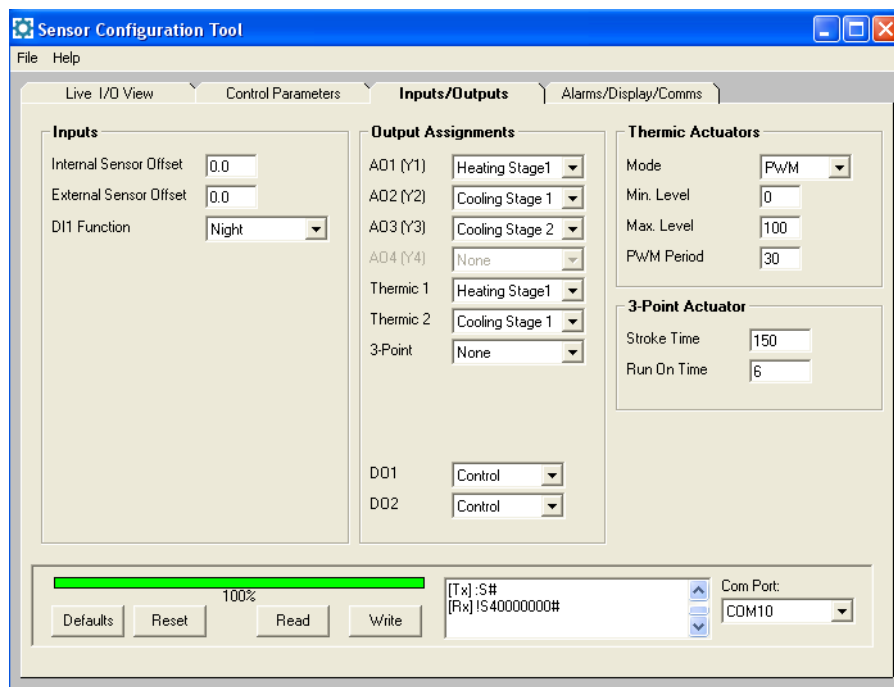
The parameter options can be configured using the Software Configuration Tool. The Configuration software is connected via the PC USB cable to the programming header of the controller as shown on the image below.



The correct process for connecting the controller via the USB is as follows:-

- Disconnect USB Connector from PC
- Disconnect the Controller from Power
- Plug-In the 4-Way Connector to the Controller
- Connect the USB to the PC
- Power Up the Controller

NOTE: Always disconnect USB from PC before plugging the cable into the controller.



Common Parameters	
Parameter Name	Description
Defaults	Reloads the default configuration from the sensor non-volatile memory. Note: All modified settings are lost.
Reset	Performs soft reset of the controller. Apply after major changes.
Read	Reads the controller data.
Write	Writes the new settings to the controller (automatically stored in the non-volatile memory)
COM Port	Select the COM port for the USB Cable or Bluetooth. USB cable driver must be installed in order the Serial to TTL connection to operate.

Live IO-View		
Parameter Name	Description	Range
INPUTS		
Internal Sensor	Not Used	
External Sensor	External Temperature Sensor Reading (RI1)	0..50°C (32..122°F)

Live IO-View		
Parameter Name	Description	Range
Setpoint Adjust	Current Setpoint Adjustment	-20...+20°C/°F
Override Input 1	Digital Input Status	Off - On
OUTPUTS		
Triac 1	Digital Output 1	Off - On
Triac 2	Digital Output 2	Off - On
Analogue Output 1	Analogue Output 1	0..100%
Analogue Output 2	Analogue Output 2	0..100%
Analogue Output 3	Analogue Output 3	0..100%
Thermic1 Position	Thermic Output 1 Position	0..100%
Thermic2 Position	Thermic Output 2 Position	0..100%
Three Point Position	Three Point Output Position	0..100%

