



neptronic®

# Universal Wall-Mount Controller

TSUB Series

BACnet Communication Module User Guide





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# Introduction

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The TSUB Controller BACnet® Communication Module User Guide provides information about using the TSUB controller with BACnet communications feature. The BACnet communication protocol for building automation and control networks enables communication between client devices within a network. The controller provides a BACnet network interface between BACnet client devices and Neptronic Controller series devices. It uses the BACnet Master Slave/Token Passing (MS/TP) protocol at the BACnet MAC layer.

## Pre-requisites

The BACnet communication user guide assumes that you are familiar with the concepts of BACnet and its terminology.

## Advantages of BACnet

BACnet enabled controllers have the following advantages:

- **Quick Message Transmission.** The controller uses a synchronous implementation for BACnet messages making it quick and efficient. Each BACnet confirmed service request is answered as quickly as possible without using the **Reply Postponed** frame. The MS/TP implementation is performed within **Tusage\_delay** of 15 minutes to ensure a **Tusage\_timeout** value within 20 minutes.
- **MS/TP Support.** The controller supports a Full Master Node state machine for MS/TP. The **Max\_Master** and the instances are configured to the device object through **BACnet WriteProperty** service or via the device's Programming Mode. The MAC address and the MS/TP baud rate setting of 9600, 19200, 38400, or 76800 are also set through the **BACnet Write Property** service or via the device's Programming Mode. In Programming mode, the device is configured through the device's keypad. For more information about the WriteProperty, refer to *Table 3 - Object Types Supported*.
- **BIBB Support.** The controller functions the same way as the B-ASC type profile server and supports the specific BIBB as per their relevant definitions.
  - DS-RP-B
  - DS-RPM-B
  - DS-WP-B
  - DS-WPM-B
  - DM-DCC-B
  - DM-DDB-B
  - DM-DOB-B
  - DM-RD-B
  - DM-TS-B
  - DM-UTC-B
  - DS-COV-B
  - DS-COVP-B
  - SCHED-WS-I-B
- **Object Support.** The controller supports a fixed list of BACnet visible values, which appear as **Present\_Values** of various BACnet standard object types in addition to a device object. For more information, refer to *Table 3 - Object Types Supported*.
- **Alarms.** The controller supports indication of various alarm conditions through value changes in properties of several objects. However, it does not generate BACnet event notifications.

## BACnet Properties Configuration

To establish communication on the network and guarantee a unique ID of devices in a BACnet system, the following properties may have to be configured.

**Table 1 - BACnet Properties Configuration**

| Property                  | Default Value      | Configuration                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MAC Address               | 000                | <ul style="list-style-type: none"> <li>Set to a unique address on the network between 000 and 254.</li> <li>The value can be set manually via the menu.</li> <li>The value can be set manually through the <b>WriteProperty</b> service to <b>Device Object.proprietary-property#1000 MSTP-Address</b>.</li> <li>The values from 128-254 represent MS/TP non-token passing slave devices.</li> </ul>                                                                                                                                                                                                                                                                                                       |
| Device Instance           | Auto               | <ul style="list-style-type: none"> <li>The controller automatically configures its device instance to 153,000 + MAC address.</li> <li>The value can be set manually via the menu.</li> <li>The value can be set manually through the <b>WriteProperty</b> service to <b>Device Object.Object_Identifier</b>.</li> <li>The device's <b>Object_Identifier</b> is a combination of the <b>Device Object_Type</b> (8) and the <b>Device_Instance</b> (0-4194302), therefore its decimal or hexadecimal representation tends to be incomprehensible.</li> <li>For example, the <b>Device_Instance</b>=1000 has an equivalent <b>Object_Identifier</b> of 0x020003E8 hexadecimal or 33555432 decimal.</li> </ul> |
| Baud Rate                 | 0 = Auto           | <ul style="list-style-type: none"> <li>The controller configures its baud rate automatically by detecting the network upon connection.</li> <li>The value can be set manually from the available values of Auto, 9600, 19200, 38400, 76800.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Max_Master                | 127                | <ul style="list-style-type: none"> <li>Configure <b>Max_Master</b> value to increase network efficiency when there are less than 127 devices on the network.</li> <li>The <b>Max_Master</b> value can be changed through the <b>WriteProperty</b> service to <b>Device Object.Max_Master</b>.</li> </ul> <p>For more information, refer to the MAC Address and Max_Master section.</p>                                                                                                                                                                                                                                                                                                                     |
| Device Object.Object_Name | Name of the device | <ul style="list-style-type: none"> <li>Configure the name of the device through the <b>WriteProperty</b> service to <b>Device Object.Object_Name</b>. For example, TSUB.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

# Configuration Options

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The following Configuration options enable you to configure and run the BACnet features of the controllers quickly.

## Quick Setup

Configure the controller for BACnet communication without programming.

1. Ensure that no other device on the network has a MAC address of 0 (the controller's default address).
2. Connect the controller to the network and power it up.
3. The controller automatically configures the baud rate and device instance allowing BACnet Property Configuration through the Write Property service. See Table 1 - BACnet Properties Configuration.
4. Repeat the steps for each controller.

## Manual Setup

Configure the controller for BACnet communication with programming.

1. Access Operation Mode (jumper set to RUN position).
2. Press and hold both function buttons for 5 seconds to access the Quick Access menu.
3. Enter the password, **637**.
4. Follow the instructions to configure the MAC Address, MAX Master, Device Instance, and Baud Rate, manually.
5. Disconnect the power to the controller, connect the controller to the network, and connect the power again.

## MAC Address and Max\_Master

The MAC address must be unique on the entire MS/TP network. However, having a unique MAC address and a high baud rate does not guarantee efficient operation of the controller and other MS/TP units on the MS/TP network. Some MAC address and Max\_Master combinations are more efficient than others. BACnet requires token-passing units to occasionally "poll" for other masters based on the MAC address and Max\_Master.

A poor combination of MAC addresses and Max\_Master can lead to a slower network due to lost time polling for masters that are not present. Unless there are 126 other units on the MS/TP network, the default Max\_Master value of 127 is not the most efficient choice for the controller. The Max\_Master default value of 127 was selected to ensure that any master, specifically a BACnet client can be found when the controller is initially started.

### Examples of MAC Address and Max\_Master Configurations

The following are some of the examples to indicate the optimum combination of Mac address and Max\_Master configurations to ensure a quick and efficient output.

#### Example 1

- MAC=0. Max\_Master=127
- MAC=1, Max\_Master=127

This configuration is slow and inefficient because every time either unit is required to find another master unit, it has to poll 126 units until it finds the right one to pass the token.

#### Example 2

- MAC=0. Max\_Master=5
- MAC=1 to MAC=4 are not used
- MAC=5, Max\_Master=5

This configuration is better than Example 1 but it is still not optimal. The Max\_Master is set to the most efficient value but the gap between the two MAC addresses is high. Therefore, each unit must poll four units until it finds the right one to pass the token.

**Example 3**

- MAC=0, Max\_Master=1
- MAC=2, Max\_Master=2

This is an incorrect configuration. The MAC=0 will never find MAC=2 because it will never poll for the master MAC address=2.

**Example 4**

- MAC=0, Max\_Master=3
- MAC=1, Max\_Master=3
- MAC=2, Max\_Master=3
- MAC=3, Max\_Master=3

This is an efficient configuration as the units are numbered consecutively and the MAX\_Master is set to the most efficient value. As a general guideline, the most efficient setup for an MS/TP network is one in which the units are consecutively numbered starting at MAC address 0 and having Max\_Master=the maximum MAC address in the system. If consecutive numbering is not possible, then the next most efficient setup is one in which all units have Max\_Master=the maximum MAC address in the system.

## Copy Config

Copy and broadcast the entire configuration of a controller over the network to controllers of the same type using the Copy Config feature.

1. Access Operation Mode (jumper set to RUN position).
2. Press and hold both function buttons for 5 seconds to access the Quick Access menu.
3. Enter the password, **637**.
4. Scroll to **Copy Config** programming menu and select **Yes**. Follow the rest of the onscreen instructions.



*Note: A Copy Config can also be executed via BACnet. See AV.165, AV.166, AV.167, and BV.90 in Table 6 - Object Table Information: Analog Value (AV) and Table 9 - Object Table Information: Binary Value (BV) for details.*

## Network Reset

Reset the controller via BACnet using the **Reinitialize Device** service. The Reinitialize Device service can be accessed using the following password: **nep**.

The Reinitialize Device service has two types of reset such as:

- *Warm Reset.* The Warm Reset restarts the controller with actual configuration.
- *Cold Reset.* The Cold Reset restarts the controller with Factory configuration.



*Note: The Cold Reset erases the actual configuration during setting MSTP address. So, exercise caution while performing a Cold Reset.*

# Device Object Properties

The following table lists all the BACnet properties supported for the device object. The W indicates that the property is writable using the BACnet **WriteProperty** service.

**Table 2 - Device Object Properties**

| Property                        | Value                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Writable |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Object_Identifier               | <ul style="list-style-type: none"> <li>• Programmable where the instance part of the Object_Identifier is in the range of 0-4194302</li> <li>• The device instance must be unique system-wide</li> <li>• The default value for the device instance=153000 (Vendor_Identifier*1000)</li> </ul>                                                                                                                                                         | W        |
| Object_Name                     | TSUB, programmable up to 32 Bytes                                                                                                                                                                                                                                                                                                                                                                                                                     | W        |
| Description                     | Programmable up to 32 Bytes (default: BACnet Unit Controller)                                                                                                                                                                                                                                                                                                                                                                                         | W        |
| Object_Type                     | Device                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
| System_Status                   | Operational                                                                                                                                                                                                                                                                                                                                                                                                                                           |          |
| Vendor_Identifier               | Always 153                                                                                                                                                                                                                                                                                                                                                                                                                                            |          |
| Vendor_Name                     | Always Neptronic                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |
| Model_Name                      | Example, TSUB                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |
| Firmware_Revision               | currently, 1.06                                                                                                                                                                                                                                                                                                                                                                                                                                       |          |
| Application_Software_Version    | currently, 1.05                                                                                                                                                                                                                                                                                                                                                                                                                                       |          |
| Protocol_Version                | Always 1                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |
| Protocol_Revision               | Always 14                                                                                                                                                                                                                                                                                                                                                                                                                                             |          |
| DataBase_Revision               | Default 0; incremented if Object Name and/or device ID change                                                                                                                                                                                                                                                                                                                                                                                         |          |
| Max_APDU_Length_Accepted        | Always 480                                                                                                                                                                                                                                                                                                                                                                                                                                            |          |
| Segmentation_Supported          | (3) = No Segmentation                                                                                                                                                                                                                                                                                                                                                                                                                                 |          |
| APDU_Timeout                    | 6000                                                                                                                                                                                                                                                                                                                                                                                                                                                  | W        |
| Number_of_APDU_Retries          | Always 3                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |
| Local_Time                      | 00:00:00                                                                                                                                                                                                                                                                                                                                                                                                                                              | W        |
| Local_Date                      | 01-Jan-2015 (Thu)                                                                                                                                                                                                                                                                                                                                                                                                                                     | W        |
| Utc_Offset                      | -300 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                          | W        |
| Daylight_Savings_Status         | False                                                                                                                                                                                                                                                                                                                                                                                                                                                 | W        |
| Backup_Failure_Timeout          | 300                                                                                                                                                                                                                                                                                                                                                                                                                                                   | W        |
| Configuration_Files             | File-1                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
| Last_Restore_Time               | 2015-01-01 (Thu), 00:00:00:00                                                                                                                                                                                                                                                                                                                                                                                                                         |          |
| Backup_And_Restore_State        | IDLE                                                                                                                                                                                                                                                                                                                                                                                                                                                  |          |
| Backup_Preparation_Time         | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |
| Restore_Completion_Time         | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |
| Restore_Preparation_Time        | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |
| Protocol_Services_Supported     | <ul style="list-style-type: none"> <li>• subscribeCOV</li> <li>• atomicReadFile</li> <li>• atomicWriteFile</li> <li>• readProperty</li> <li>• readPropertyMultiple</li> <li>• WriteProperty</li> <li>• writePropertyMultiple</li> <li>• deviceCommunicationControl</li> <li>• reinitializeDevice</li> <li>• unconfirmedPrivateTransfer</li> <li>• timeSynchronization</li> <li>• who-Has</li> <li>• who-Is</li> <li>• subscribeCOVProperty</li> </ul> |          |
| Protocol_Object_Types_Supported | <ul style="list-style-type: none"> <li>• analog-input</li> <li>• analog-output</li> <li>• analog-value</li> <li>• binary-input</li> <li>• binary-output</li> <li>• binary-value</li> <li>• device</li> <li>• file</li> <li>• program</li> </ul>                                                                                                                                                                                                       |          |

