# IntesisBox® BACnet Server

Modbus RTU Master and Modbus TCP Client

## User Manual

Intesis
Member of the HMS group

Intesis Software S.L.U.
Milà i Fontanals, 1 bis
08700 Igualada
Spain

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**IntesisBox®**

URL | http://www.intesisbox.com
email | info@intesisbox.com
tel | +34 938047134

**2/40**

Gateway for the integration of Modbus RTU and Modbus TCP installations into BACnet MSTP or BACnet IP enabled monitoring and control systems.

Order code:

**IBBACMBM1000000, 100 points version**
**IBBACMBM2500000, 250 points version**
**IBBACMBM6000000, 600 points version**
**IBBACMBM1K20000, 1200 points version**
**IBBACMBM3K00000, 3000 points version**

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# 1   Description

## 1.1   *Introduction*

This document describes the integration of Modbus RTU and Modbus TCP installations into BACnet MSTP or BACnet IP compatible devices and systems using the I*ntesisBox BACnet Server – Modbus Client* gateway.

The aim of this integration is to make accessible Modbus system signals and resources from a BACnet based control system or device, as if it was a part of the own BACnet system and vice-versa.

The gateway acts as a BACnet/IP Server or BACnet MSTP device in its BACnet interface, allowing other BACnet devices to perform subscription (COV) requests and reads/writes to its internal points. From the Modbus point of view, IntesisBox simulates a Modbus RTU Master device and or Modbus TCP Client device. Readings of the Modbus slave device(s) is performed by IntesisBox by automatic continuous polling.

Configuration is carried out using the configuration software IntesisBox® MAPS.

This document assumes that the user is familiar with BACnet and Modbus technologies and their technical terms.
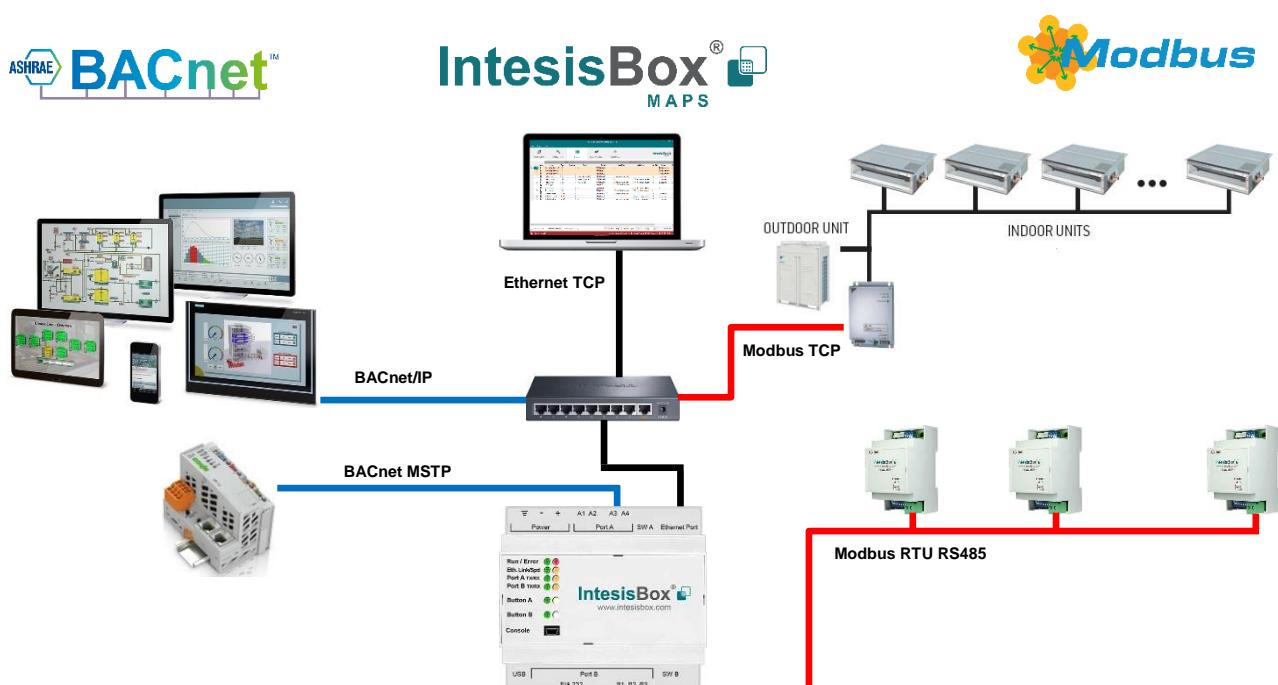


**Integration of Modbus RTU Slave or Modbus TCP Servers
to BACnet IP or MSTP control and monitoring systems**

## 1.2  *Functionality*

From the Modbus system point of view, after the start up process, IntesisBox reads continuously the points configured to be read in the Modbus TCP Server and/or Modbus RTU Slave devices and updates in its memory all the values received from the Modbus system.

From the BACnet system point of view, after the start up process, the gateway listens for any subscription (COV) request, serves any polling request, or performs any writing request of its internal points received from the BACnet system. The values received from BACnet are immediately written in the associated register of the corresponding Modbus TCP Server or Modbus RTU Slave device.

All the Modbus registers in the slave devices is associated to a *BACnet object*, with this, all the Modbus system (all the slave devices) is seen as *a single BACnet device with many objects* from the BACnet system point of view, each object corresponding to a Modbus slave/register address.

When a new value is read from Modbus for a given register, the new value is updated in the gateway's memory and, if this signal is associated to a BACnet active subscription then the new value will be sent to the subscripted BACnet device(s).

In the continuous polling of the Modbus devices, if a non-response of the BACnet device is detected, the corresponding virtual signal inside IntesisBox will be activated indicating communication error with the Modbus device. These virtual signals indicating communication status in real time with the Modbus devices are also accessible from BACnet, like the rest of the points of the gateway.

## 1.3  *Gateway's capacity*

IntesisBox capacity is listed below:

| Element | 100 version | 250 version | 600 version | 1200 version | 3000 version | Notes |
|---------|---------|---------|---------|---------|---------|-------|
| **Type of BACnet devices** | IP / MSTP | | | | | Communication with BACnet IP and MSTP |
| **Number of BACnet Objecs** | 100 | 250 | 600 | 1200 | 3000 | Maximum number of points that can be defined in the virtual BACnet device inside the gateway |
| **Number of BACnet Subscriptions (COV) requests** | 200 | 500 | 1200 | 2400 | 6000 | Maximum number of BACnet subscriptions (COV) requests accepted by the gateway |
| **Type of Modbus slave devices** | Modbus RTU (EIA485) Modbus TCP | | | | | Those supporting Modbus *protocol*. Communication over TCP/IP and RTU |
| **Number of Modbus Slave devices** | Up to 255 Devices per Node (RTU and TCP) Up to 5 TCP connections | | | | | Number of Modbus Slave devices supported by the device |

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# 2   Protocol Implementation Conformance Statement

BACnet Protocol Implementation Conformance Statement (PICS)

**Date:** *2016-11-22*
**Vendor Name:** *Intesis Software SLU*
**Product Name:** *IBOX-BAC-MBM*
**Product Model Number:** *IBOX-BAC-MBM*
**Application Software Version:** *1.0*
**Firmware Revision:** *1.0.0.0*
**BACnet Protocol Revision:** *12*

**Product Description:**

*Modbus – BACnet MS/TP & BACnet IP Gateway*

Abstraction of Modbus Registers as BACnet Objects.

## 2.1   *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)

Additional BACnet Interoperability Building Blocks Supported (Annex K):
*Reference of BIBBs List*

## 2.2   *Segmentation Capability:*

Segmented request supported    ☐ No    ☒ Yes    Window Size · *16* ·
Segmented responses supported  ☐ No    ☒ Yes    Window Size · *16* ·

## 2.3   *Data Link Layer Options:*

☒   BACnet IP, (Annex J)
☒   BACnet IP, (Annex J), Foreign Device
☐   ISO 8802-3, Ethernet (Clause 7)
☐   ANSI/ATA 878.1, 2.5 Mb. ARCNET (Clause 8)
☐   ANSI/ATA 878.1, RS-485 ARCNET (Clause 8), baud rate(s) ____
☒   MS/TP master (Clause 9), baud rate(s): 9600, 19200, 38400, 57600, 76800, 115200
☐   MS/TP slave (Clause 9), baud rate(s):
☐   Point-To-Point, EIA 232 (Clause 10), baud rate(s):
☐   Point-To-Point, modem, (Clause 10), baud rate(s):
☐   LonTalk, (Clause 11), medium: _____
☐   Other:

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## 2.4   *Device Address Binding:*

Is static device binding supported? (This is currently necessary for two-way communication with MS/TP slaves and certain other devices.) ☐ Yes   ☒ No

## 2.5   *Networking Options:*

☐     Router, Clause 6 - List all routing configurations, e.g., ARCNET-Ethernet, Ethernet-MS/TP, etc.
☐     Annex H, BACnet Tunneling Router over IP
☒     BACnet/IP Broadcast Management Device (BBMD)
       Does the BBMD support registrations by Foreign Devices?  ☒ Yes   ☐ No

## 2.6   *Character Sets Supported*

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

☒ ISO 10646 (UTF-8)        ☐ IBM™/Microsoft™ DBCS        ☐ ISO 8859-1
☐ ISO 10646 (UCS-2)        ☐ ISO 10646 (UCS-4)            ☐ JIS X 0208

## 2.7   *Gateway*

If this product is a communication gateway, describe the types of non-BACnet equipment/network(s) that the gateway supports:

**Modbus RTU (EIA485) and TCP networks.**

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# 3  BACnet Interoperability Building Blocks Supported (BIBBs)

