



# **IntesisBox<sup>®</sup> ASCII Server**

BACnet MSTP and BACnet/IP client

## **User Manual**

r1.0 EN

**Issue date:** 10/2018

**© Intesis Software S.L.U. 2018 All Rights Reserved.**

Information in this document is subject to change without notice. The software described in this document is furnished under a license agreement or nondisclosure agreement. The software may be used only in accordance with the terms of those agreements. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or any means electronic or mechanical, including photocopying and recording for any purpose other than the purchaser's personal use without the written permission of Intesis Software S.L.U.

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

**TRADEMARKS**

All trademarks and trade names used in this document are acknowledged to be the copyright of their respective holders.

Gateway for the integration of BACnet MSTP and BACnet IP installations into ASCII IP or ASCII Serial enabled monitoring and control systems.

Order code:

**IBASCBAC6000000, 600 points version**  
**IBASCBAC3K00000, 3000 points version**

## INDEX

1	Description .....	5
1.1	Introduction .....	5
1.2	Functionality .....	6
1.3	Gateway's capacity .....	6
2	BACnet interface .....	7
2.1	Description.....	7
2.2	BACnet/IP .....	8
2.3	BACnet MSTP .....	8
2.4	Points definition .....	9
3	ASCII interface .....	10
3.1	Description.....	10
3.2	ASCII Serial .....	10
3.3	ASCII TCP .....	10
3.4	Address Map .....	10
3.5	Points definition .....	10
3.6	ASCII messages.....	12
4	Connections .....	13
4.1	Powering the device .....	14
4.2	Connection to ASCII .....	14
4.2.1	ASCII TCP/IP .....	14
4.2.2	ASCII Serial .....	14
4.3	Connection to BACnet.....	14
4.3.1	BACnet IP .....	14
4.3.2	BACnet MSTP .....	15
4.4	Connection to the configuration tool.....	15
5	Set-up process and troubleshooting .....	16
5.1	Pre-requisites .....	16
5.2	IntesisBox MAPS. Configuration & monitoring tool for IntesisBox ASCII series .....	16
5.2.1	Introduction .....	16
5.2.2	Connection.....	16
5.2.3	Configuration tab .....	17
5.2.4	Signals .....	24
5.2.5	Sending the configuration to IntesisBox .....	24
5.2.6	Diagnostic .....	25
5.3	Set-up procedure.....	27
6	Electrical & Mechanical Features.....	28
7	Dimensions .....	29

# 1 Description

## 1.1 Introduction

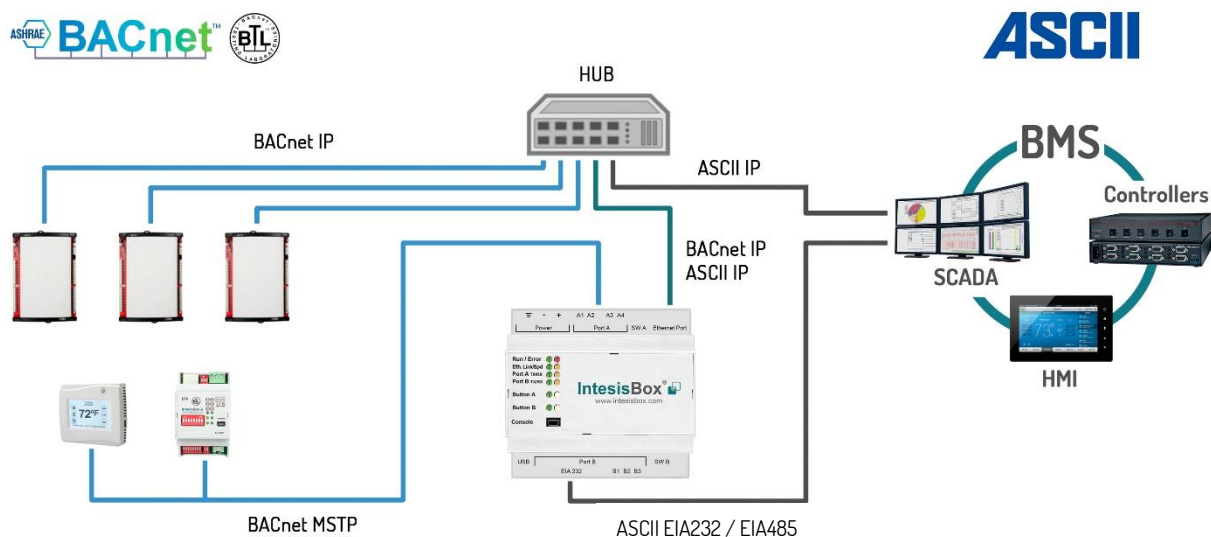
This document describes the integration of BACnet MSTP and BACnet IP installations into ASCII serial (EIA232 or EIA485) or ASCII IP compatible devices and systems using the *IntesisBox ASCII Server – BACnet Client* gateway.

