

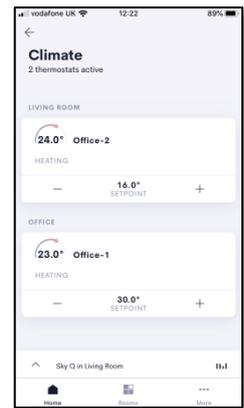
HVAC BRIDGE FOR CRESTRON HOME DATASHEET

INTRODUCTION



The HVAC Bridge for Crestron Home¹ is a software product that provides the necessary interface between selected heating and cooling systems and Crestron Home OS3.

This is not a software module for integration into a host system, but a complete program which is to be loaded onto an additional Crestron processor. Any standard 3-series processor that supports BACnet can be used. Ultamation do not provide the source code or bridge modules in an editable form.



TERMINOLOGY

Crestron Home Processor

Your system must be built around a Crestron Home/Pyng processor. Such as an MC4-R, CP4-R, CP3-R or Pyng-Hub. This is the primary processor that the client will interact with.

Bridge Processor

A standard (non Crestron Home) Crestron processor is required to run the HVAC Bridge software and act as the "bridge" between the Crestron Home processor and the heating or cooling installation. This can be any BACnet capable Crestron processor, but must be configured with a suitable BACnet licence (available from Crestron).

Once successfully configured, the bridge processor will not need to be modified again, unless the HVAC sub-system is modified.

Supported HVAC Systems

The current version supports:

-  Heatmiser Neo (heating only)
-  CoolMasterNet (cooling only)
-  Polar Bear Designs "Zentium" (heat & cool)

Future updates will provide support for additional platforms or manufacturers.

¹ Previously known as the "Heatmiser Neo Bridge for Crestron Home"

Heatmiser Neo Installation

The bridge supports integration with a Heatmiser Neo installation. This will be a stand-alone Heatmiser Neo system and comprise one or more Heatmiser Neo Hubs, each with one or more Heatmiser Neo thermostats. At present, we only support heating thermostats.

To complete the configuration you will require details of the Heatmiser Neo installation in order to create the configuration file for the bridge (see below).

CoolMasterNet Installation

The bridge supports integration with the CoolMasterNet HVAC interface which, in turn, supports a variety of air conditioning and other heating products. This should be fully commissioned and verified independently of the Crestron integration. At present, we only cooling modes via CoolMasterNet.

To complete the configuration you will require details of the CoolMasterNet installation – specifically the Line and address details for each zone – in order to create the configuration file for the bridge (see below).

Polar Bear Design – Zentium Installation

The bridge supports integration with the Zentium range of Modbus (RS-485). The Zentium Modbus network must be fully tested and you will require a COM Port on the Crestron processor. **Note:** Not ALL Crestron COM Ports are capable of RS-485. RS-232 ports can be used, but you will need a 3rd-Party RS-232-to-RS-485 converter (which often require additional power). You will see a notice in the error log if you use an RS-232 port.

To complete the configuration you will require details of the COM port used on the processor, the addresses of each individual Zentium stat (1-32) and the communications baud rate (default: 9600).

LICENCING

Licencing for a working system requires some attention as there are two important considerations.

1. Each thermostat uses up an allocation of BACnet "endpoints" available to a 3-series processor. A vanilla processor has NO BACnet licence, so one must be configured on the bridge processor. Crestron offer a free 50 endpoint licence and a chargeable 50+ endpoint licence. Which one you require will depend on the number and type of thermostats you have configured in the system.
2. The HVAC Bridge is licenced differently depending on the size of the heating system. For systems with 8 or fewer thermostats, the standard licence is required. For systems with more than 8 thermostats, a more expansive licence is required. The larger licence can also be used with 8 or fewer thermostats. Please ensure you purchase the correct licence for the size of system as there is no "upgrade" path.

BACnet Endpoint Example

Each heating thermostat requires 6 BACnet endpoints and 1 endpoint is used by the system.

Therefore a Crestron processor with the free 50 BACnet licence can support a maximum of: $(50-1)/6 = 8$ thermostats

Note: if you require more than 8 zones, you will need both the larger BACnet licence from Crestron, and the 8+ zone bridge licence.

The HVAC Bridge licence can be purchased from the Ultamation online shop where you must provide the HVAC Bridge (NOT the Crestron Home) processor's serial number (obtained via System Info) and select the appropriate system size. The key will be emailed automatically following successful payment.

HEATMISER CONFIGURATION

Each Heatmiser Neo hub will need to be addressed at a specific IP address. Since Heatmiser hubs can only be configured for dynamic addressing via DHCP, you will need to provide each hub with a MAC/IP reservation in the DHCP host. This is usually handled by the property's primary router.

Each Heatmiser thermostat is configured against a particular hub and with a unique name. This name and hub relationship is critical to a correctly working system. Please ensure the information is accurate (including case) in the configuration file.

We cannot provide support for general Heatmiser Neo commissioning.

COOLMASTERNET CONFIGURATION

Each CoolMasterNet interface will need to be addressed at a specific IP address.

