DAIKIN

Network Integration Guide

ED 19129

Group: **Controls**
Part Number: **ED 19129**
Date: **March 2023**

MT2300 Water Source Heat Pump Unit Controller Protocol Information

BACnet® Networks (MS/TP)

SmartSource® Series 2 Single and Two Stage Compressor Models: GSH/GSV, GTH/GTV, and GCV/GCH

Enfinity™ Large Two Compressor Models: CCH/CCW and LVC/LVW

Member of BACnet International

Product Description

The MT2300 is the unit controller for Daikin Applied SmartSource® single and two-stage compressor and Enfinity® large two-compressor water source heat pump units. The MT2300 controller interfaces to a BAS (building automation system) via BACnet® MS/TP network protocol.

A separate BACnet® communication module must be attached to the unit controller to so that it can be configured for network integration. The communication module is a factory or field-installed option.

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 MT2300 application and all subsequent versions until otherwise indicated. If the MT2300 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

⚠ CAUTION

Cautions indicate potentially hazardous situations, which can result in personal injury, serious injury, death, or equipment damage if not avoided.

⚠ WARNING

Warnings indicate potentially hazardous situations, which can result in property damage, severe personal injury, or death if not avoided.

⚠ DANGER

Dangers indicate a hazardous electrical situation which will result in death or serious injury if not avoided.

⚠ DANGER

Dangers indicate a hazardous gas situation which will result in death or serious injury if not avoided.

⚠ NOTICE

Notices give important information concerning a process, procedure, special handling or equipment attributes.

Revision History

ED 19129	Mar-2003	Initial release.

Notice

Limited Warranty

Consult your local Daikin Applied Representative for warranty details. To find your local Daikin Applied Representative, go to www.DaikinApplied.com.

Reference Documents

Title	Number	Company	Source
MT2300 Series Unit Controller Operation Manual	OM 1364	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 Appendix A: Protocol Implementation Conformance Statements (PICS).

BACnet Device Object Types

The MT2300 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 Appendix A: Protocol Implementation Conformance Statements (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.

⚠ CAUTION

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

Device Object_Name

Each device has a unique Object_Name by default. The Object_Name is MT2300_WSHP_Ser2_3101001 or MT2300_WSHP_SS2C_3101001. The ##### represents the Device Instance. If the Device Instance changes, and the “MT2300_WSHP” portion of the Object_Name is retained, the Device Name is updated as well.

Table 1: Device Object Properties

Property	ID	Default Value	Data Type
Object Identifier	75	Device	BACnetObjectIdentifier
Object Name	77	MT2300_WSHP_#### (Variable)	Character String
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	MT2300_WSHP_Ser2 or MT2300_WSHP_SS2C	Character String
Firmware Revision	44	SmartSource Series2: HP4 v2.0 Enfinity SS2C: HP5 v2.0	Character String
Application Software Version	12	SmartSource Series2: HP4: BB=v2.0,IO=v2.0 Enfinity SS2C: HP5: BB=v2.0,IO=v2.0	Character String
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	BACnetObjectTypes Supported
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 BACnet COVSubscriptions
Property List Identifiers	112	variable	ListofBACnet PropertyIdentifier

[1]While the MT2300 controller supports the entire set of object types from ListofBACnetPropertyIdentifier, not all object types are used.