The aim of this integration is to make accessible BACnet system signals and resources from any system capable to be programmed to read and write simple text messages through EIA232 or EIA485 serial port or Ethernet TCP/IP port (for example Extron, LiteTouch systems).

The gateway acts as a BACnet IP Client device in its BACnet interface, reading/writing points of other BACnet IP device(s), and offering this point's values of BACnet device(s) through its ASCII interface using simple ASCII messages. The readings into the BACnet device(s) performed by the gateway can be by polling or by subscription (COV).

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

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



**Integration of *BACnet IP* or *BACnet MSTP* server systems  
into *ASCII TCP/IP* or *ASCII Serial* control and monitoring systems**

## 1.2 Functionality

From the BACnet system point of view, after the start up process, IntesisBox subscribes to configured BACnet points or reads them continuously from their respective BACnet server devices and updates in its memory the value of the present\_value property received from them.

From the ASCII system point of view, after the start up process of the gateway, IntesisBox waits for any query (ASCII messages requesting readings of points or ASCII messages requesting writings of points) and acts according to the message received. See ASCII interface section for details about this ASCII messages.

Each BACnet object from the BACnet server devices is associated to an ASCII, with this, all the configured points of the BACnet server devices are seen as a single ASCII device with many registers from the ASCII system point of view, each register corresponding to a present\_value of an object on a particular BACnet server device.

When a new value is read from BACnet for a given object/present\_value, the new value is updated in the gateway's memory and made accessible at ASCII Server interface.

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

## 1.3 Gateway's capacity

IntesisBox capacity is listed below:

Element	600 version	3000 version	Notes
Type of BACnet devices	IP / MSTP		Communication with BACnet IP and MSTP
Number of BACnet devices	256		Maximum number of different BACnet devices the IntesisBox can communicate to
Number of ASCII Registers	600	3000	Maximum number of points that can be defined in the virtual ASCII Server device inside the gateway
ASCII link layers supported	Serial (EIA485/EIA485) TCP/IP		Communication with ASCII client with simple messages through a TCP/IP or serial connection

## 2 BACnet interface

This section describes the BACnet part of the IntesisBox's configuration and functionality.

### 2.1 Description

BACnet server devices are represented in the form of *Devices* holding *Objects*, normally every physical device corresponds to a logical one. The *Objects* can be of different type depending on the data and functionality they represent: Analog Input, Analog output, Digital Input, etc. Up to 23 different types of objects. Note that Outputs are objects meant to be written in the direction BACnet network to the device, and the opposite for Inputs (they are meant to offer status information of the BACnet device). Value objects are bidirectional.

Every *Object* has different properties. The most meaningful one, and the one used to read and write values by IntesisBox is the *Present Value* property, which indicates the real value of the object. Every Object of the same type in a *Device* is identified with its associated *Object Instance*.

These are the possible BACnet objects supported by IntesisBox:

Object Type	Property	Description
Analog Input	Present Value	Analog signal. i.e. Ambient temperature.
Analog Output	Present Value	Analog signal.
Analog Value	Present Value	Analog signal. i.e. Temperature set point value.
Binary Input	Present Value	Digital signal. i.e. ON/OFF status.
Binary Output	Present Value	Digital signal. i.e. ON/OFF command.
Binary Value	Present Value	Digital signal. i.e. ON/OFF status/command.
Multistate Input	Present Value	Multistate signal. i.e. Working mode status.
Multistate Output	Present Value	Multistate signal.
Multistate Value	Present Value	Multistate signal. i.e. Working mode command.
Accumulator	Present Value	Analog signal.
Loop	Present Value	Analog signal.

Every signal is identified with its associated *Device + Object Type + Object Instance*.

IntesisBox simulates a virtual BACnet device inside the BACnet system acting as client device in the BACnet system. The communication with the rest of the BACnet devices is done via the Ethernet port of the gateway which implements the BACnet protocol.

IntesisBox implements a single BACnet object of its own: this is, its BACnet Device Object, containing its BACnet Device Identifier and basic properties of IntesisBox as BACnet device (name, firmware version, etc).

Using the configuration tool with IntesisBox it's possible to scan the BACnet network for available devices and their objects, which can later be directly added to your configuration. This facilitates the configuration process, avoiding entering them manually.

BACnet/IP and BACnet MSTP physical layers are supported. Only one physical layer can be used at a time. This is, if communicating to BACnet using BACnet/IP, BACnet MSTP cannot be used, and viceversa.

## **2.2 BACnet/IP**

Main parameter to set up for BACnet/IP, additional to basic IP settings (IP, netmask, default gateway) is the communication port. IntesisBox uses port 47808 (0xBAC0) by default and it can be changed at configuration time.

When using BACnet/IP, device can also act as a Foreign Device (in order to be able to communicate with devices that are in another network domain), alternatively implement a BBMD itself (Bacnet/IP Broadcast Management Device). This functionality facilitates communication of devices in other networks with the devices in the network where IntesisBox is installed.

Communication with BACnet/IP excludes possibility of communicating with BACnet MSTP from IntesisBox.

