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# Protocol Implementation Conformance

Design Team

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## **1. Document Introduction**

This document contains the Protocol Implementation Conformance Statement (PICS) and BACnet® Interoperability Building Blocks (BIBBs) for the Room Pressure Monitor (RPM) as required by the American National Standards Institute/American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ANSI/ASHRAE) Standard 135-2004, BACnet protocol. BACnet interoperability building blocks are collections of one or more BACnet services. This document includes a listing of the BIBBs currently supported by the RPM.

RPM shall be native BACnet –Application Specific controller with MS/TP capabilities.

## **2. Product Description as per Annex A PICS (normative)**

- ◆ RPM finds its applications in Monitoring pressure of hospital rooms such as operating rooms, isolation rooms and housing contagious patients. This system is interfaced to differential capacitive pressure sensors, which sense the differential pressure and is on a Graphics LCD (128x128 dots). Current equivalent to the differential pressure shall be transmitted as per the standards (4-20mA). Apart from Current mode two different voltage output modes are available, [0-5V, 0-10V] corresponding to the differential pressure.

**Note:**

1. Event Enrollment 2 (EE2) object provides a alarm warning of an impending out of limit room pressure which in turn is reflected in the Event Enrollment 1 (EE1) object some time later. If the condition causing the EE2 alarm persist for an Alarm Delay period, EE1 in turn becomes off-normal and an alarm is generated for EE1. The result is two alarms, one for EE2 and one for EE1 separated by a time delay. In addition, the alarm represented by the EE1 may be latched, thereby forcing an operator to reset the alarm by pressing the reset button present on the front panel of the RPM. In order for the RPM to operate in the standard BACnet manner, alarm latch (BV5 Present\_Value) should be set to inactive, the Time Delay (AV5 Present\_Value) should be Zero and EE2 EVENT\_ENABLE should be set to FFF. The Alarm Latch and Alarm Delay Parameters can also be set in the Alarm Setup menu through the front panel of the RPM.
2. Supervisory password status (BV7 Present\_Value) is used for ReinitializeDevice service request. If BV7 Present\_Value is active, then it is required to provide the supervisor password with the ReinitializeDevice Service request.

### **3. BACnet Requirements**

#### **3.1 BACnet Standardized Device Profile (Annex L)**

- BACnet Operator Workstation (B-OWS)
- BACnet Building Controller (B-BC)
- BACnet Advanced Application Controller (B-AAC)
- BACnet Application Specific Controller (B-ASC)
- BACnet Smart Sensor (B-SS)
- BACnet Smart Actuator (B-SA)

### 3.2 BACnet Interoperability Building Blocks (BIBBs) (Annex K)

Table below lists all the BIBBs that are required for the BACnet Application Specific Controller (B-ASC) profile for RPM. The BIBBs that are not required for B-ASC Profile but supported in RPM are also listed.

<b>Application Services (B-ASC)</b>	<b>Designation</b>
<b>Required for B-ASC Profile</b>	
Data Sharing - Read Property – B	DS-RP-B
Data Sharing - Write Property – B	DS-WP-B
Device Management - Dynamic Device Binding – B	DM-DDB-B
Device Management - Dynamic Object Binding – B	DM-DOB-B
Device Management - Device Communication Control – B	DM-DCC-B
<b>Not Required for B-ASC Profile but supported in RPM</b>	
Data Sharing - Write Property Multiple – B	DS-WPM-B
Data Sharing - Read Property Multiple – B	DS-RPM-B
Device Management - Reinitialize Device – B	DM-RD-B
Alarm and Event-Notification Internal-B	AE-N-I-B
Alarm and Event-Information-B	AE-INFO-B
Device Management - Time Synchronization – B	DM-TS-B
Device Management-Dynamic Device Binding-A	DM-DDB-A
Device Management – UTC Time Synchronization – B	DB-UTC-B

### **3.3 *Standard Object Types Supported***

The following is a list of the standard object types as defined by ASHRAE. The objects checked are currently supported by this product. See the section in this document for the supported object type for details.

- Accumulator
- Analog Input
- Analog Output
- Analog Value
- Averaging
- Binary Input
- Binary Output
- Binary Value
- Calendar
- Command
- Device
- Event Enrollment
- File
- Group
- Life Safety Point
- Life Safety Zone
- Loop
- Multistate Input
- Multistate Output
- Multistate Value
- Notification Class
- Program
- Pulse Converter
- Schedule
- Trend Log

### 3.3.1 Analog Input (as per Clause 12.2, Table 12-2)

Dynamically Creatable:  YES  NO

Dynamically Deletable:  YES  NO

Property Identifier	Writable	Conformance Code		Property Data Type
		Required	Optional	
Object_Identifier	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetObjectIdentifier
Object_Name	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	CharacterString
Object_Type	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetObjectType
Present_Value	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	REAL
Description	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	CharacterString
Device_Type	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	CharacterString
Status_Flags	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetStatusFlags
Event_State	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetEventState
Reliability	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	BACnetReliability
Out_Of_Service	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BOOLEAN
Update_Interval	Yes	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Unsigned
Units	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetEngineeringUnits
Min_Pres_Value	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	REAL
Max_Pres_Value	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	REAL
Resolution	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	REAL