## 3.1  *Data Sharing BIBBs*

| BIBB Type | | Active | BACnet Service | Initiate | Execute |
|---|---|---|---|---|---|
| DS-RP-A | Data Sharing-ReadProperty–A | ☐ | ReadProperty | ☒ | ☐ |
| DS-RP-B | Data Sharing-ReadProperty–B | ☒ | ReadProperty | ☐ | ☒ |
| DS-RPM-A | Data Sharing-ReadPropertyMultiple–A | ☐ | ReadPropertyMultiple | ☒ | ☐ |
| DS-RPM-B | Data Sharing-ReadPropertyMultiple–B | ☒ | ReadPropertyMultiple | ☐ | ☒ |
| DS-RPC-A | Data Sharing-ReadPropertyConditiona–A | ☐ | ReadPropertyConditional | ☒ | ☐ |
| DS-RPC-B | Data Sharing-ReadPropertyConditional–B | ☐ | ReadPropertyConditional | ☐ | ☒ |
| DS-WP-A | Data Sharing-WriteProperty–A | ☐ | WriteProperty | ☒ | ☐ |
| DS-WP-B | Data Sharing-WriteProperty–B | ☒ | WriteProperty | ☐ | ☒ |
| DS-WPM-A | Data Sharing-WritePropertyMultiple–A | ☐ | WritePropertyMultiple | ☒ | ☐ |
| DS-WPM-B | Data Sharing-WritePropertyMultiple–B | ☒ | WritePropertyMultiple | ☐ | ☒ |
| DS-COV-A | Data Sharing-COV–A | ☐ | SubscribeCOV | ☒ | ☐ |
| | | ☐ | ConfirmedCOVNotification | ☐ | ☒ |
| | | ☐ | UnconfirmedCOVNotification | ☐ | ☒ |
| DS-COV-B | Data Sharing-COV–B | ☒ | SubscribeCOV | ☐ | ☒ |
| | | ☒ | ConfirmedCOVNotification | ☒ | ☐ |
| | | ☒ | UnconfirmedCOVNotification | ☒ | ☐ |
| DS-COVP-A | Data Sharing-COVP–A | ☐ | SubscribeCOVProperty | ☒ | ☐ |
| | | ☐ | ConfirmedCOVNotification | ☐ | ☒ |
| | | ☐ | UnconfirmedCOVNotification | ☐ | ☒ |
| DS-COVP-B | Data Sharing-COVP–B | ☐ | SubscribeCOVProperty | ☐ | ☒ |
| | | ☐ | ConfirmedCOVNotification | ☒ | ☐ |
| | | ☐ | UnconfirmedCOVNotification | ☒ | ☐ |
| DS-COVU-A | Data Sharing-COV-Unsubscribed–A | ☐ | UnconfirmedCOVNotification | ☐ | ☒ |
| DS-COVU-B | Data Sharing-COV- Unsubscribed -B | ☐ | UnconfirmedCOVNotification | ☒ | ☐ |

## 3.2  *Alarm and Event Management BIBBs*

| BIBB Type | | Active | BACnet Service | Initiate | Execute |
|---|---|---|---|---|---|
| AE-N-A | Alarm and Event-Notification–A | ☐ | ConfirmedEventNotification | ☐ | ☒ |
| | | ☐ | UnconfirmedEventNotification | ☐ | ☒ |
| AE-N-I-B | Alarm and Event-Notification Internal–B | ☒ | ConfirmedEventNotification | ☒ | ☐ |
| | | ☒ | UnconfirmedEventNotification | ☒ | ☐ |
| AE-N-E-B | Alarm and Event-Notification External–B | ☐ | ConfirmedEventNotification | ☒ | ☐ |
| | | ☐ | UnconfirmedEventNotification | ☒ | ☐ |
| AE-ACK-A | Alarm and Event-ACK–A | ☐ | AcknowledgeAlarm | ☒ | ☐ |
| AE-ACK-B | Alarm and Event-ACK–B | ☒ | AcknowledgeAlarm | ☐ | ☒ |
| AE-ASUM-A | Alarm and Event-Alarm Summary–A | ☐ | GetAlarmSummary | ☒ | ☐ |
| AE-ASUM-B | Alarm and Event-Alarm Summary–B | ☒ | GetAlarmSummary | ☐ | ☒ |
| AE-ESUM-A | Alarm and Event-Enrollment Summary-A | ☐ | GetEnrollmentSummary | ☒ | ☐ |
| AE-ESUM-B | Alarm and Event-Enrollment Summary-B | ☐ | GetEnrollmentSummary | ☐ | ☒ |
| AE-INFO-A | Alarm and Event-Information–A | ☐ | GetEventInformation | ☒ | ☐ |
| AE-INFO-B | Alarm and Event-Information–B | ☒ | GetEventInformation | ☐ | ☒ |
| AE-LS-A | Alarm and Event-LifeSafety–A | ☐ | LifeSafetyOperation | ☒ | ☐ |
| AE-LS-B | Alarm and Event-LifeSafety–B | ☐ | LifeSafetyOperation | ☐ | ☒ |

## 3.3   Scheduling BIBBs

| BIBB Type | | Active | BACnet Service | Initiate | Execute |
|---|---|---|---|---|---|
| SCHED-A | Scheduling–A<br>*(must support DS-RP-A and DS-WP-A)* | ☐ | | | |
| SCHED-I-B | Scheduling-Internal–B<br>*(shall support DS-RP-B and DS-WP-B)*<br>*(shall also support ether DM-TS-B or DS-UTC-B)* | ☒ | | | |
| SCHED-E-B | Scheduling-External–B<br>*(shall support SCHED-I-B and DS-WP-A)* | ☐ | | | |

## 3.4   Trending BIBBs

| BIBB Type | | Active | BACnet Service | Initiate | Execute |
|---|---|---|---|---|---|
| T-VMT-A | Trending - Viewing and Modifying Trends–A | ☐ | ReadRange | ☒ | ☐ |
| T-VMT-I-B | Trending - Viewing and Modifying Trends Inernal–B | ☒ | ReadRange | ☐ | ☒ |
| T-VMT-E-B | Trending - Viewing and Modifying Trends External–B | ☐ | ReadRange | ☐ | ☒ |
| T-ATR-A | Trending - Automated Trend Retrieval–A | ☐ | ConfirmedEventNotification | ☐ | ☒ |
| | | ☐ | ReadRange | ☒ | ☐ |
| T-ATR-B | Trending - Automated Trend Retrieval–B | ☒ | ConfirmedEventNotification | ☒ | ☐ |
| | | ☒ | ReadRange | ☐ | ☒ |

## 3.5   Network Management BIBBs

| BIBB Type | | Active | BACnet Service | Initiate | Execute |
|---|---|---|---|---|---|
| NM-CE-A | Network Management - Connection Establishment–A | ☐ | Establish-Connection-To-Network | ☒ | ☐ |
| | | ☐ | Disconnect-Connection-To-Network | ☒ | ☐ |
| NM-CE-B | Network Management - Connection Establishment– B | ☐ | Establish-Connection-To-Network | ☐ | ☒ |
| | | ☐ | Disconnect-Connection-To-Network | ☐ | ☒ |
| NM-RC-A | Network Management - Router Configuration–A | ☐ | Who-Is-Router-To-Network | ☒ | ☐ |
| | | ☐ | I-Am-Router-To-Network | ☐ | ☒ |
| | | ☐ | I-Could-Be-Router-To-Network | ☐ | ☒ |
| | | ☐ | Initialize-Routing-Table | ☒ | ☐ |
| | | ☐ | Initialize-Routing-Table-Ack | ☐ | ☒ |
| NM-RC-B | Network Management - Router Configuration–B | ☐ | Who-Is-Router-To-Network | ☒ | ☒ |
| | | ☐ | I-Am-Router-To-Network | ☒ | ☒ |
| | | ☐ | Initialize-Routing-Table | ☐ | ☒ |
| | | ☐ | Initialize-Routing-Table-Ack | ☒ | ☐ |

## 3.6  *Device Management BIBBs*

| BIBB Type | | Active | BACnet Service | Initiate | Execute |
|---|---|:---:|---|:---:|:---:|
| DM-DDB-A | Device Management - Dynamic Device Binding–A | ☒ | Who-Is | ☒ | ☐ |
| | | ☒ | I-Am | ☐ | ☒ |
| DM-DDB-B | Device Management - Dynamic Device Binding–B | ☒ | Who-Is | ☐ | ☒ |
| | | ☒ | I-Am | ☒ | ☐ |
| DM-DOB-A | Device Management - Dynamic Object Binding–A | ☐ | Who-Has | ☒ | ☐ |
| | | ☐ | I-Have | ☐ | ☒ |
| DM-DOB-B | Device Management - Dynamic Object Binding–B | ☒ | Who-Has | ☐ | ☒ |
| | | ☒ | I-Have | ☒ | ☐ |
| DM-DCC-A | Device Management - DeviceCommunicationControl–A | ☐ | DeviceCommunicationControl | ☒ | ☐ |
| DM-DCC-B | Device Management - DeviceCommunicationControl–B | ☒ | DeviceCommunicationControl | ☐ | ☒ |
| DM-PT-A | Device Management - PrivateTransfer–A | ☐ | ConfirmedPrivateTransfer | ☒ | ☐ |
| | | ☐ | UnconfirmedPrivateTransfer | ☒ | ☐ |
| DM-PT-B | Device Management - PrivateTransfer–B | ☐ | ConfirmedPrivateTransfer | ☐ | ☒ |
| | | ☐ | UnconfirmedPrivateTransfer | ☐ | ☒ |
| DM-TM-A | Device Management - Text Message–A | ☐ | ConfirmedTextMessage | ☒ | ☐ |
| | | ☐ | UnconfirmedTextMessage | ☒ | ☐ |
| DM-TM-B | Device Management - Text Message–B | ☐ | ConfirmedTextMessage | ☐ | ☒ |
| | | ☐ | UnconfirmedTextMessage | ☐ | ☒ |
| DM-TS-A | Device Management - TimeSynchronization–A | ☐ | TimeSynchronization | ☒ | ☐ |
| DM-TS-B | Device Management - TimeSynchronization–B | ☒ | TimeSynchronization | ☐ | ☒ |
| DM-UTC-A | Device Management - UTCTimeSynchronization–A | ☐ | UTCTimeSynchronization | ☒ | ☐ |
| DM-UTC-B | Device Management - UTCTimeSynchronization–B | ☐ | UTCTimeSynchronization | ☐ | ☒ |
| DM-RD-A | Device Management - ReinitializeDevice–A | ☐ | ReinitializeDevice | ☒ | ☐ |
| DM-RD-B | Device Management - ReinitializeDevice–B | ☒ | ReinitializeDevice | ☐ | ☒ |
| DM-BR-A | Device Management - Backup and Restore–A | ☐ | AtomicReadFile | ☒ | ☐ |
| | | ☐ | AtomicWriteFile | ☒ | ☐ |
| | | ☐ | CreateObject | ☒ | ☐ |
| | | ☐ | ReinitializeDevice | ☒ | ☐ |
| DM-BR-B | Device Management - Backup and Restore–B | ☐ | AtomicReadFile | ☐ | ☒ |
| | | ☐ | AtomicWriteFile | ☐ | ☒ |
| | | ☐ | ReinitializeDevice | ☐ | ☒ |
| DM-R-A | Device Management - Restart–A | ☐ | UnconfimedCOVNotification | ☐ | ☒ |
| DM-R-B | Device Management - Restart–B | ☐ | UnconfimedCOVNotification | ☒ | ☐ |
| DM-LM-A | Device Management - List Manipulation–A | ☐ | AddListElement | ☒ | ☐ |
| | | ☐ | RemoveListElement | ☒ | ☐ |
| DM-LM-B | Device Management - List Manipulation–B | ☐ | AddListElement | ☐ | ☒ |
| | | ☐ | RemoveListElement | ☐ | ☒ |
| DM-OCD-A | Device Management - Object Creation and Deletion–A | ☐ | CreateObject | ☒ | ☐ |
| | | ☐ | DeleteObject | ☒ | ☐ |
| DM-OCD-B | Device Management - Object Creation and Deletion–B | ☐ | CreateObject | ☐ | ☒ |
| | | ☐ | DeleteObject | ☐ | ☒ |
| DM-VT-A | Device Management - Virtual Terminal–A | ☐ | VT-Open | ☒ | ☐ |
| | | ☐ | VT-Close | ☒ | ☒ |
| | | ☐ | VT-Data | ☒ | ☒ |
| DM-VT-B | Device Management - Virtual Terminal–B | ☐ | VT-Open | ☐ | ☒ |
| | | ☐ | VT-Close | ☒ | ☒ |
| | | ☐ | VT-Data | ☒ | ☒ |

