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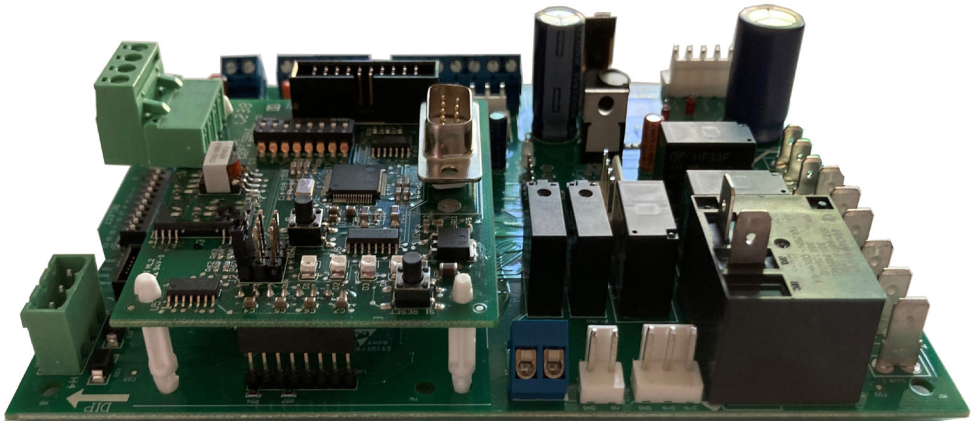
# MICROTECH® SMARTSOURCE® WSHP

## BACNET NETWORK INTEGRATION GUIDE

MICROTECH 2300 WSHP UNIT CONTROLLER
MODELS SCH/SDH, SMH/SNH, AND SSH/STH WITH R32 REFRIGERANT



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# Introduction

This manual describes how to integrate a MicroTech® MT2300 SmartSource WSHP unit controller to a BAS (building automation system) for network communication.

## Description

The MicroTech application supports SmartSource® Single/Two Stage and Dual Compressor R32 models with MT2300 controls.

The MicroTech controller supports the BACnet® MS/TP standard protocol. A separate BACnet communication module must be attached to the unit controller for network integration.

BACnet network parameters include heating/cooling/dehumidification setpoints, system status, fan and compressor operation, monitoring, and alarm objects. Once the unit has been configured as described in the Network Configuration section, BACnet objects are accessible from the BAS.

It is assumed that the user is familiar with BACnet integration. Contact the Daikin Applied Controls Customer Support group at 866-462-7829 or Controls@daikinapplied.com for additional assistance, if necessary.

## Software Version

This document supports the latest version of the MicroTech application and all subsequent versions until otherwise indicated. If the MicroTech application software is a later version, some of the information in this document may not apply.

The software version can be read from the Application_Software_Version property of the BACnet Device Object.

## Hazardous Information Messages

**DANGER**

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

**⚠ WARNING**

Warning indicates a potentially hazardous situations, which can result in property damage, personal injury, or death if not avoided.

**⚠ CAUTION**

Caution indicates a potentially hazardous situations, which can result in minor injury or equipment damage if not avoided.

***NOTICE***

Notice indicates practices not related to physical injury.

## Reference Documents

| Title | Number | Company | Source |
|---|---|---|---|
| SmartSource with MicroTech Unit Controller Operation Manual | OM 1364 | Daikin Applied | www.DaikinApplied.com |
| MicroTech SmartSource BACnet Communication Module Installation Manual | IM 1363 | Daikin Applied | www.DaikinApplied.com |
| BACnet A Data Communication Protocol for Building Automation and Control Networks | ANSI/ASHRAE 135-2006 | American Society of Heating, Refrigeration, and Air-Conditioning Engineers | www.ashrae.org |

## BACnet Networks

BACnet is a standard communication protocol for Building Automation and Control Networks developed by the American National Standards Institute (ANSI) and American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE) specified in ANSI/ASHRAE standard 135-2012 (www.ashrae.org). It addresses all aspects of the various systems that are applied to building control systems. BACnet provides the communication infrastructure needed to integrate products manufactured by different vendors and to integrate building services that are now independent.

### BACnet Network Compatibility

The WSHP unit controller is tested according to the BACnet Testing Laboratory (BTL) Test Plan. It is designed to meet the requirements of the most current BACnet Standard as stated in the Protocol Implementation and Conformance Statement (PICS). However, it is not BTL listed. See BACnet PICS.

### BACnet Device Object Types

The MicroTech WSHP unit controller incorporates standard BACnet object types (i.e., object types defined in the BACnet Standard) that conform to the BACnet Standard. Each object has properties that control unit variables. Some object types occur more than once in the unit controller; each occurrence or instance has different properties and controls different unit variables. Each instance is designated with a unique type and instance index. Some properties can be adjusted (read/write properties such as temperature setpoints) from the network and others can only be interrogated (read-only properties such as status information).

#### *Device Object Properties*

Each BACnet compatible device can only have a single BACnet Device Object. The Device Object contains other informative properties as shown in Table 1. Also see BACnet PICS.

### *Device Object Identifier*

The Device Object_Identifier uniquely specifies the unit within the network. The initial device object instance number is calculated based on the MAC Address (MS/TP) address from the unit controller application. This number must be unique on the entire BACnet network.

### *Device Object_Name*

Each device has a unique Object_Name by default. The Object_Name is MT2300_WSHP_Ser2_ or MT2300_WSHP_SS2C_ + Device Instance. The Device Object Name can be configured manually or automatically. Also see MicroTech SmartSource BACnet Communication Module IM 1363 (www.DaikinApplied.com).

**⚠ CAUTION**

If another device in the network already has this object identifier, change the instance number of one device object so that all devices in the network have a unique object identifier.

***Table 1: Device Object Properties***

| Property | ID | Default Value | Data Type |
|---|---|---|---|
| Object Identifier | 75 | Device | BACnetObjectIdentifier |
| Object Name | 77 | SmartSource Series2: MT2300_WSHP_Ser2_3101### | Character String |
| | | SmartSource SS2C: MT2300_WSHP_SS2C_3101### | |
| Object Type | 79 | 8 | BACnetObjectType |
| System Status | 112 | | BACnetDeviceStatus |
| Vendor Name | 121 | Daikin Applied | Character String |
| Vendor Identifier | 120 | 3 | Unsigned 16 |
| Model Name | 70 | SmartSource Series2: MT2300_WSHP_Ser2 | Character String |
| | | SmartSource SS2C: MT2300_WSHP_SS2C | |
| Firmware Revision | 44 | SmartSource Series2: HP4 v2.0 | Character String |
| | | SmartSource SS2C: HP5 v2.0 | |
| Application Software Version | 12 | SmartSource Series2: HP4: BB=v2.0, IO=v2.0 | Character String |
| | | SmartSource SS2C: HP5: BB=v2.0, IO=v2.0 | |
| Location | 58 | | Character String |
| Description | 28 | | Character String |
| Protocol Version | 98 | 1 | Unsigned |
| Protocol Services Supported | 97 | | BACnetServicesSupported |
| Protocol Object Types Supported[1] | 96 | AI, AV, BI, BO, BV, Device, MSI, MSV | BACnetObjectTypesSupported |
| Object List | 76 | | Sequence of BACnetObjectIdentifer |
| Max APDU Length Accepted | 62 | 480 | Unsigned 17 |
| Segmentation Supported | 107 | None | BACnetSegmentation |
| Max Segments Accepted | 167 | 4 | Unsigned |
| Local Time | 57 | Variable | Time |
| Local Date | 56 | Variable | Date |
| UTC Offset | 119 | -60 (Range: -780...780) | Integer |
| Daylight Savings Status | 24 | variable | Boolean |
| APDU Segment Timeout | 10 | 5000 | Unsigned |
| APDU Timeout | 11 | 6000 | Unsigned |
| Number of APDU Retries | 73 | 3 | Unsigned |
| Device Address Binding | 30 | | Sequence of BACnetAddressBinding |
| Database Revision | 115 | 1 | Unsigned |
| Active COV Subscriptions | 152 | | List of BACnetCOVSubscriptions |
| Property List Identifiers | 112 | Variable | List of BACnetPropertyIdentifier |

[1]While the MicroTech controller supports the entire set of object types from ListofBACnetPropertyIdentifier, not all object types are used.

# Network Configuration

## Addressing Parameters

Table 2 describes the BACnet parameter settings required for establishing network communication.

***Table 2: Network Communication Parameter Settings***

| Parameter | Default | Range | Notes |
|---|---|---|---|
| **Baud Rate** | 38400 | 9600, 19200, 38400, 76800 | Must be set to match the speed of the BACnet network. This must be done from the BACnet module configuration menu using a terminal device application such as HyperTerminal or PuTTY |
| **Max Masters** | 127 | 1 - 127 | Set to the highest address of a MS/TP master on the network segment to reduce the MS/TP token traffic and increase response time of the unit controller. This must be done using a terminal device application such as HyperTerminal or PuTTY |
| **MAC Address (AV:411)** | N/A | 0 - 127, and 255 Note that 128 - 254 are not valid addresses | Must be set according to the BACnet network requirements. When the dip switch address is set to 255 (factory default), the MAC Address is dynamically acquired during the commissioning process. Once commissioned, the MAC Address can be adjusted from the network using AV:411, or through a terminal device application such as HyperTerminal or PuTTY |
| | | | When the dip switch address is not set to 255, the static MAC Address directly matches the dip switch value |
| **System Minimum Instance (AV:412)** | 3101000 | 0 - 4194303 | Writeable only through the network. “Present Value” is used during the commissioning process to determine the Device Instance and Name |
| **Device Instance Number** | 300 | 0 - 4194302 300 not allowed | The commissioning process initializes the Device Instance Number to MAC Address + System Minimum Instance (AV:412) or is manually adjustable |
| **Device Object Name** | MT2300_ WSHP_ Ser2_0000300 or MT2300_ WSHP_ SS2C_0000300 | Up to a 31-character Device Object Name | The commissioning process initializes the Device Object Name to either “MT2300_WSHP_Ser2_” or “MT2300_WSHP_SS2C_” + Device Instance |
| **Max APDU Length** | 480 | N/A | Fixed value = 480 |

As referenced above in Table 2, certain addressing parameters are accessed using the BACnet communication module’s built-in configuration menu (Figure 1).

The BACnet configuration menu is accessed using a serial application like Windows® HyperTerminal® or PuTTY. It is assumed that the user is familiar with such an application. Addressing must be done before the controller can communicate to the network. Also refer to MicroTech WSHP BACnet Communication Module, IM 928 for further addressing information (www.DaikinApplied.com).

### *Network Variables AV:412 and AV:411*

During the automatic assignment process, AV:412 (the System Minimum Instance number) is added to the MAC Address value to determine the Device Instance Number. After the communication module is commissioned, the MAC address is commandable from the BAS using the AV:411 object.

AV:412 has an ObjectName of SystemMinInstance, the Present Value is writable, and it has a default value of 3101000. During the commissioning process, the present value of AV:412 is added to the MAC Address to determine the Device Instance Number.

In order to change the value of AV:412 on the communication module in the unconfigured state, the BAS must broadcast a new present value to AV:412 using the BACnet service (BIBB – BACnet Interface Building Block) called “Unconfirmed COV” with a ProcessID value of 1. This prevents unauthorized unconfirmed writes, or changes, to AV:412. Note that this change affects the AV:412 present value for every WSHP communication module on the trunk.

The following is an example of how AV:412 can be used in a typical BACnet BAS:

> *A network has two separate trunks. One trunk uses the default Minimum Instance Number of 3101000. The second trunk is set to a different Minimum Device Instance Number (Example 3102000) via AV:412. In this way, the two trunks can each have unique Device Instance Numbers on the network.*
>
> The AV:411 object is the MAC Address/Address Switch. It is a multi-purpose variable, which means that the ObjectName changes based on the value of the physical S3 address switch on the communication module. When the address switch is set to 255, the AV:411 Object Name is MACAddress, the Present Value is commandable via the BAS, and represents the communication module’s MS/TP MAC Address. However, if the address switch is not set to 255, the AV:411 Object Name is MACAddressSwitch, Present Value is read-only, and represents the S3 physical address switch setting.

# The BACnet Configuration Menu

The BACnet communication module's configuration menu is accessed through the DB-9 serial connector on the module itself. Any serial terminal device or application (such as Windows HyperTerminal) can be used to view the menu and change the configuration parameters.