### 3.3.2 Analog Value (as per Clause 12.4, Table 12-4)

Dynamically Creatable:  YES  NO

Dynamically Deletable:  YES  NO

Property Identifier	Writable	Conformance Code		Property Data Type
		Required	Optional	
Object_Identifier	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetObjectIdentifier
Object_Name	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	CharacterString
Object_Type	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetObjectType
Present_Value	Yes*	<input checked="" type="checkbox"/>	<input type="checkbox"/>	REAL
Description	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	CharacterString
Status_Flags	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetStatusFlags
Event_State	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetEventState
Reliability	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	BACnetReliability
Out_Of_Service	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BOOLEAN
Units	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetEngineeringUnits

\*Instance 1 is not writable

### 3.3.3 Binary Input (as per Clause 12.6, Table 12-6)

Dynamically Creatable:  YES  NO  
Dynamically Deletable:  YES  NO

Property Identifier	Writable	Conformance Code		Property Data Type
		Required	Optional	
Object_Identifier	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetObjectIdentifier
Object_Name	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	CharacterString
Object_Type	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetObjectType
Present_Value	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetBinaryPV
Description	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	CharacterString
Device_Type	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	CharacterString
Status_Flags	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetStatusFlags
Event_State	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetEventState
Reliability	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	BACnetReliability
Out_Of_Service	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BOOLEAN
Polarity	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetPolarity
Inactive_Text	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	CharacterString
Active_Text	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	CharacterString

### 3.3.4 Binary Value (as per Clause 12.8, Table 12-10)

Dynamically Creatable:  YES  NO  
Dynamically Deletable:  YES  NO

Property Identifier	Writable	Conformance Code		Property Data Type
		Required	Optional	
Object_Identifier	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetObjectIdentifier
Object_Name	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	CharacterString
Object_Type	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetObjectType
Present_Value	Yes*	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetBinaryPV
Description	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	CharacterString
Status_Flags	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetStatusFlags
Event_State	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetEventState
Reliability	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	BACnetReliability
Out_Of_Service	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BOOLEAN
Inactive_Text	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	CharacterString
Active_Text	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	CharacterString

\*Instance 1,2,7 and 8 are not writable.

3.3.5 Device (as per Clause 12.11, Table 12-13)

Dynamically Creatable:  YES  NO  
Dynamically Deletable:  YES  NO

Property Identifier	Writable	Conformance Code		Property Data Type
		Required	Optional	
Object_Identifier	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetObjectIdentifier
Object_Name	Yes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	CharacterString
Object_Type	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetObjectType
System_Status	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetDeviceStatus
Vendor_Name	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	CharacterString
Vendor_Identifier	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Unsigned16
Model_Name	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	CharacterString
Firmware_Revision	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	CharacterString
Application_Software_Version	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	CharacterString
Location	Yes	<input type="checkbox"/>	<input checked="" type="checkbox"/>	CharacterString
Description	Yes	<input type="checkbox"/>	<input checked="" type="checkbox"/>	CharacterString
Protocol_Version	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Unsigned
Protocol_Revision	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Unsigned
Protocol_Services_Supported	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetServicesSupported
Protocol_Object_Types_Supported	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetObjectTypesSupported
Object_List	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetARRAY[N]of BACnetObjectIdentifier
Max_APDU_Length_Accepted	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Unsigned
Segmentation_Supported	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetSegmentation
Local_Time	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Time
Local_Date	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Date
APDU_Timeout	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Unsigned
Number_Of_APDU_Retries	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Unsigned
Max_Master	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Unsigned(1..127)
Max_Info_Frames	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Unsigned
Device_Address_Binding	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	List of BACnetAddressBinding
Database_Revision	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Unsigned
Daylight_Savings_Status	Yes	<input type="checkbox"/>	<input checked="" type="checkbox"/>	BOOLEAN
UTC_Offset	Yes	<input type="checkbox"/>	<input checked="" type="checkbox"/>	INTIGER

### 3.3.6 Event enrollment (as per Clause 12.12, Table 12-14)

Dynamically Creatable:  YES  NO  
Dynamically Deletable:  YES  NO

Property Identifier	Writable	Conformance Code		Property Data Type
		Required	Optional	
Object_Identifier	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetObjectIdentifier
Object_Name	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	CharacterString
Object_Type	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetObjectType
Description	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	CharacterString
Event_Type	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetEventType
Notify_Type	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetNotifyType
Event_Parameters	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetEventParameter
Object_Property_Reference	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetDeviceObjectPropertyReference
Event_State	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetEventState
Event_Enable	Yes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetEventTransitionBits
Acked_Transitions	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetEventTransitionBits
Notification_Class	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Unsigned
Event_Time_Stamps	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetARRAY[3] of BACnetTimeStamp

