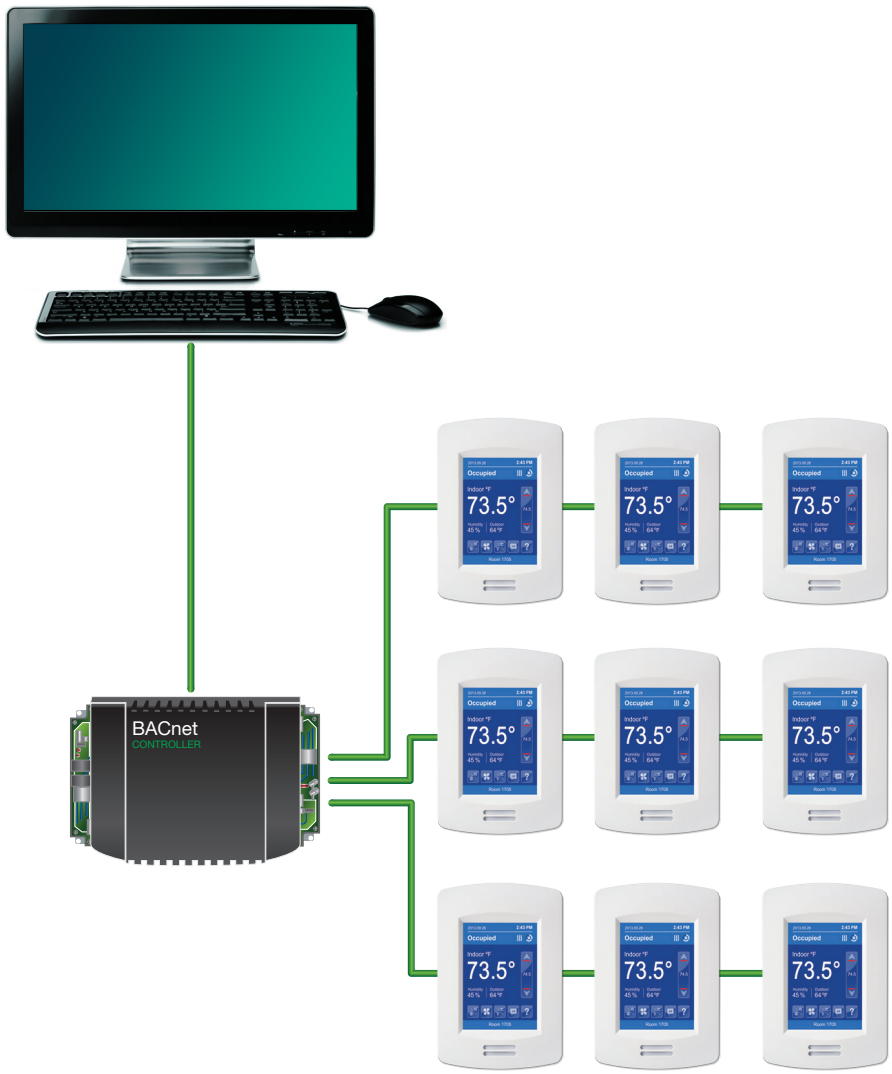
# VT8600 Series BACnet Integration

## Rooftop Unit, Heat Pump and Indoor Air Quality Controller

Commercial and Lodging HVAC Applications




VICONICS
Beyond Comfort

## VT8600 SERIES BACNET COMPATIBILITY SPECIFICATIONS

**Note:** This document contains BACnet compatibility specifications of the Viconics VT8600 Room Controllers. The document follows the BACnet PICS format, although Viconics products have not yet been BTL certified as of November 2014

**Vendor Name:** Viconics

**Supported BACnet® Services:** The BACnet® communicating controller meets all requirements for designation as an Application Specific Controller (B-ASC). The BACnet controller supports the following BACnet Interoperability Building Blocks (BIBBs).

| Application Service | Designation |
|---|---|
| Data Sharing-COV-B | DS-COV-B |
| Data Sharing – Read Property - B | DS-RP-B |
| Data Sharing – Read Property Multiple - B | DS-RPM-B |
| Data Sharing – Write Property - B | DS-WP-B |
| Data Sharing - Write Property Multiple Service - B | DS-WPM-B |
| Device Management - Time Synchronization - B | DM-TS-B |
| Device Management - Device Communication Control - B | DM-DCC-B |
| Device Management – Dynamic Device Binding - B | DM-DDB-B |
| Device Management – Dynamic Object Binding - B | DM-DOB-B |
| Scheduling-Internal-B | SCHED-I-B |

Note: The controller does not support segmented requests or responses.


VT8600

## DEVICE OBJECTS TABLE

| Object Name | Type and Instance | Object Property | Controller Parameter |
|---|---|---|---|
| VT8600U5X00B | Device | Object_Identifier<br>Property 75 (R,W) | Unique ID number of a device on a network |
| | | Object_Name<br>Property 77 (R,W) | Unique name of a device on a network |
| | | Model Name<br>Property 70 (R) | Controller model number |
| | | Firmware Revision<br>Property 44 (R) | Current BACnet® firmware revision used by controller |
| | | Protocol Version<br>Property 98 (R) | Current BACnet® firmware protocol version<br>Default is Version 1 |
| | | Protocol Revision<br>Property 139 (R) | Current BACnet® firmware protocol revision<br>Default is Version 2 |
| | | Max ADPU Length<br>Property 62 (R) | Maximum ADPU Length accepted<br>Default is 480 |
| | | ADPU Timeout<br>Property 10 (R) | ADPU timeout value<br>Default is 3000 ms |
| | | Application-Software-Version<br>Property 12 (R) | Controller base application software version<br>Default is based on current released version |
| | | Max_Master (R,W) | Maximum master devices allowed to be part of network.<br>0 to 127, default is 127 |
| | | Description<br>Property 28 (R,W) | String of printable characters<br>(Same as "Long Screen Message" CSV2) |
| | | Location<br>Property 58 (R,W) | String of printable characters<br>(Same as "Short Screen Message" CSV1) |
| | | Local Date<br>Property 56 (R) | Indicates date to best of device knowledge |
| | | Local Time<br>Property 57 (R) | Indicated time of day best of the device knowledge |

## ANALOG OBJECT PROPERTIES

| Object Type Read/Write Settings | | | Object Property | Controller Parameter |
|---|---|---|---|---|
| Input AI | Output AO | Values AV | | |
| Read Only | Read Only | Read Only | Event State Property 36 | Indicates if object has an active event state associated with it |
| Read Only | Read Only | Read Only | Object Identifier Property 75 | Unique ID number of an object on a network |
| Read Only | Read Only | Read Only | Object Name Property 77 | Unique name of an object on a network |
| Read Only | Read Only | Read Only | Object Type Property 79 | Indicates membership in a particular object type class |
| Read / Write | Read / Write | Read / Write | Out of Service Property 81 | Indicates whether (TRUE/FALSE) the physical input object represents is not in service |
| Read / Write* | Read / Write | Read / Write | Present Value Property 85 | Contains values of all properties specified |
| N/A | Read Only | Read Only | Priority Array Property 87 | Read-only array of prioritized values |
| Read Only | Read Only | Read Only | Reliability Property 103 | Indicates if Present_Value is "reliable" |
| N/A | Read Only | Read / Write † | Relinquish Default Property 104 | Default value used for Present_Value when values in Priority_Array have a NULL value |
| Read Only | Read Only | Read Only | Status Flags Property 111 | Represents flags that indicate general health of life safety point object |
| Read Only | Read Only | Read Only | Units Property 177 | Indicates measurement units of Present_Value |
| N/A | Read Only | N/A | Hight Limit Property 1101 | Specifies a limit Present_Value must exceed before an event is generated |
| N/A | Read Only | N/A | Low Limit Property 1100 | Specifies a limit Present_Value must fall below before an event is generated |

N/A = Not Applicable, property not used for objects of that type

* The Present_Value is only writeable when Out_Of_Service is TRUE.

† Relinquish default is Read Only for AV100+

## BINARY OBJECT PROPERTIES

| Object Type Read/Write Settings | | | Object Property | Controller Parameter |
|---|---|---|---|---|
| Input BI | Output BO | Values BV | | |
| Read Only | Read Only | Read Only | Active Text Property 4 | Characterizes intended effect of the ACTIVE state of Present_Value property |
| Read Only | Read Only | Read Only | Event State Property 36 | Indicates if object has an active event state associated with it |
| Read Only | Read Only | Read Only | Inactive Text Property 46 | Characterizes intended effect of INACTIVE state of Present_Value property |
| Read Only | Read Only | Read Only | Object Identifier Property 75 | Unique ID number of a device on a network |
| Read Only | Read Only | Read Only | Object Name Property 77 | Unique name of a device on a network |
| Read Only | Read Only | Read Only | Object Type Property 79 | Indicates membership in a particular object type class |
| Read / Write | Read / Write | Read / Write | Out of Service Property 81 | Indicates whether (TRUE/FALSE) physical input object represents is not in service |
| Read Only | Read / Write | N/A | Polarity Property 84 | Indicates relationship between physical state of input and Present_Value |
| Read / Write | Read / Write | Read / Write | Present Value Property 85 | Contains values of all properties specified |
| Read Only | Read Only | Read Only | Priority Array Property 87 | Read-only array of prioritized values |
| N/A | Read Only | Read Only | Relinquish Default Property 104 | Default value to be used for Present_Value when values in Priority_Array have a NULL value |
| Read Only | Read Only | Read Only | Status Flags Property 111 | Represents flags that indicate general health of life safety point object |

N/A = Not Applicable, property not used for objects of that type

## MULTISTATE OBJECT PROPERTIES

| Object Type Read/Write Settings | | Object Property | Controller Parameter |
|---|---|---|---|
| **Inputs MSI** | **Values MV** | | |
| Read Only | Read Only | Event State Property 36 | Indicates if object has an active event state associated with it |
| Read Only | Read Only | Number of States Property 74 | Defines number of states Present_Value may have |
| Read Only | Read Only | Object Identifier Property 75 | Unique ID number of a device on a network |
| Read Only | Read Only | Object Name Property 77 | Unique name of a device on a network |
| Read Only | Read Only | Object Type Property 79 | Indicates membership in a particular object type class |
| Read / Write | Read / Write | Out of Service Property 81 | Indicates whether (TRUE/FALSE) physical input object represents is not in service |
| Read / Write* | Read / Write | Present Value Property 85 | Contains values of all properties specified |
| N/A | Read Only | Priority Array Property 87 | Indicates relationship between physical state of input and Present_Value |
| N/A | Read / Write | Relinquish Default Property 104 | Default value used for Present_Value when values in Priority_Array have a NULL value |
| Read Only | Read Only | State Text Property 110 | Represents descriptions of all possible states of Present_Value |
| Read Only | Read Only | Status Flags Property 111 | Represents flags that indicate general health of life safety point object |

N/A = Not Applicable, property not used for objects of that type

*The Present_Value is only writeable when Out_Of_Service is TRUE.

## CSV OBJECT PROPERTIES

| Read/Write | Object Property | Controller Parameter |
|---|---|---|
| Read Only | Event State<br>Property 36 | Indicates object has an active event state associated with it |
| Read Only | Object Identifier<br>Property 75 | Unique ID number of a device on a network |
| Read Only | Object Name<br>Property 77 | Unique name of a device on a network |
| Read Only | Object Type<br>Property 79 | Indicates membership in a particular object type class |
| Read / Write | Present Value<br>Property 85 | Contains values of all properties specified |
| Read Only | Status Flags<br>Property 111 | Represents flags that indicate general health of life safety point object |

## PG OBJECT PROPERTIES

| Read/Write | Object Property | Controller Parameter |
|---|---|---|
| Read / Write | Description<br>Property 28 | String of printable characters whose content is not restricted. Contains the LUA program script (max size = 480 bytes) |
| Read Only | Description Of Halt<br>Property 29 | Describes the reason why a program has been halted Text is also displayed in the HMI debug log |
| Read Only | Instance Of<br>Property 48 | Local name of the application program being executed by this process |
| Read Only | Object Identifier<br>Property 75 | Unique ID number of an object on a network |
| Read Only | Object Name<br>Property 77 | Unique name of an object on a network |
| Read Only | Object Type<br>Property 79 | Indicates membership in a particular object type class |
| Read Only | Out Of Service<br>Property 81 | Indicates whether (TRUE/FALSE) the process this object represents is not in service |
| Write Only | Program Change<br>Property 90 | Used to request changes to the operating state of the program. Writing to property affects all 10 PG objects |
| Read Only | Program State<br>Property 92 | Current logical state of all 10 PG objects executing application programs |
| Read Only | Reason For Halt<br>Property 100 | If program halts, this property reflects the reason for halt for all 10 PG objects |
| Read Only | Status Flags<br>Property 111 | Represents flags that indicate general health of life safety point object |

## CAL OBJECT PROPERTIES

| Read/Write | Object Property | Controller Parameter |
|---|---|---|
| Read / Write | Date List<br>Property 23 | List of calender entries. |
| Read Only | Object Identifier<br>Property 75 | Unique ID number of an object on a network |
| Read Only | Object Name<br>Property 77 | Unique name of an object on a network |
| Read Only | Object Type<br>Property 79 | Indicates membership in a particular object type class |
| Read Only | Present Value<br>Property 85 | This property is TRUE when<br>current date matches an entry. |