Follow these steps to connect to the BACnet configuration menu (Figure 1):

1. Verify that the terminal application communication settings are set to: 19200 bps, 8-data bits, 1-stop bit, no parity, and no flow control.
2. Use a null modem serial cross over cable to connect the computer to the BACnet communication module.
3. Once connected, press the 'Enter' key to display the menu shown in Figure 1.
4. Use the BACnet configuration menu to change the terminal EIA-232 baud rate, if required for the network. Also change any additional addressing parameters available in the Figure 1.
5. Press 'S' to save the BACnet configuration settings.
6. Verify "Flash write – success" is shown for configuration pages 1 and 2. Otherwise, save the settings again.

*Figure 1: BACnet Configuration Menu*

```
Daikin Applied - MT2300_WSHP_Ser2
BACnet FW HP4 v2.0 UnitApp HP4 BB=v2.0,IO=v2.0
============== SW PN 2507443 ====================
DEVICE
1) Instance .......... 3101127
2) Name ............... MT2300_WSHP_Ser2_3101127
3) Location ............
4) Description ........
5) Units ..............English
MS/TP
6) Baudrate ...........38400
7) MaxMasters .........127
M) MAC Address ..... 127

TERMINAL
8) EIA-232 Baudrate ... 19200
B) Backup Configuration
R) Restore Configuration
S) Save settings
-------------------------------------------
```

# Device Management

## Network Device Testing

Several parameters are used only for maintenance and testing. A network management tool such as VTS is typically used to issue the network commands for the WHSP:

- DeviceCommunicationControl – Disable
- DeviceCommunicationControl - Enable
- ReinitializeDevice (Reset)
- Network “Wink” Command

## DeviceCommunicationControl - Disable

The purpose of this command is to reduce network traffic for diagnostic testing of the MS/TP network. When the communication module receives a network command to disable communication, it stops communicating unit information to the network. An optional time may be specified for how long to suspend communications. The unit continues to operate during the Disabled state.

## DeviceCommunicationControl - Enable

When the communication module receives a network command to enable communication, unit controller network communication is restored.

## ReinitializeDevice (Reset)

When the communication module receives a network ReinitializeDevice command, it performs the following:

1. Sends a command to the unit controller to perform a warm reset, maintaining non-volatile memory.
2. Resets the communication module.

If a warm reset is requested, the communication module’s non-volatile memory is maintained. If a cold reset is requested, then the communication module’s non-volatile memory is set to default values.

A cold reset can also be performed by the following button sequence on the BACnet communication module.

1. Press and hold the button labeled “Default.”
2. Momentarily press the “Reset” button.
3. The four LED indicators flash briefly and then begin sequencing on starting with LED D1.
4. Release the “Default” button when all four LED indicators are on.
5. The communication module will then clear the memory to default settings and reset.

## The Network “Wink” Command

The BACnet communication module implements a unit identification mode command to the unit controller by using the BACnet “ReinitializeDevice” request, with a Cold or Warm Start request handle, and a password of “wink” (all lower case). The “wink” unit identification function allows verification of an individual unit network address without opening the unit access panels. The Wink command can be used during all operating and non-operating (ex. Alarm) modes except for the following conditions:

- Invalid Configuration Alarm
- Incompatible Software Alarm
- Compressor Low Voltage Brownout Alarm
- Emergency Shutdown Mode
- Defrost Process

Upon receiving a wink command from a network management node, the unit controller exhibits the following identification sequence (all occur simultaneously):

- Room Sensor LED: flashes ON 3 seconds, then OFF 3 seconds for 15 total seconds, unless an alarm condition exists.
- Fan: the fan turns off for 5 seconds then on 5 seconds, then off again for 5 seconds.

# BACnet Data Tables

**⚠ CAUTION**

Please note that each time a command is written to a configuration property, (noted by a "cp" in front of the BACnet object name) the data is stored in the unit controller's non-volatile or Flash memory. Writing to Flash memory is an operation that has a finite limit. For this reason, the number of writes made to BACnet objects linked to configuration properties must be limited to avoid damage to the hardware.

The following section contains relevant information needed to integrate a MicroTech WSHP into the BACnet network.

The Network Configuration, Effective Occupancy Modes, and Space Temperature Setpoints sections provide additional details. Also see BACnet PICS.

**NOTE:** Changing a temperature setpoint's minimum or maximum value may result in an "Out of Range" error. This is due to the internal Fahrenheit to Celsius conversion. To prevent this error from occurring, use an offset of 0.1º when writing to a minimum or maximum temperature setpoint value.

## BACnet Network Parameters

***Table 3: Analog Inputs***

| Point Name | Object Type/ Instance | BACnet Object Name | Range/Default | Read/ Write Access[2] | Non-volatile Memory[1] | Description |
|---|---|---|---|---|---|---|
| Local Space Temperature | AI:1 | LocalSpaceTemp | 0 to 158ºF<br>-17.77 to 70ºC<br>Default:<br>68ºF / 20ºC | R | N | Reflects the value provided from either a room temperature sensor or thermostat input.[3] |
| Leaving Water Temperature | AI:2 | LWT | 0 to 158°F<br>-17.77 to 70°C<br>Default:<br>32ºF / 0ºC | R | N | Reflects the leaving water temperature sensor value, if installed and configured with a valid input.[3] |
| Entering Water Temperature | AI:3 | EWT | 0 to 158°F<br>-17.77 to 70°C<br>Default:<br>32ºF / 0ºC | R | N | Reflects the entering water temperature sensor value, if installed and configured with a valid input.[3] |
| Discharge Air Temperature | AI:4 | DischAirTemp | 0 to 158°F<br>-17.77 to 70°C<br>Default:<br>32ºF / 0ºC | R | N | Reflects the discharge air temperature sensor value, if installed and configured with a valid input.[3] |
| Local Setpoint Adjust | AI:5 | LocalSetpt | 55 to 95ºF<br>12.78 to 35ºC<br>Default:<br>32ºF / 0ºC | R | N | Reflects the value of the selected control temperature (space, return air, average) long range reference setpoint.<br>Applies when configured for long range setpoint adjust (baseboard configuration switch 5 is on) and is enabled by MSV:14.[3]<br>This setpoint is also used to calculate the effective heating/ cooling setpoints. See Effective Occupancy Modes. |
| Compressor 1 Suction Temperature | AI:6 | Comp1SuctionTemp | 0 to 158°F<br>-17.77 to 70°C<br>Default:<br>32ºF / 0ºC | R | N | Indicates the compressor #1 suction line temperature sensor value.[3] |
| Compressor 2 Suction Temperature | AI:7 | Comp2SuctionTemp | 0 to 158°F<br>-17.77 to 70°C<br>Default:<br>32ºF / 0ºC | R | N | Indicates the compressor #2 suction line temperature sensor value.[3] |
| Brownout Voltage Reading | AI:8 | Brownout | 0 to 4095 counts<br>Default: 0 | R | N | The compressr brownout voltage used for factory-unit controller calibration. This reference value (in counts) is compared to the brownout trip and recover setpoints to determine if a brownout condition exists. Also see AV:9. |
| Local Space Humidity | AI:9 | LocalSpaceRH | 1 to 100% | R | N | Reflects the value of the indoor relative humidity sensor, if installed and configured with a valid input. The input is also used to calculate the local space dewpoint value. |
| Return Air Temperature | AI:10 | RAT | 0 to 158°F<br>-17.77 to 70°C<br>Default:<br>32ºF / 0ºC | R | N | The value of the room/return air temperature (RAT), if installed and configured with a valid input. |

[1]Parameter is stored in FLASH/EEPROM (non-volatile memory) in either the communication module or in the unit controller. If Non-volatile Memory = Y, then the value is saved through a power cycle. Writes to this parameter must be limited. If Non-volatile Memory = N, the value is not saved through a power cycle.

[2] R = Read Only, W = Writeable, C = Commandable

[3]A Null value is equal to 621.806ºF/327.67ºC. Its purpose is to indicate a sensor failure condition or when the unit controller is not using that particular temperature value.

### *Table 4: Analog Values*

| Point Name | Object Type/ Instance | BACnet Object Name | Range/Default (in Units) | Read/ Write Access[2] | Non-volatile Memory[1] | Description |
|---|---|---|---|---|---|---|
| **Occupancy Temperature Setpoints (AV1 to AV6)** | | | | | | Defines the control temperature heating and cooling setpoints for different occupancy modes. See Effective Occupancy Modes and Space Temperature Setpoints for occupancy interaction rules. |
| Occupied Cooling Setpoint | AV:1 | cpOccupied_ Cool_Setpt | 50 to 95ºF 10 to 35ºC Default: 75ºF / 23.88ºC | W | Y | The control temperature setpoint used for the occupied cooling mode. |
| Standby Cool Setpoint | AV:2 | cpStandby_ Cool_Setpt | 50 to 95ºF 10 to 35ºC Default: 77ºF / 25ºC | W | Y | The control temperature setpoint used for the standby cooling mode. |
| Unoccupied Cool Setpoint | AV:3 | cpUnoccupied_ Cool_Setpt | 50 to 95ºF 10 to 35ºC Default: 85ºF / 29.44ºC | W | Y | The control temperature setpoint used for the unoccupied cooling mode. |
| Occupied Heat Setpoint | AV:4 | cpOccupied_ Heat_Setpt | 50 to 95ºF 10 to 35ºC Default: 70ºF / 21.11ºC | W | Y | The control temperature setpoint used for the occupied heating mode. |
| Standby Heat Setpoint | AV:5 | cpStandby_ Heat_Setpt | 50 to 95ºF 10 to 35ºC Default: 66ºF / 18.88ºC | W | Y | The control temperature setpoint used for the standby heating mode. |
| Unoccupied Heat Setpoint | AV:6 | cpUnoccupied_ Heat_Setpt | 50 to 95ºF 10 to 35ºC Default: 60ºF / 15.55ºC | W | Y | The control temperature setpoint used for the unoccupied heating mode. |
| Local Bypass Time Setpoint | AV:7 | cpBypassTime | 0, 30 to 120 min Default:120 min | W | Y | Defines the amount of time that the unit can be in the bypass mode initiated by the timed override button. Pressing the timed override button 3-11 seconds sets the bypass timer to this parameter's value. The value of 0 disables this feature. |
| Interstage OFF Timer | AV:8 | cpIntStgOffTmr | 0 to 1200 sec Default: 0 | W | Y | A countdown timer that defines the minimum period of time between turn-off of the subsequent heating and cooling stages. The Interstage off Timer is not currently supported by unit controller software. |
| Brownout Reference Setpoint | AV:9 | cpBrownoutRef | 100 to 4095 counts Default: 1600 | W | Y | Configures the brownout setpoint used for factory-calibration of the unit controller line voltage. The controller detects a brownout condition when the line voltage is less than 80% of the factory calibrated reference setpoint. An alarm is generated in the event of a brownout condition.7<br>Only perform the calibration procedure if the unit controller 24 VAC voltage is within normal operating parameters. |
| Occupied Setpoint Differential | AV:10 | cpOccDiff | 1 to 5°F 0.55 to 2.78°C Default: 1ºF / 0.55ºC | W | Y | Determines the cooling off and heating on effective setpoints. Applies when the unit is in the occupied, bypass, or standby mode as follows::<br>ClgSetptOff = EffectSetpt (AV:23) - cpOccDiff (AV:10).<br>HtgSetptOff = EffectSetpt (AV:23) + cpOccDiff (AV:10). |
| Compressor Low Suction Temp Protection Setpoint : Glycol | AV:11 | cpLowTempProtGL | 0 to 50°F -17.78 to 10°C Default: 6.5ºF/-14.16ºC | W | Y | Temperature at which a compressor low suction alarm occurs in heating mode when the loop fluid is glycol. AV:11 does not apply to the dehumidification and cooling modes, which use a fixed 28ºF low temp threshold regardless of the loop fluid type. |
| Compressor Low Suction Temp Protection Setpoint : Water | AV:12 | cpLowTempProt | 0 to 50°F -17.78 to 10°C Default: 28ºF / -2.22ºC | W | Y | Temperature at which a compressor low suction alarm occurs in the heating mode and when the loop fluid is water. AV:12 is enabled by the unit controller contact switch in the open position, which selects water. Does not apply to the dehumidification and cooling modes, which use a fixed 28ºF low temp threshold regardless of the loop fluid type. |