## **2.3 BACnet MSTP**

When choosing BACnet MSTP device needs to be associated with a MAC address (address within the MSTP network segment), to be configured with configuration software.

Following baud rates are supported for MSTP line: 9600, 19200, 38400, 76800, 115200 or Autobauding (autodetect).

Standard wiring guidelines for EIA485 apply for the BACnet MSTP line.

Communication with BACnet MSTP excludes possibility of communicating with BACnet/IP from IntesisBox.



## 2.4 Points definition

Every point defined in IntesisBox has the following BACnet features associated to it:

Feature	Description
<b>BACnet Device</b>	<p>BACnet device to which belongs the point, from a list of BACnet devices that can be defined in IntesisBox (up to 16).</p> <p>For every BACnet device defined, a virtual signal is created automatically in IntesisBox to inform about the communication with the BACnet device, this signal is available also from the ASCII interface like the rest of points.</p>
<b>BACnet object type</b>	<p>BACnet object type for the point. It can be one of the following BACnet object types supported by IntesisBox:</p> <p>AI = Analog Input. AO = Analog Output. AV = Analog Value. DI = Digital Input. DO = Digital Output. DV = Digital Value. MI = Multistate Input. MO = Multistate Output. MV = Multistate Value. LOOP = Loop ACCUM = Accumulator</p> <p><i>Consult documentation of BACnet device(s) to integrate for information about BACnet object types of the points desired to integrate.</i></p>
<b>BACnet object instance</b>	<p>BACnet object instance for the point on the external BACnet device.</p> <p><i>Consult documentation of BACnet device(s) to integrate for information about BACnet object instance of the points desired to integrate.</i></p>

Note that configuration tool used with IntesisBox enables for discovery of existing BACnet devices in the network, as well as their BACnet objects and types, which can be later directly added in configuration. This facilitates the process of choosing suitable parameters above for every BACnet object on every BACnet device to integrate.

### 3 ASCII interface

This section describes the ASCII interface of the IntesisBox, its configuration and functionality.

#### 3.1 Description

The gateway can be connected to any *ASCII enabled* device using its EIA232 interface (DB9 connector DTE), EIA485 interface or TCP/IP (Ethernet connector) and offers through this interface the possibility of supervision and control of its internal BACnet points using simple ASCII messages.

On receiving messages corresponding to write commands in its ASCII interface, the gateway sends the corresponding write command message to the associated BACnet device.

When a new value for a point is received from BACnet, the corresponding ASCII message indicating the new value will be sent through the ASCII interface, but only if the point is configured for sending this "spontaneous messages", if it is not configured to do so, then the new value will be available to be polled in any moment from the ASCII enabled device connected to this ASCII interface. This behaviour of sending or not through the ASCII interface the new values received from BACnet is configurable individually per point in the gateway.

#### 3.2 ASCII Serial

Serial communication for the ASCII communication can be configured to match the ASCII master device.

Only the RX, TX and GND lines of the EIA232 connector are used (TX/RX+ and TX/RX- for EIA485).

#### 3.3 ASCII TCP

The TCP port to use can be configured (by default 5000 is used).

The IP address, subnet mask and default router address to use by IntesisBox can be also configured.

#### 3.4 Address Map

The ASCII address map is fully configurable; any point in the IntesisBox can be freely configured with the desired internal register address. Check the configuration tool manual for more information.

#### 3.5 Points definition

Every point defined in the gateway has the following ASCII features associated to it, which can be configured:

Feature	Description
Signal	Signal or point description. Only for information purposes at user level.
ASCII string	Defines the ASCII string that will be used to access this register <ul style="list-style-type: none"><li>Max length: 32 characters</li></ul>

Read/Write	<p>Defines the current function (read, write or both) to be used from the ASCII side with this register. It can't be configured as it is directly set when selecting the current BACnet type object.</p> <table><tr><th>Function</th><th>Read</th><th>Write</th><th>Read/Write</th></tr><tr><td>BACnet Object</td><td>Analog Input Binary Input Multistate Input Loop Accumulator</td><td>Analog Output Binary Output Multistate Output</td><td>Analog Value Binary Value Multistate Value</td></tr></table>	Function	Read	Write	Read/Write	BACnet Object	Analog Input Binary Input Multistate Input Loop Accumulator	Analog Output Binary Output Multistate Output	Analog Value Binary Value Multistate Value
Function	Read	Write	Read/Write						
BACnet Object	Analog Input Binary Input Multistate Input Loop Accumulator	Analog Output Binary Output Multistate Output	Analog Value Binary Value Multistate Value						
Spontaneous	<p>Determines if any change of value for the point received from BACnet will generate a spontaneous ASCII message to send through the ASCII interface informing about the new value.</p>								
A/D	<p>Defines the current variable type for this register from the ASCII side. It can't be configured as it is directly set when selecting the current BACnet type object.</p> <table><tr><th>Type</th><th>Analog</th><th>Digital</th></tr><tr><td>BACnet Object</td><td>Analog Input Analog Output Analog Value Multistate Input Multistate Output Multistate Value Loop Accumulator</td><td>Binary Input Binary Output Binary Value</td></tr></table>	Type	Analog	Digital	BACnet Object	Analog Input Analog Output Analog Value Multistate Input Multistate Output Multistate Value Loop Accumulator	Binary Input Binary Output Binary Value		
Type	Analog	Digital							
BACnet Object	Analog Input Analog Output Analog Value Multistate Input Multistate Output Multistate Value Loop Accumulator	Binary Input Binary Output Binary Value							

### 3.6 ASCII messages

Communication from the ASCII side is carried out thanks to simple ASCII messages. Note that these messages can be configured from the configuration tool to match the ASCII master device.

