Honeywell

BACnet Integration Manual for TB7200 & TB7300 Series Thermostats

INTEGRATION MANUAL

TB7200 Series Thermostat

TB7300 Series Thermostat with Occupancy Sensor

More information

The additional following documentation is available on http://customer.honeywell.com.

- TB7200 Series Installation Instructions (form number 62-2019).
- TB7300 Series Installation Instructions (form number 62-2018).
- PIR Application Guide for TB7200 and TB7300 Series Thermostats (form number 63-4526).

PRODUCT OVERVIEW

The TB7200 Series PI thermostats are designed for zoning applications, and the TB7300 Series PI thermostats are designed for fan coil control. Both Series are communicating thermostats with models available in BACnet® MS/TP protocol and can be easily integrated into a WEBs-AX building automation system based on the NiagaraAX® platform.

TB7200 and TB7300 Series thermostats are compatible with the Honeywell Occupancy Sensor Cover. Thermostats equipped with an occupancy sensor cover provide advanced active occupancy logic, which will automatically switch occupancy levels from Occupied to Stand-By and Unoccupied as required by local activity being present or not. This advanced occupancy functionality provides advantageous energy savings during occupied hours without sacrificing occupant comfort. All thermostats can be ordered with or without a factory installed PIR cover.

Contents

COMPATIBILITY

Honeywell TB7200 and TB7300 Series thermostat compatiblity information is provided in Table 1.

Table 1. TB7200 Series and TB7300 Series Thermostat Compatibility Information

WEBs-AX Controller	Thermostats Per Controller*	WEBStation-AX
WEB-2xx	126	3.0 or later
WEB-6xx	126	3.0 or later
WEB-7xx	126	3.5

* 128 total devices supported. One node used by controller and one for a repeater. A repeater is required if more than 64 devices are on a bus.

TIPS AND THINGS YOU NEED TO KNOW

- Each thermostat is delivered from the factory with the default MAC address set at 254. At this value, BACnet communication is NOT active and the device will not participate in the token pass either. The local LED status for the communication adapter at this point is one short flash only. To enable BACnet communication, set the local MAC address configuration property of the thermostat to any valid value from 0 to 127.

- After the initial configuration of your device and if your BAS allows you to remove objects, we suggest that you remove all the configuration objects to prevent unnecessary polling of non used objects and to help speed up the network.

- All configuration objects are available and accessible locally from the device itself using the local configuration routine. Please refer to the PIR Application Guide for TB7200 and TB7300 Series Thermostats (form number 63-4526).

- In its default mode of operation, the device will automatically match its baud rate to the baud rate of the network. Automatic baud rate detection will occur when the MS/TP communication port is initialized (on power up). If the network speed is changed, the device will keep listening at the previously detected speed for 10 minutes before resuming auto-bauding. Re-powering the devices will force immediate auto-bauding.

- Enumeration sets for System Mode MV16 depends on Sequence of Operation (MV15) value upon device discovery. If required enumerations are not present, set MV15 to desired value and rediscover MV16 object. Available enumeration will now reflect required configuration.

- Enumeration sets for MV16 depends on Fan Mode Sequence (MV58) value upon device discovery. If required enumerations are not present, set MV58 to desired value and rediscover MV16 object. Available enumeration will now reflect required configuration.

- Enumeration sets for MV26 and MV27 depend on Control Type (BV75) value and Pipe Number (MV52) value upon device discovery. If required enumeration is not present, set BV75 and MV52 to desired value and rediscover MV26 and BV27 object. Available enumeration will now reflect required configuration.

- If the device should go off-line, the following binded thermostat parameters will be 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 (i.e. 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 (i.e. not just the MS/TP sub-network).

- To assign a Room Temperature (AV7) value manually, users must first enable the Override mode in the Room Temp Override (BV8) object.

- Device Name and Device ID properties are writable in Honeywell device object. Both properties can be renamed from any BACnet network management tool as long as the tool itself give access to write to these properties.

WIRING GUIDELINES

Overview

Honeywell uses EIA-485 as the physical layer between their devices and supervisory controllers

For clarity we will use the term "Device" to represent any product with an active EIA-485 network connection, including Honeywell and non-Honeywell thermostats.

Table 2. Summary of Specifications for a Honeywell EIA-485 Network

Parameter	Details
Media	Twisted pair 22AWG-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)
Polarity	Polarity sensitive
Multi-drop	Daisy-chain (no T connections)
Terminations	1. **TB7200, TB7300 and/or TB7600 Series thermostat devices are installed at both ends of the MS/TP network:** 120 Ohms resistor should be installed at each end. 2. **A TB7200, TB7300 or TB7600 Series thermostat is installed at one end of the MS/TP network and another device is installed at the other end:** Install an End-Of-Line resistor value that matches the other device's instructions regarding the End-Of-Line resistors 3. **Other devices are installed at both ends of the MS/TP network:** Follow the other device's instructions regarding the End-Of-Line resistors.
Maximum number of nodes per segment	64 (Honeywell devices only)
Maximum number of nodes per network	128
Baud rate	9600, 19200, 38400, 76800 (Auto detect)

Cable Type

Honeywell recommends the use of balanced 22-24 AWG twisted pair with a characteristic impedance of 100-130 ohms, 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?and 120?. However using120? will result in a lighter load on the network.

Capacitance (pF/ft)

The amount of equivalent capacitive load of the cable, typically listed in a per foot basis. One of the factors limiting total cable length is the capacitive load. Systems with long lengths benefit from using low capacitance cable (i.e. 17pF/ft or lower).

NETWORK CONFIGURATION

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

Figure 1 illustrates two improper network configurations and the proper daisy chain configuration.