***Table 4: Analog Values, Continued***

| Point Name | Object Type/ Instance | BACnet Object Name | Range/Default (in Units) | Read/ Write Access[2] | Non-volatile Memory[1] | Description |
|---|---|---|---|---|---|---|
| Compressor Low Suction Temp Protection Differential | AV:13 | cpLowTmpProtDif | 2 to 15°F<br>1.11 to 8.34°C<br>Default:<br>8°F / 4.44°C | W | Y | This differential is added to the selected compressor low suction temperature protection setpoint (AV:11 or AV:12). The values are used for alarm clearing. |
| Interstage ON Timer | AV:14 | cpIntStgOnTmr | 0 to 1200 sec<br>Default: 300 sec | W | Y | A countdown timer that defines the minimum period of time between turn-on of the subsequent heating and cooling stages. |
| Compressor Minimum OFF Timer | AV:15 | cpMinCompOffTmr | 0 to 1200 sec<br>Default: 360 sec | W | Y | A countdown timer that defines the minimum period of time a compressor must remain off before it is allowed to turn on again. |
| Compressor Minimum ON Timer | AV:16 | cpMinCompOnTmr | 0 to 1200 sec<br>Default: 180 sec | W | Y | A countdown timer that defines the minimum period of time a compressor must remain on before it is allowed to turn off again. |
| Unoccupied Setpoint Differential | AV:17 | cpUnoccDiff | 2 to 10°F<br>1.11 to 5.56°C<br>Default:<br>2ºF / 1.11ºC | W | Y | Determines the unoccupied mode effective off setpoint. Applies only to occupied, bypass, and standby modes as follows:<br>ClgSetptOff = EffectSetpt (AV:23) - cpUnoccDiff (AV:17).<br>HtgSetptOff = EffectSetpt (AV:23) + cpUnoccDiff (AV:17). |
| Space Temperature Input | AV:18 | Network SpaceTemp | 14 to 122°F<br>-10 to 50°C<br>Default[6]:<br>621.806ºF<br>327.67ºC | C | N | Provides the space temperature value from the network instead of using the local temperature sensor.[6,7] The network override will revert back to its default value upon unit controller reboot. |
| Network Temperature Setpoint | AV:19 | NetworkSetpoint | 50 to 95ºF<br>10 to 35ºC<br>Default[6]:<br>621.806ºF<br>327.67ºC | C | N | Allows the network to set the reference setpoint in occupied and standby occupancy modes. The local setpoint must be disabled via local setpoint enable (MSV:14). Retains the last valid value after power-up.[6] The network override reverts to the default value upon unit controller reboot. See Space Temperature Setpoints. |
| Receive Heartbeat | AV:20 | cpRcvHrtBt | 0 to 6553.4 sec<br>Default: 0<br>(Disabled) | W | Y | Specifies the maximum amount of time the supported overrides must be refreshed (i.e. written) before the unit reverts back to the default value. Each Receive Heartbeat variable has a separate timer associated with it. A value of 0 disables this feature.<br>**Receive Heartbeat Variables**<br>AV:18 SpaceTemp<br>AV:35 SetptOffset<br>AV:45 ComprEnable<br>AV:51 OccSchedule<br>MSV:1 OccSensor<br>MSV:8 ApplicMode<br>MSV:9 AuxHeatEnable<br>MSV:10 EnergyHoldoff<br>MSV:11 SpaceRH<br>MSV:12 Dewpoint |
| Send Heartbeat | AV:21 | cpSndHrtBt | 0 to 6553.4 sec<br>Default: 0<br>(Disabled) | W | Y | Send Heartbeat is not supported by the BACnet communication module. Use the Change of Value (COV) feature as an alternative. |
| Effective Space Temperature Output | AV:22 | EffectSpaceTemp | 0 to 158°F<br>-17.78 to 70°C<br>Default[6]:<br>621.806ºF<br>327.67ºC | R | N | Reflects the space temperature that the unit uses for control. This value reflects the local sensor input unless the network override is valid.[6] |
| Effective Setpoint Output | AV:23 | EffectSetpt | 50 to 95ºF<br>10 to 35ºC<br>Default[6]:<br>621.806ºF<br>327.67ºC | R | N | Effective heating or cooling setpoint the unit is attempting to maintain. The setpoint depends on effective occupancy (MSV:6).[6] See Space Temperature Setpoints. |
| Setpoint Shift Output | AV:24 | SetptShift | -5 to 5ºF<br>-2.78 to 2.78ºC<br>Default: 0ºF | R | N | Reflects the local the room sensor hardwired setpoint adjustment value from potentiometer. Applies when sensor is installed and configured for short range setpoint adjust. |

***Table 4: Analog Values, Continued***

| Point Name | Object Type/ Instance | BACnet Object Name | Range/Default (in Units) | Read/ Write Access[2] | Non-volatile Memory[1] | Description |
|---|---|---|---|---|---|---|
| Long Range Setpoint Adjust Maximum | AV:25 | cpSptAdjMax | 55 to 95ºF<br>12.78 to 35ºC<br>Default:<br>95ºF / 35ºC | W | Y | Maximum allowed value of the long range setpoint adjust. This value must be greater than or equal to the long range setpoint minimum, AV:26. |
| Long Range Setpoint Adjust Minimum | AV:26 | cpSptAdjMin | 55 to 95ºF<br>12.78 to 35ºC<br>Default:<br>55ºF / 12.78ºC | W | Y | Minimum allowed value of the long range setpoint adjust. This value must be less than or equal to the long range setpoint maximum, AV:25. |
| Hydronic Cooling ON Setpoint | AV:27 | cpHydroClgOnSpt | 50 to 70ºF<br>10 to 21.12ºC<br>Default:<br>65ºF / 18.33ºC | W | Y | Specifies the entering water temperature (EWT) hydronic cooling setpoint for units with a waterside economizer. Hydronic cooling is enabled if the EWT is below this value, and is allowed to operate in conjunction with compressor cooling.<br>If the EWT drops below the fixed value of 45ºF, hydronic cooling is disabled. |
| Hydronic Setpoint Differential | AV:28 | cpHydronicDiff | 2 to 10ºF<br>1.11 to 5.56ºC<br>Default:<br>5ºF / 2.78ºC | W | Y | Sets the temperature differential used to disable hydronic cooling (waterside economizer) and hydronic heating. |
| Low Leaving Water Temp Differential | AV:29 | cpLowLwtDiff | 2 to 15ºF<br>1.11 to 8.34ºC<br>Default:<br>7ºF / 3.89ºC | W | Y | The low leaving water temperature differential setpoint is used to calculate the freeze fault setpoint. The differential is added to the selected compressor low suction temp protection SP (AV:29 or AV:30) to then determine the Freeze fault temperature, which is based on LWT. After the freeze fault condition has been activated, the alarm must be manually reset when the LWT is above the lockout temp to allow the alarm to clear. |
| Low EWT Setpoint for Glycol | AV:30 | cpLowEwtSptGly | 15 to 40ºF<br>-9.44 to 4.45ºC<br>Default:<br>28ºF / -2.22ºC | W | Y | Value of the low entering water temperature (EWT) setpoint when using a glycol loop fluid. |
| Low EWT Setpoint for Water | AV:31 | cpLowEwtSptWtr | 40 to 65ºF<br>4.44 to 18.34ºC<br>Default:<br>55ºF / 12.78ºC | W | Y | Value of the low entering water temperature (EWT) setpoint when using water loop fluid. |
| Hydronic Heating ON Setpoint | AV:32 | cpHydroHtgOnSpt | 70 to 158ºF<br>21.11 to 70ºC<br>Default:*<br>90ºF / 32.22ºC | W | Y | Specifies the entering water temperature hydronic heating setpoint for units with a hydronic heating coil. Hydronic heating is not allowed to operate in conjunction with compressor heating. |
| Second Stage Setpoints Differential | AV:33 | cpStg2SptDiff | 1 to 5ºF<br>0.55 to 2.78ºC<br>Default:<br>2ºF / 1.11ºC | W | Y | Determines the heating stage 2 heating/cooling stages 1, 2, or 3 “on” setpoints for units controlled by a room sensor. |
| Compressor Low Pressure Alarm Delay | AV:34 | cpLowPresAlmDly | 0 to 120 sec<br>Default: 30 sec | W | Y | Specifies the time delay between the low pressure input and alarm generation for compressor(s). |
| Temperature Setpoint Offset Input | AV:35 | SetptOffset | -18 to +18ºF<br>-10 to +10ºC<br>Default: 0º | C | N | Shifts the occupied and standby effective setpoints via the network. The network override is used when the local room sensor setpoint adjust (MSV:14) is disabled.[7] The unoccupied effective setpoints are not affected. The network override reverts back to its default value upon unit controller reset. See Space Temperature Setpoints. |
| Third Stage Heating Setpoint Differential | AV:36 | cpStg3SptDiff | 1 to 10ºF<br>0.55 to 5.56ºC<br>Default:<br>6ºF / 3.33ºC | W | Y | Configures the stage 3 heating “on” setpoints for units controlled by a room sensor. |
| Fourth Stage Heating Setpoint Differential | AV:37 | cpStg4SptDiff | 1 to 10ºF<br>0.55 to 5.56ºC<br>Default:<br>6ºF / 3.33ºC | W | Y | Configures the stage 4 heating “on” setpoints for units controlled by a room sensor. |
| Fan Speed Output | AV:38 | FanSpeedCmd | 0 to 100% | R | N | Commanded fan speed percentage. AV:38 is used in conjunction with MSI:5 to indicate the fan speed status. |
| Fan Run Hours | AV:39 | FanRunHours | 0 to 65535 Hours | W | Y | Total fan run time hours.[8] |
| Compressor 1 Run Hours | AV:40 | CompRunHours | 0 to 65535 Hours | W | Y | Total compressor 1 run time hours.[8] |

***Table 4: Analog Values, Continued***

| Point Name | Object Type/ Instance | BACnet Object Name | Range/Default (in Units) | Read/ Write Access[2] | Non-volatile Memory[1] | Description |
|---|---|---|---|---|---|---|
| Compressor 1 Starts | AV:41 | CompStarts | 0 to 65535 Starts | W | Y | Total number of compressor starts.[8] |
| Compressor 2 / Compressor High Capacity Run Hours | AV:42 | Comp2RunHours / CompHiCapRunHours | 0 to 65535 Hours | W | Y | Total runtime hours for compressor high capacity or compressor 2 runtime hours, depending on application.[8] |
| Compressor 2 / Compressor High Capacity Starts | AV:43 | Comp2Starts / CompHiCapStarts | 0 to 65535 Starts | W | Y | Total number of high capacity compressor starts or compressor 2 starts, depending on application.[8] |
| Effective Space Humidity | AV:44 | EffectSpaceRH | 0 to 100% | R | N | The indoor humidity value provided by a valid network input or local sensor. It represents the network space relative humidity value (AV:45), if available. Otherwise, it represents the humidity sensor input provided by the indoor relative humidity value. |
| Network Space Humidity Override | AV:45 | NetworkSpaceRH | 0 to 100%<br>Default: Null[6] | C | N | Provides an indoor humidity value from the network instead of using the local humidity sensor. The network override reverts back to its default value upon unit controller reset. |
| Space Humidity Setpoint Differential | AV:46 | cpSpaceRH_Diff | 1 to 20%<br>5% | W | Y | Space relative humidity setpoint differential used to determine the effective “off” setpoint from the “on” setpoint. |
| Space Humidity Setpoint | AV:47 | cpSpaceRH_Setpt | 0 to 100%<br>Default: 50% | W | Y | Configures the space relative humidity setpoint value. This setpoint initiates dehumidification on units that are properly configured and have dehumidification enabled. |
| Effective Control Temperature | AV:48 | EffectControlTemp | 0 to 158°F<br>-17.77 to 70°C | R | N | Effective control temperature (space, return, or average of the two) used to determine the temperature at which the unit should heat or cool. |
| Compressor Wait for Flow Timer | AV:49 | cpWaitForFlow | 45 to 90 sec<br>Default: 60 sec | W | Y | Sets the amount of time the compressor is prevented from running after the isolation valve output energizes, allowing the supply water flow timer to expire. |
| Local Space Dewpoint | AV:50 | LocalDewpointCalc | 32 to 150°F<br>0 to 65.55ºC<br>Default: Null[6] | R | N | Reflects the local space dewpoint calculated value. The calculation uses the effective space relative humidity value in conjunction with effective space temperature value. |
| Network Dewpoint Override | AV:51 | NetworkDewpoint | 32 to 150°F<br>0 to 65.55ºC<br>Default: Null[6] | C | N | Network dewpoint override. Provides an indoor dewpoint value from the network instead of using the calculated local space dewpoint input. The network override reverts to its default value upon unit controller reset. |
| Effective Dewpoint | AV:52 | EffectiveDewpoint | 32 to 150°F<br>0 to 65.55ºC<br>Default: Null[6] | R | N | Effective dewpoint. It represents the network input (AV:51), if available and valid. Otherwise, it represents the calculated local space dewpoint input (AV:50). |
| Dewpoint Setpoint | AV:53 | cpDewpointSetp | 40 to 60°F<br>4.44 to 15.56°C<br>Default:<br>49°F / 9.44°C | W | Y | Dewpoint setpoint used for dehumidification control. Requires a relative humidity sensor with valid input. |
| Dewpoint Differential | AV:54 | cpDewpointDiff | 1 to 5°F<br>0.55 to 2.78°C<br>Default:<br>2°F / 1.1°C | W | Y | Dewpoint setpoint differential value. Used when calculating the effective dewpoint “off” setpoint from the “on” setpoint. |
| Variable Fan Speed PWM - Fan-Only | AV:55 | cpVsFanOnlyPWM | 10 to 100%<br>Default: 20% | W | Y | Variable fan speed PWM output when unit is in fan-only state. Applies when network PWM fan configuration enable (MSV:17) is enabled. |
| Variable Fan Speed PWM - Dehumidification | AV:56 | cpVsDehumPWM | 50 to 100%<br>Default: 70% | W | Y | Variable fan speed PWM output for dehumidification. Applies when network PWM fan configuration enable (MSV:17) is enabled. |
| Variable Fan Speed PWM - Cool Stage 1 | AV:57 | cpVsCool1PWM | 50 to 100%<br>Default: 80% | W | Y | Variable fan speed PWM output for cooling stage 1. Applies when network PWM fan configuration enable (MSV:17) is enabled. |
| Variable Fan Speed PWM -Cool Stage 2 | AV:58 | cpVsCool2PWM | 50 to 100%<br>Default: 100% | W | Y | Variable fan speed PWM output for cooling stage 2. Applies when network PWM fan configuration enable (MSV:17) is enabled. |
| Variable Fan Speed PWM - Heat Stage 1 | AV:59 | cpVsHeat1PWM | 50 to 100%<br>Default: 80% | W | Y | Variable fan speed PWM output for heating stage 1. Applies when network PWM fan configuration enable (MSV:17) is enabled. |