The ASCII messages used to read/write points into the gateway through this interface have the following format

- **Message to read a point's value:**

**ASCII\_String?***\r*

Where:

Characters	Description
<b>ASCII_String</b>	String indicating the point's address inside the gateway
<b>?</b>	Character use to indicate that this is a reading message (configurable from the configuration tool)
<i>\r</i>	Carriage return character (HEX 0x0D, DEC 13)

- **Message to write a point's value:**

**ASCII\_String=vv***\r*

Where:

Characters	Description
<b>ASCII_String</b>	String indicating the point's address inside the gateway
<b>=</b>	Character use to indicate that this is a reading message (configurable from the configuration tool)
<b>vv</b>	Current point's value
<i>\r</i>	Carriage return character (HEX 0x0D, DEC 13)

- **Message informing about a point's value (sent spontaneously by the gateway when receiving a change from BACnet or sent by the gateway in response to a previous poll for the point):**

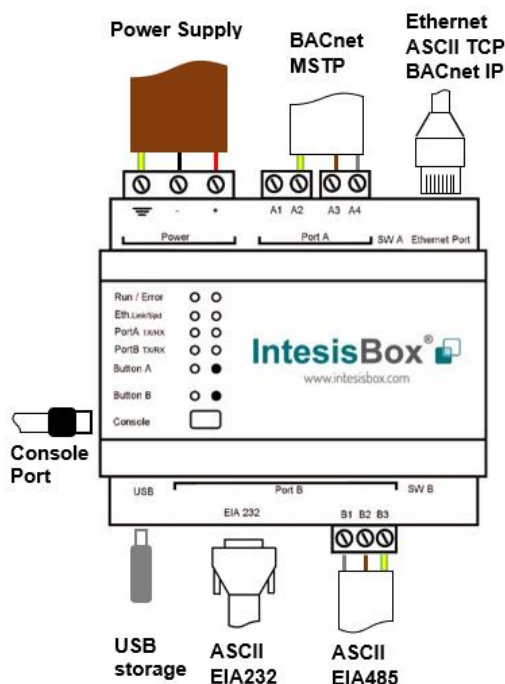
**ASCII\_String=vv***\r*

Where:

Characters	Description
<b>ASCII_String</b>	String indicating the point's address inside the gateway
<b>=</b>	Character use to indicate where point's data starts
<b>vv</b>	Current point's value
<i>\r</i>	Carriage return character (HEX 0x0D, DEC 13)

## 4 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 / ASCII TCP/IP

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 / BACnet MSTP

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

### PortB / ASCII Serial

Connect the EIA485 bus to connectors B1 (B+), B2 (A-) and B3 (SNGD) of gateway's PortB. Respect the polarity. Connect the serial cable EIA232 coming from the external serial device to the EIA232 connector of gateway's PortB. This is a DB9 male (DTE) connector in which only the lines TX, RX and GND are used. Respect the maximum distance of 15 meters.

**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  $\Omega$ . The port includes a DIP-Switch for configuration of biasing circuit as well as termination:

SW1:

**ON:** 120  $\Omega$  termination active  
**OFF:** 120  $\Omega$  termination inactive (default)

SW2-3:

**ON:** Polarization active (default in BACnet MSTP port)  
**OFF:** Polarization inactive (default in ASCII serial port)

If the gateway is installed in one bus end make sure that termination is active.

### 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 7).

## 4.1 Powering the device

A power supply working with any of the voltage range allowed is needed (check section 6). 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.

## 4.2 Connection to ASCII

### 4.2.1 ASCII TCP/IP

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.

### 4.2.2 ASCII Serial

Connect the communication cable coming from the ASCII network to the port marked as Port B of IntesisBox. Connect the EIA485 bus to connectors to connectors B1 (B+), B2 (A-) 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  $\Omega$ . Set port switch SW1 to ON if gateway is installed on one bus end. SW2-3 will generally go OFF (no polarization), as polarization will typically be provided in the ASCII Serial master device.