## SCH OBJECT PROPERTIES

| Read/Write | Object Property | Controller Parameter |
|---|---|---|
| Read Only | Effective Period<br>Property 32 | Range of dates within which the Schedule object is active. All dates are in range, so always Effective |
| Read / Write | Exception Schedule<br>Property 38 | Sequence of schedule actions that takes precedence over normal behavior on a specific day or days. By default, this property refers to the calendar. |
| Read Only | Object Identifier<br>Property 75 | Unique ID number of an object on a network |
| Read Only | Object Name<br>Property 77 | Unique name of an object on a network |
| Read Only | Object Type<br>Property 79 | Indicates membership in a particular object type class |
| Read / Write | Present Value<br>Property 85 | Contains the current value of the schedule<br>(0:unoccupied, 1:occupied)<br>Only writeable when Out Of Service is TRUE |
| Read / Write | Out Of Service<br>Property 81 | Indicates whether (TRUE/FALSE) the internal calculations of the schedule object are used to determine the value of the Present Value property |
| Read Only | Reliability<br>Property 103 | Indicates if Present Value is "reliable" |
| Read Only | Status Flags<br>Property 111 | Represents flags that indicate general health of life safety point object |
| Read / Write | Weekly Schedule<br>Property 123 | 7 elements that describe the sequence of schedule actions for each day of the week. |
| Read Only | Schedule Default<br>Property 174 | Default value to be used when no other scheduled value is in effect. Always Unoccupied |

## PROPERTY VALUE RANGE RESTRICTIONS FOR AV OBJECTS

| Object name | Object Type | Instance | Minimum Range Value | Maximum Range Value | Default Value |
|---|---|---|---|---|---|
| User HMI | AV | 2 | 0 | 11 | 0 |
| Low Backlight | AV | 3 | 0% | 100% | 60% |
| Night Backlight | AV | 4 | 0% | 100% | 5% |
| Calibrate Temperature Sensor | AV | 7 | - | 5°F(2.5°C) | 0°F (0°C) |
| COM Address | AV | 10 | 0 | 254 | 254 |
| ZigBee PAN ID | AV | 11 | 0 | 1000 | 0 |
| ZigBee channel | AV | 12 | 0 | 25 | 10 |
| ZigBee Short Address | AV | 13 | -32768 | 32767 | 0 |
| ZigBee IEEE Address | AV | 14 | 0 | 32767 | 0 |
| BACnet Stack Poll Rate | AV | 16 | 1 | 5 | 4 |
| Discharge Low Limit | AV | 20 | 35°F (1.5°C) | 65°F (18°C) | 45°F (7°C) |
| Minimum Fresh Air | AV | 21 | 0 CFM | 20000 CFM | 0 CFM |
| Maximum Fresh Air | AV | 22 | 0 CFM | 20000 CFM | 0 CFM |
| Minimum CO2 | AV | 23 | 0 ppm | 2000 ppm | 800 ppm |
| Maximum CO2 | AV | 24 | 0 ppm | 2000 ppm | 1200 ppm |
| Lua Parameter A | AV | 25 | -32768 | 32767 | 0 |
| Lua Parameter B | AV | 26 | -32768 | 32767 | 0 |
| Lua Parameter C | AV | 27 | -32768 | 32767 | 0 |
| Lua Parameter D | AV | 28 | -32768 | 32767 | 0 |
| Lua Parameter E | AV | 29 | -32768 | 32767 | 0 |
| Lua Parameter F | AV | 30 | -32768 | 32767 | 0 |
| Occupied Heat Setpoint | AV | 39 | 40°F (4.5°C) | 90°F (32°C) | 72°F (22°C) |
| Occupied Cool Setpoint | AV | 40 | 54°F (12°C) | 100°F (37.5°C) | 75°F (24°C) |
| Standby Heat Setpoint | AV | 41 | 40°F (4.5°C) | 90°F (32°C) | 69°F (21°C) |
| Standby Cool Setpoint | AV | 42 | 54°F (12°C) | 100°F (37.5°C) | 78°F (26°C) |
| Unoccupied Heat Setpoint | AV | 43 | 40°F (4.5°C) | 90°F (32°C) | 62°F (16.5°C) |
| Unoccupied Cooling Setpoint | AV | 44 | 54°F (12°C) | 100°F (37.5°C) | 80°F (26.5°C) |
| Default Heating Setpoint | AV | 45 | 65°F (18°C) | 80°F (26.5°C) | 72°F (22°C) |
| Standby Temperature Differential | AV | 46 | 10°F (5.5°C) | 50°F (28°C) | 40°F (22°C) |
| Main Password | AV | 56 | 0 | 9999 | N/A |
| User Password | AV | 57 | 0 | 9999 | 0 |

## PROPERTY VALUE RANGE RESTRICTIONS FOR AV OBJECTS

| Object Name | Object Type | Instance | Minimum Range Value | Maximum Range Value | Default Value |
|---|---|---|---|---|---|
| Heating Setpoint Limit | AV | 58 | 40°F (4.5°C) | 90°F (32°C) | 90°F (32°C) |
| Cooling Setpoint Limit | AV | 59 | 54°F (12°C) | 100°F (37.5°C) | 54°F (12°C) |
| Temporary Occupancy Time | AV | 62 | 0H | 24H | 2H |
| Minimum Deadband | AV | 63 | 2°F (1°C) | 5°F (2.5°C) | 2°F (1°C) |
| Proportional Band | AV | 65 | 3°F (1.2°C) | 10°F (5.6°C) | 3°F (1.2°C) |
| Standby time | AV | 67 | 5H | 24H | 5H |
| Unoccupied Time | AV | 68 | 0H | 24H | 0H |
| Calibrate Outside Temp. Sensor | AV | 74 | - | 5°F(2.5°C) | 0°F (0°C) |
| Number of Cooling Stages | AV | 75 | 1 | 2 | 2 |
| Power-up Delay | AV | 76 | 10 s | 120 s | 10 s |
| Economizer Minimum Position | AV | 78 | 0% | 100% | 0% |
| Economizer Maximum Position | AV | 81 | 0% | 100% | 100% |
| Heating CPH | AV | 84 | 3 | 8 | 4 |
| Cooling CPH | AV | 85 | 3 | 8 | 4 |
| Anti Short Cycle Timer | AV | 86 | 0 min | 5 min | 2 min |
| Number of Heating Stages | AV | 87 | 0 | 2 | 2 |
| Heating Demand Limit | AV | 88 | 0% | 100% | 0% |
| Cooling Demand Limit | AV | 89 | 0% | 100% | 0% |
| Heat Lock | AV | 91 | -15°F (-26°C) | 120°F (49°C) | 120°F (49°C) |
| Cool Lock | AV | 93 | -40°F (-40°C) | 125°F (52°C) | -40°F (-40°C) |
| Supply Air Setpoint | AV | 94 | 50°F (10°C) | 90°F (32°C) | 55°F (13°C) |
| Changeover Setpoint | AV | 95 | 14°F (-10°C) | 70°F (21°C) | 55°F (13°C) |
| Fresh Air Range Upper Limit | AV | 96 | 0 $ft^3$ | 20000 $ft^3$ | 0 $ft^3$ |
| Minimum Supply Heat | AV | 97 | 50°F (10°C) | 72°F (22°C) | 64°F (18°C) |
| Supply Heat Lockout | AV | 98 | -15°F (-26°C) | 120°F (49°C) | 32°F (0°C) |
| Discharge High Limit | AV | 99 | 70°F (21°C) | 150°F (65.5°C) | 120°F (49°C) |
| Room Temperature | AV | 100 | -40°F (-40°C) | 122°F (50°C) | N/A |
| Outdoor Temperature | AV | 101 | -40°F (-40°C) | 122°F (50°C) | N/A |
| Supply Temperature | AV | 102 | -40°F (-40°C) | 122°F (50°C) | N/A |
| CO2 Level | AV | 106 | 0 ppm | 2000 ppm | 0 ppm |
| Air Flow Level | AV | 107 | 0 $ft^3$ | 20000 $ft^3$ | 0 $ft^3$ |
| UI19 Status | AV | 108 | 0% | 100% | 0% |

## PROPERTY VALUE RANGE RESTRICTIONS FOR AI OBJECTS

| Object Name | Object Type | Instance | Minimum Range Value | Maximum Range Value | Default Value |
|---|---|---|---|---|---|
| Light Sensor Level | AI | 2 | 0 | 30000 | N/A |
| Rem. Sensor (UI 20) | AI | 5 | 0 | 4095 | 0 |
| Outdoor Remote Input (UI 21) | AI | 7 | 0 | 4095 | 0 |
| Supply Temp Input (UI 22) | AI | 8 | 0 | 4095 | 0 |
| UI 24 Raw Value | AI | 9 | 0 | 4095 | 0 |
| UI 19 Raw Value | AI | 31 | 0 | 4095 | 0 |
| Wireless Zone 1 IEEE address | AI | 210 | 0 | 32767 | 0 |
| Wireless Zone 2 IEEE address | AI | 220 | 0 | 32767 | 0 |
| Wireless Zone 3 IEEE address | AI | 230 | 0 | 32767 | 0 |
| Wireless Zone 4 IEEE address | AI | 240 | 0 | 32767 | 0 |
| Wireless Zone 5 IEEE address | AI | 250 | 0 | 32767 | 0 |
| Wireless Zone 6 IEEE address | AI | 260 | 0 | 32767 | 0 |
| Wireless Zone 7 IEEE address | AI | 270 | 0 | 32767 | 0 |
| Wireless Zone 8 IEEE address | AI | 280 | 0 | 32767 | 0 |
| Wireless Zone 9 IEEE address | AI | 290 | 0 | 32767 | 0 |
| Wireless Zone 10 IEEE address | AI | 300 | 0 | 32767 | 0 |

## PROPERTY VALUE RANGE RESTRICTIONS FOR AO OBJECTS

| Object Name | Object Type | Instance | Minimum Range Value | Maximum Range Value | Default Value |
|---|---|---|---|---|---|
| PI Heating Demand | AO | 21 | 0% | 100% | N/A |
| PI Cooling Demand | AO | 22 | 0% | 100% | N/A |
| Econo. Demand | AO | 23 | 0% | 100% | N/A |
| Analog Output Heat Demand | AO | 24 | 0% | 100% | N/A |
| UO 11 Analog Output | AO | 123 | 0 | 10 | 0 |
| UO 12 Analog Output | AO | 124 | 0 | 10 | 0 |
| UO 9 Analog Output | AO | 125 | 0 | 10 | 0 |
| UO 10 Analog Output | AO | 126 | 0 | 10 | 0 |

## PROPERTY VALUE RANGE RESTRICTIONS FOR BI OBJECTS

| Object Name | Object Type | Instance | Minimum Range Value | Maximum Range Value | Default Value |
|---|---|---|---|---|---|
| UI 16 Binary Input | BI | 29 | Deactivated | Activated | Deactivated |
| UI 17 Binary Input | BI | 30 | Deactivated | Activated | Deactivated |
| UI 19 Binary Input | BI | 91 | Deactivated | Activated | Deactivated |

## PROPERTY VALUE RANGE RESTRICTIONS FOR BO OBJECTS

| Object Name | Object Type | Instance | Minimum Range Value | Maximum Range Value | Default Value |
|---|---|---|---|---|---|
| G Fan Status | BO | 25 | Off | On | Off |
| Y1 Status | BO | 26 | Off | On | Off |
| Y2 Status | BO | 27 | Off | On | Off |
| W1 Status | BO | 28 | Off | On | Off |
| W2 Status | BO | 29 | Off | On | Off |
| UO 10 Binary Output | BO | 94 | Off | On | Off |
| BO 1 Auxiliary Binary Output | BO | 98 | Off | On | Off |
| UO 11 Binary Output | BO | 101 | Off | On | Off |
| UO 12 Binary Output | BO | 102 | Off | On | Off |

## PROPERTY VALUE RANGE RESTRICTIONS FOR BV OBJECTS

| Object Name | Object Type | Instance | Minimum Range Value | Maximum Range Value | Default Value |
|---|---|---|---|---|---|
| Door Contact Status | BV | 1 | Closed | Open | Closed |
| Door Contact Installed | BV | 2 | No | Yes | No |
| Window Contact Status | BV | 3 | Closed | Opened | Closed |
| Window Contact Installed | BV | 4 | No | Yes | No |
| Low Battery Alarm | BV | 5 | Off | On | Off |
| Force High Backlight | BV | 6 | Off | On | Off |
| Display Long Screen Message | BV | 7 | Off | On | Off |
| Exception Status | BV | 10 | Off | On | Off |
| PIR Local Motion | BV | 32 | Off | On | Off |
| Window Alarm | BV | 35 | Off | On | Off |
| Filter Alarm | BV | 36 | Off | On | Off |
| Service alarm | BV | 37 | Off | On | Off |
| Fan Lock Alarm | BV | 39 | Off | On | Off |
| Smart Recovery | BV | 40 | Off | On | Off |
| CO2 Alarm | BV | 41 | Off | On | Off |
| Air Alarm | BV | 42 | Off | On | Off |
| Frost Protection Alarm | BV | 43 | Off | On | Off |
| ZigBee PIR Sensor Installed | BV | 200 | Off | On | Off |
| Zigbee Sensor Motion | BV | 201 | Off | On | Off |