## 4   Service Types

| Service type | Service name | Supported | Remarks |
|---|---|:---:|---|
| Alarm and Event Services | AcknowledgeAlarm | ☒ | |
| | ConfirmedCOVNotification | ☐ | |
| | ConfirmedEventNotification | ☐ | |
| | GetAlarmSummary | ☒ | |
| | GetEnrollmentSummary | ☐ | |
| | SubscribeCOV | ☒ | |
| File Access Services | AtomicReadFile | ☐ | |
| | AtomicWriteFile | ☐ | |
| Object Access Services | AddListElement | ☐ | |
| | RemoveListElement | ☐ | |
| | CreateObject | ☐ | |
| | DeleteObject | ☐ | |
| | ReadProperty | ☒ | |
| | ReadPropertyConditional | ☐ | |
| | ReadPropertyMultiple | ☒ | |
| | ReadRange | ☒ | |
| | WriteProperty | ☒ | |
| | WritePropertyMultiple | ☒ | |
| Remote Device Management Services | DeviceComminicationControl | ☒ | |
| | ConfirmedPrivateTransfer | ☐ | |
| | ConfirmedTextMessage | ☐ | |
| | ReinitializeDevice | ☒ | |
| Virtual Terminal Services | VtOpen | ☐ | |
| | VtClose | ☐ | |
| | VtData | ☐ | |
| Security Services | Authenticate | ☐ | |
| | RequestKey | ☐ | |
| Unconfirmed Services | I-Am | ☒ | |
| | I-Have | ☐ | |
| | UnconfirmedCOVNotification | ☐ | |
| | UnconfirmedEventNotification | ☐ | |
| | UnconfirmedPrivateTransfer | ☐ | |
| | UnconfirmedTextMessage | ☐ | |
| | TimeSynchronization | ☒ | |
| | UtcTimeSynchronization | ☐ | |
| | Who-Has | ☒ | |
| | Who-Is | ☒ | |
| | LifeSafetyOperation | ☐ | |
| | SubscribeCOVProperty | ☐ | |
| | GetEventInformation | ☒ | |

## 5   Objects

### 5.1   *Supported Object Types*

The objects supported are shown in the table below.

| Object Type | ID | Supported | Management Point |
|---|---|---|---|
| Analog-Input | 0 | ☒ | |
| Analog-Output | 1 | ☒ | |
| Analog-Value | 2 | ☒ | |
| Averaging | 18 | ☐ | |
| Binary-Input | 3 | ☒ | |
| Binary-Output | 4 | ☒ | |
| Binary-Value | 5 | ☒ | |
| Calendar | 6 | ☒ | |
| Command | 7 | ☐ | |
| Device | 8 | ☒ | |
| Event-Enrollment | 9 | ☐ | |
| File | 10 | ☐ | |
| Group | 11 | ☐ | |
| Life-Safety-Point | 21 | ☐ | |
| Life-Safety-Zone | 22 | ☐ | |
| Loop | 12 | ☐ | |
| Multistate-Input | 13 | ☒ | |
| Multistate-Output | 14 | ☒ | |
| Multistate-Value | 19 | ☒ | |
| Notification-Class | 15 | ☒ | |
| Program | 16 | ☐ | |
| Schedule | 17 | ☒ | |
| Trend-Log | 20 | ☒ | |
| Trend-Log-Multiple | 27 | ☒ | |

## 5.2  *Objects and properties*

### 5.2.1  IBOX-BAC-MBM **(Device Object Type)**

| Property Identifier | Property Datatype | Value | ASHRAE | IBOX |
|---|---|---|---|---|
| Object_Identifier | BACnetObjectIdentifier | (Device, 246000) | R | R |
| Object_Name | CharacterString | "IBOX-BAC-MBM" | R | R |
| Object_Type | BACnetObjectType | DEVICE (8) (Device Object Type) | R | R |
| System_Status | BACnetDeviceStatus | OPERATIONAL (0) | R | R |
| Vendor_Name | CharacterString | "Intesis Software SLU" | R | R |
| Vendor_Identifier | Unsigned16 | 246 | R | R |
| Model_Name | CharacterString | "IBOX-BAC-MBM " | R | R |
| Firmware_Revision | CharacterString | "1.0.0.0" | R | R |
| Application_Software_ Version | CharacterString | "1.0.0.0" | R | R |
| Location | CharacterString | "" | O | - |
| Description | CharacterString | "Modbus to BACnet Gateway" | O | - |
| Protocol_Version | Unsigned | 1 | R | R |
| Protocol_Revision | Unsigned | 12 | R | R |
| Protocol_Services_ Supported | BACnetServiceSupported | Refer to section 4 [Service Types] | R | R |
| Protocol_Object_Types_ Supported | BACnetObjectTypes Supported | Refer to section 5.1 [Object Types] | R | R |
| Object_List | BACnetArray[N] of BACnetObjectIdentifier | BACnetARRAY[N] | R | R |
| Structured_Object_List | BACnetArray[N] of BACnetObjectIdentifier | - | O | - |
| Max_APDU_Length_ Accepted | Unsigned | 480 when MSTP / 1476 when BACnet/IP | R | R |
| Segmentation_Supported | BACnetSegmentation | SEGMENTED-BOTH (0) | R | R |
| Max_Segments_accepted | Unsigned | 16 | O | R |
| VT_Classes_Supported | List of BACnetVTClass | - | O | - |
| Active_VT_Sessions | List of BACnetVTSession | - | O | - |
| Local_Date | Date | Current date | O | R |
| Local_Time | Time | Current time | O | R |
| UTC_Offset | INTEGER | - | O | - |
| Daylight_Savings_Status | BOOLEAN | - | O | - |
| APDU_Segment_Timeout | Unsigned | 3000 | R | R |
| APDU_Timeout | Unsigned | 3000 | R | R |
| Number_of_APDU_ Retries | Unsigned | 3 | R | R |
| List_Of_Session_Keys | List of BACnetSessionKey | - | O | - |

| | | | | |
|---|---|---|---|---|
| Time_Synchronization_ Recipients | List of BACnetRecipient | - | O | - |
| Max_Master * ** | Unsigned | 127 | R | W |
| Max_Info_Frames * | Unsigned | 1 | O | R |
| Device_Address_Binding | List of BACnetAddressBinding | NULL (empty) | R | R |
| Database_Revision | Unsigned | 0 | R | R |
| Configuration_Files | BACnetArray[N] of BACnetObjectIdentifier | - | O | - |
| Last_Restore_Time | BACnetTimeStamp | - | O | - |
| Backup_Failure_Timeout | Unsigned16 | - | O | - |
| Active_COV_ Subscriptions | List of BACnetCOVSubscription | List of BACnetCOVSubscription | O | R |
| Slave_Proxy_Enable | BACnetArray[N] of BOOLEAN | - | O | - |
| Manual_Slave_Address_ Binding | List of BACnetAddressBinding | - | O | - |
| Auto_Slave_Discovery | BACnetArray[N] of BOOLEAN | - | O | - |
| Slave_Address_Binding | BACnetAddressBinding | - | O | - |
| Last_Restart_Reason | BACnetRestartReason | - | O | - |
| Time_Of_Device_Restart | BACnetTimeStamp | - | O | - |
| Restart_Notification_ Recipients | List of BACnetRecipient | - | O | - |
| UTC_Time_ Synchronization_ Recipients | List of BACnetRecipient | - | O | - |
| Time_Synchronization_ Interval | Unsigned | - | O | - |
| Align_Intervals | BOOLEAN | - | O | - |
| Interval_Offset | Unsigned | - | O | - |
| Profile_Name | CharacterString | - | O | - |