Other methods of wiring an EIA-485 network may give unreliable and unpredictable results. There are no troubleshooting methods for these types of networks. Therefore, a great deal of site experimentation may have to be done, making this a difficult task with no guarantee of success. Honeywell will only support daisy chain configurations.
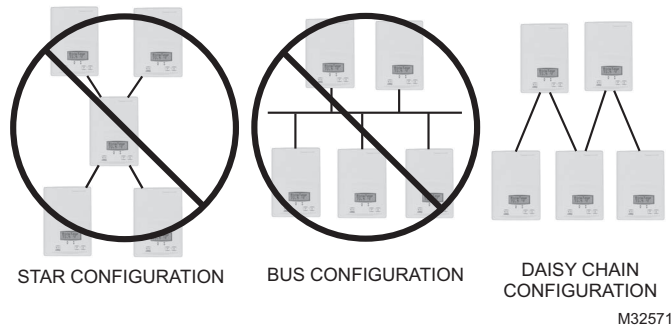

STAR CONFIGURATION   BUS CONFIGURATION   DAISY CHAIN CONFIGURATION

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**Fig. 1. Three different network configurations: star, bus, and daisy chain.
Only the daisy chain configuration is correct for an EIA-485 network.**

Maximum Number of Devices

A maximum of 64 nodes is allowed on a single daisy chain segment. A node is defined as any device (controller, thermostat, repeater, etc.) connected to the RS485 network. Terminators do not count as a node.

NOTE: Biasing is not required with this series of devices.

To determine the number of nodes on a network, add the following:

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

For the example in Figure 2, we have one node for the controller, plus 4 for the thermostats for a total of 5 nodes.

END OF LINE RESISTOR DOES
NOT COUNT AS A NODE

EOL   EOL

SC

NODE 1

NODE 2   NODE 3   NODE 4   NODE 5

LEGEND
EOL: END OF LINE RESISTOR
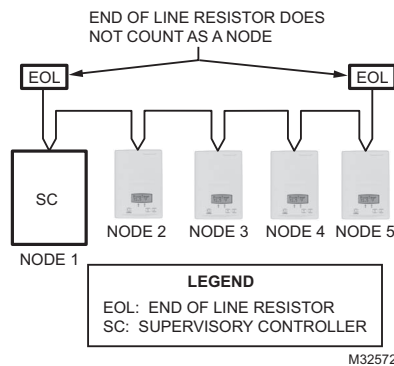SC: SUPERVISORY CONTROLLER

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Fig. 2. Five nodes network example.

If you have more than 64 devices, then repeaters are required 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 will only work reliably for data rates up to 100,000 bps. The maximum data rate is 76,800 bps for TB7200 and TB7300 Series thermostats.

If you require a maximum network length of more than 4000 feet, then 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, then repeaters are required to extend the network. The best configuration is to daisy chain the repeaters to the controller. From each of these repeaters, a separate daisy chain will branch off. Figure 3 demonstrates a valid use of repeaters in an EIA-485 network.

LEGEND
EOL: END OF LINE RESISTOR
R: RS485 REPEATER
SC: SUPERVISORY CONTROLLER

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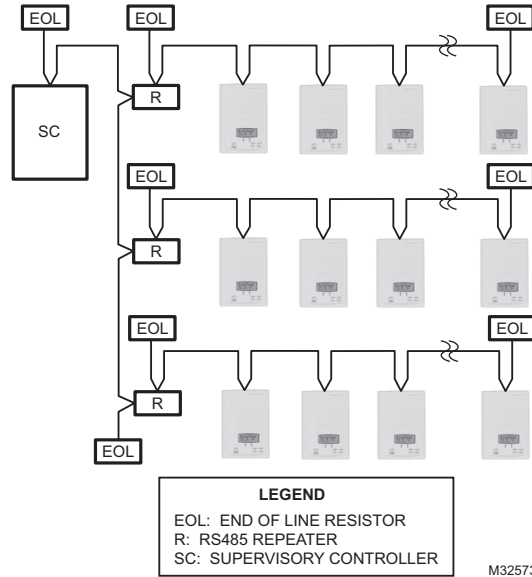
Fig. 3. Correct usage – repeaters are daisy chained to the supervisory controller and separate daisy chains branch from each repeater.

Do not install repeaters in series, as this may result in network reliability problems. Figure 4 demonstrates an incorrect use of a repeater in an EIA-485 network.

LEGEND
EOL: END OF LINE RESISTOR
R: RS485 REPEATER
SC: SUPERVISORY CONTROLLER

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Fig. 4. Incorrect usage – the second repeater in series may result in an unreliable system.

End Of Line (EOL) Resistors

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 MS/TP network configuration, the resistance value of the EOL resistor may change:
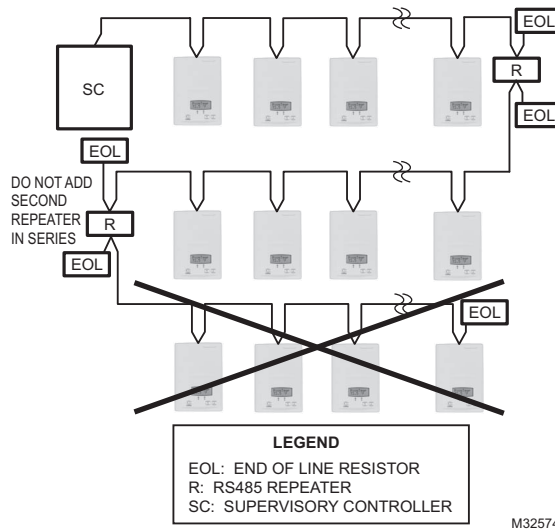
- TB7200, TB7300, or TB7600 Series devices are installed at both ends of the MS/TP network:
- 120 Ohms resistor should be installed at each end.

- A TB7200, TB7300, or TB7600 device is installed at one end of the MS/TP network and another device is installed at the other end:
- Install an End-Of-Line resistor value that matches the other device's instructions regarding its EOL resistor value;

- Other devices are installed at both ends of the MS/TP network:
- Follow the other device's instructions regarding its EOL resistor value.

NETWORK ADAPTER

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 5 shows the proper MS/TP connections and the location of the Status LED. This Status LED may help to troubleshoot network problems.
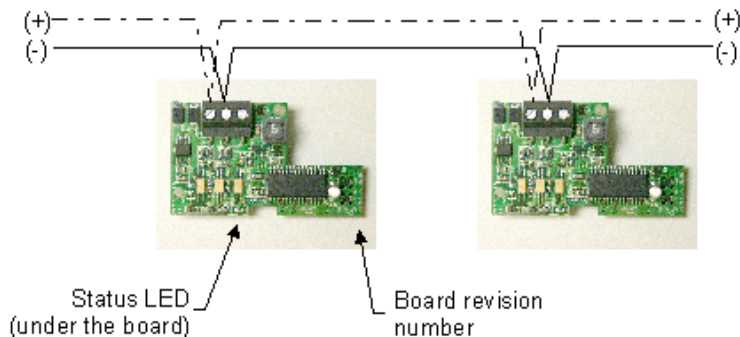

Fig. 5. Correct MS/TP connections and location of a Status LED on a BACnet module

IMPORTANT NOTE: The Ref terminal should **NEVER** be used to wire shields. The 2 shields from each feed of the network connection to a thermostat should be wired together in the back of the thermostat 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.