| Property                   | Value                                                                                                                                                                                                                                                                                                | Writable |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
|                            | <ul style="list-style-type: none"> <li>• schedule</li> <li>• pmulti-state-value</li> </ul>                                                                                                                                                                                                           |          |
| Object_List                | 195                                                                                                                                                                                                                                                                                                  |          |
| Device_Address_Binding     | Always empty                                                                                                                                                                                                                                                                                         |          |
| Max_Master                 | Programmable in the range of 1-127 (default: 127)                                                                                                                                                                                                                                                    | W        |
| Max_Info_Frames            | Always 1                                                                                                                                                                                                                                                                                             |          |
| Active_COV_Subscription    | Empty by default. COV subscription will be lost on a power cycle.                                                                                                                                                                                                                                    |          |
| Property_List              | List of properties that exist within the object.                                                                                                                                                                                                                                                     |          |
| Proprietary property #1000 | <ul style="list-style-type: none"> <li>• Programmable (default:0)</li> <li>• Represents the MS/TP MAC address in the range of 0 to 254</li> <li>• Values 128 to 254 represent MS/TP non-token passing slave devices</li> </ul>                                                                       | W        |
| Proprietary property #1001 | <ul style="list-style-type: none"> <li>• Programmable (default: Auto)</li> <li>• Represents the MS/TP Baud rate (unsigned type)</li> <li>• Values are 0 (Auto), 9600, 19200, 38400, 76800</li> <li>• Reading this property always returns the actual Baud rate</li> </ul>                            | W        |
| Proprietary property #1002 | <ul style="list-style-type: none"> <li>• Programmable (default: 15 minutes)</li> <li>• Represents the period of time that an object in/out of service will automatically return to normal. Range = 0-120 minutes (unsigned type)</li> <li>• Writing 0 means no automatic return to normal</li> </ul> | W        |

## Object Types Supported

The following table lists all the BACnet properties supported for each object type. Most of the properties are locked. The exception is **Present\_Value**, which represents the dynamic operating values of the device, and the Status\_Flag, Event\_State, and Reliability properties, which reflect the availability of the **Present\_Value**. Unless otherwise specified, properties are not changeable.

**Table 3 - Object Types Supported**

| Object Type                                                                                                                                                  | Enabled | Optional Properties Supported                                                                                                                                                                   | Writable Properties                                                                                                  | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Note: Writable properties are different for some objects. Refer to the respective Object Table information to know the writable property for objects.</i> |         |                                                                                                                                                                                                 |                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Analog Input                                                                                                                                                 | ☑       | <ul style="list-style-type: none"> <li>• Reliability</li> <li>• Description</li> <li>• Min_Present_Value</li> <li>• Max_Present_Value</li> <li>• Resolution</li> <li>• Cov-increment</li> </ul> | <ul style="list-style-type: none"> <li>• Out_of_Service</li> <li>• Cov-Increment</li> </ul>                          | <ul style="list-style-type: none"> <li>• If "Out of Service" is true, Present_Value and Status_Flag become writable properties. Refer to Out of Service Property section on page 7 for more information.</li> <li>• Object will automatically return to Normal after a programmable period of time. Refer to Proprietary property #1002 of Device Object in Table 2 - Device Object Properties.</li> </ul>                                                                                                                                     |
| Analog Value                                                                                                                                                 | ☑       | <ul style="list-style-type: none"> <li>• Reliability</li> <li>• Description</li> <li>• Cov-Increment</li> <li>• Priority_Array</li> <li>• Relinquish_Default</li> </ul>                         | <ul style="list-style-type: none"> <li>• Present_Value</li> <li>• Out_of_Service</li> <li>• Cov-Increment</li> </ul> | <ul style="list-style-type: none"> <li>• Present_Value property is writable for every AV object except AV.20, AV.24, AV.35, AV.38, AV.50, AV.60, AV.78, AV.79, AV.87.</li> <li>• Out_of_Service property is writable for AV.1, AV.3, AV.4, AV.70, AV.95.</li> <li>• Refer to Out of Service Property section on page 7 for more information.</li> <li>• Object will automatically return to Normal after a programmable period of time. Refer to Proprietary property #1002 of Device Object in Table 2 - Device Object Properties.</li> </ul> |
| Analog Output                                                                                                                                                | ☑       | <ul style="list-style-type: none"> <li>• Description</li> <li>• Reliability</li> <li>• Min-Pres-Value</li> <li>• Max-Pres-Value</li> <li>• Resolution</li> <li>• Cov-Increment</li> </ul>       | <ul style="list-style-type: none"> <li>• Present_Value</li> <li>• Cov-Increment</li> </ul>                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Binary Input                                                                                                                                                 | ☑       | <ul style="list-style-type: none"> <li>• Reliability</li> <li>• Active_Text</li> <li>• Inactive_Text</li> <li>• Description</li> </ul>                                                          | Out_of_Service                                                                                                       | <ul style="list-style-type: none"> <li>• If "Out of Service" is true, Present_Value and Status_Flag become writable properties. Refer to Out of Service Property section on page 7 for more information.</li> <li>• Object will automatically return to Normal after a programmable period of time. Refer to Proprietary property #1002 of Device Object in Table 2 - Device Object Properties.</li> </ul>                                                                                                                                     |



| Object Type       | Enabled                             | Optional Properties Supported                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Writable Properties                                                                                                                                                                                                                                                                                                               | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Binary Value      | <input checked="" type="checkbox"/> | <ul style="list-style-type: none"> <li>Reliability</li> <li>Active_Text</li> <li>Inactive_Text</li> <li>Description</li> <li>Priority_Array</li> <li>Relinquish_Default</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                           | Present_Value<br>Out_of_Service                                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>Present_V</li> <li>•</li> <li>• alue property is writable for every Binary Value object except BV.36 and BV.42.</li> <li>• Out_of_Service property is writable for BV.30.</li> <li>• Some objects are commandable. In such case, the priority-array and relinquish-default properties are available for BV.30.</li> <li>• Object automatically returns to Normal after a programmable time. Refer to Proprietary property #1002 of Device Object in Table 2 - Device Object Properties.</li> </ul> |
| Binary Output     | <input checked="" type="checkbox"/> | <ul style="list-style-type: none"> <li>Description</li> <li>Reliability</li> <li>Inactive-text</li> <li>Active-text</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                               | Present_Value                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Device            | <input checked="" type="checkbox"/> | <ul style="list-style-type: none"> <li>Max_Master</li> <li>Max_Info_Frame</li> <li>Description</li> <li>active-cov-subscriptions</li> <li>#1000 (MSTP addr)</li> <li>#1001 (Baud rate)</li> <li>#1002 (Time out)</li> <li>Local_Time</li> <li>Local_Date</li> <li>UTC_Offset</li> <li>Daylight_Savings_Status</li> <li>Apdu_Timeout</li> <li>Backup_Failure_Timeout</li> <li>Configuration_Files</li> <li>Last_Restore_Time</li> <li>Backup_And_Restore_State</li> <li>Backup_Preparation_Time</li> <li>Restore_Completion_Time</li> <li>Restore_Preparation_Time</li> </ul> | <ul style="list-style-type: none"> <li>Object_Identifier</li> <li>Object_Name</li> <li>Max_Master</li> <li>Description</li> <li>Local_Time</li> <li>Local_Date</li> <li>UTC_Offset</li> <li>Daylight_Savings_Status</li> <li>Apdu_Timeout</li> <li>Backup_Failure_Timeout</li> <li>#1000</li> <li>#1001</li> <li>#1002</li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Multi-State Value | <input checked="" type="checkbox"/> | <ul style="list-style-type: none"> <li>Description</li> <li>Reliability</li> <li>States_Text</li> <li>Priority_Array</li> <li>Relinquish_Default</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                  | Present_Value                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>• Present_Value property is writable for every Multi State Value object except MSV.14, MSV.15.</li> <li>• Out_of_Service property is not writable for MSV.</li> </ul>                                                                                                                                                                                                                                                                                                                              |
| Program           | <input checked="" type="checkbox"/> | <ul style="list-style-type: none"> <li>Description</li> <li>Reliability</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Program_Change                                                                                                                                                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>• Only LOAD and RESTART are supported for Program Change.</li> <li>• Use LOAD to apply the new firmware.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                |
| File              | <input checked="" type="checkbox"/> | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>Archive</li> <li>File Size</li> </ul>                                                                                                                                                                                                                                                      | Only 0 is the accepted value to be written into file size.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Schedule          | <input checked="" type="checkbox"/> | <ul style="list-style-type: none"> <li>Description</li> <li>Weekly Schedule</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <ul style="list-style-type: none"> <li>Effective Period</li> <li>Weekly Schedule</li> <li>Schedule Default</li> <li>Priority For Writing</li> <li>Out_of_Service</li> </ul>                                                                                                                                                       | <ul style="list-style-type: none"> <li>• If "Out of Service" is true, Present_Value becomes writable property.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                 |

## Out of Service Property

Neptronic controllers offer the use of the Out of Service writable property. When the value of this property is set to True, it disconnects the object from the physical input, enabling you to input other values. This is useful for special applications or while troubleshooting. For example, you can ignore the temperature read from a sensor and input the desired temperature value in order to perform specific tests.

For security reasons, a timeout will set the Out of Service property back to False after 15 minutes. This value can be modified to between 0 and 120 minutes (For more information, see proprietary property #1002 in *Table 2 - Device Object Properties*).

## Object Table Information

The TSUB Controller series use the following BACnet object tables, categorized on the basis of their ID. The type is the BACnet Object type, the instance is the BACnet Object. Together, the type and instance form the **BACnet Object\_Identifier** for an object according to the following C-language algorithm:

- object\_identifier= (unsigned long)((unsigned long)type<<22)+instance

## Analog Input (AI)

**Table 4 - Object Table Information: Analog Input (AI)**

| ID   | Name           | Description                                                                                                               | W?                              | Notes                                                                                                                                                                                                                                                                                                    |
|------|----------------|---------------------------------------------------------------------------------------------------------------------------|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AI.1 | AnalogInput1   | Sensor reading value on analog input 1.                                                                                   | Out of Service<br>Cov Increment | <ul style="list-style-type: none"> <li>If a 10kΩ type III sensor is used, displays 0V Fault and Out of Service Status Flags are True</li> <li>If a 0-10V sensor is used, displays 0-10V Resolution 0.01 Volt</li> <li>If a dry contact is used, displays 0 or 1 No Units 0 = Open, 1 = Close</li> </ul>  |
| AI.2 | AnalogInput2   | Sensor reading value on analog input 2.                                                                                   | Out of Service<br>Cov Increment | <ul style="list-style-type: none"> <li>If a 10kΩ type III sensor is used, displays 0V Fault and Out of Service Status Flags are True.</li> <li>If a 0-10V sensor is used, displays 0-10V Resolution 0.01 Volt</li> <li>If a dry contact is used, displays 0 or 1 No Units 0 = Open, 1 = Close</li> </ul> |
| AI.7 | InternTemp     | Internal temp sensor value (ITS) of the integrated sensor. Set MSV.21 value to <b>Internal</b> to use it as Control Temp. | Out of Service<br>Cov Increment | 32°F to 122°F or 0°C to 50°C<br>Resolution 0.02°F/0.01°C                                                                                                                                                                                                                                                 |
| AI.8 | InternHumidity | Humidity reading of on board humidity sensor.                                                                             | Out of Service<br>Cov Increment | 5% RH to 100% RH<br>Resolution 0.1% RH                                                                                                                                                                                                                                                                   |

## Analog Output (AO)

Table 5 - Object Table Information: Analog Output (AO)

| ID   | Name          | Description                                           | W?                             | Notes                      |
|------|---------------|-------------------------------------------------------|--------------------------------|----------------------------|
| AO.2 | AnalogOutput2 | Percentage value of analog output 2, based on demand. | Present Value<br>Cov Increment | 0 to 100%, Resolution 0.1% |
| AO.3 | AnalogOutput3 | Percentage value of analog output 3, based on demand. | Present Value<br>Cov Increment | 0 to 100%, Resolution 0.1% |