* Only available when MSTP is used


** Configurable through the configuration tool.

### 5.2.2 Analog Input Object Type

| Property Identifier | Property Datatype | Value | ASHRAE | IBOX |
|---|---|---|---|---|
| Object_Identifier | BACnetObjectIdentifier | (Analog Input, 0) | R | R |
| Object_Name | CharacterString | *Configurable through BACnet and Config Tool* | R | R |
| Object_Type | BACnetObjectType | ANALOG_INPUT (0) | R | R |
| Present_Value | REAL | x | R | R |
| Description | CharacterString | - | O | - |
| Device_Type | CharacterString | - | O | - |
| Status_Flags | BACnetStatusFlags | {FALSE, FALSE/TRUE, FALSE, FALSE} | R | R |
| Event_State | BACnetEventState | STATE_NORMAL (0) | R | R |
| Reliability | BACnetReliability | NO_FAULT_DETECTED (0), UNRELIABLE_OTHER (7) | O | R |
| Out_Of_Service | BOOLEAN | FALSE | R | R |
| Update_Interval | Unsigned | - | O | - |
| Units | BACnetEngineeringUnits | *Configurable through BACnet and Config Tool* | R | R |
| Min_Pres_Value | REAL | - | O | - |
| Max_Pres_Value | REAL | - | O | - |
| Resolution | REAL | - | O | - |
| COV_Increment | REAL | 0 | O | R |
| Time_Delay | Unsigned | - | O | R* |
| Notification_Class | Unsigned | - | O | R* |
| High_Limit | REAL | - | O | R* |
| Low_Limit | REAL | - | O | R* |
| Deadband | REAL | - | O | R* |
| Limit_Enable | BACnetLimitEnable | - | O | R* |
| Event_Enable | BACnetEventTransitionBits | - | O | R* |
| Acked_Transitions | BACnetEventTransitionBits | - | O | R* |
| Notify_Type | BACnetNotifyType | - | O | R* |
| Event_Time_Stamps | BACnetArray[N] of BACnetTimeStamp | - | O | R* |
| Profile_Name | CharacterString | - | O | - |

* Only available when specific object has a Notification Class configured

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## 5.2.3 Analog Output Object Type

| Property Identifier | Property Datatype | Value | ASHRAE | IBOX |
|---|---|---|---|---|
| Object_Identifier | BACnetObjectIdentifier | (Analog Output, 0) | R | R |
| Object_Name | CharacterString | *Configurable through BACnet and Config Tool* | R | R |
| Object_Type | BACnetObjectType | ANALOG_OUTPUT (1) | R | R |
| Present_Value | REAL | x | W | W |
| Description | CharacterString | - | O | - |
| Device_Type | CharacterString | - | O | - |
| Status_Flags | BACnetStatusFlags | {FALSE, FALSE, FALSE, FALSE} | R | R |
| Event_State | BACnetEventState | STATE_NORMAL (0) | R | R |
| Reliability | BACnetReliability | NO_FAULT_DETECTED (0) | O | R |
| Out_Of_Service | BOOLEAN | FALSE | R | R |
| Update_Interval | Unsigned | - | O | - |
| Units | BACnetEngineeringUnits | *Configurable through BACnet and Config Tool* | R | R |
| Min_Pres_Value | REAL | - | O | - |
| Max_Pres_Value | REAL | - | O | - |
| Resolution | REAL | - | O | - |
| COV_Increment | REAL | 0 | O | R |
| Priority_Array | BACnetPriorityArray | BACnetPriorityArray | R | R |
| Relinquish_Default | Unsigned | *Configurable through BACnet and Config Tool* | R | R |
| Time_Delay | Unsigned | - | O | R* |
| Notification_Class | Unsigned | - | O | R* |
| High_Limit | REAL | - | O | R* |
| Low_Limit | REAL | - | O | R* |
| Deadband | REAL | - | O | R* |
| Limit_Enable | BACnetLimitEnable | - | O | R* |
| Event_Enable | BACnetEventTransitionBits | - | O | R* |
| Acked_Transitions | BACnetEventTransitionBits | - | O | R* |
| Notify_Type | BACnetNotifyType | - | O | R* |
| Event_Time_Stamps | BACnetArray[N] of BACnetTimeStamp | - | O | R* |
| Profile_Name | CharacterString | - | O | - |

* Only available when specific object has a Notification Class configured

## 5.2.4 Analog Value Object Type

| Property Identifier | Property Datatype | Value | ASHRAE | IBOX |
|---|---|---|---|---|
| Object_Identifier | BACnetObjectIdentifier | (Analog Value, 0) | R | R |
| Object_Name | CharacterString | *Configurable through BACnet and Config Tool* | R | R |
| Object_Type | BACnetObjectType | ANALOG_VALUE (2) | R | R |
| Present_Value | REAL | x | R | W |
| Description | CharacterString | - | O | - |
| Status_Flags | BACnetStatusFlags | {FALSE, FALSE, FALSE, FALSE} | R | R |
| Event_State | BACnetEventState | STATE_NORMAL (0) | R | R |
| Reliability | BACnetReliability | NO_FAULT_DETECTED (0) | O | R |
| Out_Of_Service | BOOLEAN | FALSE | R | R |
| Update_Interval | Unsigned | - | O | - |
| Units | BACnetEngineeringUnits | *Configurable through BACnet and Config Tool* | R | R |
| Min_Pres_Value | REAL | - | O | - |
| Max_Pres_Value | REAL | - | O | - |
| Resolution | REAL | - | O | - |
| COV_Increment | REAL | 0 | O | R |
| Time_Delay | Unsigned | - | O | R* |
| Notification_Class | Unsigned | - | O | R* |
| High_Limit | REAL | - | O | R* |
| Low_Limit | REAL | - | O | R* |
| Deadband | REAL | - | O | R* |
| Limit_Enable | BACnetLimitEnable | - | O | R* |
| Event_Enable | BACnetEventTransitionBits | - | O | R* |
| Acked_Transitions | BACnetEventTransitionBits | - | O | R* |
| Notify_Type | BACnetNotifyType | - | O | R* |
| Event_Time_Stamps | BACnetArray[N] of BACnetTimeStamp | - | O | R* |
| Profile_Name | CharacterString | - | O | - |

* Only available when specific object has a Notification Class configured

## 5.2.5  Binary Input Object Type

| Property Identifier | Property Datatype | Value | ASHRAE | IBOX |
|---|---|---|---|---|
| Object_Identifier | BACnetObjectIdentifier | (Binary Input, 0) | R | R |
| Object_Name | CharacterString | *Configurable through BACnet and Config Tool* | R | R |
| Object_Type | BACnetObjectType | BINARY_INPUT (3) | R | R |
| Present_Value | BACnetBinaryPV | INACTIVE (0) / ACTIVE (1) | R | R |
| Description | CharacterString | - | O | - |
| Device_Type | CharacterString | - | O | - |
| Status_Flags | BACnetStatusFlags | {FALSE, FALSE/TRUE, FALSE, FALSE} | R | R |
| Event_State | BACnetEventState | STATE_NORMAL (0) | R | R |
| Reliability | BACnetReliability | NO_FAULT_DETECTED (0), UNRELIABLE_OTHER (7) | O | R |
| Out_Of_Service | BOOLEAN | FALSE | R | R |
| Polarity | BACnetPolarity | NORMAL (0) | R | R |
| Inactive_Text | CharacterString | *Configurable through BACnet and Config Tool* | O | R |
| Active_Text | CharacterString | *Configurable through BACnet and Config Tool* | O | R |
| Change_Of_State_Time | BACnetDatetime | - | O | R |
| Change_Of_State_Count | Unsigned | - | O | R |
| Time_Of_State_Count_Reset | BACnetDatetime | - | O | R |
| Elapsed_Active_Time | Unsigned | - | O | R |
| Time_Of_Active_Time_Reset | BACnetDatetime | - | O | R |
| Time_Delay | Unsigned | - | O | R* |
| Notification_Class | Unsigned | - | O | R* |
| Alarm_Value | BACnetBinaryPV | - | O | R* |
| Event_Enable | BACnetEventTransitionBits | - | O | R* |
| Acked_Transitions | BACnetEventTransitionBits | - | O | R* |
| Notify_Type | BACnetNotifyType | - | O | R* |
| Event_Time_Stamps | BACnetArray[N] of BACnetTimeStamp | - | O | R* |
| Profile_Name | CharacterString | - | O | - |

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## 5.2.6  Binary Output Object Type

| Property Identifier | Property Datatype | Value | ASHRAE | IBOX |
|---|---|---|---|---|
| Object_Identifier | BACnetObjectIdentifier | (Binary Output, 0) | R | R |
| Object_Name | CharacterString | *Configurable through BACnet and Config Tool* | R | R |
| Object_Type | BACnetObjectType | BINARY_OUTPUT (4) | R | R |
| Present_Value | BACnetBinaryPV | INACTIVE (0) / ACTIVE (1) | W | W |
| Description | CharacterString | - | O | - |
| Device_Type | CharacterString | - | O | - |
| Status_Flags | BACnetStatusFlags | {FALSE, FALSE, FALSE, FALSE} | R | R |
| Event_State | BACnetEventState | STATE_NORMAL (0) | R | R |
| Reliability | BACnetReliability | NO_FAULT_DETECTED (0) | O | R |
| Out_Of_Service | BOOLEAN | FALSE | R | R |
| Polarity | BACnetPolarity | NORMAL (0) | R | R |
| Inactive_Text | CharacterString | *Configurable through BACnet and Config Tool* | O | R |
| Active_Text | CharacterString | *Configurable through BACnet and Config Tool* | O | R |
| Change_Of_State_Time | BACnetDatetime | - | O | R |
| Change_Of_State_Count | Unsigned | - | O | R |
| Time_Of_State_Count_Reset | BACnetDatetime | - | O | R |
| Elapsed_Active_Time | Unsigned | - | O | R |
| Time_Of_Active_Time_Reset | BACnetDatetime | - | O | R |
| Minimum_Off_Time | Unsigned32 | - | O | - |
| Minimum_On_Time | Unsigned32 | - | O | - |
| Priority_Array | BACnetPriorityArray | BACnetPriorityArray | R | R |
| Relinquish_Default | BACnetBinaryPV | INACTIVE (0) | R | R |
| Time_Delay | Unsigned | - | O | R* |
| Notification_Class | Unsigned | - | O | R* |
| Feedback_Value | BACnetBinaryPV | - | O | W |
| Event_Enable | BACnetEventTransitionBits | - | O | R* |
| Acked_Transitions | BACnetEventTransitionBits | - | O | R* |
| Notify_Type | BACnetNotifyType | - | O | R* |
| Event_Time_Stamps | BACnetArray[N] of BACnetTimeStamp | - | O | R* |
| Profile_Name | CharacterString | - | O | - |