Network Adapter Status LED

Table 3 shows the different possibilities with the Status LED behavior for a BACnet module.

Table 3. Status LED condition and possible solutions.

Condition of the Status LED	Possible Cause	Solution
• 1 short blink	BACnet communication NOT active at default MAC address = 254	Change MAC address to another value from 0 to 127
• 2 short blink (no wires connected to the module)	The right module has been installed on the right thermostat model	N/A
• 2 short blink (wires connected to the module)	Module is not at the same baud rate as the network	Power off and on the thermostat
• 2 short blinks and a longer blink (wires connected to the module)	The module has detected the presence of a network	N/A
• Right after power is applied: 2 long blinks and then no blinking	Polarity has been reversed at the module	Reverse polarity at the module

INTEGRATION

Global Commands

The following figure shows which objects from the thermostat can be monitored and commanded from the BAS front-end.
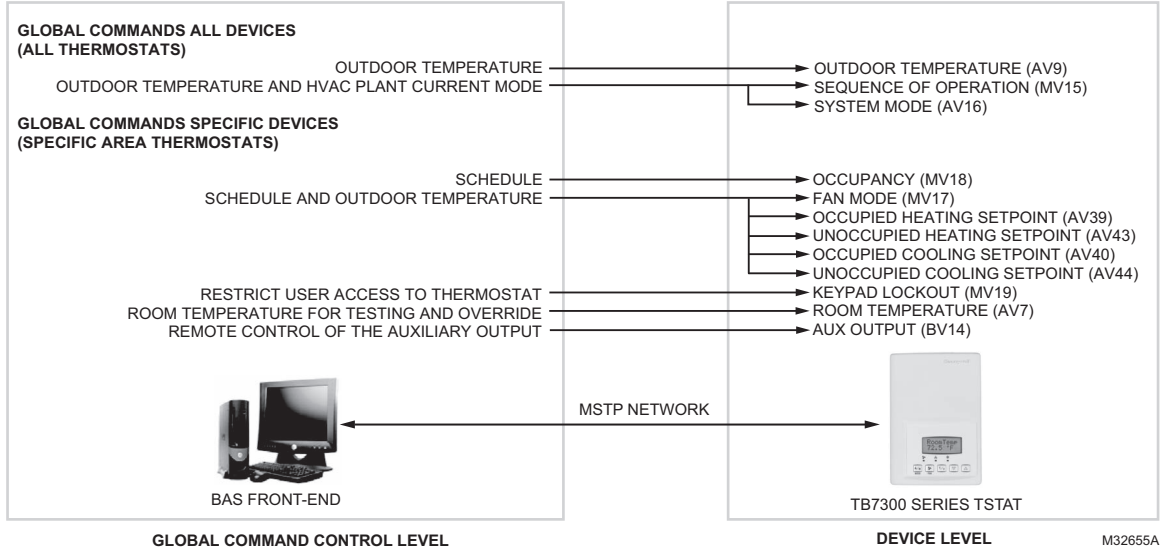
Fig. 6. Global commands from a BAS front-end to a typical TB7300 Series thermostat.

TB7200 Integration – Graphical User Interface (GUI) objects

The following objects should be typically used in a GUI:

- Room Temperature (AV7);
- Occupied and Unoccupied Heat Setpoints (AV 39 and AV43);
- Occupied and Unoccupied Cool Setpoints (AV 40 and AV34);
- Outdoor Temperature (AV 9);
- Supply Temperature (AI12) (If available);
- Occupancy Command (MV18);
- System Mode (MV16);
- Heating Valve Status (MV26);
- Cooling Valve Status (MV28);
- PI Heating Demand (AV21)
- PI Cooling Demand (AV22)
- Window Alarm (BI 35);
- Filter Alarm (BI 36);
- Service Alarm (BI 37)

Fig. 7. Example of graphical user interface objects.

TB7300 Integration – Graphical User Interface (GUI) Objects

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- Outdoor Temperature (AV 9);
- Supply Temperature (AI12) (If available);
- Occupancy Command (MV18);
- System Mode (MV16);
- Fan Mode (MV17);
- Fan Status (MV28);
- Heating Valve Status (MV26);
- Cooling Valve Status (MV28);
- PI Heating Demand (AV21);
- PI Cooling Demand (AV22);
- Window Alarm (BI 35);
- Filter Alarm (BI 36);
- Service Alarm (BI 37)

Fig. 8. Example of graphical user interface objects.