Each zone to be controlled requires a line address e.g "**L1.100**" which must be accurately entered into the configuration file.

We cannot provide support for general CoolMaster commissioning.

ZENTIUM (POLAR BEAR DESIGN) CONFIGURATION

Each Zentium RS-485 bus will require a separate RS-485 capable COM Port. This serial bus will also have a specific baud rate (default: 9600). Each zone will have been assigned a unique ID between 1 and 32 which must be entered into the configuration file.

We cannot provide support for general Zentium commissioning.

BUILDING THE CONFIGURATION FILE

A configuration file is required in order to set up the thermostats/zones on the bridge with BACnet addresses appropriate for the Crestron Home system. In its simplest form the config file will look similar to this:

```
{
  "licenceKey": "-Enter your key here, or leave blank for demo-",
  "hmHubs": [
    {
      "ipAddress": "192.168.1.123",
      "stats": [
        {
          "index": "1",
          "name": "Living Room"
        },
        {
          "index": "2",
          "name": "Kitchen"
        }
      ]
    }
  ],
  "cmHubs": [
    {
      "ipAddress": "192.168.1.124",
      "zones": [
        {
          "index": "2",
          "name": "Kitchen",
          "uid": "L1.100"
        },
        {
          "index": "3",
          "name": "Master Bedroom",
          "uid": "L1.101"
        }
      ]
    }
  ],
  "zenBuses": [
    {
      "comPort": 1,
      "baud": 9600,
      "stats": [
        {
          "index": 4,
          "address": 1
          "mode": "HeatAndCool"
        }
      ]
    }
  ]
}
```

This file MUST be well-formed JSON, it must be called "chbconfig.json" and the format should be fairly self-evident. However, there are some advanced configuration fields that are show below in **RED** – all of these are optional, and the default value is given for information. We recommend that you do not specify these values unless your installation specifically requires it.

An example configuration file is included on the product page of the shop website to give you a starting point, though this must naturally be modified to suit your installation.

Top level fields:

| | |
|--------------|--|
| licenceKey | The licence key purchased against the specific HVAC bridge processor |
| hmHubs | A JSON collection of Heatmiser hub objects. |
| cmHubs | A JSON collection of CoolMaster interface objects |
| zenBuses | A JSON collection of Zentium bus objects |
| idOverride | This is the BACnet host device ID. The default value is '101'. For info, the Crestron Home processor default BACnet id is '100'. Although optional, this value is required during Crestron Home configuration. |
| portOverride | This is the BACnet UDP port. The default value is 47808 and this must match the Crestron Home processor BACnet port. |
| baseId | This is the 'base' BACnet ID for all thermostats and defaults to '1000'. i.e. Thermostat IDs in BACnet will all start from 1000+ |
| spanId | The span ID is the gap between each thermostat ID and the default value is '100'. The formula is therefore $\text{baseId} + (\text{spanId} \times \text{Stat Index}) + \text{Param}$ |

Each Heatmiser hub object is then built up from:

| | |
|-----------|--|
| ipAddress | The IP address of a Heatmiser hub (as configured in your DHCP reservation) |
| stats | A JSON collection of "stat" objects. |
| scale | Defaults for Celsius – specify "F" for Fahrenheit |

Each stat object is then built up from:

| | |
|-------|--|
| index | The BACnet stat index used to form the base address |
| name | The Heatmiser Neo thermostat/zone name (case sensitive!) |

Zone/Thermostat indices do not need to be consecutive, so you can leave gaps if you wish to organise the BACnet IDs or leave room for expansion. See below for more information on BACnet point addressing.

Each CoolMasterNet interface is built up from:

| | |
|-----------|---|
| ipAddress | The IP address of a CoolMasterNet interface |
| zones | A JSON collection of "zone" objects. |
| scale | Defaults for Celsius – specify "F" for Fahrenheit |

Each zone object is then built up from:

| | |
|-------|---|
| index | The BACnet stat index used to form the base address |
| name | An arbitrary zone name – this is for information only |
| uid | The CoolMasterNet zone address. E.g. L1.102 |

Each Zentium bus is built up from:

| | |
|---------|--|
| comPort | The valid COM port number (1-6) for the processor. Expansion card com ports are not supported. |
| baud | The baud rate for this |

| | |
|-------|--------------------------------------|
| stats | A JSON collection of "stat" objects. |
|-------|--------------------------------------|

Each stat object is then built up from:

| | |
|---------|---|
| index | The BACNet stat index used to form the base address |
| address | The Zentium stat address as configured in the comms settings. |
| mode | "Heat", "Cool" or "HeatAndCool". Defaults to Heat. |
| scale | Defaults for Celsius – specify "F" for Fahrenheit |

A configuration file can contain a mixture of device types.

Where a heating zone has BOTH heating and cooling handled by different devices, you should define BOTH **stat** and **zone** objects and use THE SAME **index**.