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## 5.2.7 Binary Value Object Type

| Property Identifier | Property Datatype | Value | ASHRAE | IBOX |
|---|---|---|---|---|
| Object_Identifier | BACnetObjectIdentifier | (Binary Value, 0) | R | R |
| Object_Name | CharacterString | *Configurable through BACnet and Config Tool* | R | R |
| Object_Type | BACnetObjectType | BINARY_VALUE (5) | R | R |
| Present_Value | BACnetBinaryPV | INACTIVE (0) / ACTIVE (1) | W | W |
| Description | CharacterString | - | O | - |
| Status_Flags | BACnetStatusFlags | {FALSE, FALSE, FALSE, FALSE} | R | R |
| Event_State | BACnetEventState | STATE_NORMAL (0) | R | R |
| Reliability | BACnetReliability | NO_FAULT_DETECTED (0) | O | R |
| Out_Of_Service | BOOLEAN | FALSE | R | R |
| Inactive_Text | CharacterString | *Configurable through BACnet and Config Tool* | O | R |
| Active_Text | CharacterString | *Configurable through BACnet and Config Tool* | O | R |
| Change_Of_State_Time | BACnetDatetime | - | O | R |
| Change_Of_State_Count | Unsigned | - | O | R |
| Time_Of_State_Count_Reset | BACnetDatetime | - | O | R |
| Elapsed_Active_Time | Unsigned | - | O | R |
| Time_Of_Active_Time_Reset | BACnetDatetime | - | O | R |
| Minimum_Off_Time | Unsigned32 | - | O | - |
| Minimum_On_Time | Unsigned32 | - | O | - |
| Priority_Array | BACnetPriorityArray | BACnetPriorityArray | R | R |
| Relinquish_Default | BACnetBinaryPV | INACTIVE (0) | R | R |
| Time_Delay | Unsigned | - | O | R* |
| Notification_Class | Unsigned | - | O | R* |
| Alarm_Value | BACnetBinaryPV | - | O | R* |
| Event_Enable | BACnetEventTransitionBits | - | O | R* |
| Acked_Transitions | BACnetEventTransitionBits | - | O | R* |
| Notify_Type | BACnetNotifyType | - | O | R* |
| Event_Time_Stamps | BACnetArray[N] of BACnetTimeStamp | - | O | R* |
| Profile_Name | CharacterString | - | O | - |

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## 5.2.8 Multistate Input Object Type

| Property Identifier | Property Datatype | Value | ASHRAE | IBOX |
|---|---|---|---|---|
| Object_Identifier | BACnetObjectIdentifier | (Multi-state Input, 0) | R | R |
| Object_Name | CharacterString | *Configurable through BACnet and Config Tool* | R | R |
| Object_Type | BACnetObjectType | MULTISTATE_INPUT (13) | R | R |
| Present_Value | Unsigned | x | R | R |
| Description | CharacterString | - | O | - |
| Device_Type | CharacterString | - | O | - |
| Status_Flags | BACnetStatusFlags | {FALSE, FALSE/TRUE, FALSE, FALSE} | R | R |
| Event_State | BACnetEventState | STATE_NORMAL (0) | R | R |
| Reliability | BACnetReliability | NO_FAULT_DETECTED (0), UNRELIABLE_OTHER (7) | O | R |
| Out_Of_Service | BOOLEAN | FALSE | R | R |
| Number_Of_States | Unsigned | *Configurable through BACnet and Config Tool* | R | R |
| State_Text | BACnetArray[N] of CharacterString | - | O | R |
| Time_Delay | Unsigned | - | O | R* |
| Notification_Class | Unsigned | - | O | R* |
| Alarm_Values | List of Unsigned | - | O | R* |
| Fault_Values | List of Unsigned | - | O | R* |
| Event_Enable | BACnetEventTransitionBits | - | O | R* |
| Acked_Transitions | BACnetEventTransitionBits | - | O | R* |
| Notify_Type | BACnetNotifyType | - | O | R* |
| Event_Time_Stamps | BACnetArray[N] of BACnetTimeStamp | - | O | R* |
| Profile_Name | CharacterString | - | O | - |

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## 5.2.9  Multistate Output Object Type

| Property Identifier | Property Datatype | Value | ASHRAE | IBOX |
|---|---|---|---|---|
| Object_Identifier | BACnetObjectIdentifier | (Multi-state Output, 0) | R | R |
| Object_Name | CharacterString | *Configurable through BACnet and Config Tool* | R | R |
| Object_Type | BACnetObjectType | MULTISTATE_OUTPUT (14) | R | R |
| Present_Value | Unsigned | x | W | W |
| Description | CharacterString | - | O | - |
| Device_Type | CharacterString | - | O | - |
| Status_Flags | BACnetStatusFlags | {FALSE, FALSE, FALSE, FALSE} | R | R |
| Event_State | BACnetEventState | STATE_NORMAL (0) | R | R |
| Reliability | BACnetReliability | NO_FAULT_DETECTED (0) | O | R |
| Out_Of_Service | BOOLEAN | FALSE | R | R |
| Number_Of_States | Unsigned | *Configurable through BACnet and Config Tool* | R | R |
| State_Text | BACnetArray[N] of CharacterString | | O | R |
| Priority_Array | BACnetPriorityArray | BACnetPriorityArray | R | R |
| Relinquish_Default | Unsigned | 1 | R | R |
| Time_Delay | Unsigned | - | O | R* |
| Notification_Class | Unsigned | - | O | R* |
| Feedback_Value | Unsigned | - | O | W |
| Event_Enable | BACnetEventTransitionBits | - | O | R* |
| Acked_Transitions | BACnetEventTransitionBits | - | O | R* |
| Notify_Type | BACnetNotifyType | - | O | R* |
| Event_Time_Stamps | BACnetArray[N] of BACnetTimeStamp | - | O | R* |
| Profile_Name | CharacterString | - | O | - |

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## 5.2.10 Multistate Value Object Type

| Property Identifier | Property Datatype | Value | ASHRAE | IBOX |
|---|---|---|---|---|
| Object_Identifier | BACnetObjectIdentifier | (Multi-state Output, 0) | R | R |
| Object_Name | CharacterString | *Configurable through BACnet and Config Tool* | R | R |
| Object_Type | BACnetObjectType | MULTISTATE_VALUE (19) | R | R |
| Present_Value | Unsigned | x | W | W |
| Description | CharacterString | - | O | - |
| Status_Flags | BACnetStatusFlags | {FALSE, FALSE, FALSE, FALSE} | R | R |
| Event_State | BACnetEventState | STATE_NORMAL (0) | R | R |
| Reliability | BACnetReliability | NO_FAULT_DETECTED (0) | O | R |
| Out_Of_Service | BOOLEAN | FALSE | R | R |
| Number_Of_States | Unsigned | *Configurable through BACnet and Config Tool* | R | R |
| State_Text | BACnetArray[N] of CharacterString | | O | R |
| Priority_Array | BACnetPriorityArray | - | R | R |
| Relinquish_Default | Unsigned | - | R | R |
| Time_Delay | Unsigned | - | O | R* |
| Notification_Class | Unsigned | - | O | R* |
| Alarm_Values | Unsigned | - | O | R* |
| Fault_Values | Unsigned | | O | R* |
| Event_Enable | BACnetEventTransitionBits | - | O | R* |
| Acked_Transitions | BACnetEventTransitionBits | - | O | R* |
| Notify_Type | BACnetNotifyType | - | O | R* |
| Event_Time_Stamps | BACnetArray[N] of BACnetTimeStamp | - | O | R* |
| Profile_Name | CharacterString | - | O | - |

* Only available when specific object has a Notification Class configured

## 5.2.11 Calendar Object Type

| Property Identifier | Property Datatype | Value | ASHRAE | IBOX |
|---|---|---|---|---|
| Object_Identifier | BACnetObjectIdentifier | (Calendar, 6) | R | R |
| Object_Name | CharacterString | *Configurable through BACnet and Config Tool* | R | R |
| Object_Type | BACnetObjectType | CALENDAR (6) | R | R |
| Description | CharacterString | - | O | - |
| Present_Value | BOOLEAN | - | R | R |
| Date_List | BACnetLIST of BACnetCalendarEntry | - | R | W |
| Profile_Name | BACnetARRAY[N] of BACnetPropertyIdentifier | - | O | - |

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## 5.2.12 Schedule Object Type

| Property Identifier | Property Datatype | Value | ASHRAE | IBOX |
|---|---|---|---|---|
| Object_Identifier | BACnetObjectIdentifier | (Schedule, 17) | R | R |
| Object_Name | CharacterString | *Configurable through BACnet and Config Tool* | R | R |
| Object_Type | BACnetObjectType | SCHEDULE (17) | R | R |
| Present_Value | Any | - | R | R |
| Description | CharacterString | - | O | - |
| Effective_Period | BACnetDateRange | - | R | W |
| Weekly_Schedule | BACnetARRAY[7] of BACnetDailySchedule | - | R | W |
| Exception_Schedule | BACnetARRAY[N] of BACnetSpecialEvent | - | R | W |
| Schedule_Default | Any | - | R | W |
| List_Of_Object_Property_References | BACnetLIST of BACnetDeviceObjectPropertyReference | - | R | R |
| Priority_For_Writing | Unsigned(1..16) | - | R | W |
| Status_Flags | BACnetStatusFlags | - | R | R |
| Reliability | BACnetReliability | - | R | R |
| Out_Of_Service | BOOLEAN | - | R | R |
| Event_Detection_Enable | BOOLEAN | - | O | - |
| Notification_Class | Unsigned | - | O | - |
| Event_Enable | BACnetEventTransitionBits | - | O | - |
| Event_State | BACnetEventState | - | O | - |
| Acked_Transitions | BACnetEventTransitionBits | - | O | - |
| Notify_Type | BACnetNotifyType | - | O | - |
| Event_Time_Stamps | BACnetARRAY[3] of BACnetTimeStamp | - | O | - |
| Event_Message_Texts | BACnetARRAY[3] of CharacterString | - | O | - |
| Event_Message_Texts_Config | BACnetARRAY[3] of CharacterString | - | O | - |
| Reliability_Evaluation_Inhibit | BOOLEAN | - | O | - |
| Profile_Name | CharacterString | - | O | - |