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_"
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 MT2300 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
-----------------------------------------
```

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 Network Parameters

The following section contains relevant information needed to integrate a MT2300 WSHP into the BACnet network. Tables are organized by AI, AV, BI, BO, BV, MSI, MSV and Device objects as supported by the unit controller.

⚠

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 Network Configuration, Effective Occupancy Modes, and Space Temperature Setpoint Methods sections provide additional details. Also see Appendix A: Protocol Implementation Conformance Statements (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.

Table 3: Analog Inputs

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 -17.77 to 70ºC Default: 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 -17.77 to 70°C Default: 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 -17.77 to 70°C Default: 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 -17.77 to 70°C Default: 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 12.78 to 35ºC Default: 32ºF / 0ºC	R	N	Reflects the value of the selected control temperature (space, return air, average) long range reference setpoint. Applies when configured for long range setpoint adjust (baseboard configuration switch 5 is on) and is enabled by MSV:14.[3] 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 -17.77 to 70°C Default: 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 -17.77 to 70°C Default: 32ºF / 0ºC	R	N	Indicates the compressor #2 suction line temperature sensor value.[3]
Brownout Voltage Reading	AI:8	Brownout	0 to 4095 counts 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 -17.77 to 70°C Default: 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

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 Setpoint Methods 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] *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:: • ClgSetptOff = EffectSetpt (AV:23) - cpOccDiff (AV:10). • 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.
Compressor Low Suction Temp Protection Differential	AV:13	cpLowTmpProtDif	2 to 15°F 1.11 to 8.34°C Default: 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 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.

Table 4: Analog Values, Continued

Name	Object Type/ Instance	BACnet Object Name	Range/Default (in Units)	Read/ Write Access[2]	Non-volatile Memory[1]	Description
Compressor Minimum OFF Timer	AV:15	cpMinCompOffTmr	0 to 1200 sec 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 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 1.11 to 5.56°C Default: 2ºF / 1.11ºC	W	Y	Determines the unoccupied mode effective off setpoint. Applies only to occupied, bypass, and standby modes as follows: • ClgSetptOff = EffectSetpt (AV:23) - cpUnoccDiff (AV:17). • HtgSetptOff = EffectSetpt (AV:23) + cpUnoccDiff (AV:17).
Space Temperature Input	AV:18	Network SpaceTemp	14 to 122°F -10 to 50°C Default[6]: 621.806ºF 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 10 to 35ºC Default[6]: 621.806ºF 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 Setpoint Methods.
Receive Heartbeat	AV:20	cpRcvHrtBt	0 to 6553.4 sec Default: 0 (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. **Receive Heartbeat Variables** AV:18 SpaceTemp AV:35 SetptOffset AV:45 ComprEnable AV:51 OccSchedule MSV:1 OccSensor MSV:8 ApplicMode MSV:9 AuxHeatEnable MSV:10 EnergyHoldoff MSV:11 SpaceRH MSV:12 Dewpoint
Send Heartbeat	AV:21	cpSndHrtBt	0 to 6553.4 sec Default: 0 (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 -17.78 to 70°C Default[6]: 621.806ºF 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 10 to 35ºC Default[6]: 621.806ºF 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 Setpoint Methods.
Setpoint Shift Output	AV:24	SetptShift	-5 to 5ºF -2.78 to 2.78ºC 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.
Long Range Setpoint Adjust Maximum	AV:25	cpSptAdjMax	55 to 95ºF 12.78 to 35ºC Default: 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 12.78 to 35ºC Default: 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 10 to 21.12ºC Default: 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. If the EWT drops below the fixed value of 45ºF, hydronic cooling is disabled.