Control Parameters		
Parameter Name	Description	Range
Setpoint	Setpoint Middle Position.	12...86°C/°F (Default 21.0°C)
Setpoint Adjust Max	Temperature Setpoint Maximum Adjustment	0.0...20°C/°F (Default 3.0)
Setpoint Adjust Min	Temperature Setpoint Minimum Adjustment	-20.0...0°C/°F (Default -3.0)
Proportional Band	Proportional Ban	1.0..50.0 °C/°F (Default 4.0)
Integral Action Time	Integral Action time of the control loop. Set to 0 to disable.	0..1,200 seconds (Default 600s)
Deadzone	Deadzone Between Heating and Cooling Stages	0.0..6.0°C/°F (Default 1.5°C)
Heating Stages	Number of Heating Stages	0 = None 1 = 1-Stage 2 = 2-Stages
Heating Stage 1 Direction	Heating Stage 1 Direction	0 = Reverse (Default) 1 = Direct
Heating Stage 2 Direction	Heating Stage 2 Direction	0 = Reverse (Default) 1 = Direct
Cooling Stages	Number of Cooling Stages	0 = None 1 = 1-Stage 2 = 2-Stages
Cooling Stage 1 Direction	Cooling Stage 1 Direction	0 = Reverse 1 = Direct (Default)
Cooling Stage 2 Direction	Cooling Stage 2 Direction	0 = Reverse 1 = Direct (Default)
Night Mode	On/Off or Expanded Deadzone Night Mode Selection	0 = Expanded Deadzone 1 = On/Off (Default)
Night Deadzone	Deadzone Between Heating and Cooling Stages in the Night Mode	0.0..40.0°C/°F (Default 6.0°C)
RESET CONTROL (NOT AVAILABLE)		

Inputs / Outputs		
Parameter Name	Description	Range
INPUTS		
Internal Sensor Offset	Not Applicable	N/A
External Sensor Offset	One Point External Temperature Calibration Field	-10.0...+10.0°C/°K (Default 0°C)
DI1 Function	Digital Input 1 Function	0 = Override Night (Default) 1 = Disable Cooling 2 = None 3 = Change-Over 4 = Override Night; Normally Closed
OUTPUT ASSIGNMENTS		

Inputs / Outputs		
Parameter Name	Description	Range
AO1 (Y1)	Analogue Output Y1 Mode	0 = Network Value 1 = None 2 = Heating Stage 1 (Default) 3 = Heating Stage 2 4 = Cooling Stage 1 5 = Cooling Stage 2 6 = Air-Side 7 = Change-Over
AO2 (Y2)	Analogue Output Y2 Mode	0 = Network Value 1 = None 2 = Heating Stage 1 3 = Heating Stage 2 4 = Cooling Stage 1 (Default) 5 = Cooling Stage 2 6 = Air-Side 7 = Change-Over
AO3 (Y3)	Analogue Output Y3 Mode	0 = Network Value 1 = None 2 = Heating Stage 1 3 = Heating Stage 2 4 = Cooling Stage 1 5 = Cooling Stage 2 (Default) 6 = Air-Side 7 = Change-Over
Thermic 1	Thermic Output 1 Mode (Linked to DO1)	0 = Network Value 1 = None 2 = Heating Stage 1 (Default) 3 = Heating Stage 2 4 = Cooling Stage 1 5 = Cooling Stage 2 6 = Air-Side 7 = Change-Over
Thermic 2	Thermic Output 2 Mode (Linked to DO2)	0 = Network Value 1 = None 2 = Heating Stage 1 3 = Heating Stage 2 4 = Cooling Stage 1 (Default) 5 = Cooling Stage 2 6 = Air-Side 7 = Change-Over
3-Point	Three Point Output Mode (Linked to DO1 & DO2) NOTE: If selected Thermic 1 and Thermic 2 are automatically set to None.	0 = Network Value 1 = None (Default) 2 = Heating Stage 1 3 = Heating Stage 2 4 = Cooling Stage 1 5 = Cooling Stage 2 6 = Air-Side 7 = Change-Over
DO1	Digital Output 1 Mode. Set to Control to activate control logic.	0 = Network 1 = Control (Default)
DO2	Digital Output 2 Mode. Set to Control to activate control logic.	0 = Network 1 = Control (Default)
THERMIC ACTUATORS		
Mode	Thermic Actuator Mode	0 = PWM (Pulse Width Modulation, Default) 1 = On/Off
Min. Level	Minimum Output Level (Switch Off Level)	0..100% (Default 0)
Max. Level	Maximum Output Level (Switch On Output)	0..100% (Default 100)
PWM Period	Pulse Width Modulation Period	0..255 seconds (Default 30)
3-POINT ACTUATOR		
Stroke Time	3-Point Actuator Running Time	30..600 seconds (Default 150)
Run On Time	3-Point Actuator Run On Time when Fully Open /Closed	0..30 seconds (Default 6)
VALVE EXERCISE (AntiJAM)		
Anti-Jam Timeout	Valve Exercise Monitoring Period.	0 = Disabled 1-14 days