The BACnet Ids are automatically allocated based on the values described above, plus the parameter values given below. You can also get a summary of this information from the HVAC bridge command console by typing "**HVACHELP**"

Heating Only/Cooling Only or Combined Zone

| | |
|---|--|
| 1 | The current room temperature |
| 2 | The room set-point (shared between heating and cooling) |
| 3 | The thermostat operating mode (heat, cool or off (= Heatmiser frost protect) |
| 4 | The thermostat state (idle or heating or cooling) |
| 5 | Fan mode (cooling only) |
| 6 | Fan state (cooling only) |

BACnet ID example

If we use the defaults of "baselid = 1000" and "spanid = 100" and have thermostats with indices of 1, 2 and 4, the BACnet IDs will be as follows:

| | |
|------|---|
| 1101 | Stat 1 current room temperature |
| 1102 | Stat 1 room set-point |
| 1103 | Stat 1 thermostat operating mode |
| 1104 | Stat 1 thermostat state |
| 1105 | Stat 1 fan operating mode (not used for heating only) |
| 1106 | Stat 1 fan state (not used for heating only) |
| 1201 | Stat 2 current room temperature |
| 1202 | Stat 2 room set-point |
| 1203 | Stat 2 thermostat operating mode |
| 1204 | Stat 2 thermostat state |
| 1205 | Stat 2 fan operating mode (not used for heating only) |
| 1206 | Stat 2 fan state (not used for heating only) |
| 1401 | Stat 4 current room temperature |
| 1402 | Stat 4 room set-point |
| 1403 | Stat 4 thermostat operating mode |
| 1404 | Stat 4 thermostat state |
| 1405 | Stat 4 fan operating mode (not used for heating only) |
| 1406 | Stat 4 fan state (not used for heating only) |
| ... | |

These IDs are the essential information for Crestron Home configuration (see below).

INSTALLING THE CONFIGURATION FILE

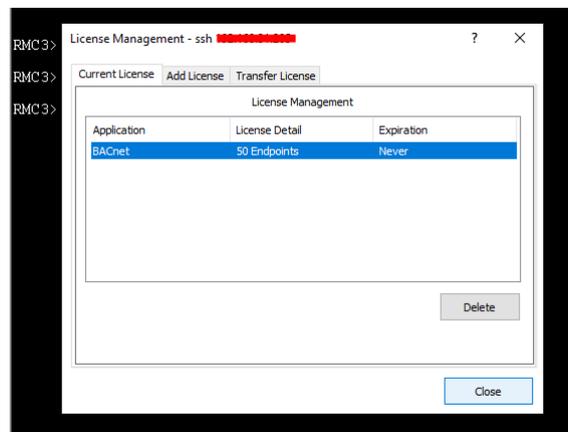
We suggest you validate the JSON config file using an online JSON validator before uploading to the processor to avoid typos.

Once checked, the config file – which must be named “chbconfig.json” – should be loaded to the HVAC Bridge processor’s NVRAM using Toolbox File Manager or some other tool, such as Filezilla.

INSTALLING THE HVAC BRIDGE SOFTWARE

BACnet Licencing

First of all, you will need to enable BACnet on the HVAC Bridge processor. This is accomplished by following the Crestron procedure for requesting and installing the appropriate BACnet licence via the Toolbox "Licence Management" feature.



A Note on BACnet Priority

Once BACnet is enabled, you must set the Host priority so that it matches the BACnet priority used in the Crestron Home configuration. We suggest you use the Crestron processor default value of '8' as this should be the default value for BOTH the Crestron Home processor and the bridge processor.

It is important to note that Crestron Home BACnet objects default to propriety '8', so great care must be taken to ensure that all processors and BACnet objects defined in Crestron Home have consistent priority.

To check the processor BACnet priority, issue the following command via Toolbox text console:

```
RMC3>BACNETPRIORITYFORHOSTWP
    Currently set write priority for hosted objects is :9

RMC3>BACNETPRIORITYFORHOSTWP 8
Setting priority for hosted objects success.
```

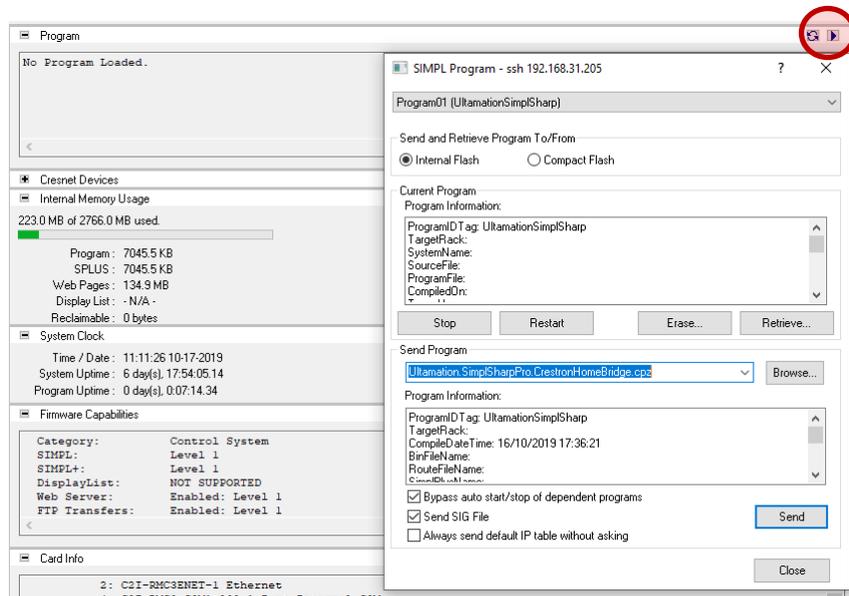
If you experience issues with Crestron Home being able to control thermostats, values do not "take", or changes made locally are not reported back, this is likely a BACnet priority mismatch.