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## 5.2.13 Notification Class Object Type

| Property Identifier | Property Datatype | Value | ASHRAE | IBOX |
|---|---|---|---|---|
| Object_Identifier | BACnetObjectIdentifier | (Notification_Class, 15) | R | R |
| Object_Name | CharacterString | *Configurable through BACnet and Config Tool* | R | R |
| Object_Type | BACnetObjectType | NOTIFICATION_CLASS (15) | R | R |
| Description | CharacterString | - | O | - |
| Notification_Class | Unsigned | - | R | R |
| Priority | BACnetARRAY[3] of Unsigned | - | R | R |
| Ack_Required | BACnetEventTransitionBits | - | R | R |
| Recipient_List | BACnetLIST of BACnetDestination | - | R | R |
| Profile_Name | CharacterString | - | O | - |

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## 5.2.14 Trend Log Object Type

| Property Identifier | Property Datatype | Value | ASHRAE | IBOX |
|---|---|---|---|---|
| Object_Identifier | BACnetObjectIdentifier | (Trend_Log, 20) | R | R |
| Object_Name | CharacterString | *Configurable through BACnet and Config Tool* | R | R |
| Object_Type | BACnetObjectType | TREND_LOG (20) | R | R |
| Description | CharacterString | - | O | - |
| Enable | BOOLEAN | | R | W |
| Start_Time | BACnetDateTime | | O | W |
| Stop_Time | BACnetDateTime | | O | W |
| Log_DeviceObjectProperty | BACnetDeviceObject PropertyReference | | O | - |
| Log_Interval | Unsigned | | O | - |
| COV_Resubscription_Interval | Unsigned | | O | - |
| Client_COV_Increment | BACnetClientCOV | | O | - |
| Stop_When_Full | BOOLEAN | | R | R |
| Buffer_Size | Unsigned | | R | R |
| Log_Buffer | List of BACnetLogRecord | | R | R |
| Record_Count | Unsigned | | R | W |
| Total_Record_Count | Unsigned | | R | R |
| Notification_Threshold | Unsigned | | O | R* |
| Records_Since_Notification | Unsigned | | O | R* |
| Last_Notify_Record | Unsigned | | O | R* |
| Event_State | BACnetEventState | | R | R |
| Notification_Class | Unsigned | | O | R* |
| Event_Enable | BACnetEventTransitionBits | | O | R* |
| Acked_Transitions | BACnetEventTransitionBits | | O | R* |
| Notify_Type | BACnetNotifyType | | O | R* |
| Event_Time_Stamps | BACnetARRAY[3] of BACnetTimeStamp | | O | R* |
| EventMessageTexts | BACnetARRAY[3] of CharacterString | | O | R* |
| Profile_Name | CharacterString | | O | - |
| Logging_Type | BACnetLoggingType | | R | R |
| Status_Flags | BACnetStatusFlags | | R | R |

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## 5.2.15 Trend Log Multiple Object Type

| Property Identifier | Property Datatype | Value | ASHRAE | IBOX |
|---|---|---|---|---|
| Object_Identifier | BACnetObjectIdentifier | (Trend_Log_Multiple, 27) | R | R |
| Object_Name | CharacterString | *Configurable through BACnet and Config Tool* | R | R |
| Object_Type | BACnetObjectType | TREND_LOG_MULTIPLE (27) | R | R |
| Description | CharacterString | - | O | - |
| Enable | BOOLEAN | | R | W |
| Start_Time | BACnetDateTime | | O | W |
| Stop_Time | BACnetDateTime | | O | W |
| Log_DeviceObjectProperty | BACnetARRAY[10] of BACnetDeviceObject PropertyReference | | O | R |
| Log_Interval | Unsigned | | O | - |
| COV_Resubscription_Interval | Unsigned | | O | - |
| Client_COV_Increment | BACnetClientCOV | | O | - |
| Stop_When_Full | BOOLEAN | | R | R |
| Buffer_Size | Unsigned | | R | R |
| Log_Buffer | List of BACnetLogRecord | | R | R |
| Record_Count | Unsigned | | R | W |
| Total_Record_Count | Unsigned | | R | R |
| Notification_Threshold | Unsigned | | O | R* |
| Records_Since_Notification | Unsigned | | O | R* |
| Last_Notify_Record | Unsigned | | O | R* |
| Event_State | BACnetEventState | | R | R |
| Notification_Class | Unsigned | | O | R* |
| Event_Enable | BACnetEventTransitionBits | | O | R* |
| Acked_Transitions | BACnetEventTransitionBits | | O | R* |
| Notify_Type | BACnetNotifyType | | O | R* |
| Event_Time_Stamps | BACnetARRAY[3] of BACnetTimeStamp | | O | R* |
| EventMessageTexts | BACnetARRAY[3] of CharacterString | | O | R* |
| Profile_Name | CharacterString | | O | - |
| Logging_Type | BACnetLoggingType | | R | R |
| Status_Flags | BACnetStatusFlags | | R | R |

\* Only available when specific object has a Notification Class configured

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## 6   Connections

Find below information regarding the IntesisBox connections available.
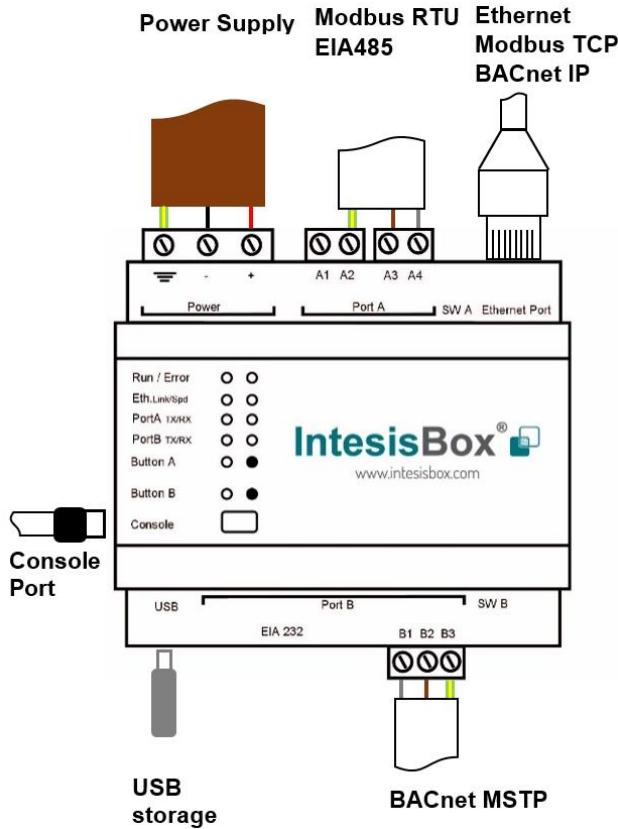


**Power Supply**
Must use NEC Class 2 or Limited Power Source (LPS) and SELV rated power supply.

**If using DC power supply:**
Respect polarity applied of terminals (+) and (-). Be sure the voltage applied is within the range admitted (check table below). The power supply can be connected to earth but only through the negative terminal, never through the positive terminal.

**If using AC power supply:**
Make sure the voltage applied is of the value admitted (24 Vac). Do not connect any of the terminals of the AC power supply to earth, and make sure the same power supply is not supplying any other device.

**Ethernet / BACnet IP / Modbus TCP**
Connect the cable coming from the IP network to the connector ETH of the gateway. Use an Ethernet CAT5 cable. If communicating through the LAN of the building, contact the network administrator and make sure traffic on the port used is allowed through all the LAN path (check the gateway user manual for more information). Default IP is 192.168.100.246. DHCP is enabled by default.

**PortA / Modbus RTU**
Connect the EIA485 bus to connectors A3 (+), A4 (-) and A1 or A2 (SNGD) of gateway's PortA. Respect the polarity.

**PortB / BACnet MSTP**
Connect the EIA485 bus to connectors B1 (-), B2 (+) and B3 (SNGD) of gateway's PortB. Respect the polarity.

**Note for PortA and PortB;** Remember the characteristics of the standard EIA485 bus: maximum distance of 1200 meters, maximum 32 devices connected to the bus, and in each end of the bus it must be a termination resistor of 120 Ω. The gateway has an internal bus biasing circuit that incorporates the termination resistor. If you install the gateway in one of the ends of the bus, then do not install an additional termination resistor in that end.

**Console Port**
Connect a mini-type B USB cable from your computer to the gateway to allow communication between the Configuration Software and the gateway. Remember that Ethernet connection is also allowed. Check the user manual for more information.

**USB**
Connect a USB storage device (not a HDD) if required. Check the user manual for more information.

Ensure proper space for all connectors when mounted (see section 9).

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## 6.1  *Powering the device*

A power supply working with any of the voltage range allowed is needed (check section 8). Once connected the RUN led (Figure above) will turn on.

**WARNING!** In order to avoid earth loops that can damage the gateway and/or any other equipment connected to it, we strongly recommend:

- The use of DC power supplies, floating or with the negative terminal connected to earth. **Never use a DC power supply with the positive terminal connected to earth**.
- The use of AC power supplies only if they are floating and not powering any other device.

## 6.2  *Connection to BACnet*

### 6.2.1  BACnet IP

Connect the communication cable coming from the network hub or switch to the ETH port (Figure above) of IntesisBox. The cable to be used shall be a straight Ethernet UTP/FTP CAT5 cable

In case there is no response from the BACnet devices to the frames sent by IntesisBox, check that they are operative and reachable from the network connection used by IntesisBox. Check the IntesisBox Ethernet interface sending *Pings* to its IP address using a PC connected to the same Ethernet network.