## Analog Value (AV)

Table 6 - Object Table Information: Analog Value (AV)

| ID    | Name                 | Description                                                                                                                                                                                                                                                                             | W?                                                   | Notes                                                                        |
|-------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|------------------------------------------------------------------------------|
| AV.1  | ControlTemp          | Temperature value that is used to calculate demand. This object is commandable. The relinquish default value will be equal to the Setpoint (AV.9) if MSV.21 is set to <b>Network</b> . Otherwise, it will be equal to the internal or external temperature depending on MSV.21 setting. | Present Value<br>Cov Increment                       | -40°F to 212°F or -40°C to 100°C<br>Resolution 0.02°F/0.01°C                 |
| AV.2  | Cfg_NetworkTimeOut   | Configuration time value. If MSV.21 is set to <b>Network</b> and no value has been sent via BMS for more than AV.2 time, the TSUB goes to <b>OFF</b> mode. AV.1 displays 999°C and object in Fault. If time is set to 0 mins, AV.1 is reset to AV.9 value.                              | Present Value<br>Cov Increment                       | 0 to 60 minutes, Resolution 1 minute                                         |
| AV.3  | ExternTemp           | Status of the extern temperature sensor (ETS). This temperature is the value read by the external temperature sensor when MSV.35 or MSV.36 is set to t10.0, t10.V, or t012.                                                                                                             | Out of Service<br>Cov Increment                      | -40°F to 212°F or -40°C to 100°C<br>Resolution 0.02°F/0.01°C                 |
| AV.4  | ChangeOverTemp       | Status of the changeover temperature sensor (SEnS). This is the value read by the changeover sensor when MSV.35 or MSV.36 is set to Changeover Sensor.                                                                                                                                  | Out of Service<br>Cov Increment                      | -40°F to 212°F or -40°C to 100°C<br>Resolution 0.02°F/0.01°C                 |
| AV.5  | Cfg_InternTempOffset | Configuration value used to calibrate the integrated temp sensor of the TSUB (ITS).                                                                                                                                                                                                     | Present Value<br>Cov Increment                       | ±9°F/±5°C, Resolution 0.2°F/0.1°C                                            |
| AV.6  | Cfg_ExternTempOffset | Configuration value used to calibrate the external temp sensor (ETS).                                                                                                                                                                                                                   | Present Value<br>Cov Increment                       | ±9°F/±5°C, Resolution 0.2°F/0.1°C                                            |
| AV.7  | Cfg_ExternTempMin    | Configuration value that represents the minimum temp read by the sensor (minimum range value).                                                                                                                                                                                          | Present Value<br>Cov Increment                       | -40°F to 32°F or -40°C to 0°C<br>Resolution 1°F/0.5°C                        |
| AV.8  | Cfg_ExternTempMax    | Configuration value that represents the maximum temp read by the sensor (maximum range value).                                                                                                                                                                                          | Present Value<br>Cov Increment                       | 122°F to 212°F or 50°C to 100°C<br>Resolution 1°F/0.5°C                      |
| AV.9  | TempSetPoint         | Configuration value used to set the actual user setpoint of the zone in occupied/day operation mode. This value may be locked to prevent the user from changing the setpoint (BV.2). This object is commandable, relinquish default will be saved to non-volatile memory.               | Present Value<br>Relinquish_Default<br>Cov Increment | 50°F to 104°F or 10°C to 40°C (AV.10 to AV.11)<br>Resolution 1°F/0.5°C       |
| AV.10 | Cfg_MinSetPoint      | Configuration value used to set the minimum temp setpoint of the zone in occupied/day operation mode, allowed by the user.                                                                                                                                                              | Present Value<br>Cov Increment                       | 50°F to 104°F or 10°C to 40°C (50°F/10°C to AV.11)<br>Resolution 1°F/0.5°C   |
| AV.11 | Cfg_MaxSetPoint      | Configuration value used to set the maximum temp setpoint of the zone in occupied/day operation mode, allowed by the user.                                                                                                                                                              | Present Value<br>Cov Increment                       | 50°F to 104°F or 10°C to 40°C (AV.10 to 104°F or 40°C), Resolution 1°F/0.5°C |
| AV.12 | SetPointCoolNoOccNSB | Configuration value of the cooling setpoint when in night setback or unoccupied mode. Set BV.35 value to setpoint for the value to be active.                                                                                                                                           | Present Value<br>Cov Increment                       | 50°F to 104°F or 10°C to 40°C (AV.13 to 104°F or 40°C), Resolution 1°F/0.5°C |
| AV.13 | SetPointHeatNoOccNSB | Configuration value of the heating setpoint when in night setback or unoccupied mode. Set BV.35 value to setpoint for the value to be active.                                                                                                                                           | Present Value<br>Cov Increment                       | 50°F to 104°F or 10°C to 40°C (50°F/10°C to AV.12)<br>Resolution 1°F/0.5°C   |

| ID    | Name                      | Description                                                                                                                                                                                                                                                   | W?                              | Notes                                                        |
|-------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|--------------------------------------------------------------|
| AV.14 | ExternTemp2               | Status of the extern temperature sensor 2 (ETS2). This temperature is the value read by the external temperature sensor 2 when any two of the MSV values from MSV.35 and MSV.36 is set to t10.0 or t10V or t012. For example, set t10.0 at MSV.35 and MSV.36  | Out of Service<br>Cov Increment | -40°F to 212°F or -40°C to 100°C<br>Resolution 0.02°F/0.01°C |
| AV.15 | Cfg_ExternTemp2Offset     | Configuration value used to calibrate the external temp sensor 2 (ETS2).                                                                                                                                                                                      | Present Value<br>Cov Increment  | ±9°F/±5°C, Resolution 0.2°F/0.1°C                            |
| AV.16 | Cfg_ExternTemp2Min        | Configuration value that represents the minimum temp read by the external temp sensor 2 (minimum range value).                                                                                                                                                | Present Value<br>Cov Increment  | -40°F to 32°F or -40°C to 0°C<br>Resolution 1°F/0.5°C        |
| AV.17 | Cfg_ExternTemp2Max        | Configuration value that represents the maximum temp read by the external temp sensor 2 (maximum range value).                                                                                                                                                | Present Value<br>Cov Increment  | 122°F to 212°F or 50°C to 100°C<br>Resolution 1°F/0.5°C      |
| AV.20 | Heating1Demand            | Status value that represents the heating demand for the Heating Ramp 1. This value is based on zone temp, zone setpoint and values set for the actual ramp.                                                                                                   | Cov Increment                   | 0 to 100%, Resolution 0.5%                                   |
| AV.21 | Cfg_Heating1PropBand      | Configuration value that represents the range through which the controller will modulate the heating output from 0 to 100% for Heating Ramp 1.                                                                                                                | Present Value<br>Cov Increment  | 1°F to 9°F or 0.5°C to 5.0°C<br>Resolution 1°F/0.5°C         |
| AV.22 | Cfg_Heating1DeadBand      | Configuration value that represents the range at which the controller will not take action when temp is below the zone setpoint for Heating Ramp 1.                                                                                                           | Present Value<br>Cov Increment  | 0°F to 9°F or 0.0°C to 5.0°C<br>Resolution 0.2°F/0.1°C       |
| AV.24 | Heating2Demand            | Status value that represents the heating demand for the Heating Ramp 2. This value is based on zone temp, zone setpoint and values set for the actual ramp.                                                                                                   | Cov Increment                   | 0 to 100%, Resolution 0.5%                                   |
| AV.25 | Cfg_Heating2PropBand      | Configuration value that represents the range through which the controller will modulate the heating output from 0 to 100% for Heating Ramp 2.                                                                                                                | Present Value<br>Cov Increment  | 1°F to 9°F or 0.5°C to 5.0°C<br>Resolution 1°F/0.5°C         |
| AV.26 | Cfg_Heating2DeadBand      | Configuration value that represents the range at which the controller will not take action when temp is below the zone setpoint for Heating Ramp 2.                                                                                                           | Present Value<br>Cov Increment  | 0°F to 9°F or 0.0°C to 5.0°C<br>Resolution 0.2°F/0.1°C       |
| AV.32 | Cfg_IntegralTimeHeating   | Configuration value that represents the reciprocal of the integral time in secs (1/I or repeats per second). To obtain a slower reaction time, the value of the integral must be small. To obtain a quicker reaction time, the integral value must be bigger. | Present Value<br>Cov Increment  | 0 to 250 seconds, Resolution 5 seconds                       |
| AV.35 | Cooling1Demand            | Status value that represents the cooling demand for the Cooling Ramp 1. This value is based on zone temp, zone setpoint and values set for the actual ramp.                                                                                                   | Cov Increment                   | 0 to 100%, Resolution 0.5%                                   |
| AV.36 | Cfg_Cooling1PropBand      | Configuration value that represents the range through which the controller will modulate the cooling output from 0 to 100% for Cooling Ramp 1.                                                                                                                | Present Value<br>Cov Increment  | 1°F to 9°F or 0.5°C to 5.0°C<br>Resolution 1°F/0.5°C         |
| AV.37 | Cfg_Cooling1DeadBand      | Configuration value that represents the range at which the controller will not take action when temp is above the zone setpoint for Cooling Ramp 1.                                                                                                           | Present Value<br>Cov Increment  | 0°F to 9°F or 0.0°C to 5.0°C<br>Resolution 0.2°F/0.1°C       |
| AV.38 | Cooling2Demand            | Status value that represents the cooling demand for the Cooling Ramp 2. This value is based on zone temp, zone setpoint and values set for the actual ramp.                                                                                                   | Cov Increment                   | 0 to 100%, Resolution 0.5%                                   |
| AV.39 | Cfg_Cooling2PropBand      | Configuration value that represents the range through which the controller will modulate the cooling output from 0 to 100% for Cooling Ramp 2.                                                                                                                | Present Value<br>Cov Increment  | 1°F to 9°F or 0.5°C to 5.0°C<br>Resolution 1°F/0.5°C         |
| AV.40 | Cfg_Cooling2DeadBand      | Configuration value that represents the range at which the controller will not take action when temp is above the zone setpoint for Cooling Ramp 2.                                                                                                           | Present Value<br>Cov Increment  | 0°F to 9°F or 0.0°C to 5.0°C<br>Resolution 0.2°F/0.1°C       |
| AV.45 | Cfg_IntegralTimeCooling   | Configuration value that represents the reciprocal of the integral time in secs (1/I or repeats per second). To obtain a slower reaction time, the value of the integral must be small. To obtain a quicker reaction time, the integral value must be bigger. | Present Value<br>Cov Increment  | 0 to 250 seconds, Resolution 5 seconds                       |
| AV.46 | Cfg_CoolingAntiCycleDelay | Configuration value in mins to prevent the cooling outputs to cycle on and off. This is a protection feature used when cooling is done through compressors.                                                                                                   | Present Value<br>Cov Increment  | 0 to 15 minutes, Resolution 1 minute                         |
| AV.50 | ChangeOverDemand          | Status value that represents the changeover demand. This value is based on changeover temp, setpoint, and values set for the actual ramp.                                                                                                                     | Cov Increment                   | 0 to 100%, Resolution 0.5%                                   |
| AV.51 | Cfg_ChangeOverPropBand    | Configuration value that represents the range through which the controller modulates the changeover output from 0 to 100%.                                                                                                                                    | Present Value<br>Cov Increment  | 1°F to 9°F or 0.5°C to 5.0°C<br>Resolution 1°F/0.5°C         |