***Table 4: Analog Values, Continued***

| Point Name | Object Type/ Instance | BACnet Object Name | Range/Default (in Units) | Read/ Write Access[2] | Non-volatile Memory[1] | Description |
|---|---|---|---|---|---|---|
| Variable Fan Speed PWM - Heat Stage 2 | AV:60 | cpVsHeat2PWM | 50 to 100% Default: 100% | W | Y | Variable fan speed PWM output for heating stage 2. Applies when network PWM fan configuration enable (MSV:17) is enabled. |
| Variable Fan Speed PWM - Electric Heat | AV:61 | cpVsElecHeatPWM | 100% | W | Y | Variable fan speed PWM output for auxiliary (electric) heating. Applies when network PWM fan configuration enable (MSV:17) is enabled. |
| Variable Fan Speed PWM - Hydronic Heat | AV:62 | cpVsHydroHeatPWM | 50 to 100% Default: 80% | W | Y | Variable fan speed PWM output for hydronic heating. Applies when network PWM fan configuration enable (MSV:17) is enabled. |
| Variable Fan Speed PWM - Hydronic Cool | AV:63 | cpVsHydroCoolPWM | 50 to 100% Default: 80% | W | Y | Variable fan speed PWM output for hydronic cooling. Applies when network PWM fan configuration enable (MSV:17) is enabled. |
| MAC Address / Address Switch | AV:411 | MacAddress (DIP = 255) | 0 to 255 | W | Y | The function of AV:411 depends on the value of the BACnet module physical address switch (S3). When it is set to 255, dynamic MAC addressing is used to commission the BACnet module. This variable represents the unit's MAC Address that can be written through the network or through the configuration serial port.<br>When the physical address switch is not set to a value of 255, it reflects the address switch setting and is read-only. |
| | | MacAddressSwitch (DIP < 255) | | R | N | |
| System Minimum Instance[4,5] | AV:412 | SystemMinInstance | 0 to 4194302 Default: 3101000 | W | Y | This value is added to the MAC Address to determine the final BACnet Device Name and Device Instance Number. Example: the default Device Instance Number = 3101007 when the MAC = 7. |

1. Parameter is stored in FLASH/EEPROM (non-volatile memory) in either the communication module or in the unit controller. If Non-volatile Memory = Y, then the value is saved through a power cycle. Writes to this parameter must be limited. If Non-volatile Memory = N, the value is not saved through a power cycle.
2. R = Read Only, W = Writeable, C = Commandable
3. The values of the individual Occupancy Temperature Setpoints (AV1 to AV6) must be kept in ascending order as follows:
   AV6 <= AV5 <= AV4 <= AV1 <= AV2 <= AV3
4. AV412 has an ObjectName of SystemMinInstance, the Present Value is writeable, and it has a default value of 3101000. During the commissioning process, the present value of AV412 is added to the MAC Address to determine the Device Instance Number. In order to change the value of AV412 on the BACnet communication module in the unconfigured state, the BAS must broadcast a new present value to AV412 using the BACnet service (BIBB – BACnet Interface Building Block) called "Unconfirmed COV" with a ProcessID value of 1. This prevents unauthorized unconfirmed writes, or changes, to AV412. Note that this change affects the AV412 present value for every water source heat pump BACnet communication module on the trunk.
5. AV:412 can be set via the BAS using auto-addressing..
6. A Null value is equal to 621.806ºF/327.67ºC. Its purpose is to indicate a sensor failure condition or when the unit controller is not using that particular temperature value.
7. After Receive Heartbeat is enabled, this variable reverts to the default (non-override) value if it is not refreshed often enough through a network command or if communication is disabled (i.e. BACnet device communication control = disable).
8. The totalizer continues to increment until the maximum count is reached, at which point the BAS must reset the value by issuing a write command. The parameter is saved in nonvolatile memory every 24 hours. If power is lost, that day's totalizer information is not stored.
9. The Invalid Configuration alarm occurs if software incompatibility has been detected or the hardware configuration jumpers are not selecting a valid model type.

**Binary Inputs (BI:1 - BI:14)** are available as network parameters based on software-configured inputs (Table 5).

**Binary Inputs (Configuration Settings) BI:15 - BI:34** are availalble to the network. The network parameters reflect hardware switch input settings for configurable unit options.

**Binary Outputs BO:1 - BO:12** are available to the network when the parameter dedicated to the corresponding binary output is configured (Table 6).

**NOTE:** All BI/BOs are read-only from the BACnet network.

***Table 5: Binary Inputs***

| Point Name | Object Type/ Instance | BACnet Object Name | Range | Description |
|---|---|---|---|---|
| A2L Board Fault | BI:1 | A2L_Fault | 0 = Alarm<br>1 = Normal | A2L refrigerant sensor fault input. Also see Alarms section.<br>0 = A2L Sensor Fault Alarm (0 VDC)<br>1 = Normal (up to 12 VDC) |
| Emergency Shutdown | BI:2 | EmergShutDn | 0=Normal<br>1=Shutdown | Emergency stop input. Indicates unit shutdown when input is pulled to ground.<br>0 = Normal unit operation (Inactive Text: Normal)<br>1 = Unit is shut down (Active Text: Shutdown) |

***Table 5: Binary Inputs, Continued***

| Point Name | Object Type/ Instance | BACnet Object Name | Range | Description |
|---|---|---|---|---|
| Compressor 1 High Pressure | BI:3 | HiPressure1 | 0 = Normal<br>1 = Alarm | Compressor 1 high pressure input. Indicates high pressure conditions when normally closed contact switch is open. The actual open/closed state of the switch cannot be determined unless the compressor 1 output is active (ON).<br>0 = Switch closed: Normal high-pressure condition (Inactive Text: Normal)<br>1 = Switch open: High pressure condition detected (Active Text: Alarm) |
| Compressor 1 Low Pressure | BI:4 | LoPressure1 | 0 = Normal<br>1 = Alarm | Compressor 1 low pressure input. Indicates low pressure conditions when normally closed contact switch is open.<br>0 = Switch closed: Normal low pressure condition (Inactive Text: Normal)<br>1 = Switch open: Low pressure condition detected (Active Text: Alarm) |
| Thermostat Fan Input | BI:5 | Tstat_G | 0 = Off (Auto)<br>1 = On | Thermostat input for fan operation. Applies when unit is configured with a factory or field-installed 24 VAC, dry contact thermostat.<br>0 = Off (Fan switch open): Fan in auto mode<br>1 = On (Fan switch closed): Request for fan from thermostat |
| Thermostat - Heating Stage 1 | BI:6 | Tstat_W1 | 0 = Inactive<br>1 = Active | Thermostat input for heating. Applies when unit is configured with a factory or field-installed 24 VAC, dry contact thermostat.<br>0 = Inactive: Thermostat switch is open, indicating no request for first stage heating<br>1 = Active: Thermostat switch is closed, indicating first stage heating is active |
| Thermostat - Heating Stage 2 | BI:7 | Tstat_W2 | 0 = Inactive<br>1 = Active | Thermostat input for heating. Applies when unit is configured with a factory or field-installed 24 VAC, dry contact thermostat.<br>0 = Inactive: Thermostat switch is open, indicating no request for second stage heating<br>1 = Active: Thermostat switch is closed, indicating second stage heating is active |
| Thermostat - Cooling Stage 1 | BI:8 | Tstat_Y1 | 0 = Inactive<br>1 = Active | Thermostat input for cooling. Applies when unit is configured with a factory or field-installed 24 VAC, dry contact thermostat.<br>0 = Inactive: Thermostat switch is open, indicating no request for first stage cooling<br>1 = Active: Thermostat switch is closed, indicating first stage cooling is active |
| Thermostat - Cooling Stage 2 | BI:9 | Tstat_Y2 | 0 = Inactive<br>1 = Active | Thermostat input for cooling. Applies when unit is configured with a factory or field-installed 24 VAC, dry contact thermostat.<br>0 = Inactive: Thermostat switch is open, indicating no request for second stage cooling<br>1 = Active: Thermostat switch is closed, indicating second stage cooling is active |
| Occupancy Switch Setting[1] | BI:10 | OccSw_In | 0 = Off<br>1 = On | Local occupancy switch input status.<br>0 = Off: Local occupancy switch is closed (unoccupied)<br>1 = On: Local occupancy switch is open (occupied) |
| Compressor 2 High Pressure | BI:11 | HiPressure2 | 0 = Normal<br>1 = Alarm | Compressor 2 high pressure input. Indicates high pressure conditions when normally closed contact switch is open. The actual open/closed state of the switch cannot be determined unless the compressor 2 output is active (ON).<br>0 = Switch closed: Normal high pressure condition (Inactive Text: Normal)<br>1 = Switch open: High pressure condition detected (Active Text: Alarm) |
| Compressor 2 Low Pressure | BI:12 | LoPressure2 | 0 = Normal<br>1 = Alarm | Compressor 2 low pressure input. Indicates low pressure conditions when normally closed contact switch is open.<br>0 = Switch closed: Normal low pressure condition (Inactive Text: Normal)<br>1 = Switch open: Low pressure condition detected (Active Text: Alarm) |
| Thermostat - Heating Stage 3 | BI:13 | Tstat_W3 | 0 = Inactive<br>1 = Active | Thermostat input for heating. Applies when unit is configured with a factory or field-installed 24 VAC, dry contact thermostat.<br>0 = Inactive: Thermostat switch is open, indicating no request for third stage heating<br>1 = Active: Thermostat switch is closed, indicating third stage heating is active |
| Thermostat - Heating Stage 4/ Cooling Stage 3 | BI:14 | Tstat_W4_Y3 | 0 = Inactive<br>1 = Active | Shared thermostat input for either fourth stage heating or third stage cooling. Applies when unit is configured with a factory or field-installed 24 VAC, dry contact thermostat.<br>0 = Inactive: Thermostat switch is open, indicating no request for fourth stage heating/third stage cooling<br>1 = Active: Thermostat switch is closed, indicating fourth stage heating/third stage cooling is active |
| **Baseboard Inputs** | | | | |
| Unit Operation | BI:15 | BB_ConfigSw1 | 0 = Off<br>1 = On | Configuration switch 1 settings for unit mode.<br>0 = Off: Normal operation<br>1 = On: Service/test mode |