## PROPERTY VALUE RANGE RESTRICTIONS FOR CSV OBJECTS

| Object Name | Object Type | Instance | Parameters |
|---|---|---|---|
| Short Screen Message | CSV | 1 | String of printable characters.<br>(Same as Location Property 58 (R,W))<br>* Not saved in EEPROM, this info will be lost after a power loss. |
| Long Screen Message | CSV | 2 | String of printable characters.<br>(Same as Description Property 28 (R,W))<br>* Not saved in EEPROM, this info will be lost after a power loss. |

## PROPERTY VALUE RANGE RESTRICTIONS FOR MV OBJECTS

| Object Name | Object ID | Instance | Index | Text | Default Value |
|---|---|---|---|---|---|
| Long Message Background Color | MV | 1 | 1 | White | White |
| | | | 2 | Green | |
| | | | 3 | Blue | |
| | | | 4 | Grey | |
| | | | 5 | Dark Grey | |
| | | | 6 | Default | |
| | | | 7 | Red | |
| HMI Color | MV | 2 | 1 | White | Green |
| | | | 2 | Green | |
| | | | 3 | Blue | |
| | | | 4 | Grey | |
| | | | 5 | Dark Grey | |
| Main Display | MV | 3 | 1 | Temperature | Temperature |
| | | | 2 | Setpoint | |
| Display Language | MV | 4 | 1 | English | English |
| | | | 2 | French | |
| | | | 3 | Spanish | |
| | | | 4 | Chinese | |
| Time Format | MV | 5 | 1 | AM-PM | AM-PM |
| | | | 2 | 24 Hours | |
| Network Units | MV | 6 | 1 | SI | SI |
| | | | 2 | Imperial | |
| Network Language | MV | 7 | 1 | English | English |
| | | | 2 | French | |
| | | | 3 | Spanish | |
| BACnet Baud Rate | MV | 8 | 1 | 9600 | Auto |
| | | | 2 | 19200 | |
| | | | 3 | 38400 | |
| | | | 4 | 57600 | |
| | | | 5 | 76800 | |
| | | | 6 | 115200 | |
| | | | 7 | Auto | |
| Occupancy Command | MV | 10 | 1 | Local Occupancy | Local Occupancy |
| | | | 2 | Occupied | |
| | | | 3 | Unoccupied | |
| Standby Mode Config | MV | 11 | 1 | Absolute | Absolute |
| | | | 2 | Offset | |

## PROPERTY VALUE RANGE RESTRICTIONS FOR MV OBJECTS

| Object Name | Object ID | Instance | Index | Text | Default Value |
|---|---|---|---|---|---|
| System Mode | MV | 16 | 1 | Off | Heat |
| | | | 2 | Auto | |
| | | | 3 | Cool | |
| | | | 4 | Heat | |
| Fan Mode | MV | 17 | 1 | On | Auto |
| | | | 2 | Auto | |
| | | | 3 | Smart | |
| Use Standby Screen | MV | 32 | 1 | No | No |
| | | | 2 | Yes | |
| UI 16 Configuration | MV | 46 | 1 | None | None |
| | | | 2 | Rem NSB | |
| | | | 3 | Motion NO | |
| | | | 4 | Motion NC | |
| | | | 5 | Window | |
| UI 17 Configuration | MV | 47 | 1 | None | None |
| | | | 2 | Door Dry | |
| | | | 3 | Override | |
| UI 19 Configuration | MV | 49 | 1 | None | None |
| | | | 2 | $CO_2$ | |
| Temperature Scale | MV | 51 | 1 | °C | °C |
| | | | 2 | °F | |
| Frost Protection | MV | 55 | 1 | Off | Off |
| | | | 2 | On | |
| Setpoint Function | MV | 58 | 1 | Dual Stp | Attach Stp |
| | | | 2 | Attach Stp | |
| Smart Recovery | MV | 71 | 1 | Off | Off |
| | | | 2 | On | |
| Econo Config | MV | 72 | 1 | Off | Off |
| | | | 2 | On | |
| Schedule menu | MV | 73 | 1 | Disabled | Enabled |
| | | | 2 | Enabled | |
| Mechanical Cooling Allowed | MV | 79 | 1 | Off | Off |
| | | | 2 | On | |
| BO1 Auxiliary Output Config | MV | 92 | 1 | NO | NO |
| | | | 2 | NC | |
| Fan Control in Heating Mode | MV | 95 | 1 | On | On |
| | | | 2 | Off-Auto | |
| | | | 3 | Off-All | |

## PROPERTY VALUE RANGE RESTRICTIONS FOR MV OBJECTS

| Object Name | Object ID | Instance | Index | Text | Default Value |
|---|---|---|---|---|---|
| UO 9 Configuration | MV | 96 | 1 | Analog | Relay RH |
| | | | 2 | Binary | |
| | | | 3 | Relay RC | |
| | | | 4 | Relay RH | |
| UO 10 Configuration | MV | 97 | 1 | Analog | Analog |
| | | | 2 | Binary | |
| | | | 3 | Relay RC | |
| UO 11 Configuration | MV | 98 | 1 | Analog | Analog |
| | | | 2 | Binary | |
| UO 12 Configuration | MV | 99 | 1 | Analog | Analog |
| | | | 2 | Binary | |
| French | MV | 101 | 1 | Disabled | Enabled |
| | | | 2 | Enabled | |
| Spanish | MV | 102 | 1 | Disabled | Enabled |
| | | | 2 | Enabled | |
| Chinese | MV | 103 | 1 | Disabled | Enabled |
| | | | 2 | Enabled | |
| Russian | MV | 104 | 1 | Disabled | Enabled |
| | | | 2 | Enabled | |
| Occupancy Source | MV | 110 | 1 | Motion | Motion |
| | | | 2 | Schedule | |
| Mode button | MV | 111 | 1 | Normal | Normal |
| | | | 2 | Off-Auto | |
| Wireless Zone 1 Set Function | MV | 210 | 1 | None | None |
| | | | 2 | Window | |
| | | | 3 | Door | |
| | | | 4 | Motion | |
| | | | 5 | Status | |
| | | | 6 | Remove | |
| Wireless Zone 2 Set Function | MV | 220 | 1 | None | None |
| | | | 2 | Window | |
| | | | 3 | Door | |
| | | | 4 | Motion | |
| | | | 5 | Status | |
| | | | 6 | Remove | |
| Wireless Zone 3 Set Function | MV | 230 | 1 | None | None |
| | | | 2 | Window | |
| | | | 3 | Door | |
| | | | 4 | Motion | |
| | | | 5 | Status | |
| | | | 6 | Remove | |

## PROPERTY VALUE RANGE RESTRICTIONS FOR MV OBJECTS

| Object Name | Object Type | Instance | Index | Text | Default Value |
|---|---|---|---|---|---|
| Wireless Zone 4 Set Function | MV | 240 | 1 | None | None |
| | | | 2 | Window | |
| | | | 3 | Door | |
| | | | 4 | Motion | |
| | | | 5 | Status | |
| | | | 6 | Remove | |
| Wireless Zone 5 Set Function | MV | 250 | 1 | None | None |
| | | | 2 | Window | |
| | | | 3 | Door | |
| | | | 4 | Motion | |
| | | | 5 | Status | |
| | | | 6 | Remove | |
| Wireless Zone 6 Set Function | MV | 260 | 1 | None | None |
| | | | 2 | Window | |
| | | | 3 | Door | |
| | | | 4 | Motion | |
| | | | 5 | Status | |
| | | | 6 | Remove | |
| Wireless Zone 7 Set Function | MV | 270 | 1 | None | None |
| | | | 2 | Window | |
| | | | 3 | Door | |
| | | | 4 | Motion | |
| | | | 5 | Status | |
| | | | 6 | Remove | |
| Wireless Zone 8 Set Function | MV | 280 | 1 | None | None |
| | | | 2 | Window | |
| | | | 3 | Door | |
| | | | 4 | Motion | |
| | | | 5 | Status | |
| | | | 6 | Remove | |
| Wireless Zone 9 Set Function | MV | 290 | 1 | None | None |
| | | | 2 | Window | |
| | | | 3 | Door | |
| | | | 4 | Motion | |
| | | | 5 | Status | |
| | | | 6 | Remove | |

## PROPERTY VALUE RANGE RESTRICTIONS FOR MV OBJECTS

| Object Name | Object Type | Instance | Index | Text | Default Value |
|---|---|---|---|---|---|
| Wireless Zone 10 Set Function | MV | 300 | 1 | None | None |
| | | | 2 | Window | |
| | | | 3 | Door | |
| | | | 4 | Motion | |
| | | | 5 | Status | |
| | | | 6 | Remove | |

## PROPERTY VALUE RANGE RESTRICTIONS FOR MSI OBJECTS

| Object Name | Object Type | Instance | Index | Text | Default Value |
|---|---|---|---|---|---|
| BACnet Status | MSI | 1 | 1 | Offline | Offline |
| | | | 2 | Online | |
| ZigBee Status | MSI | 2 | 1 | Not Detected | N/A |
| | | | 2 | Power On | |
| | | | 3 | No Network | |
| | | | 4 | Joined | |
| | | | 5 | Online | |
| Effective Occupancy | MSI | 33 | 1 | Occupied | Occupied |
| | | | 2 | Unoccupied | |
| | | | 3 | Override | |
| | | | 4 | Standby | |
| Wireless Zone 1 Status | MSI | 210 | 1 | None | None |
| | | | 2 | Closed | |
| | | | 3 | Opened | |
| | | | 4 | Motion | |
| | | | 5 | No Motion | |
| Wireless Zone 1 Battery | MSI | 211 | 1 | None | None |
| | | | 2 | Normal | |
| | | | 3 | Low | |
| Wireless Zone 1 Paired | MSI | 212 | 1 | No | No |
| | | | 2 | Yes | |
| | | | 3 | Invalid | |
| Wireless Zone 2 Status | MSI | 220 | 1 | None | None |
| | | | 2 | Closed | |
| | | | 3 | Opened | |
| | | | 4 | Motion | |
| | | | 5 | No Motion | |

## PROPERTY VALUE RANGE RESTRICTIONS FOR MSI OBJECTS

| Object Name | Object Type | Instance | Index | Text | Default Value |
|---|---|---|---|---|---|
| Wireless Zone 2 Battery | MSI | 221 | 1 | None | None |
| | | | 2 | Normal | |
| | | | 3 | Low | |
| Wireless Zone 2 Paired | MSI | 222 | 1 | No | No |
| | | | 2 | Yes | |
| | | | 3 | Invalid | |
| Wireless Zone 3 Status | MSI | 230 | 1 | None | None |
| | | | 2 | Closed | |
| | | | 3 | Opened | |
| | | | 4 | Motion | |
| | | | 5 | No Motion | |
| Wireless Zone 3 Battery | MSI | 231 | 1 | None | None |
| | | | 2 | Normal | |
| | | | 3 | Low | |
| Wireless Zone 3 Paired | MSI | 232 | 1 | No | No |
| | | | 2 | Yes | |
| | | | 3 | Invalid | |
| Wireless Zone 4 Status | MSI | 240 | 1 | None | None |
| | | | 2 | Closed | |
| | | | 3 | Opened | |
| | | | 4 | Motion | |
| | | | 5 | No Motion | |
| Wireless Zone 4 Battery | MSI | 241 | 1 | None | None |
| | | | 2 | Normal | |
| | | | 3 | Low | |
| Wireless Zone 4 Paired | MSI | 242 | 1 | No | No |
| | | | 2 | Yes | |
| | | | 3 | Invalid | |
| Wireless Zone 5 Status | MSI | 250 | 1 | None | None |
| | | | 2 | Closed | |
| | | | 3 | Opened | |
| | | | 4 | Motion | |
| | | | 5 | No Motion | |
| Wireless Zone 5 Battery | MSI | 251 | 1 | None | None |
| | | | 2 | Normal | |
| | | | 3 | Low | |
| Wireless Zone 5 Paired | MSI | 252 | 1 | No | No |
| | | | 2 | Yes | |
| | | | 3 | Invalid | |

## PROPERTY VALUE RANGE RESTRICTIONS FOR MSI OBJECTS

| Object Name | Object Type | Instance | Index | Text | Default Value |
|---|---|---|---|---|---|
| Wireless Zone 6 Status | MSI | 260 | 1 | None | None |
| | | | 2 | Closed | |
| | | | 3 | Opened | |
| | | | 4 | Motion | |
| | | | 5 | No Motion | |
| Wireless Zone 6 Battery | MSI | 261 | 1 | None | None |
| | | | 2 | Normal | |
| | | | 3 | Low | |
| Wireless Zone 6 Paired | MSI | 262 | 1 | No | No |
| | | | 2 | Yes | |
| | | | 3 | Invalid | |
| Wireless Zone 7 Status | MSI | 270 | 1 | None | None |
| | | | 2 | Closed | |
| | | | 3 | Opened | |
| | | | 4 | Motion | |
| | | | 5 | No Motion | |
| Wireless Zone 7 Battery | MSI | 271 | 1 | None | None |
| | | | 2 | Normal | |
| | | | 3 | Low | |
| Wireless Zone 7 Paired | MSI | 272 | 1 | No | No |
| | | | 2 | Yes | |
| | | | 3 | Invalid | |
| Wireless Zone 8 Status | MSI | 280 | 1 | None | None |
| | | | 2 | Closed | |
| | | | 3 | Opened | |
| | | | 4 | Motion | |
| | | | 5 | No Motion | |
| Wireless Zone 8 Battery | MSI | 281 | 1 | None | None |
| | | | 2 | Normal | |
| | | | 3 | Low | |
| Wireless Zone 8 Paired | MSI | 282 | 1 | No | No |
| | | | 2 | Yes | |
| | | | 3 | Invalid | |
| Wireless Zone 9 Status | MSI | 290 | 1 | None | None |
| | | | 2 | Closed | |
| | | | 3 | Opened | |
| | | | 4 | Motion | |
| | | | 5 | No Motion | |