If your processor does not appear to support this command, please ensure you have the latest firmware loaded.

A useful tool for checking for BACnet issues is YABE (Yet Another BACnet Explorer). We cannot, however, provide support for this.

Loading the Software

Now that BACnet is configured, and the config file has been installed, the HVAC Bridge program is ready to be installed. This can be installed like any other Crestron SIMPLSharp Pro program – use the System Info tool.



Select the file "Ultamation.SimplSharpPro.CrestronHomeBridge.cpz" and click 'Send'.

Once the program has loaded, check the configuration; as described below.

CHECKING THE HVAC BRIDGE CONFIGURATION

An important phase in the system lifecycle is when the program initially starts, reads the configuration, and starts communicating with the sub-systems. We suggest you connect to the Bridge Processor via text console during system boot (or after issuing a "PROGRES" or "REBOOT" command) so that you can monitor any start-up messages. Important events are also logged in the processor's error log. Issue the "ERROR" command to see these messages which detail such things as configuration file errors, licence validation, hub and thermostat discovery and so on.

The output should look something like this:

```

54. Notice: Simpl... # == Crestron Home HVAC Bridge
55. Notice: Simpl... # == Copyright (c) 2020 Ultamation Limited
56. Notice: Simpl... # == Release Build : 1.0.1.18513
57. Notice: Simpl... # == BACnet Support: YES
58. Notice: Simpl... # **Program 1 Started**
59. Notice: Simpl... # Loading config from: '\NVRAM\chbconfig.json'
61. Notice: Simpl... # Maximum BACnet Endpoints: 50
62. Notice: Simpl... # The stat 'Office-1' was registered for BACnet
63. Notice: Simpl... # The stat 'Office-2' was registered for BACnet
64. Notice: Simpl... # NeoBridge: Licence verification successful
65. Notice: Simpl... # HeatmiserNeo Querying Zones for Hub:192.168.xxx.xxx
66. Notice: Simpl... # HeatmiserNeo - Hub:192.168.xxx.xxx Device:Office-1
67. Notice: Simpl... # HeatmiserNeo - Hub:192.168.xxx.xxx Device:Office-2

```

You can also check the BACnet configuration with the following console command:

```
RMC3>BACNETOBJECTLIST
Device ID = 101   Object Type = Analog Value   ( 2) Object ID = 1203   Value = 1.000000
Device ID = 101   Object Type = Analog Input   ( 0) Object ID = 1101   Value = 23.000000
Device ID = 101   Object Type = Analog Input   ( 0) Object ID = 1204   Value = 0.000000
Device ID = 101   Object Type = Analog Value   ( 2) Object ID = 1202   Value = 16.000000
Device ID = 101   Object Type = Analog Input   ( 0) Object ID = 1201   Value = 23.000000
Device ID = 101   Object Type = Analog Value   ( 2) Object ID = 1103   Value = 1.000000
Device ID = 101   Object Type = Device Object ( 8) Object ID = 101    Value =
Device ID = 101   Object Type = Analog Input   ( 0) Object ID = 1104   Value = 0.000000
Device ID = 101   Object Type = Analog Value   ( 2) Object ID = 1102   Value = 16.000000
Total Count : 9
```

This shows the BACnet addresses (as described previously) with '101' being the bridge host address, and 1101 – 1106 being the first thermostat's control endpoints.

We have built in some command line tools to assist in validating the bridge configuration.

The "HVACKEY" command will provide information about the configured HVAC Bridge licence key, and whether it is valid for the host processor or not. The BACnet licencing information is available via the System Info tool within Crestron Toolbox.

The "DEVLIST" command will list all devices configured within the system, against their respective hubs, along with their base BACnet Ids. This is useful to see whether the configuration file matches up with the physical Heatmiser configuration which is retrieved from each hub. This will also show if a given thermostat is offline (i.e. the Heatmiser hub cannot "see" the thermostat).

The "HVACHELP" command will provide a quick reference for BACnet addressing and configuration.