Configuration Objects

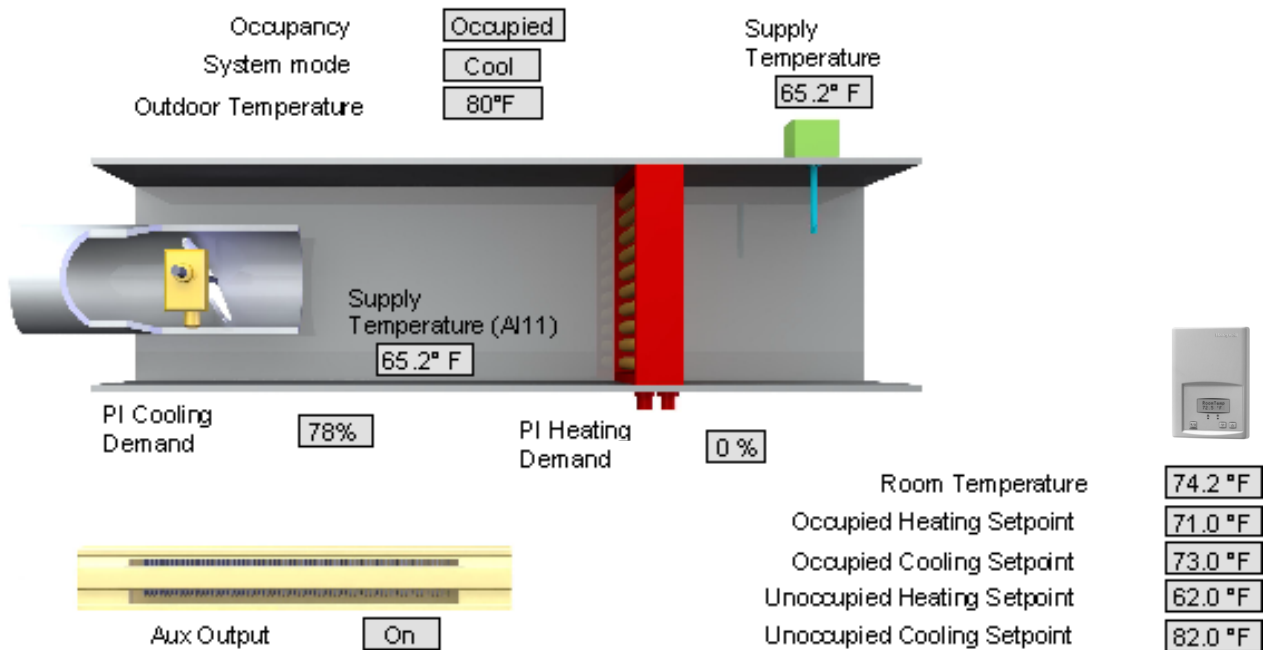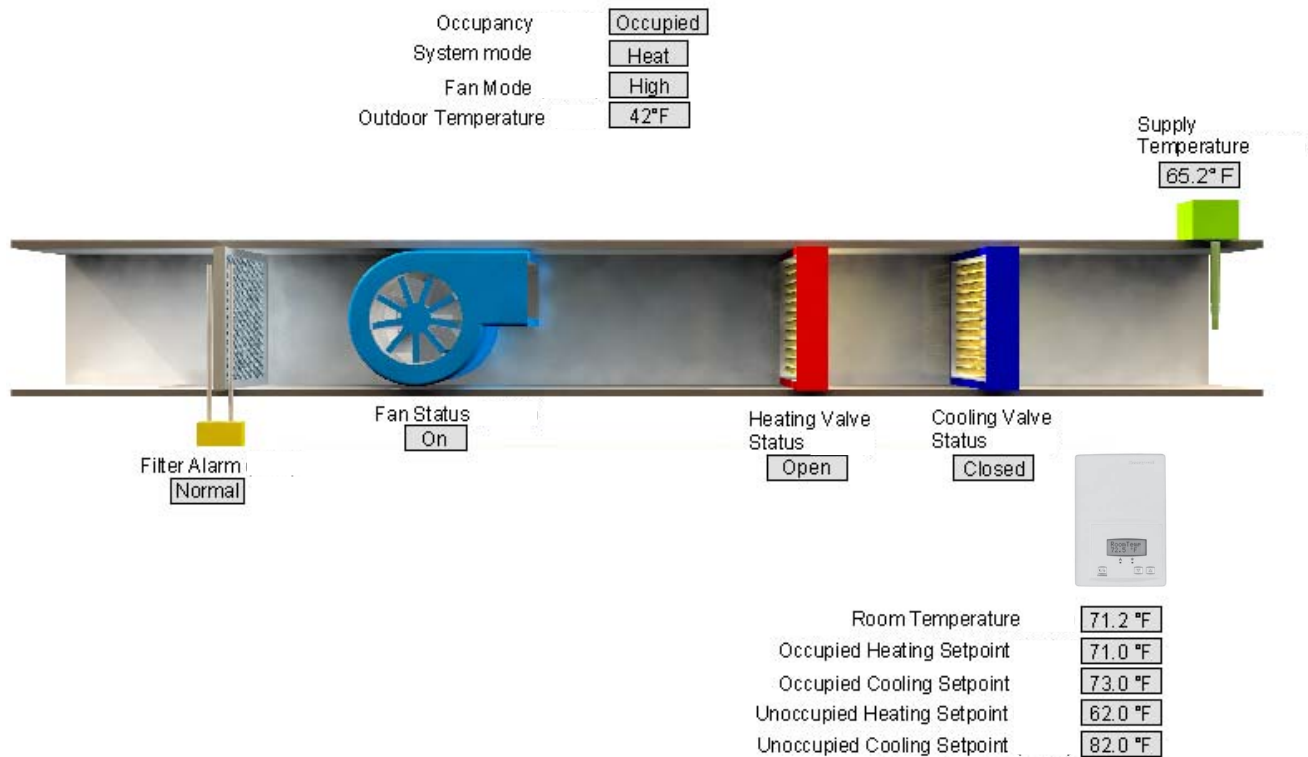The following objects and group objects should be typically used for configuration purposes:

- General Options 1 Group GRP 45 and its complete list of objects;
- General Options 2 Group GRP 55 and its complete list of objects;
- Output Configuration Options Group GRP 74 and its complete list of objects.

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

Default Device Name and default Device ID

Default **Device Name** is set to: Model number – MAC:

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

The device name will be upgraded as soon as there is a change to the device MAC address.

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

TB7200 Models

Default **Device ID** is set to: 72000 + MAC

- Where MAC is the current MAC address of the device.

The device ID will also be upgraded as soon as there is a change to the device's MAC.

For example, when a TB7200F5014B thermostat with a MAC address of 41 is connected to a network, its default Device Name will be TB7200F5x14B-41 and its default Device ID will be 72041.

TB7300 Models

Default **Device ID** is set to: 73000 + MAC

- Where MAC is the current MAC address of the device.

The device ID will also be upgraded as soon as there is a change to the device's MAC.

For example, when a TB7300C5014B thermostat with a MAC address of 63 is connected to a network, its default Device Name will be TB7300C5x14B-63 and its default Device ID will be 73063.

Integrating Honeywell Devices on an MS/TP Network

Before doing any BACnet integration, make sure to have Honeywell PICS (Protocol Implementation Conformance Statement).

This PICS document lists all the BACnet Services and Object types supported by a device and can be found at **http://customer.honeywell.com**.