| ID    | Name                     | Description                                                                                                                                                                                                                                                                         | W?                                                   | Notes                                                   |
|-------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|---------------------------------------------------------|
| AV.52 | Cfg_ChangeOverDeadBand   | Configuration value that represents the range at which the controller will not take action on the changeover output when above or below the changeover setpoint.                                                                                                                    | Present Value<br>Cov Increment                       | 0°F to 9°F or 0.0°C to 5.0°C<br>Resolution 1°F/0.5°C    |
| AV.53 | ChangeOverSetPoint       | Configuration value of the temp at which the water that enters is considered to be in cooling or heating state.                                                                                                                                                                     | Present Value<br>Cov Increment                       | 50°F to 104°F or 10°C to 40°C<br>Resolution 1°F/0.5°C   |
| AV.56 | Cfg_CL_HT_SwitchTimer    | Configuration value of the time required before the changeover is permitted to take place (time in mins).                                                                                                                                                                           | Present Value<br>Cov Increment                       | 0 to 120 minutes, Resolution 1 minute                   |
| AV.58 | CL_HT_SwitchTimerCount   | Status value of the remaining time before the changeover is authorised. This value counts down from the time set in AV.56.                                                                                                                                                          | Cov Increment                                        | 0 to 7,200 seconds, Resolution 1 second                 |
| AV.60 | FanDemand                | Status value that represents the fan demand. This value is based on the status value of other demands. Demand is also affected by the number of fan speed configured in MSV.25.                                                                                                     | Cov Increment                                        | 0 to 100%, Resolution 0.5%                              |
| AV.61 | Cfg_FanAutoTimeOutDelay  | Configuration value to prevent the cycling of the fan. If the fan was in operation, the TSUB will countdown from this value before stopping the fan.                                                                                                                                | Present Value<br>Cov Increment                       | 0 to 255 seconds, Resolution 1 second                   |
| AV.62 | Cfg_FanDampingFactor     | Configuration value in secs that represents the damping factor for changing fan speed.                                                                                                                                                                                              | Present Value<br>Cov Increment                       | 0 to 255 seconds, Resolution 1 second                   |
| AV.70 | ExternHumidity           | External humidity sensor value (Erh).                                                                                                                                                                                                                                               | Out of Service<br>Cov Increment                      | 5% RH to 95% RH, Resolution 0.1% RH                     |
| AV.71 | Cfg_InternHumidityOffset | Configuration value used to calibrate the internal relative humidity sensor (irH). Only available on models with the humidity sensor.                                                                                                                                               | Present Value<br>Cov Increment                       | ± 5% RH, Resolution 0.1% RH                             |
| AV.72 | Cfg_ExternHumidityOffset | Configuration value used to calibrate the external relative humidity sensor (Erh).                                                                                                                                                                                                  | Present Value<br>Cov Increment                       | ± 5%, Resolution 0.1% RH                                |
| AV.73 | HumSetPoint              | Configuration value used to set the actual user humidity setpoint of the zone in occupied/day operation mode. This value may be locked to prevent the user from changing the setpoint (BV.26). This object is commandable, relinquish default will be saved to non-volatile memory. | Present Value<br>Relinquish_Default<br>Cov Increment | 10% RH to 90% RH (AV.74 to AV.75)<br>Resolution 0.5% RH |
| AV.74 | Cfg_HumMinSetPoint       | Configuration value used to set the minimum relative humidity setpoint of the zone in occupied/day operation mode allowed by the user.                                                                                                                                              | Present Value<br>Cov Increment                       | 10% RH to 90% RH (10% to AV.75)<br>Resolution 0.5% RH   |
| AV.75 | Cfg_HumMaxSetPoint       | Configuration value used to set the maximum relative humidity setpoint of the zone in occupied/day operation mode allowed by the user.                                                                                                                                              | Present Value<br>Cov Increment                       | 10% RH to 65% RH (AV.74 to 90%)<br>Resolution 0.5% RH   |
| AV.76 | DehumidifySPNoOccNSB     | Configuration value of the highest relative humidity allowed when in night setback or unoccupied mode. Set BV.35 value to setpoint for the value to be active.                                                                                                                      | Present Value<br>Cov Increment                       | 10% RH to 65% RH (AV.77 to 65%)<br>Resolution 0.5% RH   |
| AV.77 | HumidifySPNoOccNSB       | Configuration value of the lowest relative humidity allowed when in night setback or unoccupied mode. Set BV.35 value to setpoint for the value to be active.                                                                                                                       | Present Value<br>Cov Increment                       | 10% RH to 65% RH (10% to AV.76)<br>Resolution 0.5% RH   |
| AV.78 | HumidifyDemand           | Status value that represents the humidifier modulation, based on relative humidity.                                                                                                                                                                                                 | Cov Increment                                        | 0% RH to 100% RH, Resolution 1% RH                      |
| AV.79 | DehumidifyDemand         | Status value that represents the dehumidification percentage, based on relative humidity.                                                                                                                                                                                           | Cov Increment                                        | 0% RH to 100% RH, Resolution 1% RH                      |
| AV.80 | Cfg_HumPropBand          | Configuration value that represents the range through which the controller modulates the humidifier or dehumidification output from 0 to 100%.                                                                                                                                      | Present Value<br>Cov Increment                       | 3% RH to 10% RH, Resolution 0.5% RH                     |
| AV.81 | Cfg_HumDeadBand          | Configuration value that represents the range at which the controller will not take action when below or above the humidity setpoint.                                                                                                                                               | Present Value<br>Cov Increment                       | 0% RH to 5% RH, Resolution 0.5% RH                      |
| AV.85 | Cfg_NSBOVERRIDEDelay     | Maximum configuration time in mins when in night setback mode and an override has been activated on the controller.                                                                                                                                                                 | Present Value<br>Cov Increment                       | 0 to 180 minutes, Resolution 15 minutes                 |
| AV.86 | Cfg_NoOccOverrideDelay   | Maximum configuration time in mins when in unoccupied mode and an override has been activated on the controller. Each time the user presses the fan button, an increment of 15 mins is added up to this value.                                                                      | Present Value<br>Cov Increment                       | 0 to 180 minutes, Resolution 15 minutes                 |

| ID     | Name                          | Description                                                                                                                                                                                                                                                                                                                                                                                       | W?                              | Notes                                                     |
|--------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------------------|
| AV.87  | Cfg_NoOccOvCountDown          | Time in mins before the state of the input changes from Occupied to Unoccupied mode. There is no time to change the state from Unoccupied to Occupied.                                                                                                                                                                                                                                            | Cov Increment                   | 0 to 180 minutes (0-AV.86), Resolution 1 minute           |
| AV.88  | Cfg_OccupancyMinTime          | Time in mins before the state of the input changes from Occupied to Unoccupied mode. Used when motion detector is not equipped with an internal timer.                                                                                                                                                                                                                                            | Present Value<br>Cov Increment  | 0 to 720 minutes, Resolution 1 minute                     |
| AV.90  | Cfg_UniversalInput1Delay      | Configuration time in secs. Once the time has expired, the controller changes the state of the input.                                                                                                                                                                                                                                                                                             | Present Value<br>Cov Increment  | 0 to 3,600 seconds, Resolution 10 seconds                 |
| AV.91  | Cfg_UniversalInput2Delay      | See AV.90                                                                                                                                                                                                                                                                                                                                                                                         | Present Value<br>Cov Increment  | 0 to 3,600 seconds, Resolution 10 seconds                 |
| AV.95  | ExternalCO2SensorValue        | Status of the carbon dioxide sensor (CO2). This is the value read by the CO2 sensor in parts per million (PPM) when MSV.35 or MSV.36 is set to CO2 sensor. AV.96 (Range) and AV.97 (Setpoint must be configured for proper reading).                                                                                                                                                              | Out of Service<br>Cov Increment | 0 to 5,000 PPM, Resolution 1 PPM                          |
| AV.96  | CO2ControlValue               | Status value that represents the current value of CO2 (PPM).                                                                                                                                                                                                                                                                                                                                      | COV Increment                   | 0 to AV.97, Resolution 1 PPM                              |
| AV.97  | Cfg_CO2Range                  | Configuration value that represents the maximum range of the CO2 sensor (PPM).                                                                                                                                                                                                                                                                                                                    | Present Value<br>Cov Increment  | 100 to 5,000 PPM, Resolution 50 PPM                       |
| AV.98  | CO2Setpoint                   | Configuration value that represents the maximum limit of CO2 concentration before the TSUB sends an alarm.                                                                                                                                                                                                                                                                                        | Present Value<br>Cov Increment  | 100 to 2,000 PPM, Resolution 10 PPM                       |
| AV.103 | Cfg_AnalogOutput2Min          | This value represents the minimum control signal of the controlled element. If the signal is 0-10Vdc, then the minimum value is 0 Volts and if the signal is 2-10 Vdc, the minimum value is 2 Volts. This value is the 0 position at 0% demand. If set at 2 Volts, a 2 Volt is applied continuously even when there is no demand. It is not used to set the minimum starting activation position. | Present Value<br>Cov Increment  | 0 Volts to 10 Volts (0 to AV.104)<br>Resolution 0.1 Volt  |
| AV.104 | Cfg_AnalogOutput2Max          | This value represents the maximum control signal of the controlled element. If signal is 0-10Vdc or 2-10Vdc, then the maximum value is 10 Volts. It can also be used to limit the maximum output of the controller. If the control signal is 0-10Vdc and the maximum voltage value is set to 8 Volts, the controlled element will never go over 80% of its total capacity.                        | Present Value<br>Cov Increment  | 0 Volts to 10 Volts (AV.103 to 10)<br>Resolution 0.1 Volt |
| AV.105 | Cfg_AnalogOutput3Min          | See AV.103                                                                                                                                                                                                                                                                                                                                                                                        | Present Value<br>Cov Increment  | 0 Volts to 10 Volts (0 to AV.106)<br>Resolution 0.1 Volt  |
| AV.106 | Cfg_AnalogOutput3Max          | See AV.104                                                                                                                                                                                                                                                                                                                                                                                        | Present Value<br>Cov Increment  | 0 Volts to 10 Volts (AV.105 to 10)<br>Resolution 0.1 Volt |
| AV.109 | Cfg_MinCoolHeat1Position      | Configuration value in percentage at which the controller sets the CH1 output during heating, provided another output has also been set to heating.                                                                                                                                                                                                                                               | Present Value<br>Cov Increment  | 0% to 100%, Resolution 1%                                 |
| AV.125 | Cfg_BinaryOutput3ClosePos     | Configuration value that indicates the percentage of demand at which the contact closes to energize the controlled element.                                                                                                                                                                                                                                                                       | Present Value<br>Cov Increment  | 15% to 80%, Resolution 1%                                 |
| AV.126 | Cfg_BinaryOutput3OpenPos      | Configuration value that indicates the percentage of demand at which the contact opens to de-energize the controlled element.                                                                                                                                                                                                                                                                     | Present Value<br>Cov Increment  | 0% to 76% (0 to BO3closepos-4%), Resolution 1%            |
| AV.127 | Cfg_BinaryOutput3ContactDelay | Configuration value in mins to add a delay before allowing the output to change from inactive to active state.                                                                                                                                                                                                                                                                                    | Present Value<br>Cov Increment  | 0 to 15 minutes, Resolution 1 minute                      |
| AV.130 | Cfg_BinaryOutput4ClosePos     | See AV.125                                                                                                                                                                                                                                                                                                                                                                                        | Present Value<br>Cov Increment  | 15% to 80%, Resolution 1%                                 |
| AV.131 | Cfg_BinaryOutput4OpenPos      | See AV.126                                                                                                                                                                                                                                                                                                                                                                                        | Present Value<br>Cov Increment  | 0% to 76% (0 to BO4closepos-4%), Resolution 1%            |
| AV.132 | Cfg_BinaryOutput4ContactDelay | See AV.127                                                                                                                                                                                                                                                                                                                                                                                        | Present Value<br>Cov Increment  | 0 to 15 minutes, Resolution 1 minute                      |