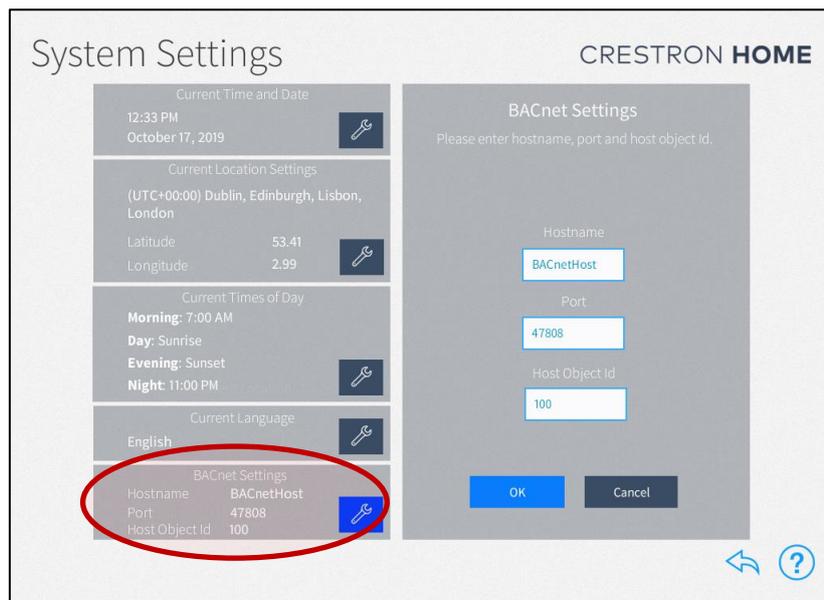
The "HVACDEBUG" command can also provide information about the communications with the various sub-systems, but this should NOT be left enabled for production.

CONFIGURING CRESTRON HOME

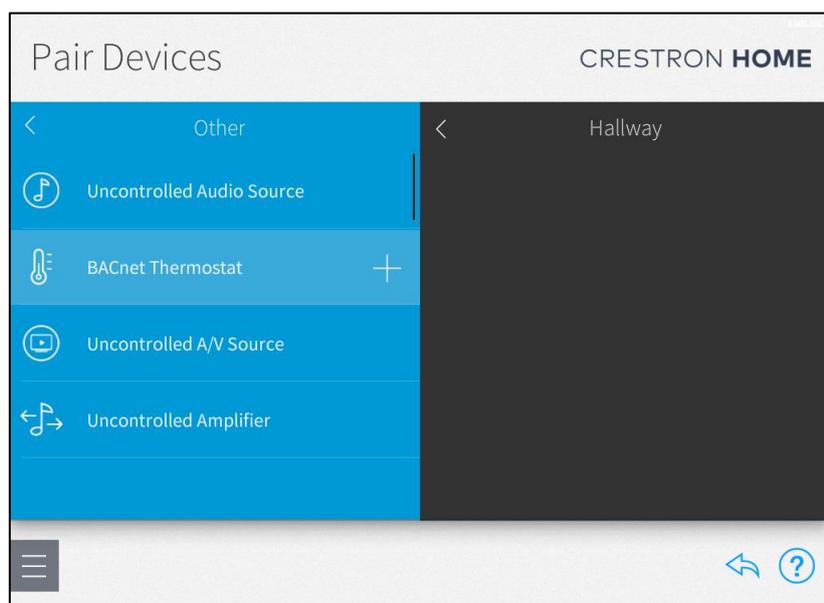
The final piece of the jigsaw is to configure the individual thermostats within Crestron Home.

The web interface is the easiest place to do this – you will need the admin credentials to complete this stage.

First of all, check the BACnet settings on your Crestron Home processor. The default settings will usually be fine.

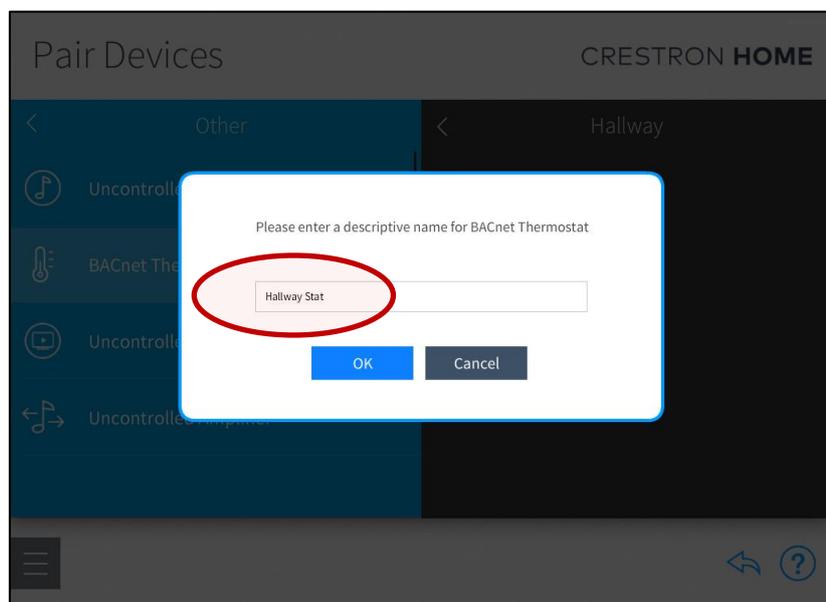


Next, you will need to add each thermostat.