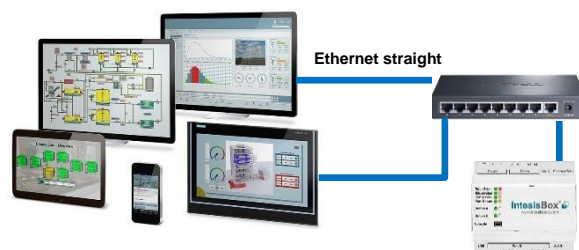
## 4.3 Connection to BACnet

### 4.3.1 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

## 4.3.2 BACnet MSTP

Connect the EIA485 bus to connectors A3 (A-), A4 (B+) 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  $\Omega$ . Set port switch SW1 to ON if gateway is installed on one bus end. SW2-3 will generally go to ON (polarization active), unless there is another client / header device providing polarization in the same bus.

## 4.4 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.

## 5 Set-up process and troubleshooting

### 5.1 Pre-requisites

It is necessary to have an ASCII TCP/IP client or ASCII Serial master operative and well connected to the corresponding ASCII port of IntesisBox as well as the BACnet IP or BACnet MSTP server devices 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.
- Mini-USB cable to connect to PC
- Link to download the configuration tool.
- Product documentation.

### 5.2 IntesisBox MAPS. Configuration & monitoring tool for IntesisBox ASCII series

#### 5.2.1 Introduction

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

The installation procedure and main functions are explained in the *IntesisBox MAPS User Manual for ASCII*. 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](http://www.intesisbox.com)

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

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

#### 5.2.2 Connection

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

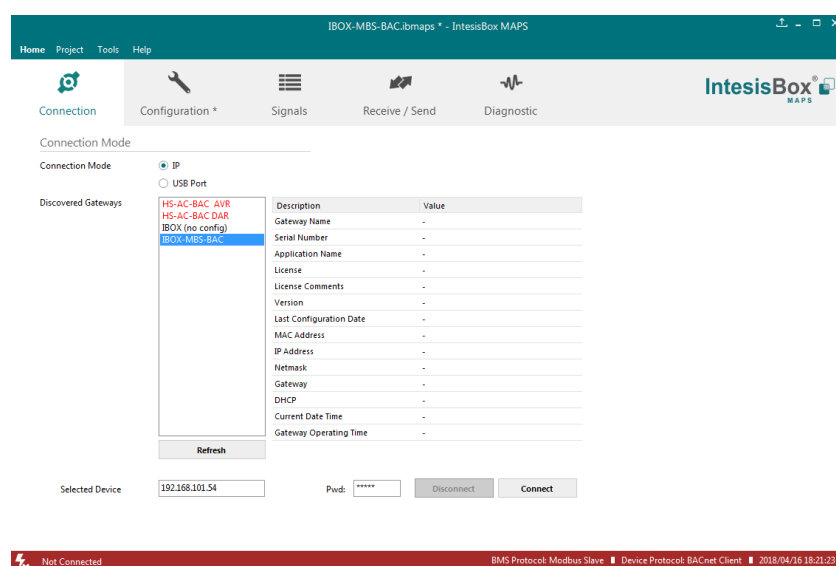


Figure 5.1 MAPS connection



### 5.2.3 Configuration tab

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

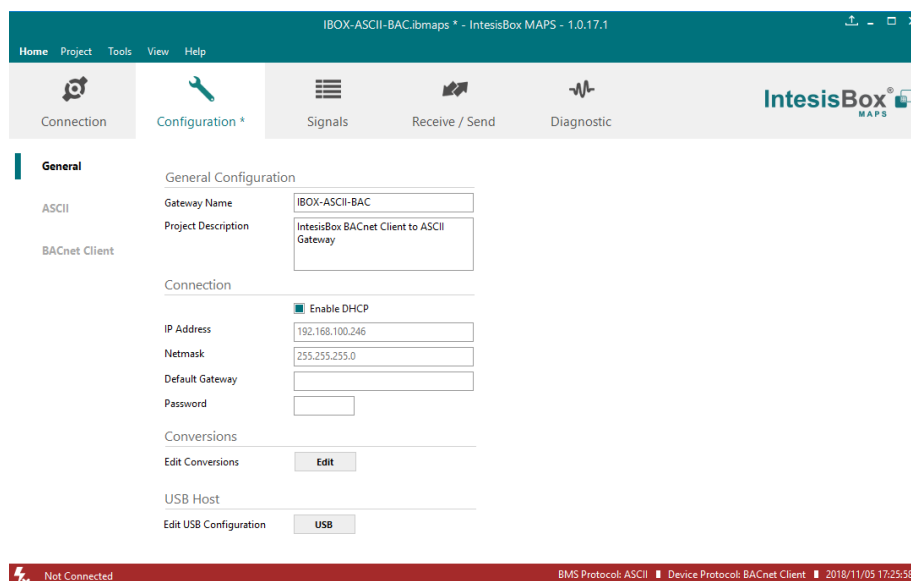


Figure 5.2 IntesisBox MAPS configuration tab

General parameters are explained in IntesisBox MAPS user manual for IntesisBox ASCII Server Series.

#### 5.2.3.1 ASCII Configuration

Set the parameters for connection to ASCII device.