Honeywell 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 Honeywell's end, 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 Honeywell object.

Graphical interfaces

For example, some graphic interface might poll every data linked to the graphic page on a COV basis. If the 3rd party device does not support COV, the graphic interface then 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. Honeywell strongly recommends a polling interval of 5 seconds minimum for any graphic interface. This becomes even more critical in area graphics where a single representation might poll many devices. If proper poll rate is not respected, devices may be reported offline by certain front end by saturating the traffic handling capacity of BACnet MS/TP without COV subscription.

Free programmed object or loops

As for the application program, you might want to read and write any MS/TP data on an "If Once" basis or a "Do Every" loop basis instead of reading or writing to a 3rd party device's object directly in the program. Otherwise, any read or write request will occur at the Supervisory Controller's program scan rate, which might as well be in hundredths of milliseconds. This can easily bog down a network as single commands can be sent to <u>all </u>ASC devices down the MS/TP trunks every hundredth of milliseconds

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

If Once Schedule = On then		Do Every 5min
MV13 = Occupied		If Schedule = On Then
End If		MV13= Occupied
If Once Schedule = Off Then	OR	Else
MV13 = Unoccupied		MV13 = Unoccupied
End If		End If
		End Do

Retries and Timeouts

Another thing to look for in a BACnet integration is the Device object of the Supervisory Controller (and the Operator's Workstation). This object contains the 2 following required properties: Retry Timeout and Number of APDU Retries.

1. The Retry Timeout property specifies the time between re-transmissions if the acknowledgement has not been received. When you are experiencing problems with controllers dropping off-line, increasing this value may help.

2. The Number of APDU Retries property specifies the number of times unsuccessful transmissions will be 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 thermostats does not reply to a Supervisory Controller (SC) request, and the SC's Retry Timeout is set to 2000 msec and the Number of APDU Retries is set to 1 (still at the SC level), then the SC will send one other request, 2 sec later. If the MS/TP device does not reply, it will be considered Off-line by the workstation.

So having a Retry Timeout value of 10000 msec and a Number of APDU Retries property set to 3 at the SC level may prevent device from dropping Off-line. These properties should also be changed at the Workstation level since the workstation will likely issue requests to any MS/TP devices when the graphics are used.

TROUBLESHOOTING

Error / Trouble Condition	Possible Cause	Solution
Thermostat 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 need to be installed as specified in this document.
	The MS/TP cable runs are broken	Locate the break and correct wiring
	MS/TP connections at the module are reversed	Respect polarity of the wires on a MS/TP network.
	The thermostat does not have power	Apply power to the thermostat

APPENDIX

TB7200 & TB7300 Series Protocol Implementation Conformance Statement (PICS)

Vendor Name: Honeywell

Product Name: TB7200 and TB7300 Series Thermostats

TB7200 Product Description

The TB7200 series BACnet communicating thermostat has been specifically designed for zoning applications to be monitored on a BACnet MS-TP® network.

TB7200 Product Model Number: TB7200C5x14B and TB7200F5x14B

TB7300 Product Description

The TB7300 series BACnet communicating thermostat has been specifically designed for zoning and fan coil applications to be monitored on a BACnet MS-TP® network.

TB7300 Product Model Number: TB7300A5x14B, TB7305A5x14B, TB7300C5x14B, TB7305C5x14B, TB7300F5x14B, and TB7305F5x14B

Supported BACnet Services

The BACnet communicating thermostat meets all requirements for designation as an Application Specific Controller (B-ASC). The BACnet thermostat series supports the following BACnet Interoperability Building Blocks (BIBBs).

Application Service	Designation
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
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

NOTE: The thermostat does not support segmented requests or responses.

BACNET OBJECTS SUPPORTED

Device Objects

Table 4. Device Objects.

Object Name	Type and Instance	Object Property	Thermostat Parameter
TB7200X5x14B TB73xxX5X14B	Device	Object_Identifier Property 75 (R,W)	Unique ID number of a device on a network.
		Object_Name Property 77 (R,W)	Unique name of a Device on a network.
		Model Name Property 70 (R)	Thermostat Model number.
		Firmware Revision Property 44 (R)	Current BACnet firmware revision used by the thermostat.
		Protocol Version Property 98 (R)	Current BACnet firmware protocol version. Default is Version 1.
		Protocol Revision Property 139 (R)	Current BACnet firmware protocol revision. Default is Version 2.
		Max ADPU Length Property 62 (R)	Maximum ADPU Length accepted Default is 244
		ADPU Timeout Property 10 (R)	ADPU timeout value Default is 60,000 ms
		Application-Software-Version Property 12 (R)	Thermostat base application software version. Default is based on current released version
		Max_Master (R,W)	Maximum master devices allowed to be part of the network. 0 to 127, default is 127.
		MS/TP_Address Property 1001 (R,W)	BACnet MS-TP MAC Address. Proprietary attribute. Default is as assigned by configuration.
		MS/TP_Baud_Rate Property 1002 (R,W)	BACnet MS-TP Baud-Rate. Proprietary attribute. Range is: 1 = 9.6 KBps, 2 = 19.2 KBps, 3 = 38.4 KBps, 4 = 76.8 KBps and 5 = Auto Baud Rate. Index 5 is *Write only*. Reading attribute will state current Baud rate used. Writing index 1 to 4 will fix the Baud rate to the desired value.

Objects Table

Table 5. Objects.