Alarm/Display/Comms		
Parameter Name	Description	Range
DISPLAY		
Temperature Units	Temperature Unit Selection	0 = Celsius (Default) 1 = Fahrenheit
COMMS		
Modbus Baud Rate NOTE: Does not show Modbus Baud Rate set via bit switches.	Modbus Baud Rate (can only be set if BR1 and BR2 are in OFF position)	0 = 9600 (Default) 1 = 19200 2 = 38400 3 = 57600
Modbus Parity	Modbus Parity	0 = None (Default) 1 = Odd 2 = Even
Stop Bits	Stop Bits	0 = 1 Stop Bit (Default) 1 = 2 Stop Bits
Address NOTE: Does not show Modbus address set via bit switches.	Modbus Address (can only be set if all address bit switches are in OFF position)	0..247 (Default 1)

Parameter Storage

The configuration parameters are stored in the non-volatile memory. When the changes are carried out via the Configuration Tool, the parameters are stored in the non-volatile memory when the controller returns to a normal display mode. If the changes are carried out over the network (BACnet), then "NonVol Update" flag is required to be forced on to save the changes.

Setting Up BACnet Address and Baud Rate

The SRC BACnet address and the baud rate is normally set through the bit switch. It is also possible to set the address and baud rate over the BACnet communication network.

NOTE: The new settings are activated if bit switches have not been moved for 5 seconds.

SETTING CONTROLLER BAUD RATE

Note: When the baud rate set 9600 via the bit switch it is possible to configure the baud rate via network.
Note: To activate the change the controller requires power cycle.

SETTING CONTROLLER BACNET MAC ID

The BACnet MAC ID is set by using bith switches 1 to 6 using binary decoding. Each bit switch represents the binary value and the address is set by the combination of bit switches. Few examples:

Note: If all address bit switches are set OFF, then the BACnet ID can be set over the BACnet.

BACnet Interoperability Building Blocks Supported (Annex K)

Application Service	Initiate	Execute	BIBB
ReadProperty		Yes	DS-RP-B
ReadPropertyMultiple		Yes	DS-RPM-B
WriteProperty		Yes	DS-WP-B
ReinitializeDevice		Yes	
Who-Is		Yes	DM-DDB-B
I-Am	Yes		
Who-Has		Yes	DM-DOB-B
I-Have	Yes		
DeviceCommunicationControl		Yes	DM-DCC-B

BACnet Standard Object Types Supported

No dynamic Creation or Deletion supported. Objects, and object instances, are assigned to fixed functions within the proprietary control application of the product as follows:

Object	Number Of Instances	Instance Assignments
Device Object	1	
Analog Input	3	AI(0) – Not Assigned AI(1) – External Temperature Sensor AI(2) – Calculated Setpoint
Analog Outputs	6	AO(0) – Y1 Output - Heating Stage AO(1) – Y2 Output - Cooling Stage 1 AO(2) – Y3 Output - Cooling Stage 2 AO(3) - Thermic1_Position AO(4) - Thermic2_Position AO(5) - ThreePoint_Position
Analogue Value	1	AV(0) – Temperature Setpoint
Binary Input	1	BI(0) – DI1 Input Status
Binary Output	5	BO(0) – DO1 Output Status BO(1) – DO2 Output Status BO(2) - Night Mode Override BO(4) - Summer/Winter Change-Over BO(5) - Cooling Disable