## PROPERTY VALUE RANGE RESTRICTIONS FOR MSI OBJECTS

| Object Name | Object Type | Instance | Index | Text | Default Value |
|---|---|---|---|---|---|
| Wireless Zone 9 Battery | MSI | 291 | 1 | None | None |
| | | | 2 | Normal | |
| | | | 3 | Low | |
| Wireless Zone 9 Paired | MSI | 292 | 1 | No | No |
| | | | 2 | Yes | |
| | | | 3 | Invalid | |
| Wireless Zone 10 Status | MSI | 300 | 1 | None | None |
| | | | 2 | Closed | |
| | | | 3 | Opened | |
| | | | 4 | Motion | |
| | | | 5 | No Motion | |
| Wireless Zone 10 Battery | MSI | 301 | 1 | None | None |
| | | | 2 | Normal | |
| | | | 3 | Low | |
| Wireless Zone 10 Paired | MSI | 302 | 1 | No | No |
| | | | 2 | Yes | |
| | | | 3 | Invalid | |

## PROPERTY VALUE RANGE RESTRICTIONS FOR PG OBJECTS

| Object Name | Object Type | Instance | Parameters |
|---|---|---|---|
| Lua Program 1 | PG | 1 | Lua program code is recorded in the description field |
| Lua Program 2 | PG | 2 | Lua program code is recorded in the description field |
| Lua Program 3 | PG | 3 | Lua program code is recorded in the description field |
| Lua Program 4 | PG | 4 | Lua program code is recorded in the description field |
| Lua Program 5 | PG | 5 | Lua program code is recorded in the description field |
| Lua Program 6 | PG | 6 | Lua program code is recorded in the description field |
| Lua Program 7 | PG | 7 | Lua program code is recorded in the description field |
| Lua Program 8 | PG | 8 | Lua program code is recorded in the description field |
| Lua Program 9 | PG | 9 | Lua program code is recorded in the description field |
| Lua Program 10 | PG | 10 | Lua program code is recorded in the description field |

## PROPERTY VALUE RANGE RESTRICTIONS FOR SCH / CAL OBJECTS

| Object Name | Object Type | Instance | Parameters |
|---|---|---|---|
| Occupancy Schedule | SCH | 1 | 7 days of the week, 3 occupied setpoint times & 3 unoccupied setpoint times alternating in fixed order. |
| Occupancy Calendar | CAL | 1 | Date, Range of dates, Weekend |

## INTEGRATION – GLOBAL COMMANDS

The following figure shows which objects from the controller can be monitored and controlled from the BAS front-end.

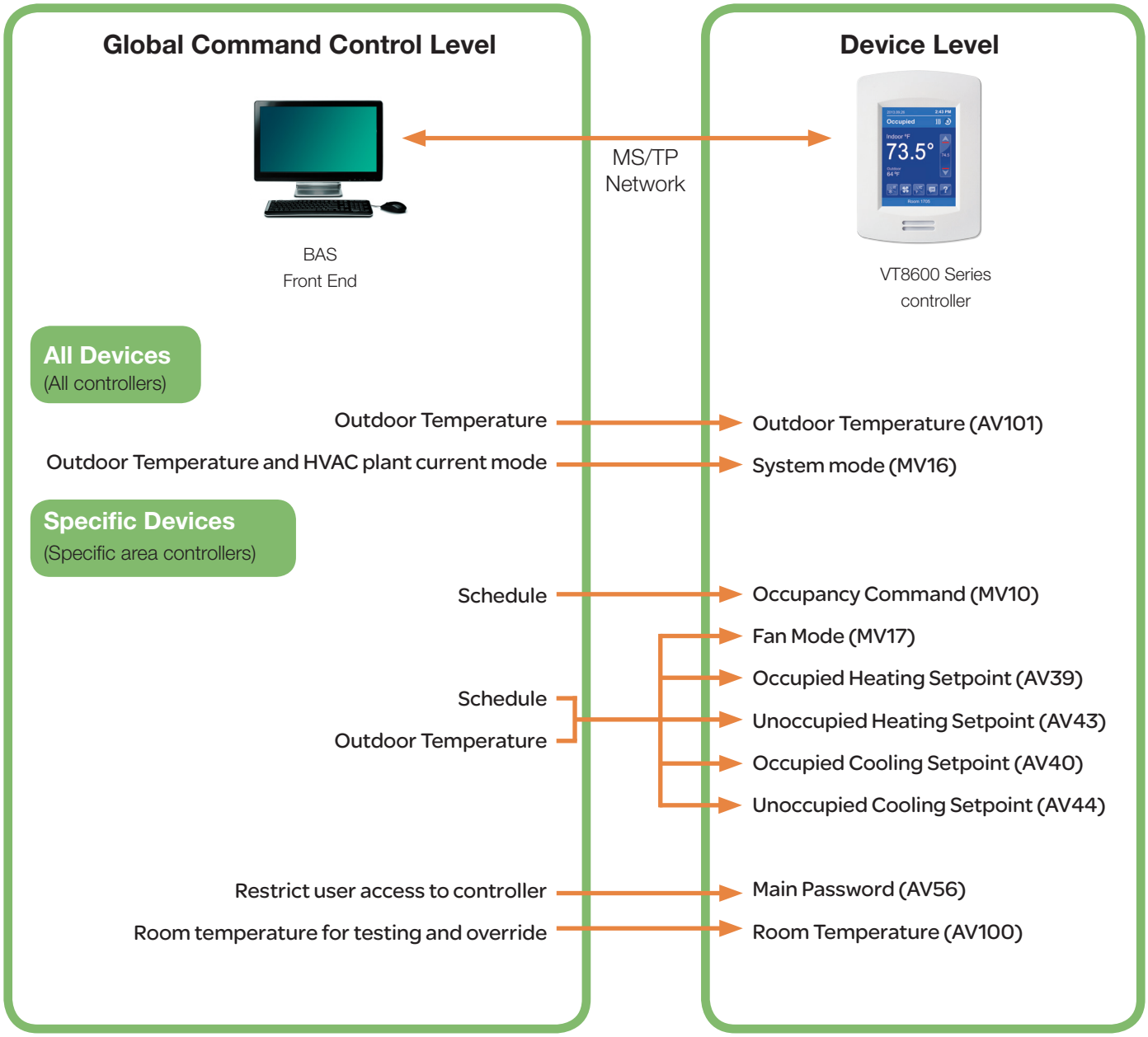



Figure 1 : Global commands from a BAS front-end to a typical VT86xx series controller

**Note: For information about integrating ZigBee wireless sensors with BACnet, refer to the ZigBee Wireless Sensor Installation Guide.**

## VT8600U5X00B INTEGRATION – GRAPHICAL USER INTERFACE OBJECTS

Objects typically used in a GUI:

- Room Temperature (AV100)
- Occupied and Unoccupied Heat Setpoints (AV39 and AV43)
- Occupied and Unoccupied Cool Setpoints (AV40 and AV44)
- Outdoor Temperature (AV101)
- Supply Temperature (AV102, if available)
- Occupancy Command (MV10)
- System Mode (MV16)
- Auxiliary Output Status (BO98)
- PI Heating Demand (AO21)
- PI Cooling Demand (AO22)
- Window Alarm (BV35)
- Filter Alarm (BV36)
- Service Alarm (BV37)

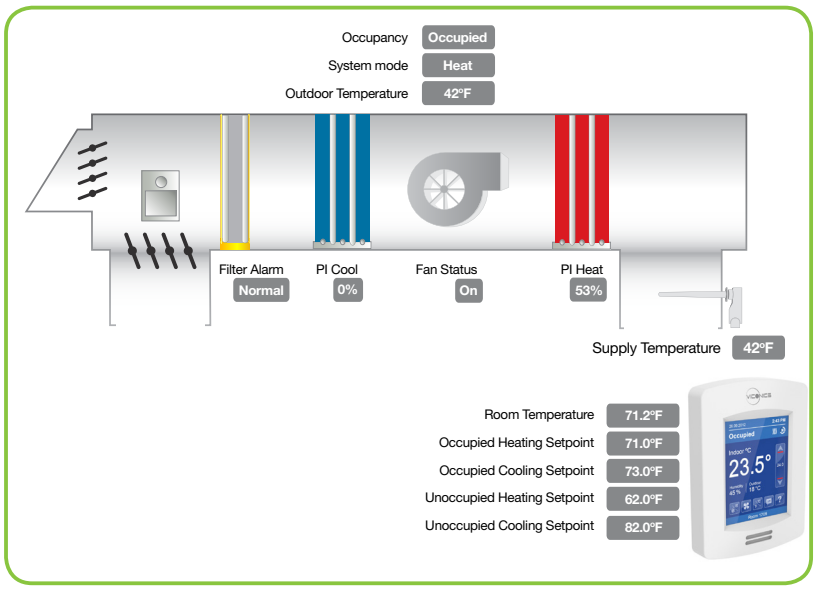



Figure-1 GUI Example - VT8600U5X00B

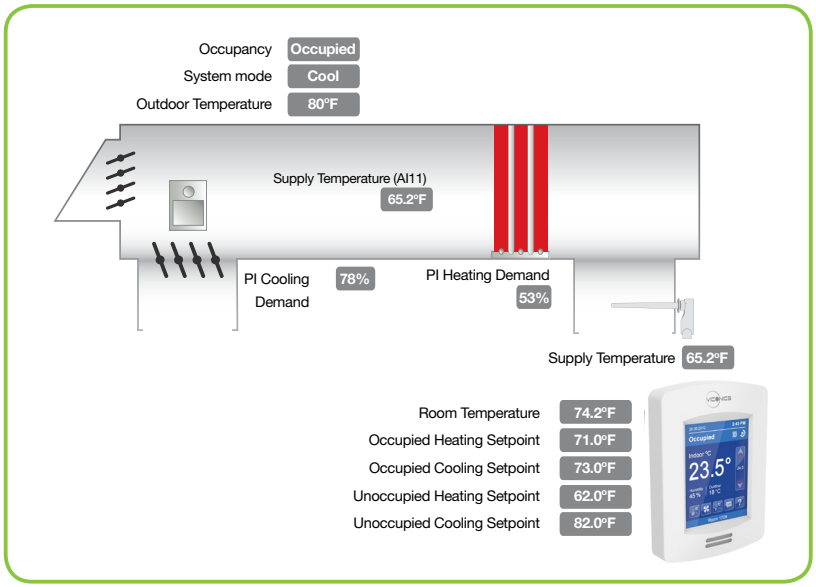



Figure-2 GUI Example - VT8600U5X00B

## CONFIGURATION OBJECTS

If your BAS allows you to remove objects, Viconics recommends removing all configuration objects once your setup is complete. This prevents unnecessary network polling and traffic.

## WIRING GUIDE

### Overview

Viconics uses EIA-485 as the physical layer between their devices and supervisory controllers. A "Device" represents any product with an active EIA-485 network connection, including Viconics and non Viconics controllers.

A summary of network specifications are listed below.

### Summary Specifications

| Parameter | Details |
|---|---|
| Media | Twisted pair 18 AWG, 22 AWG, or 24 AWG (shielded recommended) |
| Characteristic Impedance | 100-130 ohms |
| Distributed capacitance | Less than 100 pF per meter (30 pF per foot) |
| Maximum length per segment | 1200 meters (4000 feet) Note: 18 AWG cable |
| Polarity | Polarity sensitive |
| Multi-drop | Daisy-chain (no T connections) |
| Terminations | 1. Devices are installed at both ends of the MS/TP network: 120 Ohms resistor should be installed at each end.<br>2. A device is installed at one end of the MS/TP network and a third-party device is installed at the other end. Install an End-Of-Line resistor value that matches the third-party device instruction regarding the End-Of-Line resistors.<br>3. Third-party devices are installed at both ends of the MS/TP network. Follow the third-party device instructions regarding the End-Of-Line resistors. |
| Network bias resistors | 510 ohms per wire (maximum two sets per segment) |
| Maximum number of nodes per segment | 64 (Viconics devices only) |
| Maximum number of nodes per network | 128 |
| Baud rate | 9600, 19200, 38400, 57600, 76800, 115200 (Auto detect) |

Table : Summary of Specifications for a Viconics EIA-485 Network

## WIRING GUIDE

### Cable Type

Viconics recommends the use of balanced 22-24 AWG twisted pair with a characteristic impedance of 100-130 ohms and capacitance of 30 pF/ft or lower. A braided shield is also recommended.

### Impedance

A value based on the inherent conductance, resistance, capacitance, and inductance that represent the impedance of an infinitely long cable. The nominal impedance of the cable should be between 100 ohms and 120 ohms. Using 120 ohms results in a lighter load on the network.

### Capacitance (pF/ft)

The amount of equivalent capacitive load of the cable (per foot basis). One factor limiting total cable length is the capacitive load. Systems with long lengths benefit from using low capacitance cable (17pF/ft or lower).