Object Name	Type and Instance	Object Property	TB7200C5x14B	TB7200F5x14B	TB7300A5x14B	TB7305A5x14B	TB7300C5x14B	TB7305C5x14B	TB7300F5x14B	TB7305F5x14B
Room Temperature	AV 7	Present_Value (R,W)	√	√	√	√	√	√	√	√
Room Temp Override	BV 8	Present_Value (R,W)	√	√	√	√	√	√	√	√
Outdoor Temperature	AV 9	Present_Value (R,W)	√	√	√	√	√	√	√	√
Supply Temperature	AI 12	Present_Value (R)	√	√	√	√	√	√	√	√
AUX Command	BV 14	Present_Value (R,W)	√	√	√	√	√	√	√	√
Sequence of Operation	MV 15	Present_Value (R,W)	√	√	√	√	√	√	√	√
System Mode	MV 16	Present_Value (R,W)	√	√	√	√	√	√	√	√
Fan Mode	MV 17	Present_Value (R,W)			√	√	√	√	√	√
Occupancy Command	MV 18	Present_Value (R,W)	√	√	√	√	√	√	√	√
Keypad Lockout	MV 19	Present_Value (R,W)	√	√	√	√	√	√	√	√
Control Output	GRP 20	Present_Value (R)	√	√	√	√	√	√	√	√
PI Heating Demand	AV 21	Present_Value (R)	√	√	√	√	√	√	√	√
PI Cooling Demand	AV 22	Present_Value (R)	√	√	√	√	√	√	√	√
Controller Status	GRP 24	Present_Value (R)	√	√	√	√	√	√	√	√
AUX Status	BI 25	Present_Value (R)	√	√	√	√	√	√	√	√
Heating Valve Status	MV 26	Present_Value (R)	√	√	√	√	√	√		
Cooling Valve Status	MV 27	Present_Value (R)	√	√	√	√	√	√		
Fan Status	MV 28	Present_Value (R)			√	√	√	√	√	√
BI 1 Status	BI 29	Present_Value (R)	√	√	√	√	√	√	√	√
BI 2 Status	BI 30	Present_Value (R)	√	√	√	√	√	√	√	√
UI 3 Status	BI 31	Present_Value (R)	√	√	√	√	√	√	√	√
Local Motion	BI 32	Present_Value (R)	√	√	√	√	√	√	√	√
Effective Occupancy	MV 33	Present_Value (R)	√	√	√	√	√	√	√	√
Controller Alarms	GRP 34	Present_Value (R)	√	√	√	√	√	√	√	√
Window Alarm	BI 35	Present_Value (R)	√	√	√	√	√	√	√	√
Filter Alarm	BI 36	Present_Value (R)	√	√	√	√	√	√	√	√
Service Alarm	BI 37	Present_Value (R)	√	√	√	√	√	√	√	√

Table 5. Objects. (Continued)

Object Name	Type and Instance	Object Property	TB7200C5x14B	TB7200F5x14B	TB7300A5x14B	TB7305A5x14B	TB7300C5x14B	TB7305C5x14B	TB7300F5x14B	TB7305F5x14B
Temperature Setpoints	GRP 38	Present_Value (R)	√	√	√	√	√	√	√	√
Occupied Heat Setpoint	AV 39	Present_Value (R,W)	√	√	√	√	√	√	√	√
Occupied Cool Setpoint	AV 40	Present_Value (R,W)	√	√	√	√	√	√	√	√
Stand-by Heat Setpoint	AV 41	Present_Value (R,W)	√	√	√	√	√	√	√	√
Stand-by Cool Setpoint	AV 42	Present_Value (R,W)	√	√	√	√	√	√	√	√
Unoccupied Heat Setpoint	AV 43	Present_Value (R,W)	√	√	√	√	√	√	√	√
Unoccupied Cool Setpoint	AV 44	Present_Value (R,W)	√	√	√	√	√	√	√	√
General Options 1	GRP 45	Present_Value (R)	√	√	√	√	√	√	√	√
BI 1 Configuration	MV 46	Present_Value (R,W)	√	√	√	√	√	√	√	√
BI 2 Configuration	MV 47	Present_Value (R,W)	√	√	√	√	√	√	√	√
UI 3 configuration	MV 48	Present_Value (R,W)	√	√	√	√	√	√	√	√
Menu Scroll	BV 49	Present_Value (R,W)	√	√	√	√	√	√	√	√
Auto Mode Enable	BV 50	Present_Value (R,W)			√	√	√	√	√	√
Temperature Scale	BV 51	Present_Value (R,W)	√	√	√	√	√	√	√	√
Pipe Number	MV 52	Present_Value (R,W)			√	√	√	√	√	√
Out#1 Config	MV 53	Present_Value (R,W)	√	√						
AUX Configuration	MV 54	Present_Value (R,W)	√	√	√	√	√	√	√	√
General Options 2	GRP 55	Present_Value (R)	√	√	√	√	√	√	√	√
Password Value	AV 56	Present_Value (R,W)	√	√	√	√	√	√	√	√
Fan Mode Sequence	MV 58	Present_Value (R,W)			√	√	√	√	√	√
Heating Setpoint Limit	AV 58	Present_Value (R,W)	√	√	√	√	√	√	√	√
Cooling Setpoint Limit	AV 59	Present_Value (R,W)	√	√	√	√	√	√	√	√
Setpoint Type	BV 60	Present_Value (R,W)	√	√	√	√	√	√	√	√
Setpoint Function	BV 61	Present_Value (R,W)			√	√	√	√	√	√
Temporary Occupancy Time	MV 62	Present_Value (R,W)	√	√	√	√	√	√	√	√
Deadband	AV 63	Present_Value (R,W)	√	√	√	√	√	√	√	√
Reheat Time Base	BV 64	Present_Value (R,W)	√	√	√	√	√	√	√	√
Proportional Band	MV 65	Present_Value (R,W)	√	√	√	√	√	√	√	√
Auto Fan	BV 66	Present_Value (R,W)			√	√	√	√	√	√
Stand-by Time	AV 67	Present_Value (R,W)	√	√	√	√	√	√	√	√
Unoccupied Time	AV 68	Present_Value (R,W)	√	√	√	√	√	√	√	√

Table 5. Objects. (Continued)

Object Name	Type and Instance	Object Property	TB7200C5x14B	TB7200F5x14B	TB7300A5x14B	TB7305A5x14B	TB7300C5x14B	TB7305C5x14B	TB7300F5x14B	TB7305F5x14B
Output Configuration Options	GRP 74	Present_Value (R)	√	√	√	√	√	√	√	√
Control type	BV 75	Present_Value (R,W)	√				√	√		
Floating Motor timing	MV 76	Present_Value (R,W)	√				√	√		
On Off Control CPH	MV 77	Present_Value (R,W)	√		√	√	√	√		
Direct Reverse Acting	BV 78	Present_Value (R,W)		√					√	√

Standard Object Types Supported

Table 6. Standard object types supported.