***Table 5: Binary Inputs, Continued***

| Point Name | Object Type/ Instance | BACnet Object Name | Range | Description |
|---|---|---|---|---|
| Fan Operation | BI:16 | BB_ConfigSw2 | 0 = Off<br>1 = On | Configuration switch 2 settings for fan operation.<br>0 = Off: Continuous fan operation (on)<br>1 = On: Cycling fan operation (auto) |
| Loop Fluid | BI:17 | BB_ConfigSw3 | 0 = Off<br>1 = On | Configuration switch 3 settings for heat pump loop fluid type.<br>0 = Off: Water loop fluid<br>1 = On: Glycol loop fluid |
| Freeze Fault Protection | BI:18 | BB_ConfigSw4 | 0 = Off<br>1 = On | Configuration switch 4 settings for freeze fault enable.<br>0 = Off: LWT Freeze Fault Protection is disabled<br>1 = On: LWT Freeze Fault Protection is enabled |
| Room Sensor Setpoint Adjust | BI:19 | BB_ConfigSw5 | 0 = Off<br>1 = On | Configuration switch 5 settings for room sensor setpoint adjust method.<br>0 = Off: Short range: -5 to 5ºF (-2.78 to 2.78ºC)<br>1 = On: Long range: 55 to 95ºF (12.78 to 35ºC) |
| Thermostat/Room Sensor | BI:20 | BB_ConfigSw6 | 0 = Off<br>1 = On | Configuration switch 6 settings for room sensor control.<br>0 = Off: Thermostat control<br>1 = On: Room sensor control |
| Compressor Heating Enable (SmartSource Series2) | BI:21 | BB_ConfigSw7 | 0 = Off<br>1 = On | Configuration switch 7 settings for compressor heating enable. Applies when SmartSource Series2 application is selected.<br>For the SmartSource Series2 application:<br>0 = Off: Allows compressor heating mode operation<br>1 = On: Disables compressor heating mode operation |
| I/O Expansion Module (SmartSource Series2) | BI:22 | BB_ConfigSw8 | 0 = Off<br>1 = On | Configuration switch 8 settings for I/O module availability. Applies to SmartSource Series2 application.<br>0 = Off: I/O expansion module is not present<br>1 = On: I/O expansion module is required |
| I/O Expansion Module | BI:22 | BB_ConfigSw8 | 0 = Off<br>1 = On | Configuration switch 8 settings for I/O module availability. Applies to SmartSource Series2 application.<br>0 = Off: I/O expansion module is not present<br>1 = On: I/O expansion module is required |
| Compressor Availability (SmartSource SS2C) | BI:21 | BB_ConfigSw7 | 0 = Off<br>1 = On | Configuration switches 7 and 8 settings for compressor availabillity. Applies to SmartSource Two Compressor (SS2C) application.<br>Sw7 = Off, Sw8 = Off: Both compressors are available<br>Sw7 = On, Sw8 = Off: Only lead compressor is available<br>Sw7 = Off, Sw8 = On: No compressors are available<br>Sw7 = On, Sw8 = On: Invalid |
| | BI:22 | BB_ConfigSw8 | | |
| Baseboard Application Select | BI:23 | BB_ConfigSw9 | 0 = Off<br>1 = On | Indicates the software application selected for the baseboard.<br>0 = Off: SmartSource (Series2)<br>1 = On: SmartSource Two Compressor (SS2C) |
| Discrete / Variable Fan Select | BI:24 | BB_ConfigSw10 | 0 = Off<br>1 = On | Configuration switch 10 settings for fan speed options.<br>0 = Off: Single speed (with high speed output) or variable speed fan<br>1 = On: Dual speed fan (with high and low discrete outputs) |
| **I/O Expansion Module Inputs** | | | | |
| Variable Fan Speed Selection | BI:25 | IO_ConfigSw1 | 0000 to 1111 (Binary) | Configuration switch outputs (1 to 4) for variable speed fan row selection (1-16). Determines the PWM output signal used for each mode of operation. Applies when network override for variable speed fan (cpNetVsCnfgEn (MSV:17)) is disabled. |
| | BI:26 | IO_ConfigSw2 | | |
| | BI:27 | IO_ConfigSw3 | | |
| | BI:28 | IO_ConfigSw4 | | |
| Secondary Heating Options | BI:29 | IO_ConfigSw5 | 0 = Off<br>1 = On | Configuration switches 5 and 6 settings for secondary heating options.<br>Sw5 = Off, Sw6 = Off: None<br>Sw5 = On, Sw6 = Off: Supplemental electric heat<br>Sw5 = Off, Sw6 = On: Boilerless electric heat<br>Sw5 = On, Sw6 = On: Hydronic heating |
| | BI:30 | IO_ConfigSw6 | | |
| Hot Gas Reheat (HGR) | BI:31 | IO_ConfigSw7 | 0 = Off<br>1 = On | 0 = Off: HGR is disabled<br>1 = On: HGR is enabled |
| Waterside Economizer (WSE) | BI:32 | IO_ConfigSw8 | 0 = Off<br>1 = On | 0 = Off: WSE is disabled<br>1 = On: WSE is enabled |
| I/O Expansion Module Application Select | BI:33 | IO_ConfigSw9 | 0 = Off<br>1 = On | Indicates the software application configured for the I/O expansion module. Note the I/O expansion module software must match the WSHP unit controller application.<br>0 = Off: SmartSource (Series2) WSHP application<br>1 = On: SmartSource Two Compressor SS2C application |

### *Table 5: Binary Inputs, Continued*

| Point Name | Object Type/ Instance | BACnet Object Name | Range | Description |
|---|---|---|---|---|
| Compressor Dual Speed Option (SmartSource Series2) | BI:34 | IO_ConfigSw10 | 0 = Off<br>1 = On | Indicates the compressor type configured for the unit. Applies to SmartSource Series2 application.<br>0 = Off: Single speed compressor<br>1 = On: Dual speed compressor |
| Lead Compressor Select Option (SmartSource SS2C) | | | | Indicates the lead compressor selection configured for the unit. Applies to SmartSource SS2C application.<br>0 = Off: Compressor 1 is lead<br>1 = On: Compressor 2 is lead |
| Humidistat Input | BI:35 | Humidistat | 0 = Inactive<br>1 = Active | Indicates the status of the humidistat signal. The thermsostat uses this input when dehumidification or waterside economizer is required. The network variable (MSV:16) overrides the humidistat input. |

[1] This switch is effective only when the network scheduling is not in use.

### *Table 6: Binary Outputs*

| Point Name | Object Type/ Instance | BACnet Object Name | Read/ Write Access | Description |
|---|---|---|---|---|
| Thermostat Alarm | BO:1 | Alarm | R | Thermostat alarm output status.<br>0 = Alarm output command is Off (0 VAC)<br>1 = Alarm output command is On (24 VAC) |
| Compressor 1 | BO:2 | Comp1Out | R | Compressor 1 output command status.<br>0 = Compressor 1 command is Off<br>1 = Compressor 1 command is On |
| Fan Main Enable | BO:3 | FanMainOut | R | Fan main enable output command status.<br>0 = Fan main command is Off<br>1 = Fan main command is On |
| Fan Speed | BO:4 | FanLowOut | R | Fan speed output command status. Applies only when the Fan Main output command is On.<br>0 = Fan high speed command is On<br>1 = Fan low speed command is On |
| Pump Request | BO:5 | PumpOut | R | Pump output command status for loop fluid flow.<br>0 = Pump command is Off<br>1 = Pump command is On |
| Reversing Valve 1 | BO:6 | RevVlv1Out | R | Compressor 1 reversing valve output command status.<br>0 = Reversing valve 1 command is Off (cooling)<br>1 = Reversing valve 1 command is On (heating) |
| Compressor 2 / Compressor High Capacity | BO:7 | Comp2Out | R | Compressor 2 output command status.<br>0 = Compressor 2 command is Off<br>1 = Compressor 2 command is On |
| Reversing Valve 2 | BO:8 | RevVlv2Out | R | Compressor 2 reversing valve output command status.<br>0 = Reversing valve 2 command is Off (cooling)<br>1 = Reversing valve 2 command is On (heating) |
| Auxiliary Heat 1 | BO:9 | AuxHeat1Out | R | Auxiliary heat 1 output command status. Applies when unit is configured to use supplemental electric heat, boilerless electric heat, or hydronic heating.<br>0 = Electric heat 1 command is Off<br>1 = Electric heat 1 command is On |
| Auxiliary Heat 2 | BO:10 | AuxHeat2Out | R | Auxiliary heat 2 output command status. Applies when unit is configured to use supplemental electric heat or boilerless electric heat.<br>0 = Electric heat 2 command is Off<br>1 = Electric heat 2 command is On |
| Hot Gas Reheat | BO:11 | HGR_Out | R | Hot gas reheat (HGR) output command status.<br>0 = HGR command is Off (valve is closed)<br>1 = HGR command is On (valve is open) |
| Waterside Economizer | BO:12 | WSE_Out | R | Waterside economizer (WSE) output command status.<br>0 = WSE command is Off (valve is closed)<br>1 = WSE command is On (valve is open) |

### *Table 7: Binary Values*

| Point Name | Object Type/ Instance | BACnet Object Name | Range/Default (in Units) | Read/ Write Access | Non-volatile Memory[1] | Description |
|---|---|---|---|---|---|---|
| Clear Alarm | BV:1 | ClearAlarm | 0 = Normal<br>1 = Clear Alarm<br>Default: 0 | W | N | Clears all active fault alarms. Parameter returns to Normal after it a clear alarm command is issued. Also see Alarms. |

[1] Parameter is stored in FLASH/EEPROM (non-volatile memory) in either the communication module or in the unit controller. If Non-volatile Memory = Y, then the value is saved through a power cycle. Writes to this parameter must be limited. If Non-volatile Memory = N, the value is not saved through a power cycle.

### *Table 8: Multi-State Inputs*

| Point Name | Object Type/ Instance | BACnet Object Name | Range/Default (in Units) | Read/ Write Access | Non-volatile Memory[1] | Description |
|---|---|---|---|---|---|---|
| Condensate Overflow Status | MSI:1 | CondOverFlow | 1 = Dry<br>2 = Wet<br>3 = Null | R | N | Displays the condensate overflow sensor input, when installed. A Null value indicates no sensor is present. |
| Fan On/Auto Switch Status (Room Sensor) | MSI:2 | FanOnAuto | 1 = On<br>2 = Auto<br>3 = Null | R | N | Displays the room sensor fan On/Auto switch position A Null value indicates no switch is present. |
| System Mode Switch (Heat/Cool/Auto) Status | MSI:3 | HeatCoolAuto | 1 = Off<br>2 = Heat<br>3 = Cool<br>4 = Auto<br>5 = Null | R | N | Displays the room sensor System Mode switch (Heat/Cool/Auto) position. A Null value indicates no switch is available from the room sensor. |
| Dehumidification Required | MSI:4 | DehumRequired | 1 = Dehumid not Required<br>2 = Dehumid Required<br>3 = Null | R | N | Status of request for dehumidification. The request for dehumidification can come from one of three sources: humidistat input (hot gas reheat is active), Space relative humidity sensor input, or space dewpoint. |
| Fan Run Status | MSI:5 | FanRunStatus | 1 = Fan is Off<br>2 = Fan is On | R | N | Commanded fan run status. Used in conjunction with fan speed command (AV:38) to indicate fan speed status. |

[1] Parameter is stored in FLASH/EEPROM (non-volatile memory). Non-volatile Memory = N indicates the value is not saved through a power cycle.