| ID     | Name                          | Description                                                                                                                                                                                  | W?                             | Notes                                                      |
|--------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|------------------------------------------------------------|
| AV.133 | Cfg_BinaryOutput5ClosePos     | See AV.125                                                                                                                                                                                   | Present Value<br>Cov Increment | 15% to 80%, Resolution 1%                                  |
| AV.134 | Cfg_BinaryOutput5OpenPos      | See AV.126                                                                                                                                                                                   | Present Value<br>Cov Increment | 0% to 76% (0 to BO5closepos-4%), Resolution 1%             |
| AV.135 | Cfg_BinaryOutput5ContactDelay | See AV.127                                                                                                                                                                                   | Present Value<br>Cov Increment | 0 to 15 minutes, Resolution 1 minute                       |
| AV.136 | Cfg_BinaryOutput6ClosePos     | See AV.125                                                                                                                                                                                   | Present Value<br>Cov Increment | 15% to 80%, Resolution 1%                                  |
| AV.137 | Cfg_BinaryOutput6OpenPos      | See AV.126                                                                                                                                                                                   | Present Value<br>Cov Increment | 0% to 76% (0 to BO6closepos-4%), Resolution 1%             |
| AV.138 | Cfg_BinaryOutput6ContactDelay | See AV.127                                                                                                                                                                                   | Present Value<br>Cov Increment | 0 to 15 minutes, Resolution 1 minute                       |
| AV.139 | Cfg_BinaryOutput7ClosePos     | See AV.125                                                                                                                                                                                   | Present Value<br>Cov Increment | 15% to 80%, Resolution 1%                                  |
| AV.140 | Cfg_BinaryOutput7OpenPos      | See AV.126                                                                                                                                                                                   | Present Value<br>Cov Increment | 0% to 76% (0 to BO7closepos-4%), Resolution 1%             |
| AV.141 | Cfg_BinaryOutput7ConatctDelay | See AV.127                                                                                                                                                                                   | Present Value<br>Cov Increment | 0 to 15 minutes, Resolution 1 minute                       |
| AV.151 | Cfg_FloatingBO3/BO7 Timer     | Configuration value that represents the time required by the valve actuator to complete a stroke. Value required only when MSV.79 BO3 Signal Type is set to floating.                        | Present Value<br>Cov Increment | 15 to 250 seconds, Resolution 5 seconds                    |
| AV.156 | FloatingOutputBO3/BO7         | Status value to show the floating signal demand. This value may be overridden. Activated only if BO3 Signal Type MSV.79 is set to floating.                                                  | Present Value<br>Cov Increment | 0% to 100%, Resolution 0.1%                                |
| AV.165 | CopyCfgStartAddress           | Represents the first address in the range of copied controllers while using the Copy Config option.                                                                                          | Present Value<br>Cov Increment | 0 to 254, Resolution 1 No unit                             |
| AV.166 | CopyCfgEndAddress             | Represents the last address in the range of copied controllers while using the Copy Config option.                                                                                           | Present Value<br>Cov Increment | 0 to 254, Resolution 1 No unit                             |
| AV.167 | CopyCfgResult                 | Value is used to verify whether the copy to the controller's operation was successful or has failed while using the Copy Config option.                                                      | Present Value<br>Cov Increment | 0 to 254, Resolution 1 No unit                             |
| AV.185 | PressureSensorValue           | Pressure sensor value in Pascals. If the value is higher than 10,000, the value will be divided by 100 and shows a decimal point. For example, 10,000 will be 100.0 and 10050 will be 100.5. | Present Value<br>Cov Increment | 0 to AV.186, Resolution 1 or 0.1 (if value > 10000) Pa     |
| AV.186 | Cfg_PressureSensorRange       | The maximum range for pressure. If the value is higher than 10,000, the value will be divided by 100 and shows a decimal point. For example, 10,000 will be 100.0 and 10050 will be 100.5.   | Present Value<br>Cov Increment | 200 to 200.0 Pa, Resolution 1 or 0.1 (if value > 10000) Pa |
| AV.190 | VFDPressureLoop               | Actual VFD Pressure loop.                                                                                                                                                                    | Present Value<br>Cov Increment | 0% to 100%, Resolution 1%                                  |
| AV.191 | Cfg_VFDPressureSetPoint       | Setpoint value for VFD pressure. If the value is higher than 10,000, the value will be divided by 100 and shows a decimal point. For example, 10,000 will be 100.0 and 10050 will be 100.5.  | Present Value<br>Cov Increment | 100 to AV.186, Resolution 1 or 0.1 (if value > 10000) Pa   |
| AV.192 | Cfg_VFDPressureDeadBand       | Dead band value for VFD pressure.                                                                                                                                                            | Present Value<br>Cov Increment | 0 to 100 Pa, Resolution 1 Pa                               |
| AV.193 | Cfg_VFDPressurePropBand       | Proportional band value for VFD pressure.                                                                                                                                                    | Present Value<br>Cov Increment | 100 to 500 Pa, Resolution 1 Pa                             |
| AV.194 | Cfg_VFDPressureIntegralTime   | VFD pressure integral seconds.                                                                                                                                                               | Present Value<br>Cov Increment | 0 to 250 seconds, Resolution 5 seconds                     |

| ID     | Name                    | Description                                                                                                                                                                                                                                                                                                                                                                                                              | W?                             | Notes                                                              |
|--------|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------------------------------------------------------------------|
| AV.200 | VFDTempCoolLoop         | Actual VFD temperature loop while cooling.                                                                                                                                                                                                                                                                                                                                                                               | Present Value<br>Cov Increment | 0% to 100%, Resolution 1%                                          |
| AV.201 | VFDTempHeatLoop         | Actual VFD temperature loop while heating.                                                                                                                                                                                                                                                                                                                                                                               | Present Value<br>Cov Increment | 0% to 100%, Resolution 1%                                          |
| AV.202 | Cfg_VFDTempSetPoint     | VFD temperature setpoint.                                                                                                                                                                                                                                                                                                                                                                                                | Present Value<br>Cov Increment | 50°F to 104°F or 10.0°C to 40.0°C<br>Resolution 1°F/ 0.5°C         |
| AV.203 | Cfg_VFDTempDeadBand     | VFD temperature dead band value.                                                                                                                                                                                                                                                                                                                                                                                         | Present Value<br>Cov Increment | 0°F to 9°F or 0.0°C to 5.0°C<br>Resolution 0.2°F/ 0.1°C            |
| AV.204 | Cfg_VFDTempPropBand     | VFD temperature proportional band value.                                                                                                                                                                                                                                                                                                                                                                                 | Present Value<br>Cov Increment | 1°F to 9°F or 0.5°C to 5.0°C<br>Resolution 0.2°F/ 0.1°C            |
| AV.205 | Cfg_VFDTempIntegralTime | VFD temperature integral seconds.                                                                                                                                                                                                                                                                                                                                                                                        | Present Value<br>Cov Increment | 0 to 250 seconds, Resolution 5 seconds                             |
| AV.206 | CloseOffVoltage         | Configuration value of the voltage required in order to close the 6-way valve.                                                                                                                                                                                                                                                                                                                                           | Present Value<br>Cov Increment | 0 to 11V, Resolution 0.1 V                                         |
| AV.207 | MinCoolingVoltage       | Configuration value of the voltage required for the 6-way valve to start cooling.                                                                                                                                                                                                                                                                                                                                        | Present Value<br>Cov Increment | 0 to 11V, Resolution 0.1 V                                         |
| AV.208 | MinHeatingVoltage       | Configuration value of the voltage required for the 6-way valve to start heating.                                                                                                                                                                                                                                                                                                                                        | Present Value<br>Cov Increment | 0 to 11V, Resolution 0.1 V                                         |
| AV.210 | DeltaTemperature        | Status value of the difference between the inlet and outlet temperature.<br>The inlet temperature will be set to the value defined by AV.1 if none of the AIs are set to Delta Temp Inlet 10K or Delta Temp Inlet 0-10. If none of the AIs are set to Delta Temp Outlet 10K, Delta Temp Outlet 0-10 or if a Delta Temperature Input is in fault, the present value of AV.210 will be set to the value defined by AV.211. | Out of Service                 | 10.4°F to 53.6°F or -12°C to 12°C,<br>Resolution 0.018°F or 0.01°C |
| AV.211 | DeltaTempSetPoint       | Configuration value of the setpoint for the delta temperature control mode.                                                                                                                                                                                                                                                                                                                                              | Present Value                  | 10.4°F to 53.6°F or -12°C to 12°C,<br>Resolution 0.018°F or 0.01°C |
| AV.212 | DeltaTempInlet          | Status value of the delta inlet temperature.                                                                                                                                                                                                                                                                                                                                                                             | Out of Service                 | -40°F to 212°F or -40°C to 100°C<br>Resolution 0.018°F or 0.01°C   |
| AV.213 | DeltaTempOutlet         | Status value of the delta outlet temperature.                                                                                                                                                                                                                                                                                                                                                                            | Out of Service                 | -40°F to 212°F or -40°C to 100°C<br>Resolution 0.018°F or 0.01°C   |
| AV.227 | PulseOutput3            | Status value to show the pulse signal demand. This value may be overridden. Activated only if BO3 Signal Type is set to pulsing.                                                                                                                                                                                                                                                                                         | Present Value<br>Cov Increment | 0% to 100%, Resolution 0.1%                                        |
| AV.228 | PulseOutput4            | Status value to show the pulse signal demand. This value may be overridden. Activated only if BO4 Signal Type is set to pulsing.                                                                                                                                                                                                                                                                                         | Present Value<br>Cov Increment | 0% to 100%, Resolution 0.1%                                        |
| AV.229 | PulseOutput5            | Status value to show the pulse signal demand. This value may be overridden. Activated only if BO5 Signal Type is set to pulsing.                                                                                                                                                                                                                                                                                         | Present Value<br>Cov Increment | 0% to 100%, Resolution 0.1%                                        |
| AV.230 | PulseOutput6            | Status value to show the pulse signal demand. This value may be overridden. Activated only if BO6 Signal Type is set to pulsing.                                                                                                                                                                                                                                                                                         | Present Value<br>Cov Increment | 0% to 100%, Resolution 0.1%                                        |
| AV.231 | PulseOutput7            | Status value to show the pulse signal demand. This value may be overridden. Activated only if BO7 Signal Type is set to pulsing.                                                                                                                                                                                                                                                                                         | Present Value<br>Cov Increment | 0% to 100%, Resolution 0.1%                                        |
| AV.233 | AO2Voltage              | Status value to show the voltage for AO2 ramp.                                                                                                                                                                                                                                                                                                                                                                           | Out of Service                 | 0.00V to 10.50V, Resolution 0.01V                                  |
| AV.234 | AO3Voltage              | Status value to show the voltage for AO3 ramp.                                                                                                                                                                                                                                                                                                                                                                           | Out of Service                 | 0.00V to 10.50V, Resolution 0.01V                                  |

| ID     | Name                         | Description                                                                                                                                   | W?            | Notes                     |
|--------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------------------|
| AV.240 | UserBacklightSetPoint        | Setpoint for backlight setting in the user mode. In the user mode, the TSUB unit is in operation by the user.                                 | Present Value | 0% to 100%, Resolution 1% |
| AV.241 | OccupancyBacklightSetPoint   | Setpoint for the backlight setting in the occupied mode. In the occupied mode, the TSUB unit is idle but the occupancy state is active.       | Present Value | 0% to 100%, Resolution 1% |
| AV.242 | UnoccupancyBacklightSetPoint | Setpoint for the backlight setting in the unoccupied mode. In the unoccupied mode, the TSUB unit is idle but the occupancy state is inactive. | Present Value | 0% to 100%, Resolution 1% |

## Binary Input (BI)

Table 7 - Object Table Information: Binary Input (BI)

| ID   | Name      | Description                                                                                    | W?             | Notes                                                  |
|------|-----------|------------------------------------------------------------------------------------------------|----------------|--------------------------------------------------------|
| BI.1 | PIR_Relay | Status of the internal PIR sensor value: (0) Relay was not activated, (1) Relay was activated. | Out of Service | 0 = Relay was not activated<br>1 = Relay was activated |

## Binary Output (BO)

Table 8 - Object Table Information: Binary Output (BO)

| ID   | Name          | Description                                        | W?            | Notes               |
|------|---------------|----------------------------------------------------|---------------|---------------------|
| BO.3 | BinaryOutput3 | Contact status of the output: (0) Open, (1) Close. | Present Value | 0 = Open, 1 = Close |
| BO.4 | BinaryOutput4 | Contact status of the output: (0) Open, (1) Close. | Present Value | 0 = Open, 1 = Close |
| BO.5 | BinaryOutput5 | Contact status of the output: (0) Open, (1) Close. | Present Value | 0 = Open, 1 = Close |
| BO.6 | BinaryOutput6 | Contact status of the output: (0) Open, (1) Close. | Present Value | 0 = Open, 1 = Close |
| BO.7 | BinaryOutput7 | Contact status of the output: (0) Open, (1) Close. | Present Value | 0 = Open, 1 = Close |