Table 4: Analog Values, Continued

Name	Object Type/ Instance	BACnet Object Name	Range/Default (in Units)	Read/ Write Access[2]	Non-volatile Memory[1]	Description
Hydronic Setpoint Differential	AV:28	cpHydronicDiff	2 to 10ºF 1.11 to 5.56ºC Default: 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 1.11 to 8.34ºC Default: 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 -9.44 to 4.45ºC Default: 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 4.44 to 18.34ºC Default: 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 21.11 to 70ºC Default:* 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 0.55 to 2.78ºC Default: 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 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 -10 to +10ºC 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 Setpoint Methods.
Third Stage Heating Setpoint Differential	AV:36	cpStg3SptDiff	1 to 10ºF 0.55 to 5.56ºC Default: 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 0.55 to 5.56ºC Default: 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]
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% 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.

Table 4: Analog Values, Continued

Name	Object Type/ Instance	BACnet Object Name	Range/Default (in Units)	Read/ Write Access[2]	Non-volatile Memory[1]	Description
Space Humidity Setpoint Differential	AV:46	cpSpaceRH_Diff	1 to 20% 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% 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 -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 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 0 to 65.55ºC 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 0 to 65.55ºC 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 0 to 65.55ºC 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 4.44 to 15.56°C Default: 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 0.55 to 2.78°C Default: 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% 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% 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% 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% 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% Default: 80%	W	Y	Variable fan speed PWM output for heating stage 1. Applies when network PWM fan configuration enable (MSV:17) is enabled.
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.

Table 4: Analog Values, Continued

Name	Object Type/ Instance	BACnet Object Name	Range/Default (in Units)	Read/ Write Access[2]	Non-volatile Memory[1]	Description
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. 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. The auto-addressing feature was designed for units communicating to a Daikin System Manager. AV:412 can be set via the BAS using auto-addressing, but this feature is intended primarily for the Daikin System Manager controller.
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 (Confiuration Settings) BI:15-BI:24 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 input is configured and active (Table 6).

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

Table 5: Binary Inputs

Name	Object Type/ Instance	BACnet Object Name	Range	Description
A2L Board Fault	BI:1	A2L_Fault	0 = Alarm 1 = Normal	A2L refrigerant sensor fault input. Also see Alarms section. 0 = A2L Sensor Fault Alarm (0 VDC) 1 = Normal (up to 12 VDC)
Emergency Shutdown	BI:2	EmergShutDn	0 = Off 1 = On	Emergency stop input. Indicates unit shutdown when normally open contact switch is closed. 0 = Off (Switch open): Normal unit operation 1 = On (Switch closed): Unit is shut down
Compressor 1 High Pressure	BI:3	HiPressure1	0 = Off 1 = On	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). 0 = Off (Switch closed): Normal pressure 1 = On (Switch open): High pressure condition detected
Compressor 1 Low Pressure	BI:4	LoPressure1	0 = Off 1 = On	Compressor 1 low pressure input. Indicates low pressure conditions when normally closed contact switch is open. 0 = Off (Switch closed): Normal pressure 1 = On (Switch open): Low pressure condition detected