## NETWORK CONFIGURATION

EIA-485 networks use a daisy chain configuration.  A daisy chain has only one main cable and every network device is connected directly along its path.

**Figure 3** illustrates two improper network configurations and the proper daisy chain configuration.

Figure 3 : Three different network configurations: star, bus, and daisy chain. Only the daisy chain configuration is correct for an EIA-485 network

Other methods of wiring an EIA-485 network may give unreliable and unpredictable results. There are no troubleshooting methods for these types of networks. Site experimentation may be required with no guarantee of success. As a result, Viconics only supports daisy chain configurations.

### Maximum Number of Devices

A maximum of 64 nodes are allowed on a single daisy-chain segment. A node is defined as any device (panel, zone, or Repeater) connected to the RS485 network. Terminators do not count as a node.

Add the following to determine the number of nodes on a network:

- One node for each device, including main panels
- One node for each repeater on the chain

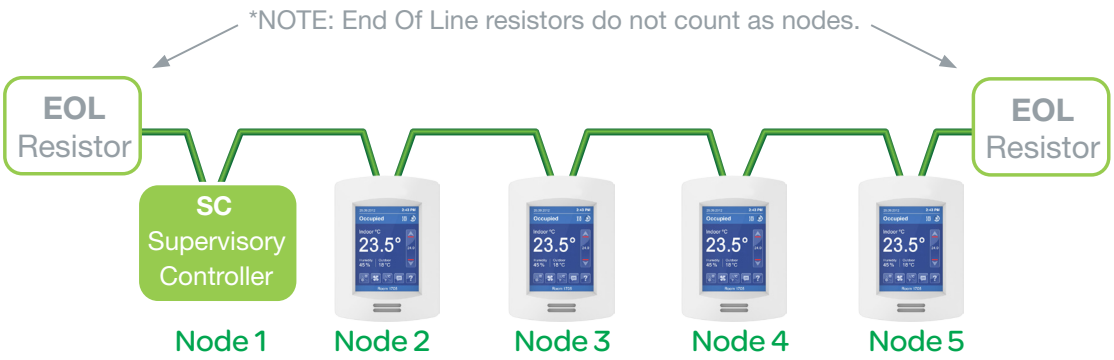



Figure 4 : Example Network - 5 Nodes

Figure 4 shows one node for the main SC panel and 4 for the controllers, for a total of 5 nodes. If there are more than 64 devices, install repeaters to extend the network.

### Maximum Cable Length

The maximum length of a chain is related to its transmission speed. The longer the chain, the slower the speed. Using proper cable, the maximum length of an EIA-485 daisy chain is 4000-ft (1200 m). This only works reliably for data rates up to 100,000 bps. Viconics maximum data rate is 76,800 bps. If you require a maximum network length of more than 4000 feet, repeaters are required to extend the network.

### EIA-485 Repeaters

If you have more than 64 devices, or require a maximum network length of more than 4000 feet, repeaters are required to extend the network.

### End Of Line (EOL) Resistors


Figure-5 Correct Repeater Use in an EIA-485 Network

The ideal configuration is to daisy chain the repeaters to the main panel. From each of these repeaters, a separate daisy chain branches off. Figure 5 demonstrates a valid use of repeaters in an EIA-485 network.

Do not install repeaters in series as this may result in network reliability problems. Incorrect use of a repeater in an EIA-485 network is illustrated below in Figure 6.

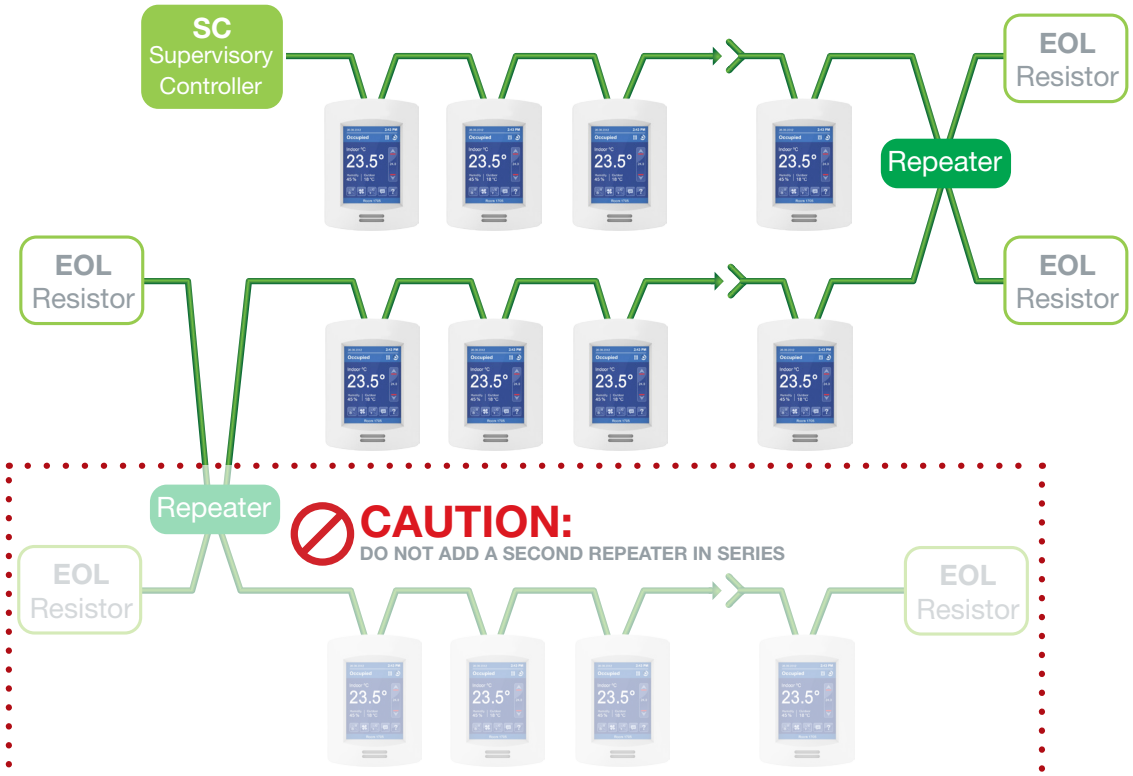



Figure-6 Incorrect Repeater Use in an EIA-485 Network

MS/TP network must be properly terminated. For daisy chain configurations, you must install an EOL resistor at each end of the daisy chain. Depending on your MSTP network configuration, the resistance value of the EOL resistor may change. Viconics devices are installed at both ends of the MSTP network. Also, a 120 Ohm resistor should be installed at each end.

A Viconics device is installed at one end of the MSTP network and a 3rd party device is installed at the other end. Make sure you install an End-Of-Line resistor value that matches the 3rd party devices instructions regarding its EOL resistor value. Any 3rd party devices are installed at both ends of the MSTP network.

## Network Adapter

### BACnet® Communication Wiring (if applicable)

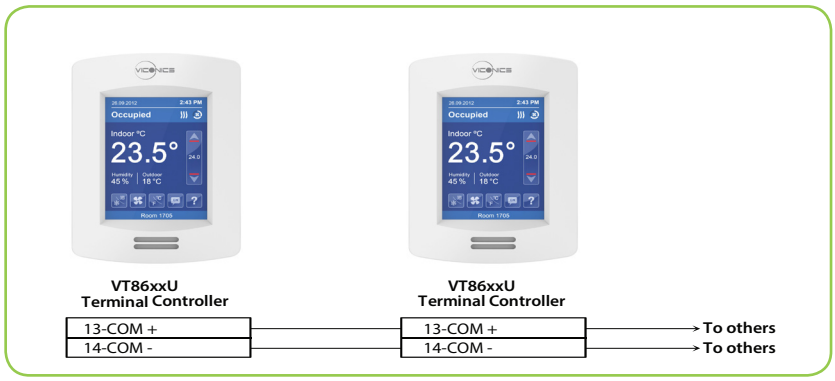



Figure-7 MS/TP Connections

The polarity of the connection to the cable is important. From one module to the other it is important that the same colored wire be connected to “plus” or “+” and the other colored wire be connected to the “minus” or ”-“. Figure 7 shows the proper MS/TP connections.

NOTE: The Ref terminal should NEVER be used to wire shields. The 2 shields from each feed of the network connection to a controller should be wired together in the back of the controller and properly protected to prevent any accidental connection to the ground.

The joined shield connection should then be grounded at a SINGLE point on the whole segment. More than one ground connection to a shielded wire may induce ground loop noises and affect communication.

## DEFAULT DEVICE NAME AND ID

Default Device Name set to Model number – MAC where:

- MAC is the current MAC address of the device.
- Model number is Viconics part number.

The device name upgrades as soon as there is a change to the device MAC address.

The Device Name and Device ID properties are writable. Both properties can be renamed from any BACnet® network management tool as long as the tool itself can write to these properties.

### VT8600U5X00B Models

Default Device ID is set to: 86000 + MAC where MAC is the current MAC address of the device.
The device ID upgrades as soon as there is a change to the device’s MAC. For example, when a VT8600 controller with a MAC address of 63 is connected to a network, its default Device ID is 86063.

## INTEGRATING VICONICS DEVICES ON A BACNET MS/TP NETWORK

Before doing any BACnet® integration, make sure you refer to a Viconics PICS document (Protocol Implementation Conformance Statement). The PICS document lists all the BACnet® Services and Object types supported by a device. You can find the document at www.viconics.com.

Viconics devices do not support the COV service. COV reporting allows an object to send out notices when its Present-Value property is incremented by a pre-defined value. Since this is not supported at Viconics, special attention should be given to the polling time settings at the Supervisory Controller and Workstation level when using a graphic interface or an application program to read or write to a Viconics object.

### Graphical Interfaces

A graphic interface might poll all data linked to the graphic page on a COV basis. If the third-party device does not support COV, the graphical interface relies on a pre-configured polling interval, which is usually in hundredths of milliseconds. Any device containing a monitored object could be subject to network traffic congestion if such a polling interval is used. Viconics strongly recommends a polling interval of 5 seconds (minimum) for any graphical interface. This becomes even more critical in graphics where a single representation might poll many devices. If the proper poll rate is not respected, devices may be reported offline by certain front-ends by saturating the traffic handling capacity of BACnet® MS/TP without COV subscription.

### Free Programmed Object or Loops

Read and write MS/TP data on an “If Once” basis or a “Do Every Loop" basis instead of reading or writing to a third-party device’s object directly in the program. Otherwise, any read or write request occurs at the Supervisory Controller’s program scan rate, which may be in hundredths of milliseconds. This can bog down a network as single commands can be sent to all ASC devices down the MS/TP trunks every hundredths of milliseconds

Programs writing to the devices should have a structure similar to the following:

```
If Once Schedule = On then
MV10 = Occupied
End If
If Once Schedule = Off Then
MV10 = Unoccupied
End If
```

OR

```
Do Every 5min
If Schedule = On Then
MV10= Occupied
Else
MV10 = Unoccupied
End If
End Do
```

### Retries and Timeouts

In BACnet® integration, you should note the device object of the Supervisory Controller and Operator’s Workstation. This object contains the two following required properties:

1) Retry Timeout

2) Number of APDU Retries

The Retry Timeout specifies the time between re-transmissions if the acknowledgement is not received. Increasing this value may help if you are experiencing problems with controllers dropping off line.

The Number of APDU Retries specifies the number of times unsuccessful transmissions are repeated. If the receiving controller has not received the transmission successfully after this many attempts, no further attempts will be made.

For example, if one of the controllers does not reply to a Supervisory Controller (SC) request, and the SC’s Retry Timeout is set to 2000 milliseconds and the Number of APDU Retries is set to 1 (SC level), the SC sends one other request 2 seconds later. If the MS/TP device does not reply, it is considered off line by the workstation.

Having a Retry Timeout value of 10450 milliseconds and a Number of APDU Retries property set to 3 at the SC level may prevent the device from dropping off line. These properties should also be changed at the workstation level since the workstation issues requests to any MS/TP devices when the graphics are used.

### Writing and Binding Behaviour

Refer to the proper section as per the table below for BACnet write command behaviour for specific objects and functionality.

Green = proper write binding method
Orange = correct write binding method with behaviour changes on the user HMI
Red = application locking write binding method

| Object type | Relinquish Default | Priority Array 4-16 | Priority Array 1-3 |
|---|---|---|---|
| AI's, BI's & MI's | Note A) | Note A) | Note A) |
| Configuration Properties | Note B) | Note C) | Note C1) |
| User HMI objects | Note B) | Note C) | Note C1) |
| Status objects | Note D) | Note E) | Note E1) |
| Physical hardware output objects | Note D) | Note F) | Note F1) |

## Note A) AI's, BI's & MI's.

Object examples in this category: AI2 / Light Sensor Level, BI29 / UI16 Status, MI33 / Effective Occupancy.

All input objects are read only and cannot be written to independently of the priority array used. These types of points are typically used for statuses and external logic functions.

## Note B) Configuration Properties and User HMI objects.

Object examples in the configuration property category: AV57 / User Password, BV6 / Force High Level Back-light, MV2 / HMI color.