Object Type	Supported Objects	Dynamically Creatable	Dynamically Deletable	Optional Properties Supported	Writable Properties
Analog Input	☑	☐	☐	Reliability	Out_of_Service
Analog Value	☑	☐	☐	Reliability	Present_Value[a,b] Out_of_Service[a] Object_Name[c]
Binary Input	☑	☐	☐	Reliability Active_Text Inactive_Text	Out_of_Service
Binary Value	☑	☐	☐	Reliability Active_Text Inactive_Text	Present_Value Out_of_Service
Device	☑	☐	☐	Max_Master Max_Info_frames	Object_Identifier Object_name Max_Master
Group	☑	☐	☐	N/A	N/A
Multi-state Value	☑	☐	☐	Reliability States_Text	Present_Value[d] Out_of_Service[d]

[a] Present_Value and Out_of_Service properties are writable for every AV objects except :
- PI Heating Demand (AV21)
- PI Cooling Demand (AV22)

[b] Present_Value property for Room Temperature (AV7) is writable only if Room Temp Override (BV8) is enabled.

[c] Object_Name property is writable for the following object only :
- Room Temperature (AV7)

[d] Present_Value and Out_of_Service properties are writable for every MV objects except :
- Heating Valve Status (MV26)
- Cooling Valve Status (MV27)
- Fan Status (MV28)
- Effective Occupancy (MV33)

List of Proprietary Properties

Table 7. Proprietary Properties.

Property name	ID	BACnet Data type	Description
Major_Version	1000	CharacterString	The version number of the BACnet communications module. This is the hardware version number
MS/TP_Address	1001	Unsigned	Display the MAC layer address of the module
MS/TP_Baud_Rate	1002	Unsigned	Display the communication baud rate of the module
Sensor_Offset	1005	REAL	Display the temperature calibration value. The temperature range is –5.0 ºF to 5.0 ºF.

Property Value Range Restrictions

Table 8. Property value range restrictions.

Object name	Object Type and instance	Minimum range value	Maximum range value	Default value
Room Temperature	AV 7	-39.9°F (-40°C)	121.9°F (50°C)	N/A
Outdoor Temperature	AV 9	-39°F (-40°C)	121.9°F (50°C)	N/A
Supply Temperature	AI 12	-39.9°F (-40°C)	121.9°F (50°C)	N/A
PI Heating demand	AV 21	0%	100%	0%
PI Cooling demand	AV 22	0%	100%	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)	74°F (24°C)
Stand-by Heat Setpoint	AV 41	40°F (4.5°C)	90°F (32°C)	72°F (22°C)
Stand-by Cool Setpoint	AV 42	54°F (12°C)	100°F (37.5°C)	74°F (24°C)
Unoccupied Heat Setpoint	AV 43	40°F (4.5°C)	90°F (32°C)	62°F (16.5°C)
Unoccupied Cool Setpoint	AV 44	54°F (12°C)	100°F (37.5°C)	80°F (26.5°C)
Password Value	AV 56	0	1000	0
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)
Deadband	AV 63	2°F (1°C)	5°F (2.5°C)	2°F (1°C)
Stand-by Time	AV 67	0.5 Hours	24.0 Hours	0.5 Hours
Unoccupied Time	AV 68	0.0 Hours	24.0 Hours	0.0 Hours

Property Enumeration Sets for BV & BI Objects

Table 9. Property enumeration sets for BV and BI objects.

Object Name	Object Type and Instance	Inactive_Text	Active_Text	Default value
Room Temp Override	BV 8	Normal	Override	Normal
AUX Command	BV 14	Off	On	Off
Aux Status	BI 25	Off	On	Off
BI 1 Status	BI 29	Deactivated	Activated	Deactivated
BI 2 Status	BI 30	Deactivated	Activated	Deactivated
UI 3 Status(*)	BI 31	Deactivated	Activated	Deactivated
Local Motion	BI 32	No Motion	Motion	No Motion
Window Alarm	BI 35	Off	On	Off
Filter Alarm	BI 36	Off	On	Off
Service Alarm	BI 37	Off	On	Off
Menu Scroll	BV 49	No Scroll	Scroll Active	Scroll Active
Auto Mode Enable	BV 50	Disabled	Enabled	Enabled
Temperature Scale	BV 51	°C	°F	°F
Setpoint Type	BV 60	Permanent	Temporary	Permanent
Setpoint Function	BV 61	Dual Setpoints	Attached Setpoints	Dual Setpoints
Reheat Time Base	BV 64	15 minutes	10 seconds	15 minutes
Auto Fan	BV 66	Auto Speed	Auto Speed / Auto Demand	Auto Speed
Control Type	BV 75	On/Off	Floating	On/Off
Direct/ Reverse Acting	BV 78	Direct Acting	Reverse Acting	Direst Acting

(**) This object will be linked to the value of the "UI 3 Configuration" object. When the "UI 3 Configuration" object value is 0, 3 or 4, the value will be set to "Deactivated."

Enumeration Sets for MV Objects

Table 10. Property enumeration sets for MV objects.

Object Name	Object ID	BACnet Index	Text	Default value
Sequence of Operation	MV 15	1	Cooling Only	Heating Only
		2	Heating Only	
		3	Cooling & Reheat	
		4	Heating & Reheat	
		5	Cool/Heat4P	
		6	Cool/Heat4P&Reht	
System Mode **Note 1**	MV 16	1	Off	**Note 2**
		2	Auto	
		3	Cool	
		4	Heat	
Fan Mode **Note 3**	MV 17	1, 2, 3 or 4	**Note 4**	**Note 5**
Occupancy Command	MV 18	1	Local Occupancy	Depends on network command
		2	Occupied	
		3	Unoccupied	
Keypad Lockout	MV 19	1	Level 0	Level 0
		2	Level 1	
		3	Level 2	
		4	Level 3	
		5	Level 4	
		6	Level 5	

NOTES:
1. Enumeration sets for MV16 depends on Sequence of Operation (MV15) value upon device discovery. If required enumeration is not present, set MV15 to desired value and rediscover MV16 object. Available enumeration will now reflect required configuration.
2. Default value of MV16 depends on MV15 value upon device discovery**.**

MV15 Index	Function	Default Value is BV50 Enabled	Default Value is BV50 Disabled
1	Cooling Only	Cool	Cool
2	Cooling with Reheat	Auto	Heat
3	Heating Only	Heat	Heat
4	Heating with Reheat	Heat	Heat
5	Cooling/Heating 4 Pipes	Auto	Heat
6	Cooling/Heating 4 Pipes with Reheat	Auto	Heat

3. Enumeration sets for MV17 depends on Fan Mode Sequence (MV58) value upon device discovery. If required enumeration is not present, set MV58 to desired value and rediscover MV17 object. Available enumeration will now reflect required configuration.
4. Available state text and default value depends on Fan Mode Sequence (MV58) value upon device discovery.
5. Same as Note 4.