**Device Object Properties
(Required Object Properties)**

Property Name /ID	Attributes	Range	Default
Object Identifier	R/W		MAC_Address + 651000 (Adjustable)
Object Name	R/W	32 Characters Max	Concatenation of product type and MAC address i.e. "SRC_001"
Object Type	R		8
System Status	R		STATUS_OPERATIONAL
Vendor Name	R		SyxthSense
Vendor Identifier			651
Model Name	R		URD
Protocol Version	R		1
Protocol Revision	R		10
Max APDU Length	R		480
Segmentation Support	R		No
APDU Timeout	R		3000 ms
Number APDU Retries	R		3
MaxMaster	R		127
Max_Info_Frames	R		1
Database Revision	R		0

Analogue Input Objects

	Property Name /ID	Attributes	Range	Default
Required Object Properties	Object Identifier	R		
	Object Name	R		AI(0) – Not Assigned AI(1) – External Temperature Sensor AI(2) – Calculated Setpoint
	Object Type	R		0
	Present Value	R/W	AI(0): N/A AI(1): 0..150 AI(2): 0..150	
	Status Flag	R		
	Event State	R		
	Out-Of-Service	R/W		FALSE
	Units	R		AI(0): N/A AI(1): UNITS_DEGREES_CELCIUS or UNITS_DEGREES_FAHRENHEIT AI(2): UNITS_DEGREES_CELCIUS or UNITS_DEGREES_FAHRENHEIT
Optional Properties	None			
Proprietary Properties	None			

Analogue Output Objects

	Property Name /ID	Attributes	Range	Default
Required Object Properties	Object Identifier	R		
	Object Name	R		AO(0) = "Y1" AO(1) = "Y2" AO(2) = "Y3" AO(3) = "Thermic1_Position" AO(4) = "Thermic2_Position" AO(5) = "ThreePoint_Position"
	Object Type	R		1
	Present Value	R/W	0..100	
	Status Flag	R		
	Event State	R		
	Out-Of-Service	R/W		FALSE
	Units	R		UNITS_PRECENT
Optional Properties	None			
Proprietary Properties	None			

Analogue Value Objects

	Property Name /ID	Attributes	Range	Default
Required Object Properties	Object Identifier	R		
	Object Name	R		AV(0) – Temperature Setpoint AV(1) – Not Assigned
	Object Type	R		2
	Present Value	R/W	AV(0): 12..86 AV(1): N/A	
	Status Flag	R		
	Event State	R		
	Out-Of-Service	R/W		FALSE
	Units	R		AV(0) = UNITS_DEGREES_CELSIUS or UNITS_DEGREES_FAHRENHEIT AV(1) = N/A
	Priority Array	R		
	Relinquish Default	R/W		AV(0) = Nonvol Temperature Setpoint AV(1) = N/A
Optional Properties	None			
Proprietary Properties	None			

Binary Input Objects

	Property Name /ID	Attributes	Range	Default
Required Object Properties	Object Identifier	R		
	Object Name	R		BI(0) = "DI1"
	Object Type	R		3
	Present Value	R/W	0..1	
	Status Flags	R		
	Event State	R		
	Out-Of-Service	R/W		FALSE
	Polarity	R/W		POLARITY_NORMAL
	Active Text	R		"on"
	Inactive Text	R		"off"
Optional Properties	None			
Proprietary Properties	None			

Binary Output Objects

	Property Name /ID	Attributes	Range	Default
Required Object Properties	Object Identifier	R		
	Object Name	R		BO(0) = "DO1" BO(1) = "DO2" BO(2) = "Night_Mode_Override" BO(3) = "Summer_Winter_Changeover" BO(4) = "Cooling_Disable"
	Object Type	R		4
	Present Value	R/W	0..1	
	Status Flags	R		
	Event State	R		
	Out-Of-Service	R/W		FALSE
	Polarity	R/W		POLARITY_NORMAL
	Priority Array	R		
	Relinquish Default	R/W		BINARY_INACTIVE
	Active Text	R		"on"
	Inactive Text	R		"off"
Optional Properties	None			
Proprietary Properties	None			