Thermostat Fan Input	BI:5	Tstat_G	0 = Off (Auto) 1 = On	Thermostat input for fan operation. Applies when unit is configured with a factory or field-installed 24 VAC, dry contact thermostat. 0 = Off (Fan switch open): Fan in auto mode 1 = On (Fan switch closed): Request for fan from thermostat
Thermostat - Heating Stage 1	BI:6	Tstat_W1	0 = Inactive 1 = Active	Thermostat input for heating. Applies when unit is configured with a factory or field-installed 24 VAC, dry contact thermostat. 0 = Inactive: Thermostat switch is open, indicating no request for first stage heating 1 = Active: Thermostat switch is closed, indicating first stage heating is active

Table 5: Binary Inputs, Continued

Name	Object Type/ Instance	BACnet Object Name	Range	Description
Thermostat - Heating Stage 2	BI:7	Tstat_W2	0 = Inactive 1 = Active	Thermostat input for heating. Applies when unit is configured with a factory or field-installed 24 VAC, dry contact thermostat. 0 = Inactive: Thermostat switch is open, indicating no request for second stage heating 1 = Active: Thermostat switch is closed, indicating second stage heating is active
Thermostat - Cooling Stage 1	BI:8	Tstat_Y1	0 = Inactive 1 = Active	Thermostat input for cooling. Applies when unit is configured with a factory or field-installed 24 VAC, dry contact thermostat. 0 = Inactive: Thermostat switch is open, indicating no request for first stage cooling 1 = Active: Thermostat switch is closed, indicating first stage cooling is active
Thermostat - Cooling Stage 2	BI:9	Tstat_Y2	0 = Inactive 1 = Active	Thermostat input for cooling. Applies when unit is configured with a factory or field-installed 24 VAC, dry contact thermostat. 0 = Inactive: Thermostat switch is open, indicating no request for second stage cooling 1 = Active: Thermostat switch is closed, indicating second stage cooling is active
Occupancy Switch Setting[1]	BI:10	OccSw_In	0 = Off 1 = On	Local occupancy switch input status. 0 = Off: Local occupancy switch is closed (unoccupied) 1 = On: Local occupancy switch is open (occupied)
Compressor 2 High Pressure	BI:11	HiPressure2	0 = Off 1 = On	Compressor 2 high pressure input. Indicates high pressure conditions when normally closed contact is open. The actual open/closed state of the switch cannot be determined unless the compressor 2 output is active (ON). 0 = Off (Switch closed): Normal pressure 1 = On (Switch open): High pressure condition detected
Compressor 2 Low Pressure	BI:12	LoPressure2	0 = Off 1 = On	Compressor 2 low pressure input. Indicates low pressure conditions when normally closed contact switch is open. 0 = Off (Switch closed): Normal pressure 1 = On (Switch open): Low pressure condition detected
Thermostat - Heating Stage 3	BI:13	Tstat_W3	0 = Inactive 1 = Active	Thermostat input for heating. Applies when unit is configured with a factory or field-installed 24 VAC, dry contact thermostat. 0 = Inactive: Thermostat switch is open, indicating no request for third stage heating 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 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. 0 = Inactive: Thermostat switch is open, indicating no request for fourth stage heating/third stage cooling 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 1 = On	Configuration switch 1 settings for unit mode. 0 = Off: Normal operation 1 = On: Service/test mode
Fan Operation	BI:16	BB_ConfigSw2	0 = Off 1 = On	Configuration switch 2 settings for fan operation. 0 = Off: Continuous fan operation (on) 1 = On: Cycling fan operation (auto)
Loop Fluid	BI:17	BB_ConfigSw3	0 = Off 1 = On	Configuration switch 3 settings for heat pump loop fluid type. 0 = Off: Water loop fluid 1 = On: Glycol loop fluid
Freeze Fault Protection	BI:18	BB_ConfigSw4	0 = Off 1 = On	Configuration switch 4 settings for freeze fault enable. 0 = Off: LWT Freeze Fault Protection is disabled 1 = On: LWT Freeze Fault Protection is enabled
Room Sensor Setpoint Adjust	BI:19	BB_ConfigSw5	0 = Off 1 = On	Configuration switch 5 settings for room sensor setpoint adjust method. 0 = Off: Short range: -5 to 5ºF (-2.78 to 2.78ºC) 1 = On: Long range: 55 to 95ºF (12.78 to 35ºC)
Thermostat/Room Sensor	BI:20	BB_ConfigSw6	0 = Off 1 = On	Configuration switch 6 settings for room sensor control. 0 = Off: Thermostat control 1 = On: Room sensor control