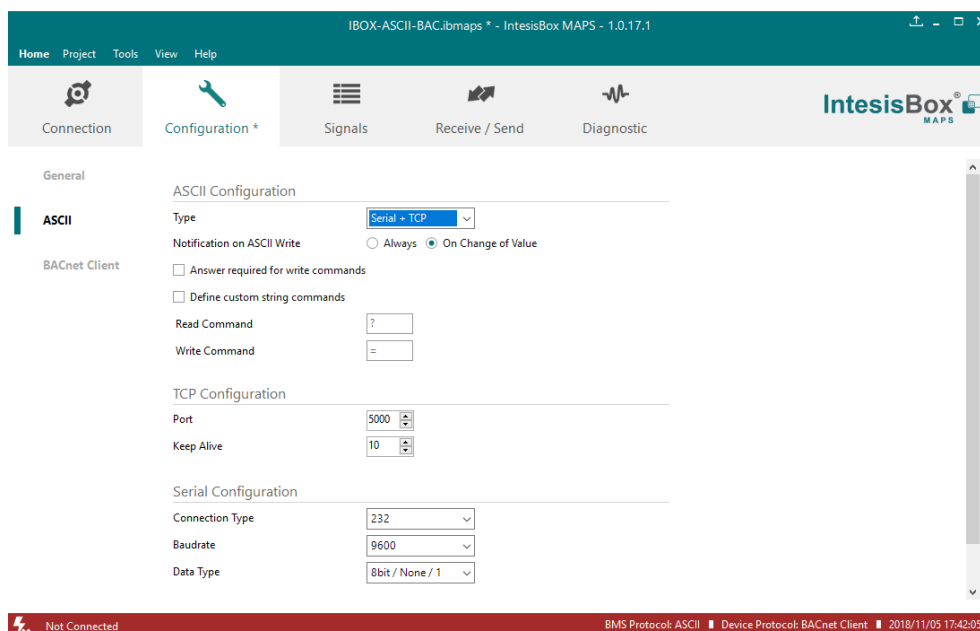


Figure 5.3 IntesisBox MAPS configuration tab for BACnet Client

- **Communication type:** Select if ASCII communication will be through TCP/IP, serial (EIA232 or EIA485) or both.
- **Notification on ASCII Value:** Gateway will allow sending spontaneous messages to the ASCII bus when a change of value is received in the BACnet side.
- **Answer required for write commands:** If enabled, the gateway will send back an OK message to the ASCII master device.
- **Define custom string commands:** Define the special character to be used to read or write the internal gateway datapoint.
- **Port:** TCP port to be used for the ASCII communication. By default, it is set to 5000.
- **Keep Alive:** Time of inactivity before sending a keep alive message.
  - **0:** Disabled
  - **1...1440:** Possible values expressed in minutes. By default, it is set to 10.
- **Connection type:** Physical connection, between EIA232 and EIA485 can be selected.
- **Baud rate:** Selectable from 1200, 2400, 4800, 9600, 19200, 38400, 56700 and 115200.
- **Data type:**
  - Data Bits: 8
  - Parity can be selected from: none, even, odd.
  - Stop Bits: 1 and 2

### 5.2.3.2 BACnet Client Configuration

Set the parameters for connection to BACnet network / BACnet server devices in the network.

Figure 5.4 IntesisBox MAPS configuration tab for BACnet Client

Configuration for BACnet client has three sections: General Configuration, Devices Configuration and Gateway Mode.

- General Configuration

In this section, following parameters should be configured:

1. **Device Name.** Name of the device in the bacnet network ('object name' property of device object)
2. **Device Instance.** Instance number of the device in the bacnet network (instance number property of device object)
3. **Password.** BACnet password of the device to execute service 'Device Management – Restart', sent by other device in the BACnet network.
4. **Sequential comms.** Enables sequential communication with other BACnet server devices. This is, no new request will be initiated from IntesisBox until response to last request has been received. This becomes necessary in case of communication with BACnet MSTP devices behind a BACnet IP to MSTP router, as no concurrent transactions are possible in MSTP.

- Gateway Mode

In this section, following parameters should be configured:

1. **Mode.** Select whether IntesisBox is going to connect with BACnet IP or BACnet MSTP. Rest of parameters in the section will be different depending on this.
2. **(Mode IP) UDP Port.** UDP port that will be used for BACnet IP communication. It defaults to 47808 (0xBAC0)
3. **(Mode IP) Network Role.** Related to capability of the device of communicating with devices from other networks. Disabled, Foreign Device or BBMD are the possible choices. In case of Foreign Device, IP of the BBMD where it will connect needs to be entered, as well as TTL (time-to-live). In case of selecting BBMD, table of BBMD's in the BACnet network needs to be entered.
4. **(Mode MSTP) Max Masters.** Highest MAC address of BACnet MSTP master device in the MSTP line.
5. **(Mode MSTP) Max Info Frames.** Max number of frames that the device can send out to the network when it receives token in the MSTP line.
6. **(Mode MSTP) Baudrate.** Baudrate of the BACnet MSTP link.
7. **(Mode MSTP) MAC Address.** MAC address of IntesisBox as BACnet MSTP device in the MSTP line.