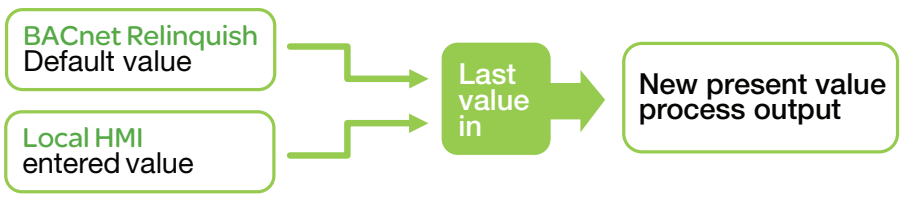
Object examples in the User HMI category: AV40 / Occupied Cool Setpoint, MV16 / System Mode, MV17 / Fan Mode.

Writing and binding to the relinquish default property is the preferred method to use when setting up network logic using the configuration properties and user HMI objects.

When writing and binding to the relinquish default, the control will store and archive the new written present value in flash over the network. As soon as the new present value is received, the controller will use this new present value in all its internal control logics and functions.

When writing and binding to the relinquish default, the controller internal control logics and functions are **NOT** by-passed, and the controller will still operate normally.

When writing and binding to the relinquish default, a user can still change user HMI values and an installer can still change configuration properties. In this case, the present value used by the controller internal control logics and functions is the last one received. Either the network present value or a value changed locally at the controller HMI.



## Note C) Configuration Properties and User HMI objects.

Writing and binding to the priority arrays 4 to 16 property is a method to use **IF** the required intent is to lock the local HMI and prevent local adjustments made by the user HMI values or the configuration property values. If preventing the local user from accessing or tampering with the local HMI is the goal there are other simpler and more elegant ways to do so:

- Proper selection of the user experience of the local HMI. AV2 / User HMI can tailor the user screen to properly present to the user the only local adjustments allowed. In total 12 different HMI user screen options are available. Locking the object by writing to array 4 to 16 is not required.
- AV56 / Main Password will prevent unauthorized installers from tampering with the configuration properties. Locking the object by writing to array 4 to 16 is not required.
- AV57 / User Password will prevent unauthorized users from tampering with the user HMI value. Locking the object by writing to array 4 to 16 is not required.

When writing and binding to the priority array 4 to 16, the control will **NOT** store and archive to flash memory and will simply use it in RAM. As soon as the new present value is received in priority arrays 4 to 16, the controller will use this new present value in all its internal control logics and functions.

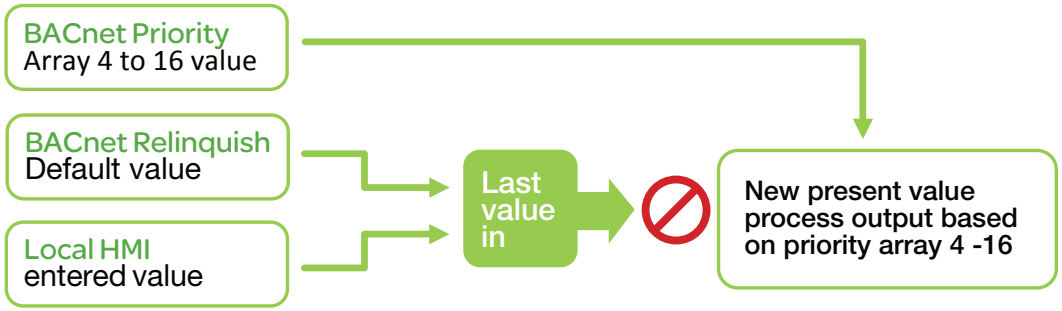
When writing and binding to the priority array 4 to 16, the controller internal control logics and functions **ARE** bypassed, and the controller will **NOT** operate with its own present values, but will be forced to use the last write commands received on priority arrays 4 to 16 for its built-in internal control logics and functions. **HOWEVER**, since these present values are only stored in RAM and not in flash, if a power reset occurs, the override type function will be lost and the controller will start to operate using the relinquish default value. If the override type function is required, a new write command to priority arrays 4 to 16 is needed.

The controller fully supports native and BACnet compliant priority array 1 to 16 write commands. This simply means that a write value at level 4 has a higher authority than a write at level 9.

When writing and binding to priority array 4 to 16, a user **cannot** change user HMI values and an installer **cannot** change configuration properties. In this case, the present value used by the controller internal control logics and functions is the last write command received at priority array 4 to 16.


You can easily identify an overridden point at the controller in either configuration view, the setpoint view, the service view or the test outputs view. The point will be highlighted in **RED** indicating a write command to priority array 4 to 16.

The **ONLY** way to release the override due to the use of writing to priority array 4 to 16 is to send a **write NULL** command to the proper priority array currently locking the controller.



## Note C1) Configuration Properties and User HMI objects.

The behaviour is similar to the behaviour described in NOTE C with the following exceptions and changes

When writing and binding to the priority array 1 to 3, the controller **WILL** store and archive to flash memory. As soon as the new present value is received in priority array 1 to 3, the controller will use this new present value in all its internal control logics and functions.

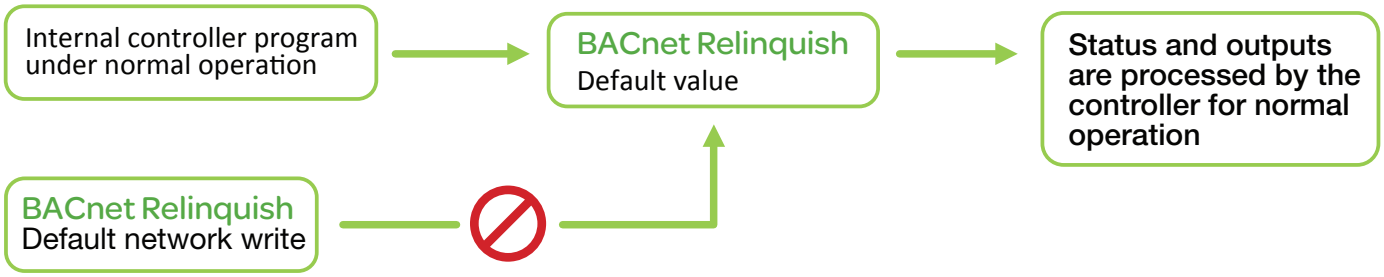
When writing and binding to the priority array 1 to 3, the controller internal control logics and functions **ARE** bypassed the same way they are when writing to priority array 4 to 16. The controller will **NOT** operate with its own present values, but will be forced to use the last write commands received on priority array 1 to 3 for its built-in internal control logics and functions. **HOWEVER**, since writing to priority array 1 to 3 will store the value in flash memory, if a power reset occurs, the override type function **will be maintained** and the controller will start to operate right away using the last value written to priority array 1 to 3.

The **ONLY** way to release the override due to the use of writing to priority array 1 to 3 is to send a **write NULL** command to the proper priority array currently locking the controller. Only then will the controller start using the relinquish default value and allow the user or installer to change values.

## Note D) Status objects and Physical hardware output objects.

No override functions are effective when writing or binding to the relinquish default property of status objects and physical hardware output objects. When writing to the relinquish default property, the internal program is not bypassed and still has priority over the write command on the relinquish default property.

The internal program constantly writes internally to the same location used by the relinquish default property hence a single BACnet write at relinquish default has no effect on status objects and physical hardware output objects.



**Note E)** Status objects.

Object examples in this category: BV36 / Filter Alarm, AV21 / PI Heating Demand. All status objects are writable.

Writing and binding to the priority array 4 to 16 property is a method to use **IF** the requirement is to lock the controller program and prevent statuses from being flagged based on the internal operation of the controller application programming.

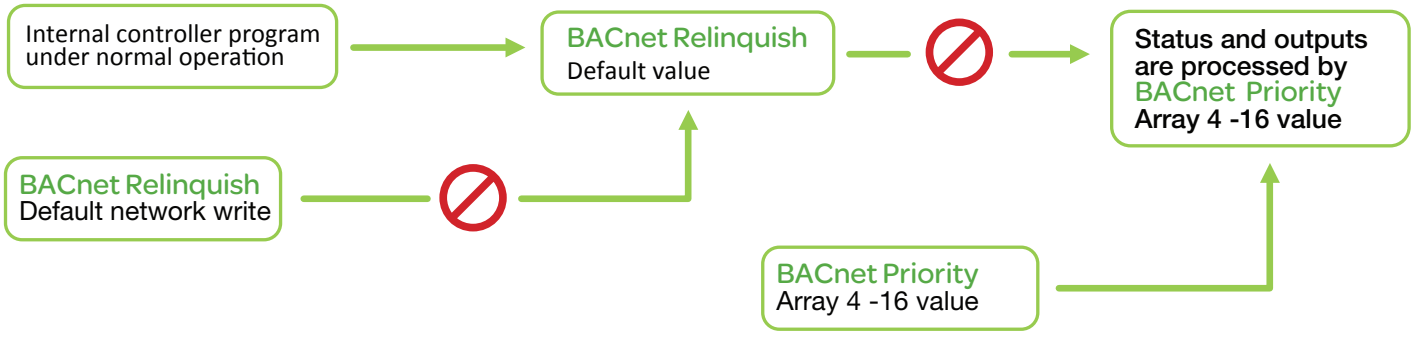
When writing and binding to the priority array 4 to 16, the control will **NOT** store and archive to flash memory and will simply use it in RAM. As soon as the new present value is received in priority array 4 to 16, the controller will use this new present value in all its internal control logics and functions.

When writing and binding to the priority array 4 to 16, the controller internal control logics and functions **ARE** bypassed, and the controller will **NOT** operate with its own present values, but will be forced to use the last write commands received on priority array 4 to 16 for its built-in internal control logics and functions. **HOWEVER**, since these present values are only stored in RAM and not in flash, if a power reset occurs, the override type function will be lost and the controller will start to operate using the relinquish default value. If the override type function is required, a new write command to priority array 4 to 16 is needed.

The controller fully supports native and BACnet compliant priority array 1 to 16 write commands. This simply means that a write value at level 4 has a higher authority than a write at level 9.


When writing and binding to priority array 4 to 16, you locally identify if an override is effective on a status object using the service view. The point will be highlighted in **RED** indicating a write command to priority array 4 to 16. In this case, the present value used by the controller internal control logics is by-passed and the value displayed and used is the last write command received at priority array 4-16.

The **ONLY** way to release the override due to the use of writing to priority array 4 to 16 is to send a **write NULL** command to the proper priority array currently locking the controller.



**Note E1)** Status objects.

Object examples in this category: BV36 / Filter Alarm, AV21 / PI Heating Demand. All status objects are writable.

The behaviour is similar to the behaviour described in NOTE E with the following exceptions and changes

When writing and binding to the priority array 1 to 3, the controller **WILL** store and archive to flash memory. As soon as the new present value is received in priority array 1 to 3, the controller will use this new present value in all its internal control logics and functions.

When writing and binding to the priority array 1 to 3, the controller internal control logics and functions **ARE** bypassed the same way they are when writing to priority array 4 to 16. The controller will **NOT** operate with its own present values, but will be forced to use the last write commands received on priority array 1 to 3 for its built-in internal control logics and functions. **HOWEVER**, since writing to priority array 1 to 3 will store the value in flash memory, if a power reset occurs, the override type function will be maintained and the controller will start to operate right away using the last value written to priority array 1 to 3.

The **ONLY** way to release the override due to the use of writing to priority array 1 to 3 is to send a **write NULL** command to the proper priority array currently locking the controller. Only then will the controller start using the relinquish default value and allow the user or installer to change values.

**Note F)** Physical hardware output objects.

Object examples in this category: BO95 / BO4 High Speed fan, AO123 / UO11 Analog Status. All physical hardware output objects are writable. **CAUTION NEEDS TO BE EXERCISED** since bypassing the internal control functions of the controller **CAN RESULT** in damage to the equipment.

Writing and binding to the priority array 4 to 16 property is a method to use **IF** the requirement is to lock the controller program and prevent physical hardware output objects from being powered based on the internal operation of the controller application programming.

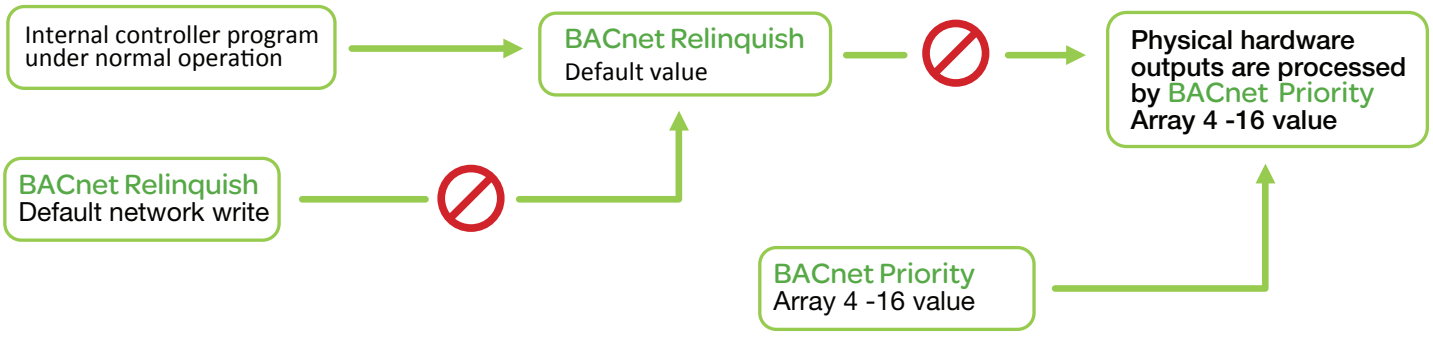
When writing and binding to the priority array 4 to 16, the control will **NOT** store and archive to flash memory and will simply use it in RAM. As soon as the new present value is received in priority array 4 to 16, the controller will use this new present value in all its internal control logics and functions.