### *Table 9: Multi-State Values*

| Point Name | Object Type/ Instance | BACnet Object Name | Range/Default (in Units) | Read/ Write Access[2] | Non-volatile Memory[1] | Description |
|---|---|---|---|---|---|---|
| Compressor Enable Input | MSV:1 | ComprEnable | 1 = Disabled<br>2 = Enabled<br>3 = Null (Compressors Enabled)<br>Default: 3 = Null | C | N | Network input that enables or disables compressor operation. This is usually based on proof of loop fluid flow. The loop pump must be running to provide adequate flow through the unit so the compressor(s) can operate safely. The network override reverts back to its default value upon unit controller reboot.<br>A Null value does not affect compressor operation. |
| Current Alarm | MSV:2 | CurrentAlarm | 1 to 26 | R | N | Displays the current highest priority active alarm. See Alarms section for enumeration details. |
| Network Fan On/Auto Input | MSV:3 | NetworkFanOnAuto | 1 = Fan Auto<br>2 = Fan On<br>3 = Null<br>Default: 3 = Null | C | N | Network override for baseboard fan operation configuration switch 2, the room sensor fan On/Auto switch input, and the thermostat G-terminal fan On/Auto input. These are used only when MSV:3 is set to 3 (Null). The network override reverts back to its default value upon unit controller reboot. A Null value indicates no network input. |
| Unit Status | MSV:4 | McQWSHPStatus | 1 to 10<br>See Description | R | N | Indicates the unit operating state.<br>1 = Off Alarm<br>2 = Off<br>3 = Start<br>4 = Fan Only (fan is allowed to operate)<br>5 = Prepare to Heat<br>6 = Heating<br>7 = Prepare to Cool<br>8 = Cooling<br>9 = Prepare to Dehumidify<br>10 = Dehumidification |
| Previous Alarm | MSV:5 | PreviousAlarm | 1 to 26 | R | N | Indicates the previous unit fault. See Alarms section for enumeration details. |

***Table 9: Multi-State Values, Continued***

| Point Name | Object Type/ Instance | BACnet Object Name | Range/Default (in Units) | Read/ Write Access[2] | Non-volatile Memory[1] | Description |
|---|---|---|---|---|---|---|
| Effective Occupancy | MSV:6 | EffectOccup | 1 = Occupied<br>2 = Unoccupied<br>3 = Bypass<br>4 = Standby<br>5 = Null | R | N | Indicates the unit's current occupancy mode. The mode tin which the unit operates depends on Occupancy Schedule, Occupancy Schedule Override, and/or an Occupancy Sensor. Reflects the local unoccupied input unless the MSV:7, MSV:8, or MSV:9 network overrides are not in a Null state. See Effective Occupancy Modes. |
| Occupancy Override Input | MSV:7 | OccManCmd | 1 = Occupied<br>2 = Unoccupied<br>3 = Bypass<br>4 = Standby<br>5 = Null<br>Default: 5 = Null | C | N | Network command to override the Occupancy Schedule. Occupancy Schedule Override has priority over the Occupancy Schedule and Remote Occupancy Sensor. It also monitors the Local Timed Override hardwired input that places the unit in the Occupied mode during the amount of time declared in Timed Override Setpoint. Schedule Override and/or an Occupancy Sensor. The network override reverts back to its default value upon unit controller reboot. See Effective Occupancy Modes. |
| Occupancy Scheduler | MSV:8 | OccSchedule | 1 = Occupied<br>2 = Unoccupied<br>3 = Standby<br>4 = Null<br>Default: 4 = Null | C | N | Commands the WSHP into different occupancy modes. A scheduler or a supervisory controller typically sends the command using Schedule Override.[3] The network override reverts back to its default value upon unit controller reboot. See Effective Occupancy Modes. |
| Occupancy Sensor | MSV:9 | OccSensor | 1 = Occupied<br>2 = Unoccupied<br>3 = Null<br>Default: 3 = Null | C | N | Network input that indicates the presence of occupants in the space (motion detection).[7] The network override will revert back to its default value upon unit controller reboot. See Effective Occupancy Modes. |
| Application Mode | MSV:10 | ApplicMode | 1 = Auto<br>2 = Heat<br>3 = Cool<br>4 = Off<br>5 = Fan Only<br>6 = Dehumid<br>7 = Null<br>Default: 7 = Null | C | N | Sets the unit in an application mode (Auto, Off, Heat, Cool, Dehumidification, or Fan Only). Application Mode does not "force" the unit into any state. However, it does disable certain unit operations. Examples: 1) Application Mode of Cool disables heating, 2) Heat disables cooling and dehumidification, and 3) Fan Only disables heating, cooling, and dehumidification.[7] MSV:10 overrides the local room sensor's System Mode Switch (Heat/ Cool/Auto). The local System Mode Switch is only used when MSV:10 is set to 7 (Null).<br>The network override reverts back to its default value upon unit controller reboot. |
| Auxiliary Heat Enable | MSV:11 | AuxHeatEnable | 1 = Disabled<br>2 = Enabled<br>3 = Null<br>Default: 3 = Null | C | N | Enables or disables auxiliary heat for units with electric heat. Electric heat is always enabled when it is the only source of heating, and is unaffected by this variable. The default state is Null, in which case auxiliary heat is enabled.<br>The network override reverts back to its default value upon unit controller reboot. |
| Energy Hold Off | MSV:12 | EnergyHoldOff | 1 = Normal<br>2 = Energy Hold Off<br>3 = Null<br>Default: 3 = Null | C | N | When the unit is in the Energy Hold Off mode, the unit uses Standby setpoints. This command has priority over Effective Occupancy. The network override reverts back to its default value upon unit controller reboot. |
| Pump Request Output | MSV:13 | PumpRequest | 1 = No Request for Flow<br>2 = Request for Flow<br>3 = Null<br>Default: 3 = Null | R | N | Indicates when the unit is requesting flow from the loop water controller. The loop pump must be running to provide adequate flow through the unit so the compressor(s) can operate safely. Allows the network to access whether proper loop fluid flow is occurring. |
| Room Sensor Setpoint Adjust Enable/Disable | MSV:14 | cpLocSpEnable | 1 = Disabled<br>2 = Enabled<br>Default: 2 = Enabled | W | Y | Enables or disables the local hardwired setpoint adjustment. If the value of MSV:14 is set to 1, this disables the setpoint control from a room sensor and enables the setpoint control from the network. |
| Units (English/Metric) | MSV:15 | Units | 1 = English (E)<br>2 = Metric (M)<br>Default: 1= English | W | Y | Units of measure for temperature conversion. Switching the default of English to Metric changes the temperature values for all applicable properties in the BACnet application. |

### *Table 9: Multi-State Values, Continued*

| Point Name | Object Type/ Instance | BACnet Object Name | Range/Default (in Units) | Read/ Write Access[2] | Non-volatile Memory[1] | Description |
|---|---|---|---|---|---|---|
| Network Humidistat Input | MSV:16 | NetworkHumidistat | 1 = No Dehumid Request<br>2 = Request Dehumid<br>3 = Null<br>Default: 3 = Null | C | N | Enables the network to override the humidistat input. The humidistat input is used only when MSV:16 is set to 3 (Null). |
| Network Variable Speed Fan Enable | MSV:17 | cpNetVsCnfgEn | 1 = Disabled<br>2 = Enabled<br>3 = Null<br>Default: 1 = Disabled | W | Y | Network value that enables or disables the variable speed fan (PWM) network configuration settings. When enabled, the controller uses configuration values AV:55-AV:63. When disabled, fan speed is set according to pre-determined values that cannot be changed from the network. |
| Space Dehumidification Method | MSV:18 | cpSpaceDehumCnfg | 1 = Relative Humidity<br>2 = Dewpoint<br>3 = Null<br>Default:<br>1 = Relative Humidity | W | Y | Determines the dehumidification control strategy used for the space. |
| Space Relative Humidity Sensor | MSV:19 | cpSpaceRHSensor | 1 = Not Installed<br>2 = Installed<br>3 = Null<br>Default:<br>1 = Not Installed | W | Y | Configures the space relative humidity sensor. The RH sensor is required when the unit is controlling dehumidification based on relative humidity or dewpoint. Used for field installation or replacement. |
| Control Temperature Source | MSV:20 | cpControlTempSrc | Space = 1<br>Return = 2<br>Average = 3<br>Null = 4<br>Default: 1 = Space | W | Y | Selects the control temperature source from either a space sensor, return sensor, or the average from both inputs. Selection is used to determine the effective control temperature (AV:48). |

[1]Parameter is stored in FLASH/EEPROM (non-volatile memory) in either the communication module or in the unit controller. If Non-volatile Memory = Y, then the value is saved through a power cycle. Writes to this parameter must be limited. If Non-volatile Memory = N, the value is not saved through a power cycle.

[2]R = Read Only, W = Writeable, C = Commandable

### *Table 10: Device Object Properties*

| Point Name | Object Type/ Instance | BACnet Object Name | Range/Default (in Units) | Read/ Write Access[2] | Non-volatile Memory[1] | Description |
|---|---|---|---|---|---|---|
| Description | Device | Description | 31 Characters | W | Y | Text string. Property can be changed through the BACnet configuration menu or the network.[3] |
| Device Instance Number | Device | Object_Identifier | 1 to 4194302 | W | Y | Unique Instance Number or object-identifier assigned by integrator. See BACnet MAC Address (AV:411) and BACnet Minimum Instance Number (AV:412) for the objects used to configure the Device Name.[3] |
| Location | Device | Location | 31 Characters | W | Y | Text string that can be changed through the BACnet configuration menu or the network.[3] |
| Device Object Name | Device | Object_Name | 31 Characters | W | Y | Text string used to define the BACnet device name. It can be changed through the BACnet configuration menu or the network.[3] |
| Software Version | Device | Application_ Software_Version | 31 Characters | R | N | The major and minor software version of the unit controller text string. |
| MaxMasters | Device | Max_Master | 1 to 127<br>Default: 127 | W | Y | MaxMasters should be set to highest address of a MS/TP master on the network segment. The default value is 127 for maximum compatibility. Setting this to the highest address of an MS/TP master device on the network reduces the MS/TP token traffic and decreases the response time of the unit controller. MaxMasters can be set from the BAS or from the BACnet configuration menu.[3] |
| MS/TP Baud Rate | NA | NA | 9600, 19200, 38400, 76800<br>Default: 38400 | NA | Y | Set the baud rate to match the speed of the network. Speeds above 38400 should be avoided unless the network wiring has been tested and verified to meet the required speed. Must be set using the BACnet configuration menu.[3] |

[1]Parameter is stored in FLASH/EEPROM (non-volatile memory) in either the communication module or in the unit controller. If Non-volatile Memory = Y, then the value is saved through a power cycle. Writes to this parameter must be limited. If Non-volatile Memory = N, the value is not saved through a power cycle.

[2]R = Read Only, W = Writeable, C = Commandable.

[3]See Network Configuration for Device addressing details.

# Alarms

The MicroTech unit controller has various ways of monitoring, acknowledging, and clearing alarms. Table 11 lists all alarms available to the network from the MicroTech controller.

## Alarm Monitoring

When a shutdown alarm is present, the BACnet object for unit status (McQWSHPStatus, MSV:4) indicates 1=Off Alarm.

CurrentAlarm (MSV:2) provides the highest priority active alarm to the network.

PreviousAlarm (MSV:5) provides the previous highest priority active alarm to the network.

## Clearing Alarms

The alarm condition must be corrected and the alarm cleared before normal unit operation can resume. Some alarms clear automatically when conditions return to normal, while others must be cleared manually. These conditions are noted in Table 11.

Alarms can cleared by writing the BV:1 BACnet alarm object from 0 = Normal to 1 = Clear Alarm. When the network indicates an alarm, it is best to investigate what has triggered the alarm and determine root cause. The purpose of writing to BV:1 is to intentionally clear any active alarms.

The Clear Alarm parameter reverts to Normal after being written to from the network. If an alarm is cleared but the alarm condition still exists, the controller immediately re-activates the alarm.

**NOTE:** Cycling power to the unit controller resets the fault alarm.

## Intelligent Alarm Reset

The MicroTech unit controller supports intelligent alarm resetting. This feature automatically clears the alarm the first two times it occurs within a 24-hour period. The third time an alarm occurs, it must be manually cleared.

This feature is used to minimize nuisance trips of automatic lockouts caused by temporary conditions that may interrupt unit operation. Intelligent alarms are described as “Intel” in the Clear column of Table 11.

## Remote Sensor with Tenant Override

This method of clearning alarms applies to units configured for room sensor control using a remote sensor tenant override feature. The room sensor tenant override can be used to generate a manual alarm clear.

Once the cause of the alarm has been addressed, press the tenant override button for more than 10 seconds. This forces the unit controller to clear the alarm.