- Devices Configuration

In this section, a single entry for which BACnet server device the IntesisBox is to communicate with needs to be entered.

In Signals table, each signal will need to be associated with the device it will be read to/written from.

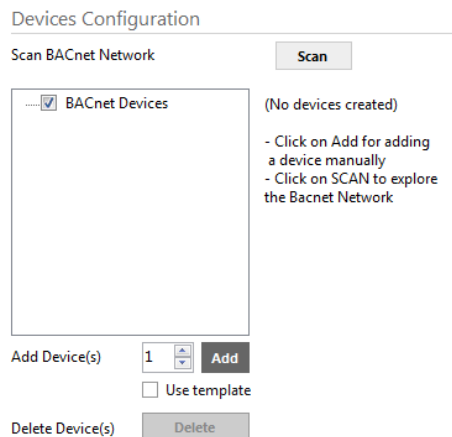


Figure 5.5 Devices configuration section

Devices can be added in three ways:

- **Manually:** With checkbox 'Use template' disabled, **Add** button should be clicked. Number of devices to add can be adjusted in the text field next to button **Add**.
- **From template:** Same as manual but based on a template file. This will add in Signals table all the signals specified in the template file for the device to be integrated.
- **From scan:** Gives functionality to scan the BACnet network for existing BACnet server devices and their objects, enabling to add them in the config. See section 'BACnet scan functionality' below for further detail.

Once a device is added, following fields must be filled in for each device:

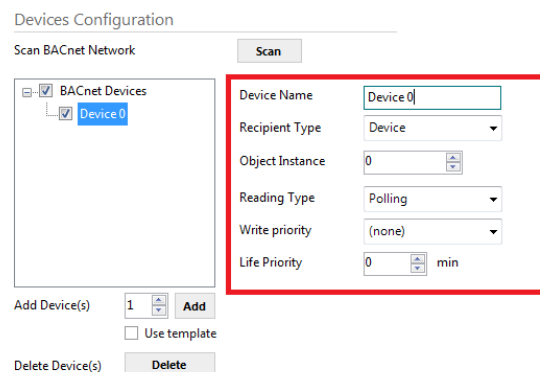


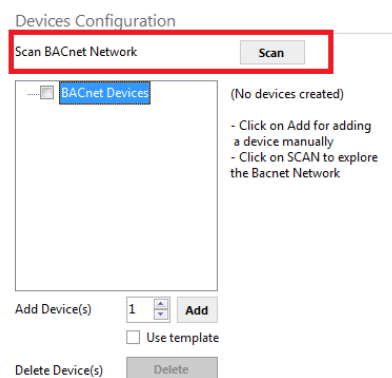
Figure 5.6 Devices configuration section

1. **Device Name.** Device identifier within MAPS. It will be used to reference the device from the signals table
2. **Recipient Type.** Way in which the device will be identified within the BACnet network. Options are Device (instance), Address, Address (MSTP). Depending on which option is chosen different parameters will appear to enter the details of the address.
3. **(Recipient type: Device) Object Instance:** Instance number of device object for the BACnet server device.
4. **(Recipient type: Address) Network:** Destination network, 0..65535. 0 for local network, 65535 for broadcast (all networks).
5. **(Recipient type: Address) IP / Port:** IP and Port of the BACnet server device.
6. **(Recipient type: Address (MAC)) Network:** Destination network, 0..65535. 0 for local network, 65535 for broadcast (all networks).

7. **(Recipient type: Address (MAC)) MSTP MAC Address:** MAC address 0..255 of the BACnet server device.
  8. **Reading type:** Related to service that will be used to read the BACnet server device. Options are Polling (ReadProperty), COV, COV-unconf (unconfirmed COV), Polling Multiple (ReadPropertyMultiple).
  9. **Write priority:** priority with which writes will be performed. Default is (none) (no priority), can be chosen from 1 (highest) to 16 (lowest) and none.
  10. **COV Lifetime:** Periodic timeout at which COV subscription will be renewed.
- BACnet scan functionality