### 3.3.7 Multi-State Input (as per Clause 12.18, Table 12-21)

Dynamically Creatable:  YES  NO  
Dynamically Deletable:  YES  NO

Property Identifier	Writable	Conformance Code		Property Data Type
		Required	Optional	
Object_Identifier	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetObjectIdentifier
Object_Name	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	CharacterString
Object_Type	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetObjectType
Present_Value	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Unsigned
Description	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	CharacterString
Device_Type	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	CharacterString
Status_Flags	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetStatusFlags
Event_State	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetEventState
Reliability	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	BACnetReliability
Out_Of_Service	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BOOLEAN
Number_Of_States	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Unsigned
State_Text	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	BACnetARRAY[N]of CharacterString

**3.3.8 Multi-State Value (as per Clause 12.20, Table 12-23)**

Dynamically Creatable:  YES  NO  
Dynamically Deletable:  YES  NO

Property Identifier	Writable	Conformance Code		Property Data Type
		Required	Optional	
Object_Identifier	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetObjectIdentifier
Object_Name	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	CharacterString
Object_Type	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetObjectType
Present_Value	Yes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Unsigned
Description	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	CharacterString
Status_Flags	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetStatusFlags
Event_State	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetEventState
Reliability	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	BACnetReliability
Out_Of_Service	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BOOLEAN
Number_Of_States	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Unsigned
State_Text	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	BACnetARRAY[N] of CharacterString

\*Instance 3 is not writable.

**3.3.9 Notification Class (as per Clause 12.21, Table 12-24)**

Dynamically Creatable:  YES  NO  
Dynamically Deletable:  YES  NO

Property Identifier	Writable	Conformance Code		Property Data Type
		Required	Optional	
Object_Identifier	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetObjectIdentifier
Object_Name	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	CharacterString
Object_Type	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetObjectType
Description	No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	CharacterString
Notification_Class	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Unsigned
Priority	Yes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetARRAY[3] of Unsigned
Ack_Required	No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BACnetEventTransitionBits
Recipient_List	Yes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	List of BACnetDestination

### 3.4 Data Link Layer Option

- BACnet Internet Protocol (IP) (Annex J)
- BACnet IP (Annex J), Foreign Device
- ISO 8802-3, Ethernet (Clause 7)
- ANSI/ATA 878.1, 2.5 MB ARCNET network (Clause 8)
- ANSI/ATA 878.1, RS-485 ARCNET network (Clause 8), baud rates:
- Master-Slave/Token-Passing (MS/TP) master (Clause 9), baud rates: 9600, 19200, 38400, 76800
- MS/TP slave (Clause 9), baud rates: 9600, 19200, 38400, 76800
- Point-To-Point, EIA 232 (Clause 10), baud rates:
- Point-To-Point, modem (Clause 10), baud rates:
- LonTalk® protocol (Clause 11), medium:
- Other:

### 3.5 Segmentation Capability

- Segmented requests supported : Window Size: N/A
- Segmented responses supported : Window Size: N/A

### 3.6 Device Address Binding

*Is static device binding supported?* (Required for two-way communication between MS/TP slaves and other devices)

- YES  NO

### 3.7 Networking Options

- Router, Clause 6:
- Annex H, BACnet Tunneling Router over IP
- BACnet/IP Broadcast Management Device (BBMD)  
Does the BBMD support registrations by Foreign Devices?  YES  NO

### 3.8 Character Sets Supported

Indicating support for multiple character sets does not imply that they can all be supported simultaneously.

- ANSI X3.4
- IBM®/Microsoft® Double-Byte Character Set (DBCS)
- ISO 8859-1
- ISO 10646 Universal Character Set-2 (UCS-2)
- ISO 10646 (UCS-4)
- Japanese Industrial Standard (JIS) C 6226

### 3.9 RPM Supported Services

Table below lists all the BACnet standard application services. The checked services are supported by the RPM.

Application Service	Initiates Requests	Executes Requests
ConfirmedEventNotification Service	<input checked="" type="checkbox"/>	<input type="checkbox"/>
UnconfirmedEventNotification Service	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GetEventInformation Service	<input type="checkbox"/>	<input checked="" type="checkbox"/>
ReadProperty Service	<input type="checkbox"/>	<input checked="" type="checkbox"/>
ReadPropertyMultiple Service	<input type="checkbox"/>	<input checked="" type="checkbox"/>
WriteProperty Service	<input type="checkbox"/>	<input checked="" type="checkbox"/>
WritePropertyMultiple Service	<input type="checkbox"/>	<input checked="" type="checkbox"/>
DeviceCommunicationControl Service	<input type="checkbox"/>	<input checked="" type="checkbox"/>
ReinitializeDevice Service	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Timesynchronization Service	<input type="checkbox"/>	<input checked="" type="checkbox"/>
UTCTimesynchronization Service	<input type="checkbox"/>	<input checked="" type="checkbox"/>
who-Is	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Who-Has	<input type="checkbox"/>	<input checked="" type="checkbox"/>
I-Am	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
I-Have	<input checked="" type="checkbox"/>	<input type="checkbox"/>