Compressor Heating Enable (SmartSource Series2)	BI:21	BB_ConfigSw7	0 = Off 1 = On	Configuration switch 7 settings for compressor heating enable. Applies when SmartSource Series2 application is selected. For the SmartSource Series2 application: 0 = Off: Allows compressor heating mode operation 1 = On: Disables compressor heating mode operation
I/O Expansion Module (SmartSource Series2)	BI:22	BB_ConfigSw8	0 = Off 1 = On	Configuration switch 8 settings for I/O module availability. Applies to SmartSource Series2 application. 0 = Off: I/O expansion module is not present 1 = On: I/O expansion module is required

Table 5: Binary Inputs, Continued

Name	Object Type/ Instance	BACnet Object Name	Range	Description
Compressor Availability (Enfinity Large Two Compressor SS2C)	BI:21	BB_ConfigSw7	0 = Off 1 = On	Configuration switches 7 and 8 settings for compressor availabillity. Applies to Enfinity Large Two Compressor SS2C application. Sw7 = Off, Sw8 = Off: Both compressors are available Sw7 = On, Sw8 = Off: Only lead compressor is available Sw7 = Off, Sw8 = On: No compressors are available Sw7 = On, Sw8 = On: Invalid
	BI:22	BB_ConfigSw8		
Baseboard Application Select	BI:23	BB_ConfigSw9	0 = Off 1 = On	Indicates the software application selected for the baseboard. 0 = Off: SmartSource (Series2) 1 = On: Enfinity Large Two Compressor (SS2C)
Discrete / Variable Fan Select	BI:24	BB_ConfigSw10	0 = Off 1 = On	Configuration switch 10 settings for fan speed options. 0 = Off: Single speed (with high speed output) or variable speed fan 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 1 = On	Configuration switches 5 and 6 settings for secondary heating options. Sw5 = Off, Sw6 = Off: None Sw5 = On, Sw6 = Off: Supplemental electric heat Sw5 = Off, Sw6 = On: Boilerless electric heat Sw5 = On, Sw6 = On: Hydronic heating
	BI:30	IO_ConfigSw6		
Hot Gas Reheat (HGR)	BI:31	IO_ConfigSw7	0 = Off 1 = On	0 = Off: HGR is disabled 1 = On: HGR is enabled
Waterside Economizer (WSE)	BI:32	IO_ConfigSw8	0 = Off 1 = On	0 = Off: WSE is disabled 1 = On: WSE is enabled
I/O Expansion Module Application Select	BI:33	IO_ConfigSw9	0 = Off 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. 0 = Off: SmartSource (Series2) WSHP application 1 = On: Enfinity Large Two Compressor SS2C application
Compressor Dual Speed Option (SmartSource Series2)	BI:34	IO_ConfigSw10	0 = Off 1 = On	Indicates the compressor type configured for the unit. Applies to SmartSource Series2 application. 0 = Off: Single speed compressor 1 = On: Dual speed compressor
Lead Compressor Select (Enfinity Large Two Compressor SS2C)				Indicates the lead compressor selection configured for the unit. Applies to Enfinity Large Two Compressor SS2C application. 0 = Off: Compressor 1 is lead 1 = On: Compressor 2 is lead

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

Table 6: Binary Outputs

Name	Object Type/ Instance	BACnet Object Name	Read/ Write Access	Description
Thermostat Alarm	BO:1	Alarm	R	Thermostat alarm output status. 0 = Alarm output command is Off (0 VAC) 1 = Alarm output command is On (24 VAC)
Compressor 1	BO:2	Comp1Out	R	Compressor 1 output command status. 0 = Compressor 1 command is Off 1 = Compressor 1 command is On
Fan Main Enable	BO:3	FanMainOut	R	Fan main enable output command status. 0 = Fan main command is Off 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. 0 = Fan high speed command is On 1 = Fan low speed command is On
Pump Request	BO:5	PumpOut	R	Pump output command status for loop fluid flow. 0 = Pump command is Off 1 = Pump command is On
Reversing Valve 1	BO:6	RevVlv1Out	R	Compressor 1 reversing valve output command status. 0 = Reversing valve 1 command is Off (cooling) 1 = Reversing valve 1 command is On (heating)
Compressor 2	BO:7	Comp2Out	R	Compressor 2 output command status. 0 = Compressor 2 command is Off 1 = Compressor 2 command is On

Table 6: Binary Outputs, Continued

Name	Object Type/ Instance	BACnet Object Name	Read/ Write Access	Description
Reversing Valve 2	BO:8	RevVlv2Out	R	Compressor 2 reversing valve output command status. 0 = Reversing valve 2 command is Off (cooling) 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. 0 = Electric heat 1 command is Off 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. 0 = Electric heat 2 command is Off 1 = Electric heat 2 command is On