**NOTE:** Grounding the tenant override generates a BACnet “I Am” Service Request.

## Manual Alarm Reset Methods

These conditions generate a manual reset:

1. A brief disruption to unit power causes the controller to reboot
2. The room sensor timed override button is pressed for more than 10 seconds
3. A remote network alarm reset is performed

***Table 11: BACnet Alarms by Priority***

| Alarm Enumeration | Alarm Text | Description | Clear | Network Reset | Details[3] |
|---|---|---|---|---|---|
| 1 | No Alms | No Alarms | | | |
| 2 | IO Comm Fail | IO Expansion Module Communication Fail | Auto | No | The IO expansion module is not communicating with the unit controller (baseboard). |
| 3 | Software Err | Incompatible Software | Requires Reboot | No | Incorrect software part number or version number. |
| 4 | CnfgErr | Invalid Configuration | Requires Reboot | No | In general, an alarm indicates one of several conditions related to the unit controller baseboard and IO expansion module configuration switch settings. Details about these conditions are provided in the table footnotes.[3] |
| 5 | A2L Leak | A2L Mitigation Board Refrigerant Leak | Auto | No | The A2L mitigation board has detected a refrigerant concentration level that requires action. When alarm occurs, the unit enters a fan-only state and fans run on high speed until alarm is cleared. |
| 6 | A2L No Pwr | A2L Mitigation Board No Power | Auto | No | The 12V input from the A2L mitigation board has been lost. When this occurs, the unit enters the off-alarm state. All control outputs are disabled except for reversing valves. |
| 7 | Cmp Brownout | Compressor Low Voltage Brownout | Auto | Yes | The 24V power input supplied to the baseboard is less than 80% of the reference voltage (the voltage level required to safely run the compressors). The alarm forces the unit into normal shutdown to protect from low line voltage conditions. The alarm automatically clears once the voltage input exceeds the 90% reference voltage threshold.[2] |
| 8 | Cmp1 Hi Pres | Compressor 1 High Pressure | Manual | Yes | Compressor high pressure switch indicates a high pressure condition. |
| 9 | Cmp2 Hi Pres | Compressor 2 High Pressure | | | |
| 10 | Cmp1 Lo Pres | Compressor 1 Low Pressure | Manual | Yes | Compressor low pressure switch indicates a low pressure condition for longer than the alarm delay timer default (AV:34). |
| 11 | Cmp2 Lo Pres | Compressor 2 Low Pressure | | | |
| 27 | Cmp1 Hi Disch Temp | Compressor 1 High Discharge Temperature | Manual | Yes | Compressor high and low pressure switches have both opened simultaneously, indicating a compressor high discharge temperature condition exists. |
| 28 | Cmp2 Hi Disch Temp | Compressor 2 High Discharge Temperature | | | |
| 12 | Cmp1 Sctn Tmp Snsr Flt | Compressor 1 Suction Temperature Sensor Fault | Manual | Yes | The compressor suction temperature sensor exceeds the allowable temperature range. |
| 13 | Cmp2 Sctn Tmp Snsr Flt | Compressor 2 Suction Temperature Sensor Fault | | | |
| 14 | LWT Snsr Flt | Leaving Water Temperature (LWT) Sensor Fault | Manual | Yes | The unit is configured for freeze fault detection and the LWT sensor exceeds the allowable temperature range. |
| 15 | Freeze Flt | Freeze Fault Detect | Manual | Yes | The freezestat indicates that the leaving water temperature is below the allowable setpoint for adequate freeze protection. Applies to both water and glycol loop applications. |
| 16 | Cmp1 Lo Sctn | Compressor 1 Low Suction Temperature | Auto / Intel[1] See Description | Yes | If the unit is in cooling or dehumidification mode, alarm indicates that the compressor low suction temperature is below the fixed alarm setpoint of 28°F (-2.22°C). If the unit is in heating mode, the compressor low suction temperature alarm is determined by the loop fluid setpoint. This setpoint is based on the configuration switch 3 setting:<br>Switch 3 is Off: Water loop setpoint (AV:12) is used.<br>Switch 3 is On: Glycol loop setpoint (AV:11) is used.<br>Alarm clears automatically when in cooling/ dehumidification modes. Alarm is cleared using Intelligent Reset[1] when in heating mode. |
| 17 | Cmp2 Lo Sctn | Compressor 2 Low Suction Temperature | | | |
| 18 | A2L Snsr Flt | A2L Mitigation Board Refrigerant Sensor Fault | Auto | No | The A2L mitigation board has detected a fault with one or more of the refrigerant sensors. The unit controller continues to operate normally with the fan at constant high speed. |
| 19 | Cntrl Temp Snsr Flt | Control Temperature Sensor Fault | Manual | Yes | The space / return air temperature sensor(s) input value exceeds the allowabe temperature range. Alarm applies to units that are configured for room sensor control or with hot gas reheat (HGR). |

***Table 11. BACnet Alarms by Priority, Continued***

| Alarm Enumeration | Alarm Text | Description | Clear | Network Reset | Details[3] |
|---|---|---|---|---|---|
| 20 | EWT Snsr Flt | Entering Water Temperature (EWT) Sensor Fault | Manual | Yes | The entering water temperature (EWT) sensor input vaue exceeds the allowable temperature range. Applies to boilerless electric heat and hydronic heating/cooling unit configurations only. |
| 21 | Room Snsr Flt | Room Temperature Sensor Fault | Manual | Yes | The space temperature sensor input vaue exceeds the allowable temperature range. |
| 22 | RAT Snsr Flt | Return Air Temperature (RAT) Sensor Fault | Manual | Yes | The return air temperature sensor input vaue exceeds the allowable temperature range. Applies to units with control temperature enabled or with hot gas reheat (HGR) |
| 23 | RH Snsr Flt | Space Relative Humidity (RH) Sensor Fault | Manual | Yes | The relative humidity sensor input vaue exceeds the allowable range. |
| 24 | EWT Low | Entering Water Temperature (EWT) Low | Auto | No | Alarm indicates that the EWT is below the selected water or glycol setpoint. Applies to units in heating without boilerless electric heat. |
| 25 | Condensate Overflow | Condensate Overflow | Auto | Yes | Alarm indicates the detection of water in the condensate overflow pan for 60 consecutive seconds. Alarm disables cooling and dehumidification operation until drain pan is dry. |
| 26 | WSE Low Temp Cutout | Waterside Economizer Low Temperature Cutout | Auto | No | Alarm indicates a low EWT condition. Applies to units that have a waterside economizer with an active request for cooling. |

[1] The intelligent reset feature automatically clears an alarm the first two times it occurs within 24 hours. The third time the alarm occurs within this time, the alarm requires a manual reset.

[2] For WSHP applications where the refrigerant charge limits need to meet UL60335-2-40 standard requirements of Title 24, the MicroTech controller is supplied with an additional A2L leak detection mitigation board and alarm support.

[3] An Invalid Configuration alarm can occur for these reasons: 1. An application software mismatch between the baseboard and IO expansion module due to invalid configuration switch 9 settings. 2. A hardware error due to the installation of an internal test application. 3. Series2 application only: The baseboard detects an IO expansion module but its configuration switch 8 is incorrectly set to the OFF position. The following (4-7) apply to SS2C application only: 4. The baseboard configuration switch 10 is incorrectly set to the ON position, indicating an invalid dual speed fan selection. 5. The baseboard configuration switches 7 and 8 are incorrectly set to the ON position, indicating an invalid compressor selection. 6. The IO expansion module is enabling HGR but the baseboard has no compressors available on the 7 and 8 configuration switches. 7. No compressors are available, and no form of heating and cooling options are selected.

# Effective Occupancy Modes

Occupancy is a critical parameter when determining the mode of operation.

The unit operates in one of four different occupancy modes as described in Table 12 below.

***Table 12: Occupancy Mode Descriptions***

| Mode | Description |
|---|---|
| Occupied | Space is occupied |
| Unoccupied | Space is unoccupied |
| Standby | Unit is using setpoints that are in between the values defined by Occupied and Unoccupied states |
| Bypass | Space is considered occupied for the duration of the bypass timer |

The unit controller calculates the proper occupancy state based on several physical and network variables. This section describes the parameters and how Effective Occupancy (*EffectOccup*) is determined.

Table 13 describes the parameters used to calculate effective occupancy (MSV:6-MSV:9). Table 14 describes the relationship among those network occupancy inputs and the respective configuration parameters.

***Table 13: Occupancy Parameters***

| Parameter | Description |
|---|---|
| EffectOccup (MSV:6) | Indicates the actual occupancy mode of the unit (Occupied, Unoccupied, Bypass, Standby) |
| OccManCmd (MSV:7) | Network occupancy override input |
| OccSchedule (MSV:8) | Network occupancy scheduler |
| OccSensor (MSV:9) | Network occupancy sensor |
| OccSw_In (BI:10) | Physical input for the Unoccupied switch mode |
| TenantOverride | Determined by space temperature sensor input if installed and has a tenant override button. Sets the unit to Occupied/Bypass mode |
| cpBypassTime (AV:7) | Allows the unit to enter Bypass mode when the timer is active and bypass time has been set |

***Table 14: Occupancy Mode Interactions***

| OccManCmd (MSV:7) | OccSchedule (MSV:8) | OccSensor (MSV:9) | OccSw_In (BI:10) | EffectOccup (MSV:6) |
|---|---|---|---|---|
| 1 (Occ) | NA | NA | NA | 1 (Occ) |
| 2 (Unoc) | NA | NA | NA | 2 (Unoc) |
| 3 (Bypass) | 1 (Occ) | NA | NA | 1 (Occ) |
| | 2 (Unoc) | NA | NA | 3 (Bypass) |
| | 3 (Standby) | NA | NA | 3 (Bypass) |
| | 4 (Null) | 1 (Occ) | NA | 1 (Occ) |
| | | 2 (Unoc) | NA | 2 (Unoc) |
| 4 (Standby) | NA | NA | NA | 4 (Standby) |
| 5 (Null) | 1 (Occ) | 1 (Occ) | NA | 1 (Occ) |
| | | 2 (Unoc) | NA | 4 (Standby) |
| | 2 (Unoc) | NA | NA | 2 (Unoc) |
| | 3 (Standby) | NA | NA | 4 (Standby) |
| | 4 (Null) | 1 (Occ) | NA | 1 (Occ) |
| | | 2 (Unoc) | NA | 2 (Unoc) |
| 5 (Null) | 4 (Null) | 3 (Null) | 1 (Occ) | 1 (Occ) |
| 5 (Null) | 4 (Null) | 3 (Null) | 0 (Unoc) | 2 (Unoc) |

# Space Temperature Setpoints

This section highlights the temperature setpoint parameters and relationship to one another (Table 15 and Table 16). The interactions are based on network overrides, occupancy mode, short and long range setpoint adjust options, and long range setpoint adjust min/max ranges. Figure 2 shows a space temperature setpoint operation diagram to illustrate the relationship among the inputs and their default values.

## General Rules

The occupancy temperature setpoints must be kept in ascending order as follows:

AV6 <= AV5 <= AV4 <= AV1 <= AV2 <= AV3

***Table 15: Temperature Setpoint Interactions***

| Setpoint | BACnet Object | Default | Interaction Rule |
|---|---|---|---|
| Occupied Cooling Setpoint | AV:1 | 75°F | AV1 > (AV4 + AV10) |
| Standby Cool Setpoint | AV:2 | 77°F | AV2 > (AV5 + AV10) |
| Unoccupied Cool Setpoint | AV:3 | 85°F | AV3 > (AV6 + AV17) |
| Occupied Heat Setpoint | AV:4 | 70°F | AV4 > (AV1 – AV10) |
| Standby Heat Setpoint | AV:5 | 66°F | AV5 > (AV2 – AV10) |
| Unoccupied Heat Setpoint | AV:6 | 60°F | AV6 > (AV3 – AV17) |
| Occupied Setpoint Differential | AV:10 | 1°F | |
| Unoccupied Setpoint Differential | AV:17 | 2ºF | |

## Standard Application Mode Setpoints

***Table 16: Example Calculations***

| Unoccupied Mode | Occupied Mode using Network Setpoints | Occupied Mode using Long Range Setpoint Adjust | Standby Mode using Short Range Setpoint Adjust |
|---|---|---|---|
| Effective Cool ON SP = 85°F | MSV14=Disabled | MSV14 = Enabled | MSV14 = Enabled |
| Effective Cool OFF SP = (85-2) = 83°F | AV19 = 72°F | Reference SP = AI5 = 72.5°F | HP1: AV25 = 3°F |
| | | | HP2: AV24 = 3°F |
| Effective Heat ON SP = 60°F | AV35 = 0.5°F | Deadband Factor = ((75 – 70) / 2) = 2.5 | Effective Cool ON SP = (77 + 3) = 80°F |
| Effective Heat OFF SP = (60 + 2) = 62°F | Reference SP = (72 + 0.5) = 72.5°F | Effective Cool ON SP = (72.5 + 2.5) = 75°F | Effective Cool OFF SP = (80 – 1) = 79°F |
| | Deadband Factor = ((75 – 70) / 2) = 2.5 | Effective Cool OFF SP = (75 – 1) = 74°F | Effective Heat ON SP = (66 + 3) = 69°F |
| | Effective Cool ON SP = (72.5 + 2.5) = 75°F | Effective Heat ON SP = (72.5 – 2.5) = 70°F | Effective Heat OFF SP = (69 + 1) = 70°F |
| | Effective Cool OFF SP = (75 – 1) = 74°F | Effective Heat OFF SP = (70 + 1) = 71°F | |
| | Effective Heat ON SP = (72.5 - 2.5) = 70°F | | |
| | Effective Heat OFF SP = (70 + 1) = 71°F | | |

Examples described here apply to Stage 1 heating/cooling.