## Binary Value (BV)

**Table 9 - Object Table Information: Binary Value (BV)**

| ID    | Name                   | Description                                                                                                                                                                                                                            | W?                              | Notes                                |
|-------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|--------------------------------------|
| BV.1  | Cfg_TempUnitBACnet     | Configuration of the temp units used in BACnet. If set to (0), the temp will be in Celsius scale. If set to (1), the temp will be in Fahrenheit scale.                                                                                 | Present Value                   | 0 = Celsius, 1 = Fahrenheit          |
| BV.2  | Cfg_TempSetPointLock   | Configuration to lock the zone setpoint and prevent users from changing the value. (0) Disable setpoint lock, (1) Enable setpoint lock.                                                                                                | Present Value                   | 0 = Disable, 1 = Enable              |
| BV.3  | Cfg_UserSysOffMode     | Configuration to allow users to turn off the controller. (0) Enable - user can turn off the controller, (1) Disable - prevents the user from turning off the controller.                                                               | Present Value                   | 0 = Enable, 1 = Disable              |
| BV.4  | Cfg_TempUnitTstat      | Configuration of the temp units used on TSUB. If set to (0), the temp will be in Celsius scale. If set to (1), the temp will be in Fahrenheit scale.                                                                                   | Present Value                   | 0 = Celsius, 1 = Fahrenheit          |
| BV.5  | Cfg_FreezeProtection   | Configuration value to enable or disable the automatic activation of the heating outputs when zone temp is at 4°C (39.2°F) and will deactivate when zone temp is at 5°C (41°F).                                                        | Present Value                   | 0 = Off, 1 = On                      |
| BV.10 | Cfg_Heating1RampLock   | Configuration value used to lock the heating ramp 1 even when a heating demand is active.                                                                                                                                              | Present Value                   | 0 = Off, 1 = On                      |
| BV.11 | Cfg_Heating2RampLock   | Configuration value used to lock the heating ramp 2 even when a heating demand is active.                                                                                                                                              | Present Value                   | 0 = Off, 1 = On                      |
| BV.13 | Cfg_CoolingRampLock    | Configuration value used to lock the cooling ramp even when a cooling demand is active.                                                                                                                                                | Present Value                   | 0 = Off, 1 = On                      |
| BV.17 | Cfg_ChangeOverRampLock | Configuration value used to lock the changeover ramp even when a cooling or heating demand is active.                                                                                                                                  | Present Value                   | 0 = Off, 1 = On                      |
| BV.20 | Cfg_UserFanAutoMode    | Configuration value to enable or disable the automatic fan option. If set to (0) Enabled, the user has the option to let the TSUB decide the fan speed automatically. If set to (1) Disable, the user must set the fan speed manually. | Present Value                   | 0 = Enable, 1 = Disable              |
| BV.21 | Cfg_FanSpeedOption     | Configuration value to select between the Standard (Neptronic) and Advanced (OE1) fan speed specifications.                                                                                                                            | Present Value                   | 0 = Standard, 1 = Advanced           |
| BV.22 | Cfg_UserSysFanMode     | Configuration value to enable or disable the fan option in MSV.1. If set to (1) Enable and BV.21 is set to (1) Advanced, the fan option will appear in MSV.1. If set to (0) Disable, the MSV.1 will not have fan option.               | Present Value                   | 0 = Disable, 1 = Enable              |
| BV.23 | Cfg_HideFanDisplay     | Configuration value to hide or show the fan symbol displayed on the controller.                                                                                                                                                        | Present Value                   | 0 = Yes, 1 = No                      |
| BV.25 | Cfg_HumControlSource   | Configuration value that controls the humidity source, either internal or external. Only available on models with the humidity sensor.                                                                                                 | Present Value                   | 0 = Intern Sensor, 1 = Extern Sensor |
| BV.26 | Cfg_HumSetPointLock    | Configuration value to prevent the user from changing the relative humidity setpoint.                                                                                                                                                  | Present Value                   | 0 = Disable, 1 = Enable              |
| BV.27 | Cfg_HumidifyRampLock   | Configuration value used to lock the humidification ramp even when a humidification demand is active.                                                                                                                                  | Present Value                   | 0 = Off, 1 = On                      |
| BV.28 | Cfg_DehumidifyRampLock | Configuration value used to lock the dehumidification ramp even when a dehumidification demand is active.                                                                                                                              | Present Value                   | 0 = Off, 1 = On                      |
| BV.30 | ChangeOverMode         | Status value of the actual changeover mode (0) Cooling, (1) Heating. Note that this value can be set via BACnet or locally with MSV.10.                                                                                                | Present Value<br>Out of Service | 0 = Cooling, 1 = Heating             |

| ID    | Name                         | Description                                                                                                                                                                                                                                                                                                                      | W?            | Notes                           |
|-------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------------------------|
| BV.35 | Cfg_NightorNoOccMode         | Configuration to determine the action of the TSUB when in night setback or no occupancy mode. When set to (0) setpoint, the TSUB will maintain the setpoint values of AV.12 & AV.13. If set to (1) OFF, the TSUB will turn off and will not consider any setpoints.                                                              | Present Value | 0 = Setpoint, 1 = OFF           |
| BV.36 | AL_DirtyFilter               | Status value to inform if a filter change is required. (0) No, (1) Yes                                                                                                                                                                                                                                                           | Read Only     | 0 = No, 1 = Yes                 |
| BV.37 | AL_FlowSwitch                | Status value to inform if an airflow alarm is active. (0) No, (1) Yes                                                                                                                                                                                                                                                            | Read Only     | 0 = No, 1 = Yes                 |
| BV.38 | AL_Override                  | Status value to inform if an override is active. (0) No, (1) Yes                                                                                                                                                                                                                                                                 | Read Only     | 0 = No, 1 = Yes                 |
| BV.39 | AL_WindowOpened              | Status value to inform that a window has been opened. (0) No, (1) Yes                                                                                                                                                                                                                                                            | Read Only     | 0 = No, 1 = Yes                 |
| BV.40 | AL_DoorOpened                | Status value to inform that a door has been opened. (0) No, (1) Yes                                                                                                                                                                                                                                                              | Read Only     | 0 = No, 1 = Yes                 |
| BV.41 | AL_OverHeat                  | Status value to inform if a heat/reheat with fan override is active. (0) No, (1) Yes                                                                                                                                                                                                                                             | Read Only     | 0 = No, 1 = Yes                 |
| BV.42 | AL_SelectorSwitchStatus      | Status value to inform if the selector switch is in (0) Remote mode, (1) Local mode.                                                                                                                                                                                                                                             | Read Only     | 0 = Remote mode, 1 = Local mode |
| BV.45 | Cfg_AnalogInput1Contact      | Configuration to change the contact's normal position. Input can be set to (0) Normally Opened or (1) Normally Closed.                                                                                                                                                                                                           | Present Value | 0 = Norm Open, 1 = Norm Close   |
| BV.46 | Cfg_AnalogInput2Contact      | See BV.45                                                                                                                                                                                                                                                                                                                        | Present Value | 0 = Norm Open, 1 = Norm Close   |
| BV.49 | Cfg_WindowOpenedMode         | Configuration to determine the action of the TSUB when window is open. When set to (0) setpoint, the TSUB will maintain the setpoint values of AV.12 & AV.13. If set to (1) OFF, the TSUB will turn off and will not consider any setpoints.                                                                                     | Present Value | 0 = Setpoint, 1 = OFF           |
| BV.50 | Cfg_DoorOpenedMode           | Configuration to determine the action of the TSUB when door is open. When set to (0) setpoint, the TSUB will maintain the setpoint values of AV.12 & AV.13. If set to (1) OFF, the TSUB will turn off and will not consider any setpoints.                                                                                       | Present Value | 0 = Setpoint, 1 = OFF           |
| BV.56 | Cfg_AnalogOutput2Direction   | Configuration of the analog output direction. When set to (0) Direct, the signal ramp is configured from 0-10Vdc. When set to (1) Reverse, the signal ramp is configured from 10-0Vdc.                                                                                                                                           | Present Value | 0 = Direct, 1 = Reverse         |
| BV.57 | Cfg_AnalogOutput3Direction   | See BV.56                                                                                                                                                                                                                                                                                                                        | Present Value | 0 = Direct, 1 = Reverse         |
| BV.62 | Cfg_BinaryOutput3Direction   | Configuration of the binary output direction. When set to (0) Direct, the contact is considered Normally Opened. When set to (1) Reverse, the contact is considered Normally Closed.                                                                                                                                             | Present Value | 0 = Direct, 1 = Reverse         |
| BV.63 | Cfg_BinaryOutput4Direction   | See BV.62                                                                                                                                                                                                                                                                                                                        | Present Value | 0 = Direct, 1 = Reverse         |
| BV.64 | Cfg_BinaryOutput5Direction   | See BV.62                                                                                                                                                                                                                                                                                                                        | Present Value | 0 = Direct, 1 = Reverse         |
| BV.65 | Cfg_BinaryOutput6Direction   | See BV.62                                                                                                                                                                                                                                                                                                                        | Present Value | 0 = Direct, 1 = Reverse         |
| BV.66 | Cfg_BinaryOutput7Direction   | See BV.62                                                                                                                                                                                                                                                                                                                        | Present Value | 0 = Direct, 1 = Reverse         |
| BV.75 | Cfg_FloatingBO3/BO4Direction | Configuration of the binary contact normally state (Normally Open, Normally Close) when MSV.79 VO3 Signal Type is set to floating. This object affects the valve actuator rotation. When set to (0) Direct, BO3 closes the valve and BO4 opens the valve. When set to (1) Reverse, BO3 opens the valve and BO4 closes the valve. | Present Value | 0 = Direct, 1 = Reverse         |

| ID     | Name                         | Description                                                                                                                                                                                                                                                                                                                     | W?            | Notes                                                                                    |
|--------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------------------------------------------------------------------------------|
| BV.76  | Cfg_FloatingBO5/BO6Direction | Configuration of the binary contact normal state (Normally open, Normally close) when MSV. 81 BO3 Signal Type is set to floating. This object affects the valve actuator rotation. When set to (0) Direct, BO5 closes the valve and BO6 opens the valve. When set to (1) Reverse, BO6 opens the valve and BO5 closes the valve. | Present Value | 0 = Direct, 1 = Reverse                                                                  |
| BV.85  | Cfg_ServiceDisplayAddress    | When activated, the TSub lights up and displays the MSTP address. It remains active until deactivated via BACnet or upon cycling power to the controller. Useful when troubleshooting and/or servicing the controller.                                                                                                          | Present Value | 0 = Off, 1 = On                                                                          |
| BV.86  | Cfg_KeyPadUpperLeftLock      | If object is ON, the button is inactive in RUN mode but is active in the PRG mode via the TSub. Button is used to change the fan speed.                                                                                                                                                                                         | Present Value | 0 = Off, 1 = On<br>If set to "On", functionality of these buttons will not be available. |
| BV.87  | Cfg_KeyPadBottomLeftLock     | If object is ON, the button is inactive in RUN mode but is active in the PRG mode via the TSub. Button is used to change temp control modes.                                                                                                                                                                                    | Present Value | 0 = Off, 1 = On<br>If set to "On", functionality of these buttons will not be available. |
| BV.88  | Cfg_KeyPadArrowsLock         | If object is ON, the button is inactive in RUN mode but is active in the PRG mode via the TSub. Buttons are used to change the setpoint.                                                                                                                                                                                        | Present Value | 0 = Off, 1 = On<br>If set to "On", functionality of these buttons will not be available. |
| BV.89  | Cfg_ProgramModeLock          | If object is ON, all buttons are inactive and PRG mode is not accessible via the TSub.                                                                                                                                                                                                                                          | Present Value | 0 = Off, 1 = On                                                                          |
| BV.90  | CopyCfgExecute               | When using Copy Config, this value is used to start the copy to other controllers.                                                                                                                                                                                                                                              | Present Value | 0 = No, 1 = Yes                                                                          |
| BV.91  | Cfg_ActivateSchedule         | Configuration to activate the schedule. The schedule is configurable via BACnet or Modbus. If no schedule is configured, the mode will always be occupied. The time and day will be displayed on the TSub.                                                                                                                      | Present Value | 0 = No, 1 = Yes                                                                          |
| BV.105 | Cfg_AnalogInput1MinVolt      | Minimum voltage for Analog Input 1.                                                                                                                                                                                                                                                                                             | Present Value | 0 = 0 Volt, 1 = 2 Volt                                                                   |
| BV.106 | Cfg_AnalogInput2MinVolt      | Minimum voltage for Analog Input 2.                                                                                                                                                                                                                                                                                             | Present Value | 0 = 0 Volt, 1 = 2 Volt                                                                   |
| BV.111 | Cfg_DeltaTempLogic           | Configuration value to enable or disable the delta temperature control mode.                                                                                                                                                                                                                                                    | Present Value | 0 = Off, 1 = On                                                                          |
| BV.112 | Cfg_DisplayHumidity          | Configuration value to display or hide the humidity value.                                                                                                                                                                                                                                                                      | Present Value | 0 = No, 1 = Yes                                                                          |
| BV.113 | Cfg_DisplayCO2               | Configuration value to display or hide the CO <sub>2</sub> value.                                                                                                                                                                                                                                                               | Present Value | 0 = No, 1 = Yes                                                                          |
| BV.114 | Cfg_VFDTempSetpointSource    | Configuration value for the source for the VFD temperature setpoint. When set to (0) VFDTempSetPoint, the setpoint defined by AV.202 will be used. When set to (1) TempSetPoint, the setpoint defined by AV.9 will be used.                                                                                                     | Present Value | 0 = VFDTempSetPoint, 1 = TempSetPoint                                                    |
| BV.116 | Cfg_AnalogOutput2OffVoltage  | Configuration value to set the analog output 2 voltage to either 0V or the minimum voltage set by AV.103 when MSV.1 is set to Off.                                                                                                                                                                                              | Present Value | 0 = Min, 1 = Off                                                                         |
| BV.117 | Cfg_AnalogOutput3OffVoltage  | Configuration value to set the analog output 3 voltage to either 0V or the minimum voltage set by AV.105 when MSV.1 is set to Off.                                                                                                                                                                                              | Present Value | 0 = Min, 1 = Off                                                                         |