Check as well with the network admin that there are no limitations regarding UDP communication or ports blocked.
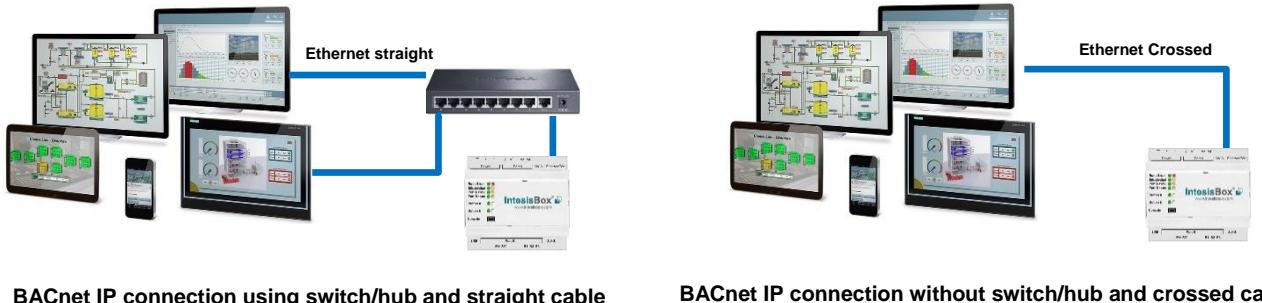


**BACnet IP connection using switch/hub and straight cable**          **BACnet IP connection without switch/hub and crossed cable**

### 6.2.2  BACnet MSTP

Connect the EIA485 bus to connectors A3 (+), A4 (-) and A1 or A2 (SNGD) of gateway's PortA. Respect the polarity.

Remember the characteristics of the standard EIA485 bus: maximum distance of 1200 meters, maximum 32 devices connected to the bus, and in each end of the bus it must be a termination resistor of 120 Ω. The gateway has an internal bus biasing circuit that incorporates the termination resistor. If you install the gateway in one of the ends of the bus, then do not install an additional termination resistor in that end.

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## 6.3   *Connection to Modbus*

### 6.3.1   Modbus TCP

Connect the communication cable coming from the network hub or switch to the ETH port of IntesisBox. The cable to be used shall be a straight Ethernet UTP/FTP CAT5 cable.

### 6.3.2   Modbus RTU

Connect the communication cable coming from the Modbus network to the port marked as Modbus of IntesisBox. Connect the EIA485 bus to connectors B2 (+), B1 (-) and A1 or A2 (SNGD) or to connectors B1 (-), B2 (+) and B3 (SNGD) of gateway's PortB. Respect the polarity.

Remember the characteristics of the standard EIA485 bus: maximum distance of 1200 meters, maximum 32 devices connected to the bus, and in each end of the bus it must be a termination resistor of 120 Ω. The gateway has an internal bus biasing circuit that incorporates the termination resistor. If you install the gateway in one of the ends of the bus, then do not install an additional termination resistor in that end.

## 6.4   *Connection to the configuration tool*

This action allows the user to have access to configuration and monitoring of the device (more information can be found in the configuration tool User Manual). Two methods to connect to the PC can be used:

- **Ethernet:** Using the Ethernet port of IntesisBox.

- **USB:** Using the console port of IntesisBox, connect a USB cable from the console port to the PC.

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# 7   Set-up process and troubleshooting

## 7.1   *Pre-requisites*

It is necessary to have a BACnet IP client or MSTP device operative and well connected to the corresponding BACnet port of IntesisBox and a Modbus RTU slave or Modbus TCP client connected to their corresponding ports as well.

Connectors, connection cables, PC to use the configuration tool and other auxiliary material, if needed, are not supplied by Intesis Software SLU for this standard integration.

Items supplied by Intesis Software for this integration are:

- IntesisBox gateway.
- Link to download the configuration tool.
- Product documentation.

## 7.2   *IntesisBox MAPS. Configuration & monitoring tool for IntesisBox BACnet series*

### 7.2.1   Introduction

IntesisBox MAPS is a Windows® compatible software developed specifically to monitor and configure IntesisBox BACnet series.

The installation procedure and main functions are explained in the *IntesisBox MAPS User Manual*. This document can be downloaded from the link indicated in the installation sheet supplied with the IntesisBox device or in the product website at www.intesisbox.com

In this section, only the specific case of Modbus to BACnet systems will be covered.

Please check the IntesisBox MAPS user manual for specific information about the different parameters and how to configure them.

### 7.2.2   Connection

To configure the IntesisBox connection parameters press on the **Connection** button in the *menu bar*.
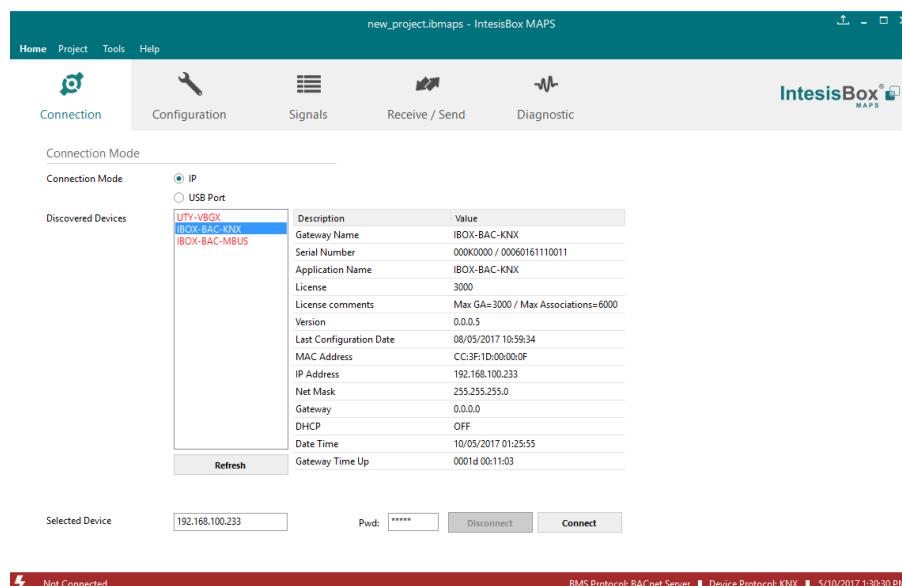


**Figure 7.1** MAPS connection

## 7.2.3 Configuration tab

Select the *Configuration* tab to configure the connection parameters. Three subsets of information are shown in this window: General (Gateway general parameters), BACnet Server (BACnet interface configuration) and Modbus Master (Modbus interface parameters).
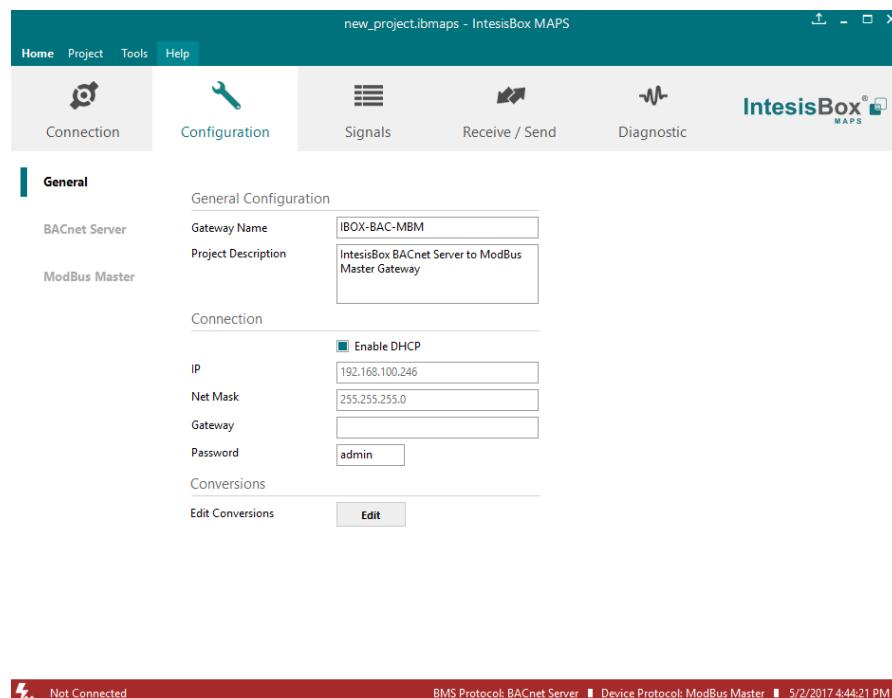


**Figure 7.2** IntesisBox MAPS configuration tab

## 7.2.4 Signals

All available objects, Object Instances, its corresponding Modbus register and other main parmaters are listed in the signals tab. More information on each parameter and how to configure it can be found in the IntesisBox MAPS user manual.



**Figure 7.3** IntesisBox MAPS Signals tab

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### 7.2.5 Sending the configuration to IntesisBox

When the configuration is finished, follow the next steps.

1.- Click on **Save** button to save the project to the project folder on your hard disk (more information in IntesisBox MAPS User Manual).

2.- You will be prompted to generate the configuration file to be sent to the gateway.
a.- If **Yes** is selected, the file containing the configuration for the gateway will be generated and saved also into the project folder.

b.- If **NO** is selected, remember that the binary file with the project needs to be generated before the IntesisBox starts to work as expected.

3.- Press the **Send File** button to send the binary file to the IntesisBox device. The process of file transmission can be monitored in the IntesisBox Communication Console window. IntesisBox will reboot automatically once the new configuration is loaded.
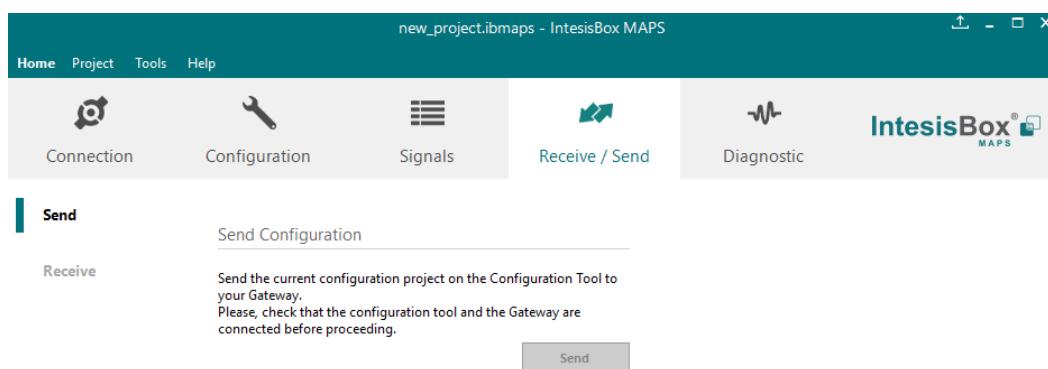


**Figure 7.4** IntesisBox MAPS Receive/Send tab

**After any configuration change, do not forget to send the configuration file to the IntesisBox using button Send File.**

### 7.2.6 Diagnostic

To help integrators in the commissioning tasks and troubleshooting, the Configuration Tool offers some specific tools and viewers.