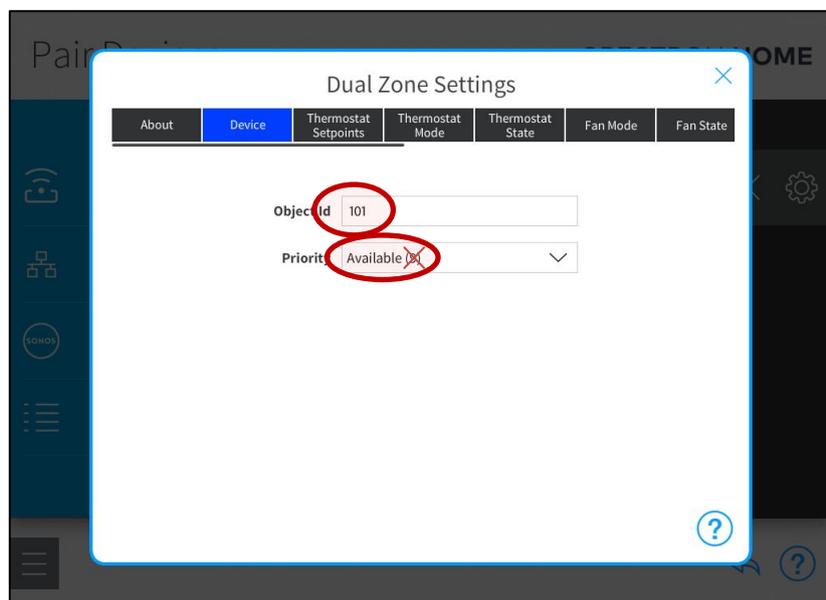


This is accomplished through the "Pair Devices" feature. Select the room for the thermostat, then "Other" and finally add a "BACnet Thermostat".

Enter a friendly name for the thermostat. On the Crestron Home configuration, there is no correlation between names in Crestron Home and names in the sub-systems. All of the pairing is accomplished via the BACnet addresses, as shown below.



Next, edit the newly created item, and enter the Object Id that was used for the HVAC Bridge processor – the default value, unless override using the "idOverride" config setting will be '101'.

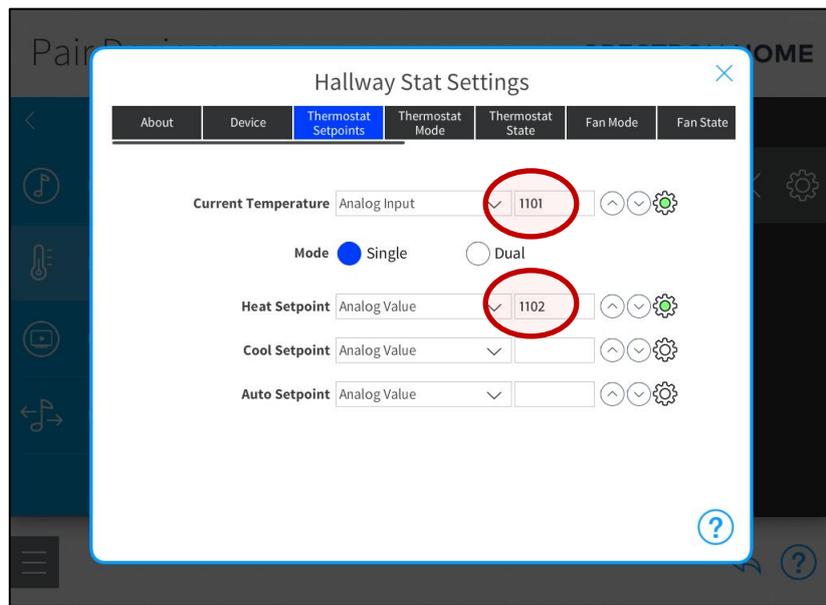


Ensure that you set the Priority to '8' as described in "A Note about BACnet Priority".

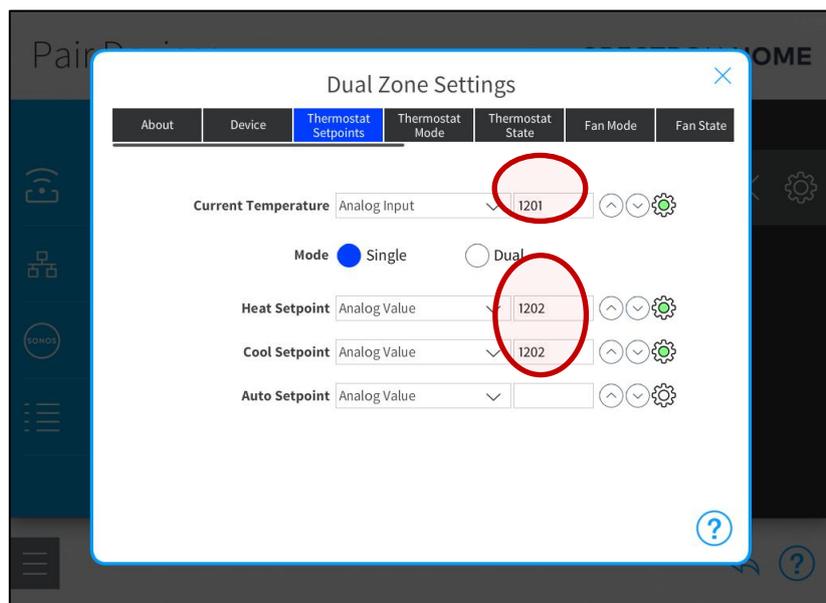
Next, move on to the Thermostat Setpoints tab. This is where we will configure the room temperature feedback and set points.