When writing and binding to the priority array 4 to 16, the controller internal control logics and functions **ARE** bypassed, and the controller will **NOT** operate with its own present values, but will be forced to use the last write commands received on priority array 4 to 16 for its built-in internal control logics and functions. **HOWEVER**, since these present values are only stored in RAM and not in flash, if a power reset occurs, the override type function will be lost and the controller will start to operate using the relinquish default value. If the override type function is required, a new write command to priority array 4 to 16 is needed.

The controller fully supports native and BACnet compliant priority array 1 to 16 write commands. This simply means that a write value at level 4 has a higher authority than a write at level 9.

When writing and binding to priority array 4 to 16, you locally identify if an override is effective on a status object using the test output view or the service view. The point will be highlighted in **RED** indicating a write command to priority array 4 to 16. In this case, the present value used by the controller internal control logics is bypassed and the value displayed and used is the last write command received at priority array 4-16.

The **ONLY** way to release the override due to the use of writing to priority array 4 to 16 is to send a **write NULL** command to the proper priority array currently locking the controller.

**Note F1)** Physical hardware output objects.

Object examples in this category: BO95 / BO4 High Speed fan, AO123 / UO11 Analog Status. All physical hardware output objects are writable. **CAUTION NEEDS TO BE EXERCISED** since bypassing the internal control functions of the controller **CAN RESULT** in damage to the equipment.

The behaviour is similar to the behaviour described in NOTE F with the following exceptions and changes

When writing and binding to the priority array 1 to 3, the controller **WILL** store and archive to flash memory. As soon as the new present value is received in priority array 1 to 3, the controller will use this new present value in all its internal control logics and functions.

When writing and binding to the priority array 1 to 3, the controller internal control logics and functions **ARE** bypassed the same way they are when writing to priority array 4 to 16. The controller will **NOT** operate with its own present values, but will be forced to use the last write commands received on priority array 1 to 3 for its built-in internal control logics and functions. **HOWEVER**, since writing to priority array 1 to 3 will store the value in flash, if a power reset occurs, the override type function **will be maintained** and the controller will start to operate right away using the last value written to priority array 1 to 3.

The **ONLY** way to release the override due to the use of writing to priority array 1 to 3 is to send a **write NULL** command to the proper priority array currently locking the controller. Only then will the controller start using the relinquish default value and allow the user or installer to change values.

### General Notes on BACnet Writing and Binding Behaviour.

- If in doubt as to whether a point is overridden using BACnet priority array 1 to 16 or not, open the controller configuration menu, the service view or the test output view. An overridden point will appear in RED in the tables.
- ALL entries in priority array 1 to 16 MUST be set to “null” if normal operation using the internal control functions and factory application program is to be used.
- Reinitializing the controller to factory default directly from the configuration interface at the controller WILL release ANY and ALL write entries into priority array 1 to 16 on ALL objects.

### Summary for Integrators

- AI’s, BI’s & MI’s are not writable and are typically only used for status
- Configuration properties and user HMI objects
  - Write and bind to relinquish default if you want the local interface to still be able to modify these settings
  - Write and bind to priority array 4 to 16 if you desire to override the local application but not save that override after a power reset
  - Write and bind to priority array 1 to 3 if you desire to override the local application and save that override after a power reset
- Status objects and physical hardware output objects
  - Write and bind to relinquish default has no effect since the internal application program constantly overrides the last network command value
  - Write and bind to priority array 4 to 16 if you desire to override the local application but not save that override after a power reset
  - Write and bind to priority array 1 to 3 if you desire to override the local application and save that override after a power reset

## TIPS AND THINGS YOU NEED TO KNOW

- Each controller is delivered from the factory with the default MAC address set at 254. At this value, the BACnet® communication is not active and the device does not participate in the token pass. To enable the BACnet® communication, set the local MAC address configuration property of the controller to any valid value from 0 to 127.
- After the initial configuration of your device and if your BAS allows you to remove objects, you should remove all configuration objects to prevent unnecessary polling of unused objects and to help speed up the network.
- In default mode of operation, the device automatically matches its baud rate to the baud rate of the network. Automatic baud rate detection occurs when the MS-TP communication port is initialized (on power up). If the network speed is changed, the device keeps listening at the previously detected speed for 10 minutes before resuming auto-baud. Re-powering the devices forces the auto-baud.
- If the device goes off line, the following bound controller parameters are released:

  Room Temperature

  Outdoor Temperature

  Occupancy

- The BACnet® Data Link layer has two key parameters, the device object name and the device object ID. The device object name must be unique from any other BACnet® device object name on the BACnet® network (not just the MS-TP sub-network). The device object ID must be unique from any other BACnet® device object ID on the entire BACnet® network (not just the MS-TP sub-network).
- Time synchronization can be made through a network even if the controller does not support the full date. Therefore, the device cannot claim conformance to the DeviceManagement – TimeSynchronization - B (DM-TS-B) service. The device object does not have the Local_Time or Local_Date properties.
- Device Name and Device ID properties are writable in Viconics device objects. Both properties can be renamed from any BACnet® network management tool as long as the tool itself gives access to write to these properties.

## TROUBLESHOOTING

| Error / Fault | Possible Cause | Solution |
|---|---|---|
| Controller does not come online | Two or more controllers have the same MAC address. | Modify each duplicate address to a unique number. |
| | The MS-TP network has too many devices. | Do not exceed the maximum number of devices and maximum length allowed by the EIA-485 specifications. |
| | Too many devices were installed without any repeaters. | Repeaters must be installed |
| | The MS-TP cable runs are broken | Locate the break and correct the wiring. |
| | MS-TP connections at the module are reversed | Respect polarity of the wires on a MS-TP network. |
| | The controller does not have power | Apply power to the controller |

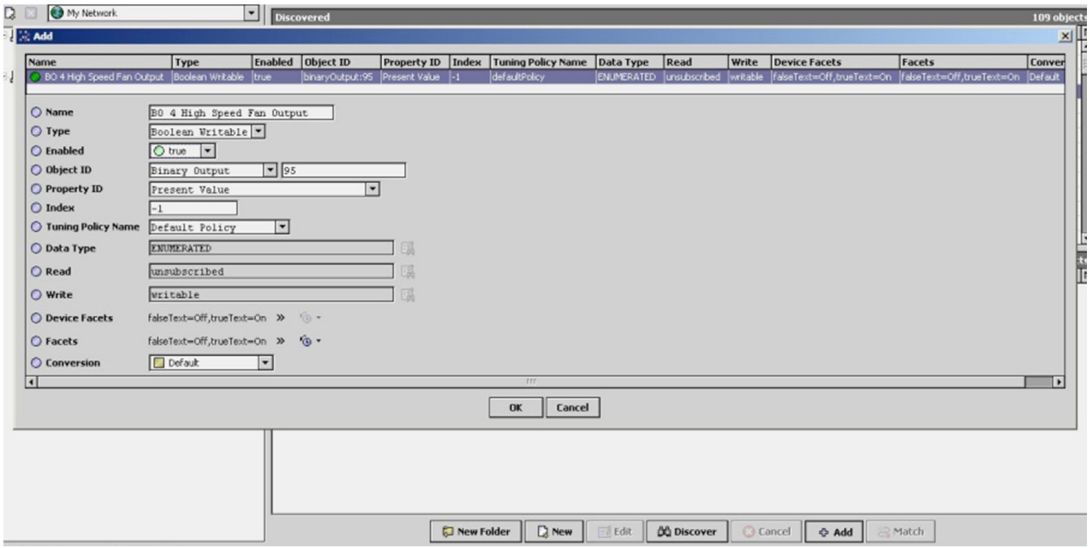
# APPENDIX A

## Important notice to all Niagara integrators

For all intents and purposes, BO95 / BO4 High Speed Fan Output is used on all examples below.
Where BO95 is the object BACnet instance and BO 4 is the terminal location on the controller

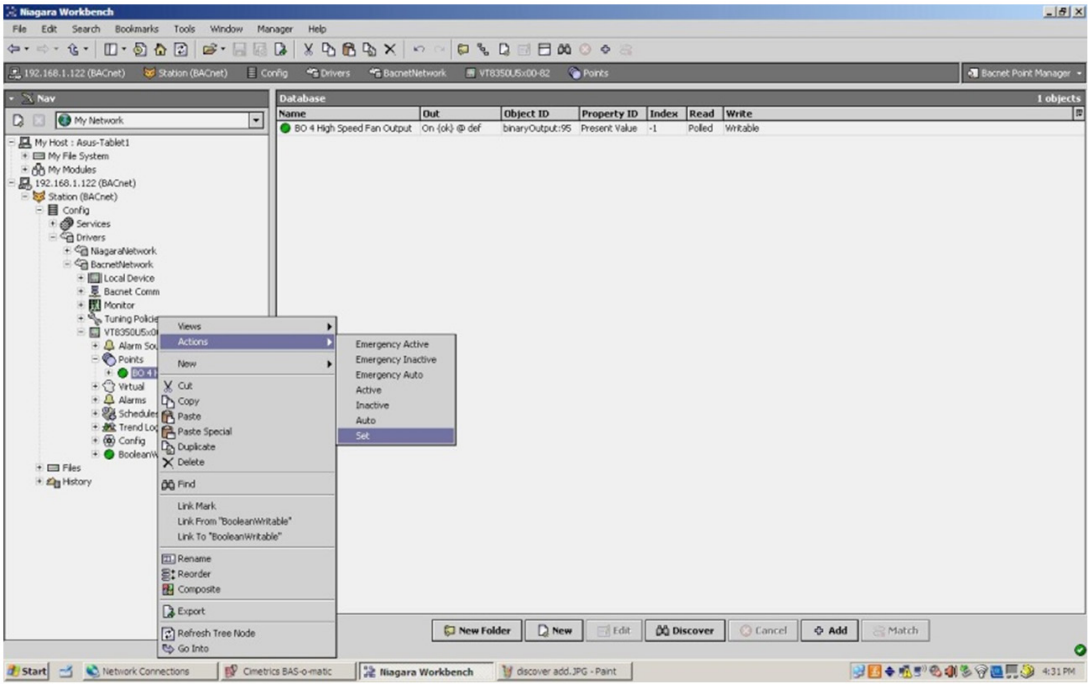
### Using native Niagara Set Command for an object

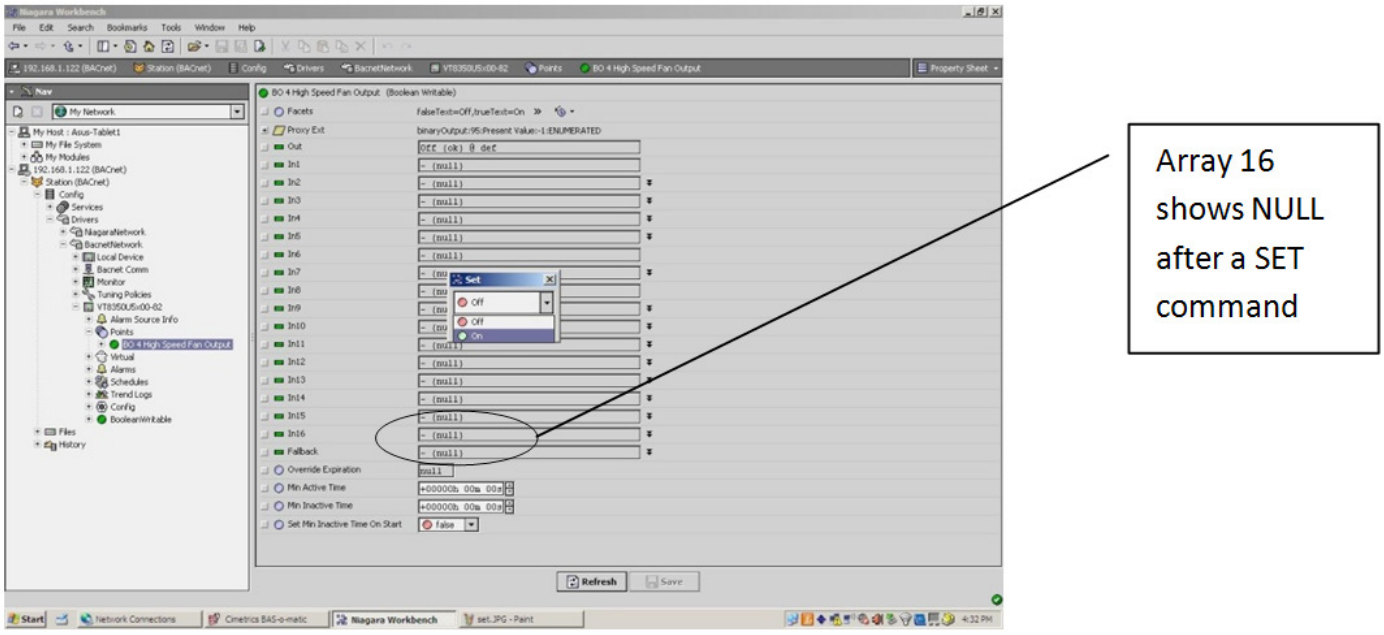
Typically when BACnet device objects are discovered under a BACnet device in Niagara, objects are proxied under the local server database using standard Niagara device and object management processes.