MV17 Index	Function MV58 State Text Index	Default Value
1	1 Low - 2 Med - 3 High	High
2	1 Low - 2 High	High
3	1 Low - 2 Med - 3 High - 4 Auto	High
4	1 Low - 2 High - 3 Auto	High
5	1 Auto -2 On	Auto

Table 10. Property enumeration sets for MV objects. (Continued)

Object Name	Object ID	BACnet Index	Text	Default value
Heating Valve Status **Note 6**	MV 26	**Note 7**	**Note 7**	**Note 7**
Cooling Valve Status **Note 8**	MV 27	**Note 9**	**Note 9**	**Note 9**
Fan Status	MV 28	1	Off	Off
		2	Low	
		3	Med	
		4	High	
Effective Occupancy	MV 33	1	Occupied	Depends on local occupancy
		2	Unoccupied	
		3	Temporary Occupied	
		4	Stand-by	

6. Enumeration sets for MV26 depends on Control Type (BV75) value and Pipe Number (MV52) value upon device discovery. If required enumeration is not present, set BV75 and MV52 to desired value and rediscover MV26 object. Available enumeration will now reflect required configuration.
7. Available object name, state text and default value depends on Control Type (BV75) value and Pipe Number (MV52) upon device discovery.

BV75 Value	MV52 Index	MV26 Object Name	Function MV26 State Text Index	Default Value
On/Off	1 (2 pipe)	Unused Output	N/A	N/A
	2 (4 pipe)	Heating Valve Status	1 Closed – 2 Open	Closed
Floating	1 (2 pipe)	Unused Output	N/A	N/A
	2 (4 pipe)	Heating Valve Status	1 Stopped - 2 Opening - 3 Closing	Stopped

8. Enumeration sets for MV27 depends on Control Type (BV75) value and Pipe Number (MV52) value upon device discovery. If required enumeration is not present, set BV75 and MV52 to desired value and rediscover MV27 object. Available enumeration will now reflect required configuration.
9. Available object name, state text and default value depends on Control Type (BV75) value and Pipe Number (MV52) upon device discovery.

BV75 Value	MV52 Index	MV27 Object Name	Function MV26 State Text Index	Default Value
On/Off	1 (2 pipe)	Heat/Cool Valve Status	1 Closed – 2 Open	Closed
	2 (4 pipe)	Cooling Valve Status	1 Closed – 2 Open	Closed
Floating	1 (2 pipe)	Heat/Cool Valve Status	1 Stopped - 2 Opening - 3 Closing	Stopped
	2 (4 pipe)	Cooling Valve Status	1 Stopped - 2 Opening - 3 Closing	Stopped

Table 10. Property enumeration sets for MV objects. (Continued)

Object Name	Object ID	BACnet Index	Text	Default value
BI1 Configuration	MV 46	1	None	None
		2	Rem NSB	
		3	Motion NO	
		4	Motion NC	
		5	Window	
BI2 Configuration	MV 47	1	None	None
		2	Door Dry	
		3	Override	
		4	Filter	
		5	Service	
UI3 Configuration	MV 48	1	None	None
		2	COC/NH	
		3	COC/NC	
		4	COS	
		5	SS	
Pipe Number	MV 52	1	2 Pipe	4 Pipes
		2	4 Pipe	
Out#1 Cfg	MV 53	1	2	4
		2	4	
AUX Configuration	MV 54	1	Not used	Not Used
		2	NO with Occ	
		3	NC with Occ	
		4	NO with Occ & Fan	
		5	NC with Occ & Fan	
		6	Network controlled	

Table 10. Property enumeration sets for MV objects. (Continued)

Object Name	Object ID	BACnet Index	Text			Default value
Fan Mode Sequence	MV 58	1	Low-Med-High			On-Auto
		2	Low-High			
		3	Low-Med-High-Auto			
		4	Low-High-Auto			
		5	On-Auto			
Temporary Occupancy Time	MV 62	1	0 hour			2 hours
		2	1 hour			
		3	2 hours			
		4	3 hours			
		5	4 hours			
		6	5 hours			
		7	6 hours			
		8	7 hours			
		9	8 hours			
		10	9 hours			
		11	10 hours			
		12	11 hours			
		13	12 hours			
		14	13 hours			
		15	14 hours			
		16	15 hours			
		17	16 hours			
		18	17 hours			
		19	18 hours			
		20	19 hours			
		21	20 hours			
		22	21 hours			
		23	22 hours			
		24	23 hours			
		25	24 hours			
Proportional Band	MV 65	1	3	3 F	1.2 C	3
		2	4	4 F	1.7 C	
		3	5	5 F	2.2 C	
		4	6	6 F	2.8 C	
		5	7	7 F	3.3 C	
		6	8	8 F	3.9 C	
		7	9	9 F	5.0 C	
		8	10	10 F	5.6 C	

Table 10. Property enumeration sets for MV objects. (Continued)

Object Name	Object ID	BACnet Index	Text	Default value
Floating Motor Timing	MV 76	1	0.5 minute	1.5 minutes
		2	1 minute	
		3	1.5 minutes	
		4	2 minutes	
		5	2.5 minutes	
		6	3 minutes	
		7	3.5 minutes	
		8	4 minutes	
		9	4.5 minutes	
		10	5 minutes	
		11	5.5 minutes	
		12	6 minutes	
		13	6.5 minutes	
		14	7 minutes	
		15	7.5 minutes	
		16	8 minutes	
		17	8.5 minutes	
		18	9 minutes	
On-Off Control CPH	MV 77	1	3 CPH	4 CPH
		2	4 CPH	
		3	5 CPH	
		4	6 CPH	
		5	7 CPH	
		6	8 CPH	

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