Enter the two BACnet addresses for current temp and set point. Either refer back to the table of values given by the BACNETOBJECTLIST command, or use the formulas from the BACnet address calculation reference).

For a zone which is heating ONLY, only set the Heat Setpoint as shown in the first image. Conversely, for a zone that is cooling ONLY, only set the Cool Setpoint. For zones that are BOTH heating AND cooling, set BOTH Heat and Cool Setpoints to the same value, as show in the second image.



The image below shows a heating and cooling configuration, this time for zone index 2. Note that the Setpoint object IDs are THE SAME – this is intentional.



The Mode should be left at "Single" and the Cool and Auto Setpoints left blank.

The types (Analog Input/Value) must be set as shown.

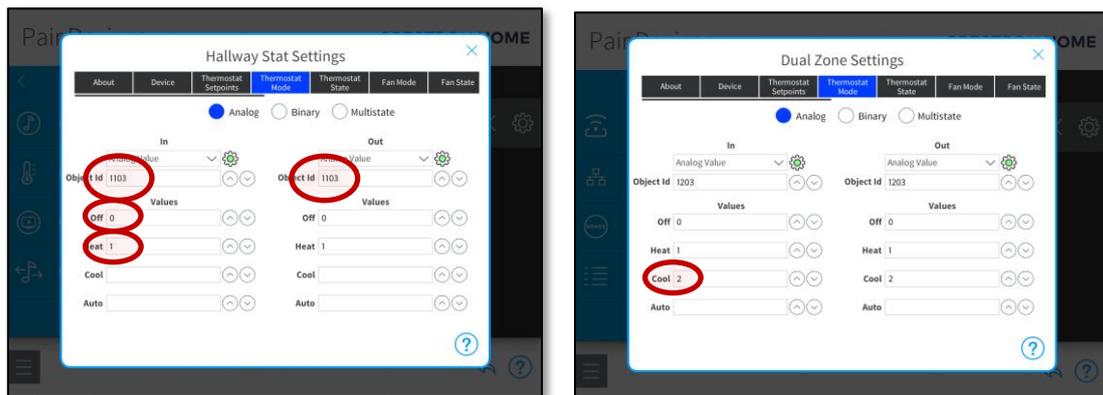
If the HVAC Bridge processor is running correctly, the cog will turn GREEN. If the BACnet object cannot be found, this cog will turn RED. If you are confident that the BACnet addresses are correct, this is ok and will turn GREEN as soon as the HVAC Bridge processor is running correctly.

There is no need to further configure these settings with the cog icon. Leave everything at their default values.

Next, move on to the Thermostat Mode tab.

This page connects the zone's operating mode where 'Off' in Crestron Home is mapped onto either the thermostat's Frost Protect mode or cooling system's off state, and 'Heat' is the normal run mode for the thermostat where heat will be called for if and when the current temperature falls below the room's set point and, conversely 'Cool' is normal run mode for the cooling system where cooling demand will be called for if the room temperature rises above the set point.

The left hand image shows a heating only zone, while the right hand shows a heating AND cooling zone.



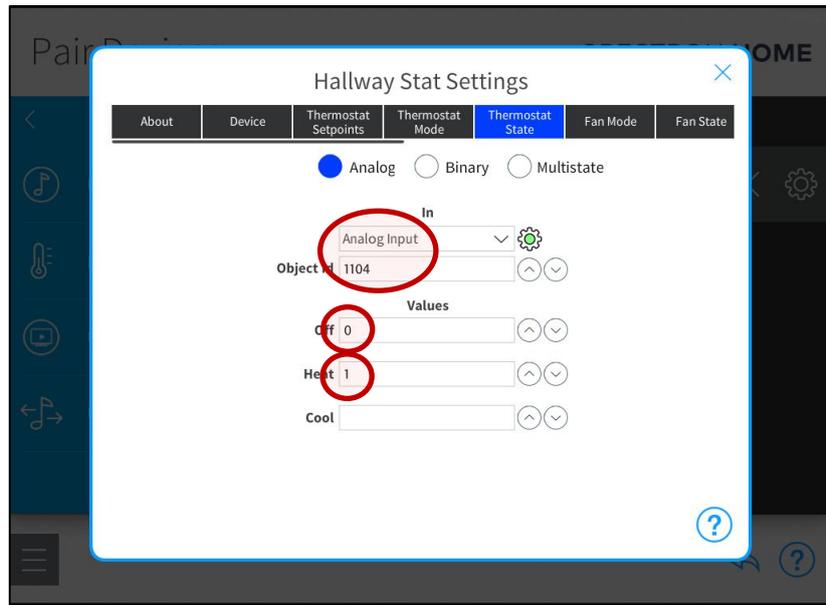
Set the type to Analog, and set both IN and OUT to "Analog Value". Set the Object Id's of both IN and OUT (use the table as a guide):