Hot Gas Reheat	BO:11	HGR_Out	R	Hot gas reheat (HGR) output command status. 0 = HGR command is Off (valve is closed) 1 = HGR command is On (valve is open)
Waterside Economizer	BO:12	WSE_Out	R	Waterside economizer (WSE) output command status. 0 = WSE command is Off (valve is closed) 1 = WSE command is On (valve is open)

Table 7: Binary Values

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 1 = Clear Alarm 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

Name	Object Type/ Instance	BACnet Object Name	Range/Default (in Units)	Read/ Write Access[2]	Non-volatile Memory[1]	Description
Condensate Overflow Status	MSI:1	CondOverFlow	1 = Dry 2 = Wet 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 2 = Auto 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 2 = Heat 3 = Cool 4 = Auto 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 2 = Dehumid Required 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 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) 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 9: Multi-State Values

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 2 = Enabled 3 = Null (Compressors Enabled) 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. 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 2 = Fan On 3 = Null 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 See Description	R	N	Indicates the unit operating state. 1 = Off Alarm 2 = Off 3 = Start 4 = Fan Only (fan is allowed to operate) 5 = Prepare to Heat 6 = Heating 7 = Prepare to Cool 8 = Cooling 9 = Prepare to Dehumidify 10 = Dehumidification
Previous Alarm	MSV:5	PreviousAlarm	1 to 26	R	N	Indicates the previous unit fault. See Alarms section for enumeration details.
Effective Occupancy	MSV:6	EffectOccup	1 = Occupied 2 = Unoccupied 3 = Bypass 4 = Standby 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 2 = Unoccupied 3 = Bypass 4 = Standby 5 = Null 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 2 = Unoccupied 3 = Standby 4 = Null 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 2 = Unoccupied 3 = Null 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 2 = Heat 3 = Cool 4 = Off 5 = Fan Only 6 = Dehumid 7 = Null 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). The network override reverts back to its default value upon unit controller reboot.

Table 9: Multi-State Values, Continued

Name	Object Type/ Instance	BACnet Object Name	Range/Default (in Units)	Read/ Write Access[2]	Non-volatile Memory[1]	Description
Auxiliary Heat Enable	MSV:11	AuxHeatEnable	1 = Disabled 2 = Enabled 3 = Null 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.[7] The network override reverts back to its default value upon unit controller reboot.
Energy Hold Off	MSV:12	EnergyHoldOff	1 = Normal 2 = Energy Hold Off 3 = Null 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.[7] The network override reverts back to its default value upon unit controller reboot.
Pump Request Output	MSV:13	PumpRequest	1 = No Request for Flow 2 = Request for Flow 3 = Null 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 2 = Enabled 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) 2 = Metric (M) 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.
Network Humidistat Input	MSV:16	NetworkHumidistat	1 = No Dehumid Request 2 = Request Dehumid 3 = Null 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 2 = Enabled 3 = Null 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 2 = Dewpoint 3 = Null Default: 1 = Relative Humidity	W	Y	Determines the dehumidification control strategy used for the space.
Space Relative Humidity Sensor	MSV:19	cpSpaceRHSensor	1 = Not Installed 2 = Installed 3 = Null Default: 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 Return = 2 Average = 3 Null = 4 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

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 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 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.

Alarm Management

The MT2300 unit controller has various ways of monitoring, acknowledging, and clearing alarms. Table 11 lists all alarms available to the network from the MT2300 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 MT2300 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: Alarms by Priority and Index Number