1. **The unit is operating in Unoccupied mode.**
   - EffCoolOnSP = AV3
   - EffCoolOffSP = (EffCoolOnSP – AV17)
   - EffHeatOnSP = AV6
   - EffHeatOffSP = (EffHeatOnSP + AV17)
2. **The unit is operating in Occupied or Standby mode with Local Setpoint Adjust disabled by MSV14=1.** This calculation then depends on whether or not there is a valid AV19 value. The DeadBandFactor used in this calculation is shown here for both Occupied and Standby modes (and applies to both a valid and invalid AV19 value):

   Occupied: DeadBandFactor = ((AV1 – AV4) / 2)
   Standby: DeadBandFactor = ((AV2 – AV5) / 2)

   **Valid AV19 value:**
   - ReferenceSP = (AV19 + AV35)
   - EffCoolOnSP = (ReferenceSP + DeadBandFactor)
   - EffCoolOffSP = (EffCoolOnSP – AV10)
   - EffHeatOnSP = (ReferenceSP – DeadBandFactor)
   - EffHeatOffSP = (EffHeatOnSP + AV10)

   **Invalid AV19 value: (Analog Null)**

   The Reference setpoint used in this calculation is shown here for both Occupied and Standby modes:

   Occupied: ReferenceSP = (AV1 – DeadBandFactor + AV35)

   Standby: ReferenceSP = (AV2 – DeadBandFactor + AV35)
   - EffCoolOnSP = (ReferenceSP + DeadBandFactor)
   - EffCoolOffSP = (EffCoolOnSP – AV10)
   - EffHeatOnSP = (ReferenceSP – DeadBandFactor)
   - EffHeatOffSP = (EffHeatOnSP + AV10)

3. **The unit is operating In Occupied or Standby mode with Long Range Local Setpoint Adjust selected and MSV14=2.**

   Occupied: DeadBandFactor = ((AV1 – AV4) / 2)
   Standby: DeadBandFactor = ((AV2 – AV5) / 2)

   - ReferenceSP = AI5
   - EffCoolOnSP = (ReferenceSP + DeadBandFactor)
   - EffCoolOffSP = (EffCoolOnSP – AV10)
   - EffHeatOnSP = (ReferenceSP – DeadBandFactor)
   - EffHeatOffSP = (EffHeatOnSP + AV10)

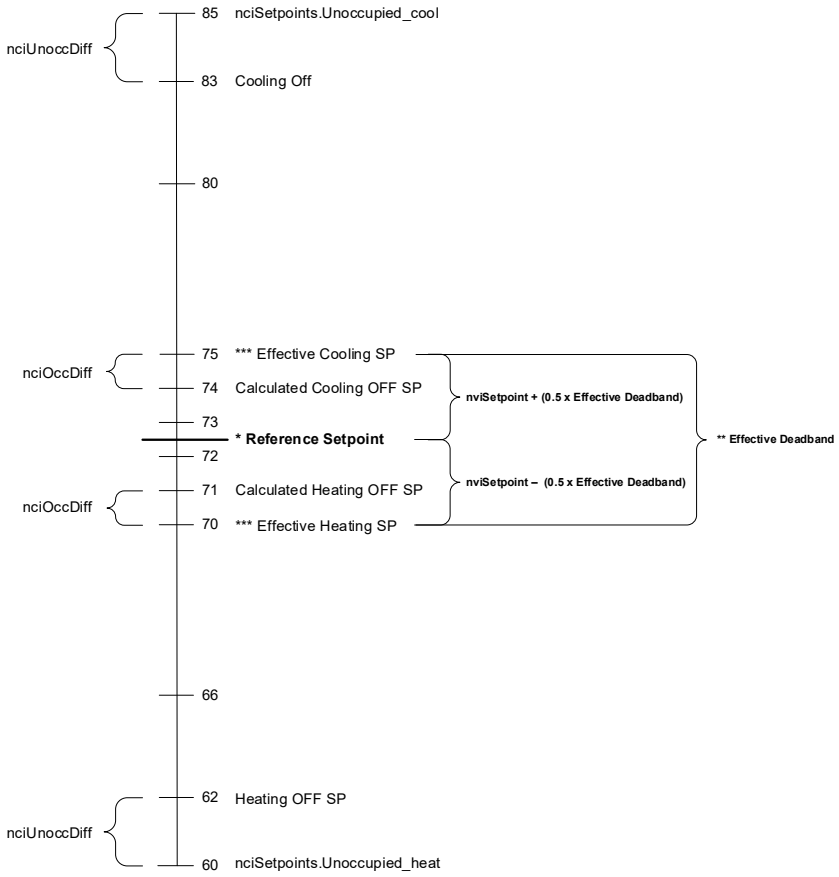
4. **The unit is operating in Occupied mode with Short Range Local Setpoint Adjust selected and MSV14=2**.

   - EffCoolOnSP = (AV1 + AV24)
   - EffCoolOffSP = (EffCoolOnSP – AV10)
   - EffHeatOnSP = (AV4 + AV24)
   - EffHeatOffSP = (EffHeatOnSP + AV10)

5. **The unit is operating in Standby mode with Short Range Local Setpoint Adjust selected and MSV14=2.**

   - EffCoolOnSP (HP1) = (AV2 + AV25)
   - EffCoolOnSP (HP2) = (AV2 + AV24)
   - EffCoolOffSP = (EffCoolOnSP – AV10)
   - EffHeatOnSP = (AV5 + AV24)
   - EffHeatOffSP = (EffHeatOnSP + AV10)

***Figure 2: Space Temperature Sensor Setpoint Operation***



# BACnet PICS

This section contains the Protocol Implementation Conformance Statement (PICS) for the MT2300 SmartSource WSHP Single Compressor (Series2) and SmartSource Two Compressor (SS2C) Unit Controller models as required by ANSI/ASHRAE Standard 135-2012, BACnet: A Data Communication Protocol for Building Automation and Control Networks.

## Protocol Implementation Conformance Statement

| | | |
|---|---|---|
| **Date** | November 2023 | |
| **Vendor Name** | Daikin Applied | |
| **Model Name** | Series2: MT2300_WSHP_Ser2 | SS2C: MT2300_WSHP_SS2C |
| **Application Software Version** | Series2: HP4 BB=v2.0 IO=v2.0 | SS2C: HP5 BB=v2.0, IO=v2.0 |
| **Firmware Version** | Series2: HP4 v2.0 | SS2C: HP5 v2.0 |
| | PN 2507443020 | PN 2507443020 |
| **BACnet Protocol Version / Revision** | 1.14[1] | |

[1]Note that 1.14 represents Version 1, Revision 14

## Product Description

The MicroTech WSHP unit controller with optional BACnet communication module is designed to operate the heat pump unit and integrate it into a BACnet building automation system.

## BACnet Standardized Device Profile

| | | |
|---|---|---|
| ☐ | BACnet Advanced Workstation | (B-AWS) |
| ☐ | BACnet Operator Workstation | (B-OWS) |
| ☐ | BACnet Operator Display | (B-OD) |
| ☐ | BACnet Building Controller | (B-BC) |
| ☐ | BACnet Advanced Application Controller | (B-AAC) |
| ☒ | BACnet Application Specific Controller | (B-ASC) |
| ☐ | BACnet Smart Sensor | (B-SS) |
| ☐ | BACnet Smart Actuator | (B-SA) |

## BACnet Interoperability Building Blocks Supported

### Data Sharing

| | |
|---|---|
| Data Sharing – Read Property – B | DS-RP-B |
| Data Sharing – Read Property Multiple – B | DS-RPM-B |
| Data Sharing – Write Property – B | DS-WP-B |
| Data Sharing – Write Property Multiple – B | DS-WPM-B |
| Data Sharing – COV – B (15 Maximum Objects Supported) | DS-COV-B |

### Device Management

| | |
|---|---|
| Device Management – Dynamic Device Binding – B | DM-DDB-B |
| Device Management – Dynamic Object Binding – B | DM-DOB-B |
| Device Management – Device Communication Control – B | DM-DCC-B |
| Device Management – Time Synchronization – B | DM-TS-B |
| Device Management – Reinitialize Device – B | DM-RD-B |

### Segmentation Capability

| | | | |
|---|---|---|---|
| ☐ | Able to transmit segmented messages | Window size | 1 for MS/TP<br>2..8 for IP |
| ☐ | Able to receive segmented messages | Window size | 1 for MS/TP<br>2..8 for IP |

### Data Link Layer Options

| | | |
|---|---|---|
| ☐ | BACnet IP, (Annex J) | - |
| ☐ | BACnet IP, (Annex J), Foreign Device | - |
| ☐ | ISO 8802-3, Ethernet (Clause 7) | - |
| ☐ | ANSI/ATA 878.1, 2.5 Mb. ARCNET (Clause 8) | - |
| ☐ | ANSI/ATA 878.1, RS-485 ARCNET (Clause 8), baud rate(s) | - |
| ☒ | MS/TP master (Clause 9), baud rate(s) | 9600<br>19200<br>38400<br>76800 |
| ☐ | MS/TP slave (Clause 9), baud rate(s) | 9600<br>19200<br>38400<br>76800 |
| ☐ | Point-To-Point, EIA 232 (Clause 10), baud rate(s) | - |
| ☐ | Point-To-Point, modem, (Clause 10), baud rate(s) | - |

### Device Address Binding

| | | |
|---|---|---|
| Is static device binding supported? | ☐ Yes | ☒ No |

### Character Sets Supported

**NOTE:** Support for multiple character sets does not imply they can be supported simultaneously.

| | | |
|---|---|---|
| ☒ UTF-8 | ☐ IBM / Microsoft DBCS | ☒ ISO 8859-1 |
| ☒ ISO 10646 (UCS-2) | ☐ ISO 10646 (UCS-4) | ☐ JIS C 6226 |

# Standard Object Types Supported

| Object-Type | Creatable | Deleteable | Optional | Writeable |
|---|---|---|---|---|
| Analog Input | ☐ | ☐ | | COV_Increment |
| Analog Value | ☐ | ☐ | | COV_Increment, Present_Value, Priority_Array, Relinquish_Default |
| Binary Input | ☐ | ☐ | Active_Text, Description, Inactive_Text | |
| Binary Value | ☐ | ☐ | Active_Text, Description, Inactive_Text | Present_Value |
| Multi-state Input | ☐ | ☐ | State_Text | |
| Multi-state Value | ☐ | ☐ | State_Text | Present_Value, Priority_Array, Relinquish_Default, |
| Device | ☐ | ☐ | Description<br>Location<br>Max_Master | Description<br>Location (Limit 32 Chars)<br>Max_Master |

# Revision History

| Revision | Date | Description of Changes |
|---|---|---|
| ED 19129 | December 2023 | Initial release |
| ED 19129-1 | May 2024 | Supports low-GWP refrigerant R32 units and WSHP single/two stage and dual compressor applications, including the following:<br>• Added analog value network points for monitoring and control of relative humidity<br>• Added analog value network points for PWM fan speed cool and heat overrides<br>• Added support for the Property List property<br>• Added analog value network point for wait for flow timer<br>• Added binary inputs and outputs as separate points available to the network |

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