Finally, set the values for 'Off', 'Heat' and 'Cool' to '0', '1' and '2' respectively. Changing the IN values will also set the OUT values to match.

Note – it doesn't hurt to set all of these values, even if a zone does not use heating or cooling.

Select the Thermostat State tab.

The last step is to configure the Thermostat State which lets Crestron Home know if the heating is currently in demand.



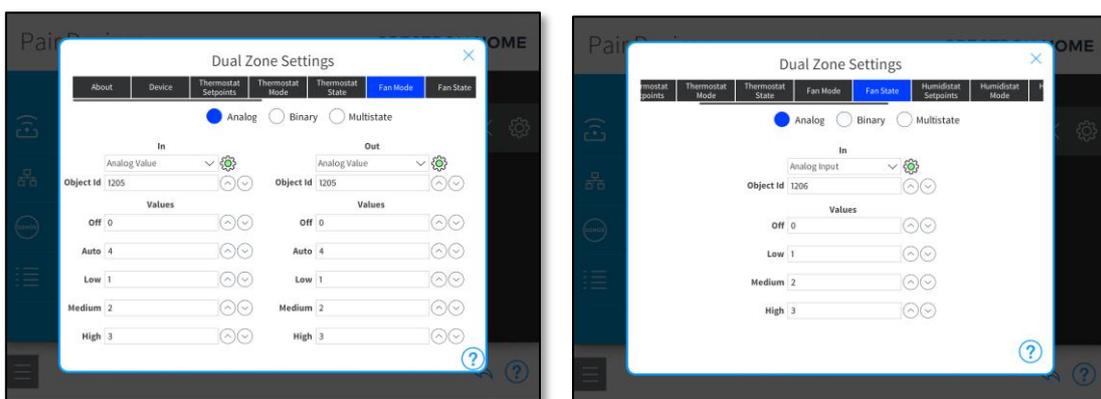
Again set the Object Id.

The values should be set for 'Off', 'Heat' and 'Cool' as '0', '1' and '2' respectively.

Specific settings for Cooling Systems

Zones with Coolmaster elements should, in addition to the configuration already given, set up the Fan Mode and Fan State settings.

This is very similar to the Thermostat Mode and State in that, the same values are duplicated for In and Out.



The values must be as follows: 0=Off, 1=Low, 2=Medium, 3=High, 4=Auto (mode only).

You can issue the "HVACHELP" command on the Bridge Processor console for a quick summary of BACnet object IDs and values.

You have completed the configuration for a single thermostat. Repeat this process for each additional thermostat.

You can now test the integration between Crestron Home and the Heatmiser Neo, Coolmaster or Zentium systems.

The system can be set from either side – so that the homeowner can use Crestron Home or the local thermostat's controls. Please note that there is a natural delay between control changes being reflected by the other system and feedback being updated. For example, when you modify the set point from Crestron Home, it may take several seconds before the thermostat reflects the change and changes the heating demand state which, in turn, may take several seconds to be reflected back in Crestron Home. This is perfectly normal aspect of the heating control system and integration.

SUPPORT

For any issues or feature requests, please contact Ultamation at support@ultamation.com

BACNET ADDRESS CALCULATION REFERENCE

The following formulae are used for deriving BACnet object addresses. This may seem a little daunting, though it is quite straight forward and it only really needed if you wish to use a specific BACnet numbering scheme. We suggest you stick with the default in most cases.

Current Temperature (Analog INPUT)

General form = BaseId + (Stat Index * SpanId) + 1

(Default) 1000+StatIndex*100+1

Heat Setpoint (Analog VALUE)

General form = BaseId + (Stat Index * SpanId) + 2

(Default) 1000+StatIndex*100+2

Thermostat Mode (Analog VALUE)

General form = BaseId + (Stat Index * SpanId) + 3

(Default) 1000+StatIndex*100+3

Thermostat State (Analog INPUT)

General form = BaseId + (Stat Index * SpanId) + 4

(Default) 1000+StatIndex*100+4

Fan Mode (Analog VALUE) (Cooling only)

General form = BaseId + (Stat Index * SpanId) + 5

(Default) 1000+StatIndex*100+5

Fan State (Analog INPUT) (Cooling only)

General form = BaseId + (Stat Index * SpanId) + 6

(Default) 1000+StatIndex*100+6