## Multi State Value (MSV)

**Table 10 - Object Table Information: Multi State Value (MSV)**

| ID     | Name                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | W?                                  | Notes                                                                                                                                                                                                                                                                                                                       |
|--------|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MSV.1  | SystemMode                | Status of the actual mode selected. This value may be changed via TSub and/or BACnet. The options may vary based on the selection at BV.3, BV.21, BV.98, and MSV.20.<br>Auto: Controller mode changes automatically between heating and cooling in operation when there is a cooling or heating demand.<br>Heating: Controller is in heating (in operation only when there is a heating demand).<br>EMH: In this mode, the controller enables only the emergency heat output, the compressor output is disabled.<br>Cooling: Controller is in cooling (in operation only when there is a cooling demand).<br>Fan: In this mode, the control mode is OFF (no heat, no cool) and the fan operates at the speed selected by the user on the thermostat or via MSV.2.<br>Off: Controller does not respond to any demand.<br>Note: Use the text provided by the STATE TEXT property to find the appropriate option available in your configuration. | Present Value                       | Auto [MSV.20 allows Auto Mode (1 or 5)]<br>Heating [MSV.20 allows Heating Mode (1, 2, or 4)]<br>EMH [BV.95 and BV.98 = On and Enable (1) and MSV.20 allows Heating Mode (1, 2, or 4)]<br>Cooling [MSV.20 allows Cooling Mode (1, 3, or 4)]<br>Fan [BV.21 = Advanced (1)] and BV.22 = Enable (1)]<br>Off [BV.3 = Enable (0)] |
| MSV.2  | UserFanSpeedSelect        | Status of the actual fan speed. This value may be changed via the TSub and/or BACnet.<br>(1) Auto: Fan automatically changes speed, based on demand.<br>(2) Low: Fan is limited to low fan speed.<br>(3) Medium: Fan is limited to medium fan speed.<br>(4) High: Fan is limited to high fan speed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Present Value                       | 1 = Auto<br>2 = Low<br>3 = Medium<br>4 = High                                                                                                                                                                                                                                                                               |
| MSV.5  | HumControlMode            | Configuration value to authorize humidification and/or dehumidification in order to maintain relative humidity setpoints.<br>(1) Auto: The TSub will operate automatically to humidify or dehumidify, according to the demand.<br>(2) Dehumidification: The TSub is authorized only to dehumidify.<br>(3) Humidification: The TSub is authorized only to humidify.<br>(4) OFF: The TSub will not consider relative humidity setpoints and no action will be taken.                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Present Value                       | 1 = Auto<br>2 = Dehumidification<br>3 = Humidification<br>4 = OFF                                                                                                                                                                                                                                                           |
| MSV.10 | Cfg_ChangeOverControlMode | Configuration that indicates the source of the changeover value.<br>(1) Locally: Analog or binary input is configured in the TSub and will execute the changeover with the set parameters.<br>(2) Cooling: Changeover is sent and controlled by the BMS. No changeover will occur unless the BMS sends the signal to do so.<br>(3) Heating: Changeover is sent and controlled by the BMS. No changeover will occur unless the BMS sends the signal to do so.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Present Value                       | 1= Locally<br>2= Cooling<br>3= Heating                                                                                                                                                                                                                                                                                      |
| MSV.13 | NsbOccCommand             | Configuration to set the occupancy or night setback mode. This object is commendable, relinquish default will be saved to non-volatile memory.<br>(1) Locally: Occupancy or Night setback is activated via a configured input wired to a timer or an occupancy sensor.<br>(2) OFF: Forces the TSub Off. Signal sent via BMS.<br>(3) Occupancy: Forces the TSub to occupied or day mode. Signal sent via BMS.<br>(4) No Occupancy: Forces the TSub to unoccupied or night setback mode. Signal sent via BMS.                                                                                                                                                                                                                                                                                                                                                                                                                                    | Present Value<br>Relinquish_Default | If BI = Occupancy or Night Setback at MSV.35 and/or MSV.36<br>1 = Locally<br>2 = Off<br>3 = Occupancy/Day<br>4 = No Occupancy/Night<br>If BI = any option except Occupancy or Night Setback at MSV.35 and/or MSV.36<br>1 = Off<br>2 = Occupancy/Day<br>3 = No Occupancy/Night                                               |

| ID     | Name                    | Description                                                                                                                                                                                                                                                                                                                                                     | W?            | Notes                                                                           |
|--------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------|
| MSV.14 | OccupancyStatus         | Status that indicates the actual occupancy.<br>(1) Unoccupied: Zone is not occupied.<br>(2) Occupied: Zone is occupied.<br>(3) Override: Zone is unoccupied but put back to occupied mode for a maximum pre-determined time set at AV.86.                                                                                                                       | Read Only     | 1 = NoOccupancy<br>2 = Occupancy<br>3 = Override                                |
| MSV.15 | NightSetBackStatus      | Status that indicates the actual mode of the zone.<br>(1) Day: Zone is in day operation mode.<br>(2) Night: Zone is in night setback mode.<br>(3) Override: Zone is in night setback mode but put back to day operation for a maximum pre-determined time set at AV.85.                                                                                         | Read Only     | 1 = Day<br>2 = Night<br>3 = Override                                            |
| MSV.20 | Cfg_Sequence Select     | Configuration value to limit available options at MSV.1.<br>(1) Auto: All modes available.<br>(2) Heating: Only Heating.<br>(3) Cooling: Only Cooling.<br>(4) ON: Heating or Cooling.<br>(5) Auto Lock: Only Auto.                                                                                                                                              | Present Value | 1 = Auto<br>2 = Heating<br>3 = Cooling<br>4 = HeatingOrCooling<br>5 = Auto Lock |
| MSV.21 | Cfg_TempControlSource   | Configuration value to set the control temp to be used by the TSUB.<br>(1) Network Sensor: AV.1 will use temp value sent via the BMS. See AV.2 for timeout safety feature (Net).<br>(2) Intern Sensor: AV.1 will use the integrated temp sensor of the TSUB (ITS).<br>(3) Extern Sensor: AV.1 will use the external temp sensor configured (ETS).               | Present Value | 1 = Network (Net)<br>2 = Internal (ITS)<br>3 = External (ETS)                   |
| MSV.22 | Cfd_VFDTempInput        | Configuration value to select the source for VFD temperature control.<br>(1) InternSensor(ITS): Controller will be controlled by its internal temperature sensor.<br>(2) ExternSensor(ETS): Controller will be controlled by the external temperature sensor 1.<br>(3) ExternSensor2(ETS2): Controller will be controlled by the external temperature sensor 2. | Present Value | 1 = InternSensor(ITS)<br>2 = ExternSensor(ETS)<br>3 = ExternSensor2(ETS2)       |
| MSV.25 | Cfg_FanOperationType    | Configuration value to set the number of fan speed available on the fan coil.<br>(1) 1 Speed: Fan coil has a one speed fan (wired to Low).<br>(2) 2 Speed: Fan coil has a two speed fan (wired to Medium).<br>(3) 3 Speed: Fan coil has a three speed fan (wired to High).                                                                                      | Present Value | 1= 1Speed<br>2= 2Speeds<br>3= 3Speeds                                           |
| MSV.26 | Cfg_FanModeNoOccNight   | Configuration value to set the fan speed for no occupancy or night setback mode.<br>(1) Low: Fan is limited to low speed.<br>(2) Medium: Fan is limited to medium speed.<br>(3) High: Fan is limited to high speed.<br>(4) Auto: Fan automatically changes speed, based on demand.                                                                              | Present Value | 1= Low<br>2= Medium<br>3= High<br>4 = Auto                                      |
| MSV.27 | Cfg_FanModeWindowOpened | Configuration value to set the fan speed mode when the window is open.<br>(1) Low: Fan is limited to low speed.<br>(2) Medium: Fan is limited to medium speed.<br>(3) High: Fan is limited to high speed.<br>(4) Auto: Fan automatically changes speed, based on demand.                                                                                        | Present Value | 1= Low<br>2= Medium<br>3= High<br>4 = Auto                                      |
| MSV.28 | Cfg_FanModeDoorOpened   | Configuration value to set the fan speed mode when the door is open.<br>(1) Low: Fan is limited to low speed.<br>(2) Medium: Fan is limited to medium speed.<br>(3) High: Fan is limited to high speed.<br>(4) Auto: Fan automatically changes speed, based on demand.                                                                                          | Present Value | 1= Low<br>2= Medium<br>3= High<br>4 = Auto                                      |

| ID     | Name                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | W?            | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MSV.35 | Cfg_AnalogInput1Type | <p>Configuration value to select the input signal type for Analog Input 1 (AI1).</p> <p>(1) OFF: Controller does not use the input.</p> <p>(2) Extern Sensor 10k: Controller uses a 10kΩ type III external temperature sensor.</p> <p>(3) Change Over Sensor: Heating mode activates when the temperature read by the external sensor is above the Changeover Setpoint and cooling mode activates when the temperature read by the external sensor is below the Changeover Setpoint.</p> <p>(4) Ch Ov Contact Norm Cool: Heating mode activates when the contact is closed and cooling mode activates when the contact is opened.</p> <p>(5) Ch Ov Contact Norm Heat: Cooling mode activates when the contact is closed and heating mode activates when the contact is opened.</p> <p>(6) Outside Air Sensor: Controller uses a 10kΩ type III outside air sensor.</p> <p>(7) Extern Sensor 0-10V: Controller uses a 0 to 10 Vdc external temperature sensor.</p> <p>(8) CO2 0-10V: Controller uses a 0 to 10 Vdc CO2 sensor.</p> <p>(9) Occupancy: Controller activates the Occupancy mode.</p> <p>(10) Night Set Back: Controller activates the night set back mode.</p> <p>(11) Override: Controller activates an alarm to indicate that there has been an override and the controller is forced into OFF mode.</p> <p>(12) Window: Controller activates an alarm to indicate that the window is open. If this value is selected, BV.49 and MSV.27 will be available.</p> <p>(13) Door: Controller activates an alarm to indicate that the door is open. If this value is selected, BV.50 and MSV.28 will be available.</p> <p>(14) Dirty Filter: Controller activates an alarm to indicate that the filter is dirty.</p> <p>(15) Flow Switch: Controller activates an alarm to indicate that there is no airflow.</p> <p>(16) Overheat: Controller activates an alarm to indicate that the heating equipment has overheated. The controller shuts off the heating outputs.</p> <p>(17) Selector Switch: Controller activates the Local mode. The controller shuts off fan outputs.</p> <p>(18) Fan Feedback: Controller senses the pulse feedback of the ECM motor.</p> <p>(19) Humidity Sensor 0-10V: Controller modulates the output based on the humidify demand.</p> <p>(20) Pressure Sensor 0-10V: Controller uses a 0 to 10Vdc pressure static sensor.</p> <p>(21) Extern Sensor TT012: Controller uses a 10kΩ type 24 external temperature sensor.</p> <p>(22) Delta Temp Inlet 10K: Controller uses a 10K type 3 temperature sensor and selects it as the inlet temperature in the ΔT control mode.</p> <p>(23) Delta Temp Inlet 0-10: Controller uses a 0 to 10 Vdc temperature sensor and selects it as the inlet temperature in the ΔT control mode.</p> <p>(24) Delta Temp Outlet 10K: Controller uses a 10K type 3 temperature sensor and selects it as the outlet temperature in the ΔT control mode.</p> <p>(25) Delta Temp Outlet 0-10: Controller uses a 0 to 10 Vdc temperature sensor and selects it as the outlet temperature in the ΔT control mode.</p> | Present Value | <p>1 = OFF</p> <p>2 = Extern Sensor 10k</p> <p>3 = Change Over Sensor</p> <p>4 = Ch Ov Contact Norm Cool</p> <p>5 = Ch Ov Contact Norm Heat</p> <p>6 = Outside Air Sensor</p> <p>7 = Extern Sensor 0-10V</p> <p>8 = CO2 0-10V</p> <p>9 = Occupancy</p> <p>10 = Night Set Back</p> <p>11 = Override</p> <p>12 = Window</p> <p>13 = Door</p> <p>14 = Dirty Filter</p> <p>15 = Flow Switch</p> <p>16 = Overheat</p> <p>17 = Selector Switch</p> <p>18 = Fan Feedback</p> <p>19 = Humidity Sensor 0-10V</p> <p>20 = Pressure Sensor 0-10V</p> <p>21 = Extern Sensor TT012</p> <p>22 = Delta Temp Inlet 10K</p> <p>23 = Delta Temp Inlet 0-10</p> <p>24 = Delta Temp Outlet 10K</p> <p>25 = Delta Temp Outlet 0-10</p> |
| MSV.36 | Cfg_AnalogInput2Type | See MSV.35                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Present Value |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