In order to start using the diagnostic tools, connection with the Gateway is required.

The Diagnostic section is composed by two main parts: Tools and Viewers.

- **Tools**
  Use the tools section to check the current hardware status of the box, log communications into compressed files to be sent to the support, change the Diagnostic panels' view or send commands to the gateway.

- **Viewers**
  In order to check the current status, viewer for the Internal and External protocols are available. It is also available a generic Console viewer for general information about communications and the gateway status and finally a Signals Viewer to simulate the BMS behavior or to check the current values in the system.

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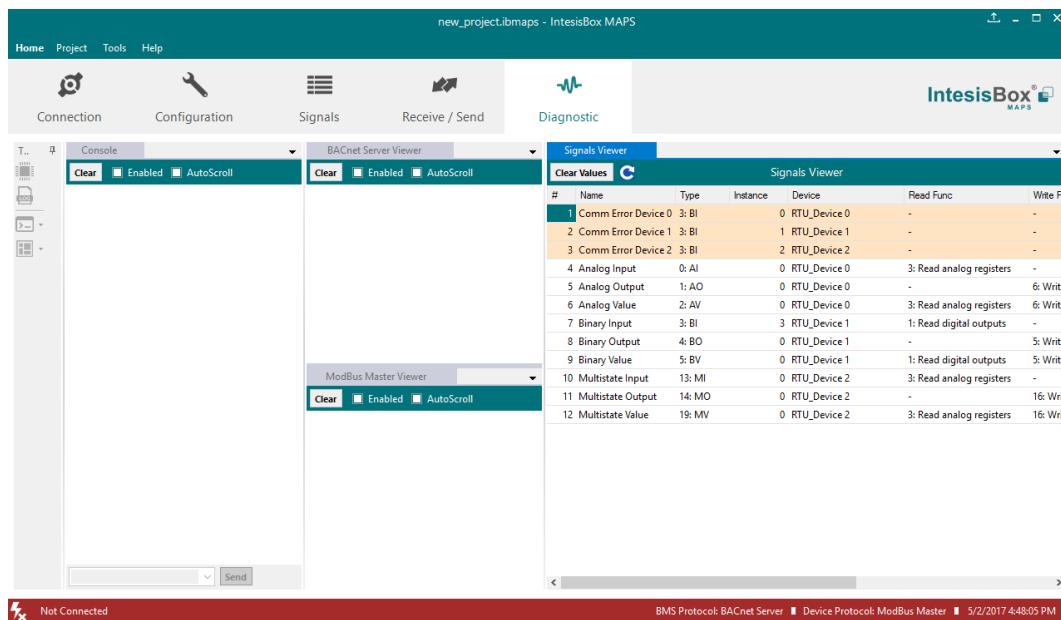
**Figure 7.5** Diagnostic

More information about the Diagnostic section can be found in the Configuraion Tool manual.

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## 7.3 *Set-up procedure*

1. Install IntesisBox MAPS on your laptop, use the setup program supplied for this and follow the instructions given by the Installation wizard.

2. Install IntesisBox in the desired installation site. Installation can be on DIN rail or on a stable not vibrating surface (DIN rail mounted inside a metallic industrial cabinet connected to ground is recommended).

3. If using BACnet IP, connect the communication cable coming from the BACnet IP network to the port marked as Ethernet on IntesisBox (More details in section 6).

   If using BACnet MSTP, connect the communication cables coming from the BACnet MSTP network to the port marked as Port A on IntesisBox (More details in section 6).

4. If using, Modbus RTU, connect the communication cable coming from the EIA485 port of the Modbus RTU installation to the port marked as Port B of IntesisBox (More details in section 6).

   If using, Modbus TCP, connect the communication cable coming from the Ethernet port of the Modbus TCP installation to the port marked as Port B of IntesisBox (More details in section 6).

5. Power up IntesisBox. The supply voltage can be 9 to 30 Vdc or just 24 Vac. Take care of the polarity of the supply voltage applied.

   **WARNING!** In order to avoid earth loops that can damage IntesisBox and/or any other equipment connected to it, we strongly recommend:

   - The use of DC power supplies, floating or with the negative terminal connected to earth. **Never use a DC power supply with the positive terminal connected to earth**.
   - The use of AC power supplies only if they are floating and not powering any other device.

6. If you want to connect using IP, connect the Ethernet cable from the laptop PC to the port marked as USB of IntesisBox (More details in section 6).

   If you want to connect using IP, connect the Ethernet cable from the laptop PC to the port marked as USB of IntesisBox (More details in section 6).

7. Open IntesisBox MAPS, create a new project selecting a copy of the one named **IBOX-BAC-MBM**.

8. Modify the configuration as desired, save it and download the configuration file to IntesisBox as explained in the IntesisBox MAPS user manual.

9. Visit the Diagnostic section and check that there is communication activity, some TX frames and some other RX frames. This means that the communication with the BACnet master device and Modbus Slave devices is OK. In case there is no communication activity between IntesisBox and the BACnet and/or Modbus devices, check that those are operative: check the baud rate, the communication cable used to connect all devices and any other communication parameter.

# 8 Electrical & Mechanical Features



| | | | | |
|---|---|---|---|---|
| **Enclosure** | Plastic, type PC (UL 94 V-0)<br>Net dimensions (dxwxh): 90x88x56 mm<br>Recommended space for installation (dxwxh): 130x100x100mm<br>Color: Light Grey. RAL 7035 | **Battery** | Size: Coin 20mm x 3.2mm<br>Capacity: 3V / 225mAh<br>Type: Manganese Dioxide Lithium |
| **Mounting** | Wall.<br>DIN rail EN60715 TH35. | **Console Port** | Mini Type-B USB 2.0 compliant<br>1500VDC isolation |
| **Terminal Wiring**<br>(for power supply and low-voltage signals) | Per terminal: solid wires or stranded wires (twisted or with ferrule)<br>1 core: 0.5mm$^2$… 2.5mm$^2$<br>2 cores: 0.5mm$^2$… 1.5mm$^2$<br>3 cores: not permitted | **USB port** | Type-A USB 2.0 compliant<br>Only for USB flash storage device<br>(USB pen drive)<br>Power consumption limited to 150mA<br>(HDD connection not allowed) |
| **Power** | 1 x Plug-in screw terminal block (3 poles)<br>9 to 36VDC +/-10%, Max.: 140mA.<br>24VAC +/-10% 50-60Hz, Max.: 127mA<br>Recommended: 24VDC | **Push Button** | Button A: Check the user manual<br>Button B: Check the user manual |
| | | **Operation Temperature** | 0°C to +60°C |
| **Ethernet** | 1 x Ethernet 10/100 Mbps RJ45<br>2 x Ethernet LED: port link and activity | **Operational Humidity** | 5 to 95%, no condensation |
| | | **Protection** | IP20 (IEC60529) |
| **Port A** | 1 x Serial EIA485 Plug-in screw terminal block (2 poles)<br>A, B<br>1 x Plug-in screw terminal block green (2 poles)<br>SGND (Reference ground or shield)<br>1500VDC isolation from others ports | **LED Indicators** | 6 x On board LED indicators<br>1 x Error LED<br>1 x Power LED<br>2 x Port A TX/RX<br>2 x Port B TX/RX<br>1 x Button A indicator<br>1 x Button B indicator |
| **Switch A**<br>(SWA) | 1 x DIP-Switch for serial EIA485 configuration:<br>Position 1:<br>**ON:** 120 Ω termination active<br>**Off:** 120 Ω termination inactive<br>Position 2-3:<br>**ON:** Polarization active<br>**Off:** Polarization inactive | | |
| **PORT B** | 1 x Serial EIA232 (SUB-D9 male connector)<br>Pinout from a DTE device<br>1500VDC isolation from other ports<br>(except PORT B: EIA485)<br>1 x Serial EIA485 Plug-in screw terminal block (3 poles)<br>A, B, SGND (Reference ground or shield)<br>1500VDC isolation from other ports<br>(except PORT B: EIA232) | | |
| **Switch B**<br>SWB) | 1 x DIP-Switch for serial EIA485 configuration:<br>Position 1:<br>**ON:** 120 Ω termination active<br>**Off:** 120 Ω termination inactive<br>Position 2-3:<br>**ON:** Polarization active<br>**Off:** Polarization inactive | 100 mm | |

## 9   Dimensions
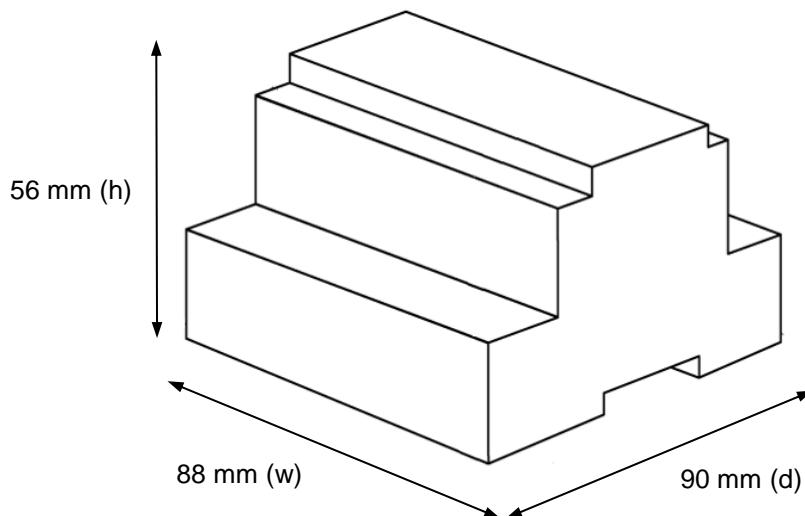


Recommended available space for its installation into a cabinet (wall or DIN rail mounting), with space enough for external connections