As such using the simple add object command, Niagara creates local proxy extensions of certain of the object properties including the BACnet object present value.

When using the “set” command under Niagara, the local server issues a BACnet write command to the controller **without** specifying any specific priority array from 1 to 16. As per the BACnet standard, when a controller receives an unspecified write command, the controller automatically assigns it to priority array level 16.





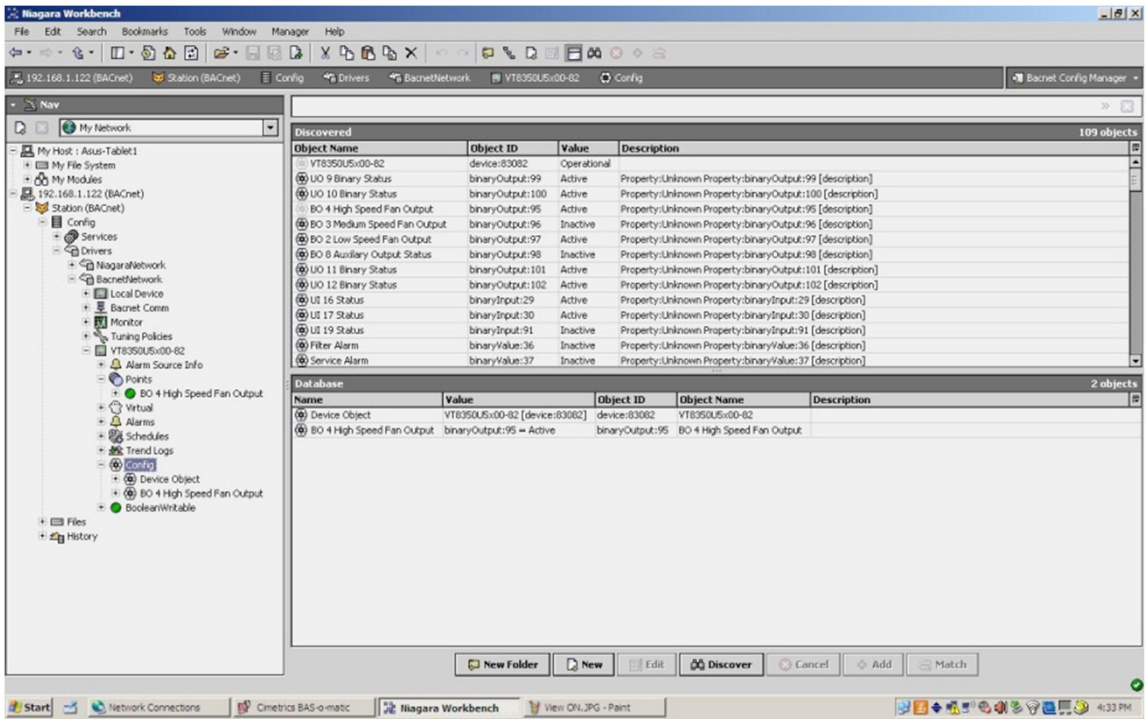

As such, the controller now has an entry in priority array 16 of an object which effectively **"overrides"** it and **by-passes** the local control application program.

The know issue with this is that by default, Niagara does not poll or update any of the priority arrays of an object and it is NOT reflected under the proxied object property sheet.

So although you do see the real present value of the object under present value "Out" extension of the object, the displayed priority array 16 "In16" shows a value of NULL. But in effect, it is not NULL.

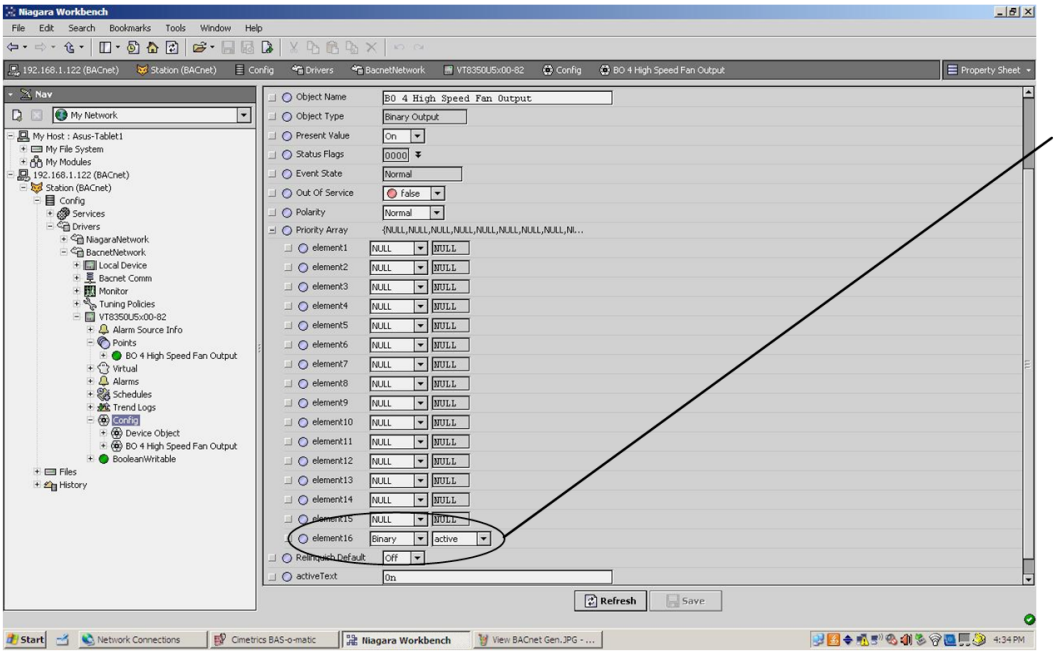
**Viewing if a BACnet array 1 to 16 is actually being used**

The only way to positively confirm if a point has an entry in any of the 16 priority array levels is to use the Niagara BACnet "Config" view. Simply open the view and add the objects as needed.



Now to confirm if there is an entry, simply view the property sheet of the BACnet object.

In this view you will confirm an entry at level 16 or any other priority array level.

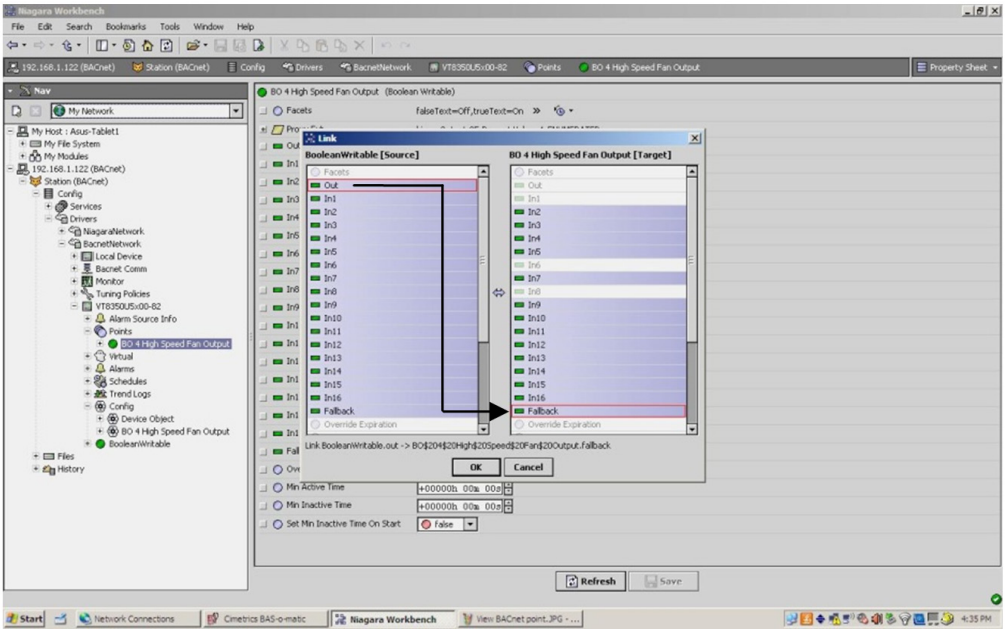


BACnet Array 16 shows the real controller value overriding the point after a set command

If the point was overridden by accident and the normal controller operation is required and desired, simply set the overridden priority array to NULL to resume the controller normal operation under the relinquish default property value.

**Binding to a point using the Fallback**

Caution need to be taken when binding objects to specific server logic for central control and applications. The same cautions that apply to the “set” command apply to the binding of a point using the Niagara “fallback” proxy extension.



Binding a logic block or function to the “fallback” sets the same behaviour as using the Niagara “set” command. The local server issues a BACnet write command to the controller **without** specifying any

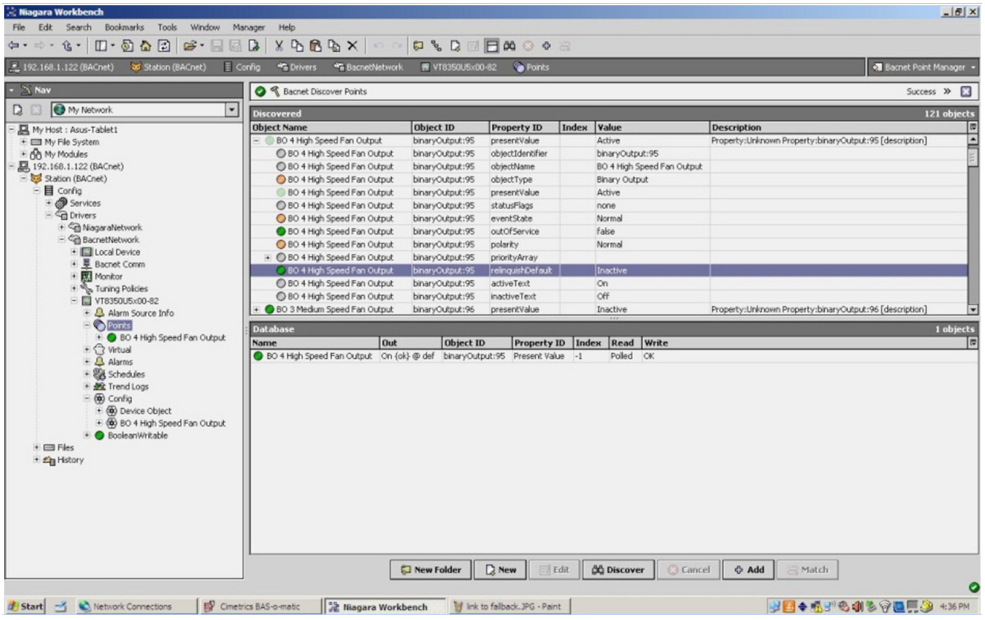
specific priority array from 1 to 16. As per the BACnet standard, when a controller receives an unspecified write command, the controller automatically assigns it to priority array level 16.

As such, the controller now has an entry in priority array 16 of an object which effectively **overrides** it and **by-passes** the local control application program.

If the intent of the central logic block or sequence is simply to reset local values and still allow local users to change certain settings (such as setpoints and system mode for example) then the easiest way is to bind the logic block to the BACnet relinquish default property value as described below.

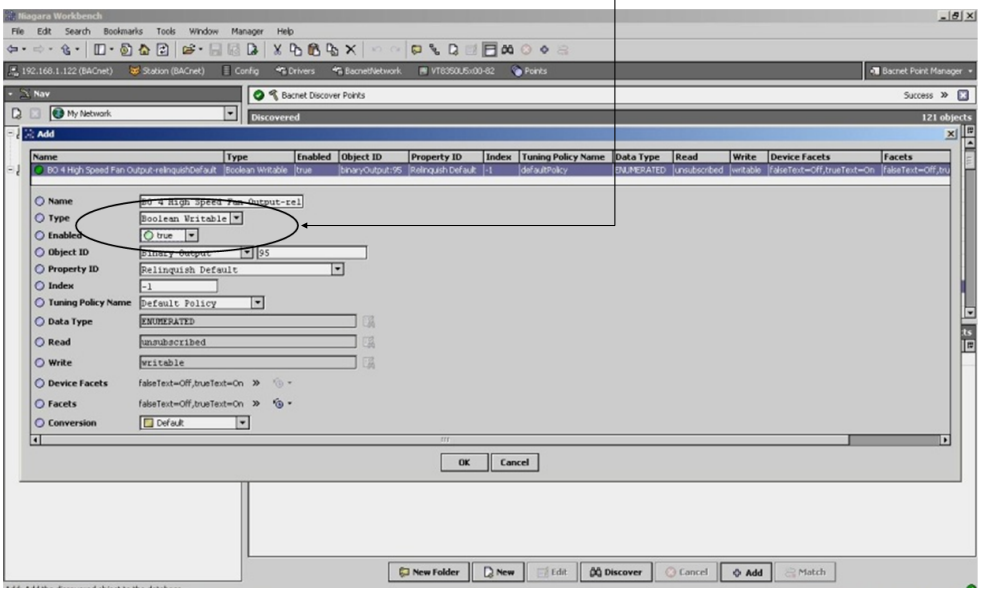
**Adding the relinquish default object property for binding**

In the Niagara point manager under the device, click on the plus (+) icon to expand all the options and properties of the desired object.




Locate the relinquish default property value and add it to the local server database of proxied objects.

Make sure it is added as a writable object and that it is enabled.



Now when binding your logic block simply point to the relinquish default property of an object at the “fallback” value. This will directly issue the write command to the relinquish default property value insuring you are not locking down the application at priority array 16.