| ID     | Name                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | W?            | Notes                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MSV.57 | Cfg_AnalogOutput2Ramp       | <p>Configuration of the ramp used to modulate AO1 based on demand.</p> <p>(1) Off: The controller does not use the output.</p> <p>(2) Change Over With Fan: The controller modulates heating and cooling, as appropriate.</p> <p>(3) Cooling1With Fan: This ramp is used for cooling. The controller performs cooling based on the cooling proportional, integral, and dead band values.</p> <p>(4) Cooling2 With Fan: This ramp is used for cooling. The controller performs cooling based on the cooling proportional, integral, and dead band values.</p> <p>(5) Heating1 With Fan: This ramp is used for heating. The controller performs heating based on the heating proportional, integral, and dead band values.</p> <p>(6) Heating2 With Fan: This ramp is used for heating. The controller performs heating based on the heating proportional, integral, and dead band values.</p> <p>(7) Heating2: This ramp is used for heating. The controller performs heating based on the heating proportional, integral, and dead band values.</p> <p>(8) Cooling1Heating1 With Fan: The controller performs cooling regularly. If another output is set to heat, it performs heating regularly.</p> <p>(9) Humidify With Fan: The controller modulates the output based on the humidify demand.</p> <p>(10) CO2 Alarm: Carbon dioxide (CO2) alarm. The controller activates or deactivates the output based on carbon dioxide levels.</p> <p>(11) 6 Way valve: The controller will modulate the 6-way valve based on the cooling or heating demand.</p> <p>(12) Delta Temperature: The controller will modulate the <math>\Delta T</math> control based on the inlet and outlet temperature of the water inside the fan coil unit.</p> <p>(13) VFD/ECMTempLoopEnable: The controller will modulate the VFD or ECM fan based on the selected temperature input.</p> <p>(14) VFD Pressure Loop: The controller will modulate the static pressure based on the reading and the pressure setpoint.</p> <p>If BV.95 Cfg_HeatPumpOption is set to Off, AO2 has an additional option:</p> <p>(15) Fan: The controller modulates the output according to AV. 60 Fan Demand.</p> | Present Value | <p>1 = Off</p> <p>2 = Change Over With Fan</p> <p>3 = Cooling1 With Fan</p> <p>4 = Cooling2 With Fan</p> <p>5 = Heating1 With Fan</p> <p>6 = Heating2 With Fan</p> <p>7 = Heating2</p> <p>8 = Cooling1 Heating1 With Fan</p> <p>9 = Humidify With Fan</p> <p>10 = CO2 Alarm</p> <p>11 = 6 Way valve</p> <p>12 = Delta Temperature</p> <p>13 = VFD/ECMTempLoopEnable</p> <p>14 = VFD Pressure Loop</p> <p>15 = Fan</p> |
| MSV.58 | Cfg_AnalogOutput2SignalType | <p>Configuration of the analog output signal type.</p> <p>(1) Analog: Modulating signal based on the demand, scaled between the minimum and maximum control signal. It is affected by AV.103, AV.104 and BV.56.</p> <p>(2) On/Off: On/Off signal based on the demand, scaled between the minimum and maximum control signal. It is affected by AV.103, AV.104 and BV.56.</p> <p>(3) Pulsing: TPM signal based on the demand, scaled between the minimum and maximum control signal. It is affected by AV.103, AV.104 and BV.56.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Present Value | <p>1 = Analog</p> <p>2 = On-Off</p> <p>3 = Pulsing</p>                                                                                                                                                                                                                                                                                                                                                                |
| MSV.59 | Cfg_AnalogOutput3Ramp       | See MSV.57                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Present Value | <p>1 = Off</p> <p>2 = Change Over With Fan</p> <p>3 = Cooling1 With Fan</p> <p>4 = Cooling2 With Fan</p> <p>5 = Heating1 With Fan</p> <p>6 = Heating2 With Fan</p> <p>7 = Heating2</p> <p>8 = Cooling1 Heating1 With Fan</p> <p>9 = Humidify With Fan</p> <p>10 = CO2 Alarm</p> <p>11 = 6 Way valve</p> <p>12 = Delta Temperature</p>                                                                                 |

| ID     | Name                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | W?            | Notes                                                                                                                                                                                                                                                                                                                                                                                                |
|--------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MSV.60 | Cfg_AnalogOutput3SignalType | See MSV.58                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Present Value | 1 = Analog<br>2 = On-Off<br>3 = Pulsing                                                                                                                                                                                                                                                                                                                                                              |
| MSV.72 | Cfg_BinaryOutput3Ramp       | <p>Configuration of the ramp used to modulate BO1 based on demand. The ramp is fixed if BV.95 Cfg_HeatPumpOption is set to On.</p> <p>(1) Off: The controller does not use the output.</p> <p>(2) Change Over With Fan: The controller modulates heating and cooling, as appropriate.</p> <p>(3) Cooling1 With Fan: This ramp is used for cooling. The controller performs cooling based on the cooling proportional, integral, and dead band values.</p> <p>(4) Cooling2 With Fan: This ramp is used for cooling. The controller performs cooling based on the cooling proportional, integral, and dead band values.</p> <p>(5) Heating1 With Fan: This ramp is used for heating. The controller performs heating based on the heating proportional, integral, and dead band values.</p> <p>(6) Heating2 With Fan: This ramp is used for heating. The controller performs heating based on the heating proportional, integral, and dead band values.</p> <p>(7) Heating2: This ramp is used for heating. The controller performs heating based on the heating proportional, integral, and dead band values.</p> <p>(8) Cooling1Heating1 With Fan: The controller performs cooling regularly. If another output is set to heat, it performs heating regularly.</p> <p>(9) Humidify With Fan: The controller modulates the output based on the humidify demand.</p> <p>(10) CO2 Alarm: Carbon dioxide (CO2) alarm. The controller activates or deactivates the output based on carbon dioxide levels.</p> | Present Value | <p>1 = Off</p> <p>2 = Change Over With Fan</p> <p>3 = Cooling1 With Fan</p> <p>4 = Cooling2 With Fan</p> <p>5 = Heating1 With Fan</p> <p>6 = Heating2 With Fan</p> <p>7 = Heating2</p> <p>8 = Cooling1Heating1 With Fan</p> <p>9 = Humidify With Fan</p> <p>10 = CO2 Alarm</p>                                                                                                                       |
| MSV.73 | Cfg_BinaryOutput4Ramp       | If MSV.25 Cfg_FanOperationType is set to 3 speeds, (1) Fan: High speed contact. Else, see MSV.72.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Present Value |                                                                                                                                                                                                                                                                                                                                                                                                      |
| MSV.74 | Cfg_BinaryOutput5Ramp       | If MSV.25 Cfg_FanOperationType is set to 3 speeds, (1) Fan: Medium speed contact. If MSV.25 Cfg_FanOperationType is set to 2 speeds, (1) Fan: High speed contact. Else, see MSV.72.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Present Value |                                                                                                                                                                                                                                                                                                                                                                                                      |
| MSV.75 | Cfg_BinaryOutput6Ramp       | <p>If MSV.25 Cfg_FanOperationType is set to 3 speeds, (1) Fan: Low speed contact.</p> <p>If MSV.25 Cfg_FanOperationType is set to 2 speeds, (1) Fan: Medium speed contact.</p> <p>If MSV.25 Cfg_FanOperationType is set to 1 speed, (1) Fan: High speed contact.</p> <p>If MSV.57 Cfg_AnalogOutput2Ramp is set to Fan, see MSV.72.</p> <p>(11) 6 Way valve: The controller will modulate the 6-way valve based on the cooling or heating demand.</p> <p>(12) Delta Temperature: The controller will modulate the <math>\Delta T</math> control based on the inlet and outlet temperature of the water inside the fan coil unit.</p> <p>(13) VFD/ECMTempLoopEnable: The controller will modulate the VFD or ECM fan based on the selected temperature input.</p> <p>(14) VFD Pressure Loop: The controller will modulate the static pressure based on the reading and pressure setpoint.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Present Value | <p>1 = Off</p> <p>2 = Change Over With Fan</p> <p>3 = Cooling1 With Fan</p> <p>4 = Cooling2 With Fan</p> <p>5 = Heating1 With Fan</p> <p>6 = Heating2 With Fan</p> <p>7 = Heating2</p> <p>8 = Cooling1Heating1 With Fan</p> <p>9 = Humidify With Fan</p> <p>10 = CO2 Alarm</p> <p>11 = 6 Way valve</p> <p>12 = Delta Temperature</p> <p>13 = VFD/ECMTempLoopEnable</p> <p>14 = VFD Pressure Loop</p> |
| MSV.76 | Cfg_BinaryOutput7Ramp       | See MSV.72                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Present Value |                                                                                                                                                                                                                                                                                                                                                                                                      |

| ID     | Name                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | W?            | Notes                                                                                           |
|--------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------------|
| MSV.79 | Cfg_BinaryOutput3SignalType | Configuration of the output signal type.<br>(1) Pulsing: TPM signal affected by MSV.72. Pulse is available for heating ramp 1 and 2 only.<br>(2) On/Off: Digital output affected by AV.125, AV.126 and BV.62.<br>(3) Floating: Modulating output affected by AV.151 and BV.75. Floating is available for cooling ramps and heating ramps. Option available for BO3 only. When BO3 is set to (3) floating, it automatically changes MSV.76 BinaryOutput7Ramp and MSV.83 BinaryOutput7SignalType to match the configuration of BO3. | Present Value | 1 = Pulsing<br>2 = On-Off<br>3 = Floating                                                       |
| MSV.80 | Cfg_BinaryOutput4SignalType | See MSV.79                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Present Value | 1 = Pulsing<br>2 = On-Off                                                                       |
| MSV.81 | Cfg_BinaryOutput5SignalType | See MSV.79                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Present Value | 1 = Pulsing<br>2 = On-Off                                                                       |
| MSV.82 | Cfg_BinaryOutput6SignalType | See MSV.79                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Present Value | 1 = Pulsing<br>2 = On-Off                                                                       |
| MSV.83 | Cfg_BinaryOutput7SignalType | See MSV.79                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Present Value | 1 = Pulsing<br>2 = On-Off                                                                       |
| MSV.95 | Cfg_DisplayInfo             | Configuration value of the information displayed on the TSUB.<br>(1) Display Temp Demand: The TSUB will display the actual temp and cooling/heating demand.<br>(2) Display Setpoint Demand: TSUB will display the actual setpoint and cooling/heating demand.<br>(3) Display Temp: TSUB will display the actual temp but no demand.<br>(4) Display Setpoint: TSUB will display the actual setpoint but no demand.<br>(5) Display Off: TSUB display will be off (no display).                                                      | Present Value | 1 = Temp and demand<br>2 = Setpoint and demand<br>3 = Temp only<br>4 = Setpoint only<br>5 = Off |
| MSV.96 | Cfg_ValveSize               | Configuration value of the valve size in inches for the 6-way valve.                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Present Value | 1 = 1/2<br>2 = 3/4<br>3 = 1                                                                     |

## Other

| ID    | Name               | Description                                                                                                                                                                                                | W?                                                                                                | Notes                                                       |
|-------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| PGM.1 | ProgramFirmware    | Program firmware. Set to LOAD to program the file in application memory. The controller will be reset and the firmware will be LOADED into the memory. Use only the binary file provided by Neptronic.     | Program Change                                                                                    | Program Change, only LOAD (1) and RESTART (4) are supported |
| FIL.1 | FirmwareBinaryFile | Firmware binary file. Set to LOAD to program the file in application memory. The controller will be reset and the firmware will be LOADED into the memory. Use only the binary file provided by Neptronic. | File Size<br>Archive                                                                              | File Size is accepted for 0 value only                      |
| SCH.1 | OccupancySchedule  | Weekly occupancy schedule to specify which occupancy state is active during specific periods of day. Write to Present Value of MSV.13.                                                                     | Weekly Schedule<br>Schedule Default<br>Priority for Writing<br>Effective Period<br>Out of Service |                                                             |

[illegible]



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