Priority	Alarm Index[3]	Alarm Text	Description	Clear	Network Reset	Details
0	1	No Alms	No Alarms			
1	2	IO Comm Fail	IO Expansion Module Communication Fail	Auto	No	The IO expansion module is not communicating with the unit controller (baseboard).
2	3	Software Err	Incompatible Software	Requires Reboot	No	Incorrect software part number or version number.
3	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]
4	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.
5	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.
6	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]
7	8	Cmp1 Hi Pres	Compressor 1 High Pressure	Manual	Yes	Compressor high pressure switch indicates a high pressure condition.
8	9	Cmp2 Hi Pres	Compressor 2 High Pressure			
9	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).
10	11	Cmp2 Lo Pres	Compressor 2 Low Pressure			
11	12	Cmp1 Sctn Tmp Snsr Flt	Compressor 1 Suction Temperature Sensor Fault	Manual	Yes	The compressor suction temperature sensor exceeds the allowable temperature range.
12	13	Cmp2 Sctn Tmp Snsr Flt	Compressor 2 Suction Temperature Sensor Fault			
13	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.
14	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.
15	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). *Alarm clears automatically when in cooling/ dehumidification modes. 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: Switch 3 is Off: Water loop setpoint (AV:12) is used. Switch 3 is On: Glycol loop setpoint (AV:11) is used. *Alarm is cleared using Intelligent Reset[1] when in heating mode.
16	17	Cmp2 Lo Sctn	Compressor 2 Low Suction Temperature			
17	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.
18	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).
19	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.
20	21	Room Snsr Flt	Room Temperature Sensor Fault	Manual	Yes	The space temperature sensor input vaue exceeds the allowable temperature range.
21	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)
22	23	RH Snsr Flt	Space Relative Humidity (RH) Sensor Fault	Manual	Yes	The relative humidity sensor input vaue exceeds the allowable range.

Table 11. Alarms by Priority and Index Number, Continued

Priority	Alarm Index[3]	Alarm Text	Description	Clear	Network Reset	Details
23	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.
24	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.
25	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, the MT2300 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

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)

Setpoint Methods

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. See the following section for examples. 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)

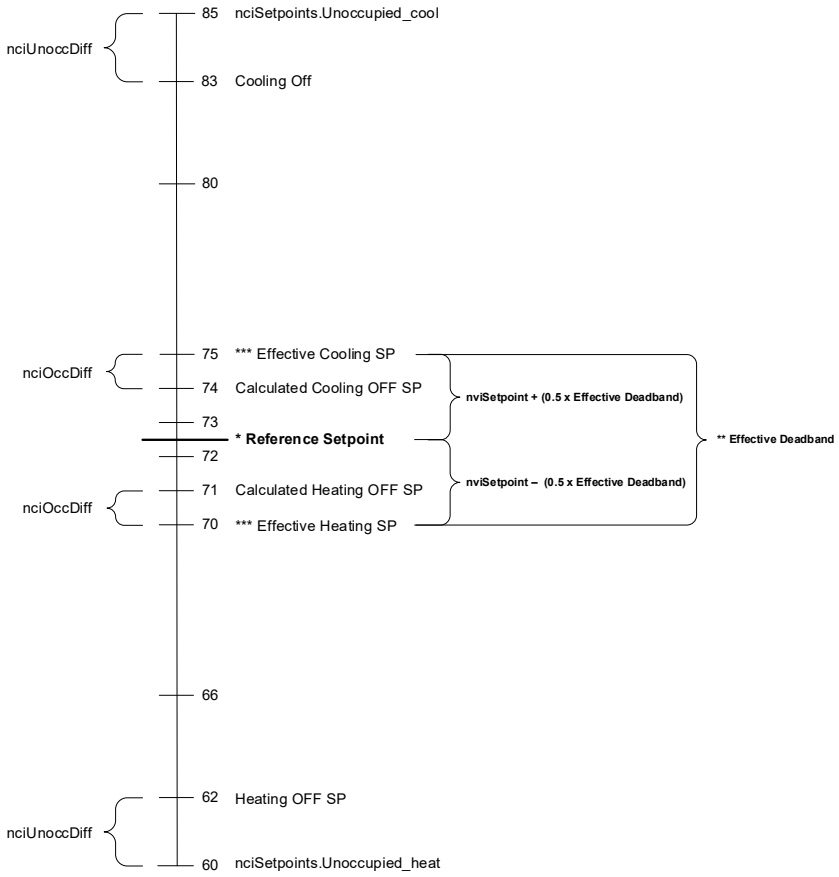
   Standby: ReferenceSP = (AV2 – DeadBandFactor + AV35)
   - EffCoolOnSP = (ReferenceSP + DeadBandFactor)
   - EffCoolOffSP = (EffCoolOnSP – AV10)
   - EffHeatOnSP = (ReferenceSP – DeadBandFactor)
   - EffHeatOffSP = (EffHeatOnSP + AV10)
3. **The unit is operating In Occupied or Standby mode with Long Range 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 for MT2300 WSHP Unit Controller

This section contains the Protocol Implementation Conformance Statement (PICS) for the MT2300 WSHP Unit Controller used with SmartSource Single and Two Stage Compressor and Enfinity Large Two Compressor models as required by ANSI/ASHRAE Standard 135-2006, BACnet: A Data Communication Protocol for Building Automation and Control Networks.

Protocol Implementation Conformance Statement

Date	December 2022	
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
BACnet Protocol Version	1.14	

Product Description

The MT2300 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 2..8 for IP
☐	Able to receive segmented messages	Window size	1 for MS/TP 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 19200 38400 76800
☐	MS/TP slave (Clause 9), baud rate(s)	9600 19200 38400 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, Present_Value
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 Location Max_Master	Description Location (Limit 32 Chars) Max_Master

Daikin Applied Training and Development

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