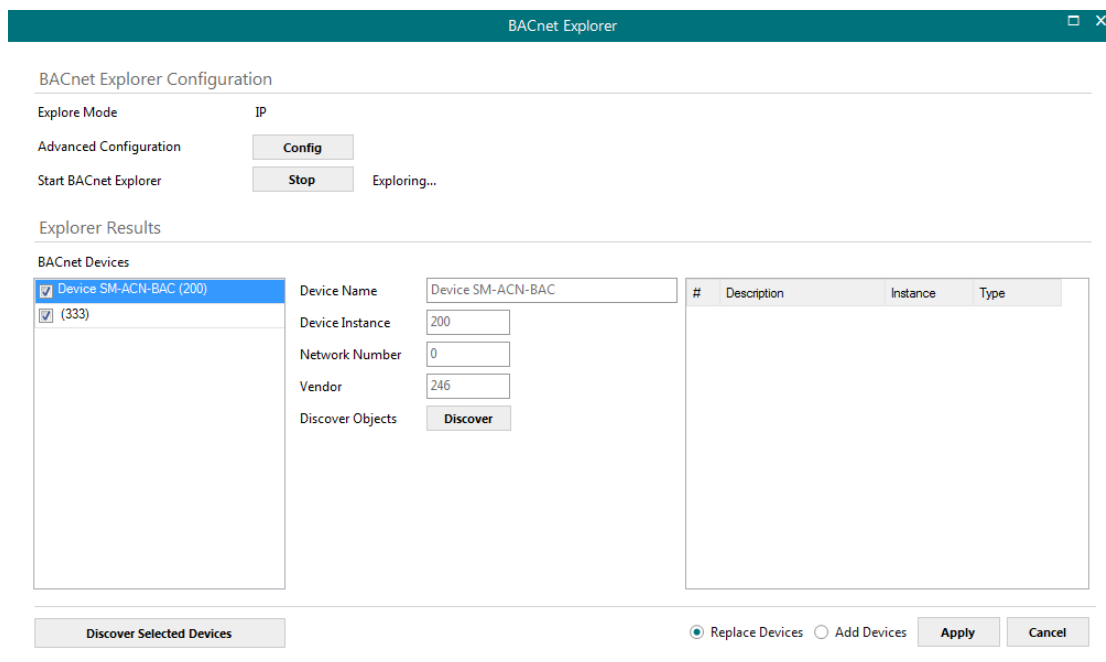
Devices Configuration section includes functionality to scan the BACnet network for existing BACnet servers and their objects.

To access this Scan functionality window, make sure that you're online/connected with the device and click on **Scan** button.



**Figure 5.7** BACnet Network scan button

If properly connected to the IntesisBox, following dialog will appear:



**Figure 5.8** BACnet Network scan dialog

In top section of the window **BACnet Explorer Configuration**, following parameters are available:

- **Explore Mode:** It can be either IP or MSTP, depending on last configuration downloaded to IntesisBox.



**NOTE:** Bacnet Explorer function will use or BACnet exploration actual parameters for BACnet configured in IntesisBox. This is, values for Link layer (IP or MSTP), Device Object Instance, MAC & baud rate or IP address, etc.

Therefore, it might be necessary to download a basic BACnet configuration parameters to the IntesisBox before proceeding with the scan of the BACnet network

- **Advanced Configuration:** In this section the way the scan is performed is configured. Following parameters can be setup:
  1. **Start and End Instance:** Search will be based on Device object instance number of present devices in the network. Search can be done on all possible Instances (0 to 4194302) or narrowed down (until even a single device) if the Device instance is known a priori, or within a certain range. Narrowing the value between start and end instance will speed up the search for BACnet devices
  2. **Step:** Number of BACnet devices queried at once.
  3. **Scan timeout:** Timeout that will wait for answer after request from a BACnet device.
  4. **Discover MSTP slaves** (only when Explore Mode is MSTP): Will enable scan of MSTP slave nodes (by default, only MSTP master nodes will be discovered). If enabled, **Start MAC**, **End MAC** and **Timeout** (in ms) for the scan can be adjusted.
  5. **MSTP Slaves through IP** (only when Explore Mode is IP): In case that BACnet IP to MSTP routers are present in the BACnet/IP network, will enable scan of MSTP slaves through the corresponding BACnet/IP router (note that MSTP master nodes under a BACnet/IP router will always be scanned). If enabled, **Net Number**, **Start MAC**, **End MAC** and **Timeout** (in ms) for the scan can be adjusted.
- **Start BACnet Explorer:** Exploration of the bacnet network will start once the window **BACnet Explorer** itself is open. You can Stop and restart it (button **Stop** becomes **Start**), in order to stop scanning traffic in the BACnet network. BACnet devices found in the network will appear in **Explorer Results** section as they respond.

The screenshot shows the 'BACnet Explorer' window with the 'Configuration' tab selected. Under 'Explore Mode', 'IP' is chosen. The 'Advanced Configuration' section has a 'Config' button. The 'Start BACnet Explorer' section shows a 'Stop' button and the status 'Exploring...'. The 'Explorer Results' section displays a list of 'BACnet Devices' on the left, including 'Device SM-ACN-BAC (200)', 'Device IBOX-BAC-DALI (246)', 'ANYBUS-BAC-PRT ocruz (111)', and 'Device IBOX-MBS-BAC (1005)'. The 'Device SM-ACN-BAC (200)' is selected, and its details are shown in the center: Device Name 'Device SM-ACN-BAC', Device Instance '200', Network Number '0', and Vendor '246'. A 'Discover' button is next to the 'Discover Objects' label. On the right, there is a table with columns '#', 'Description', 'Instance', and 'Type'. At the bottom, there is a 'Discover Selected Devices' button, radio buttons for 'Replace Devices' (selected) and 'Add Devices', and 'Apply' and 'Cancel' buttons.

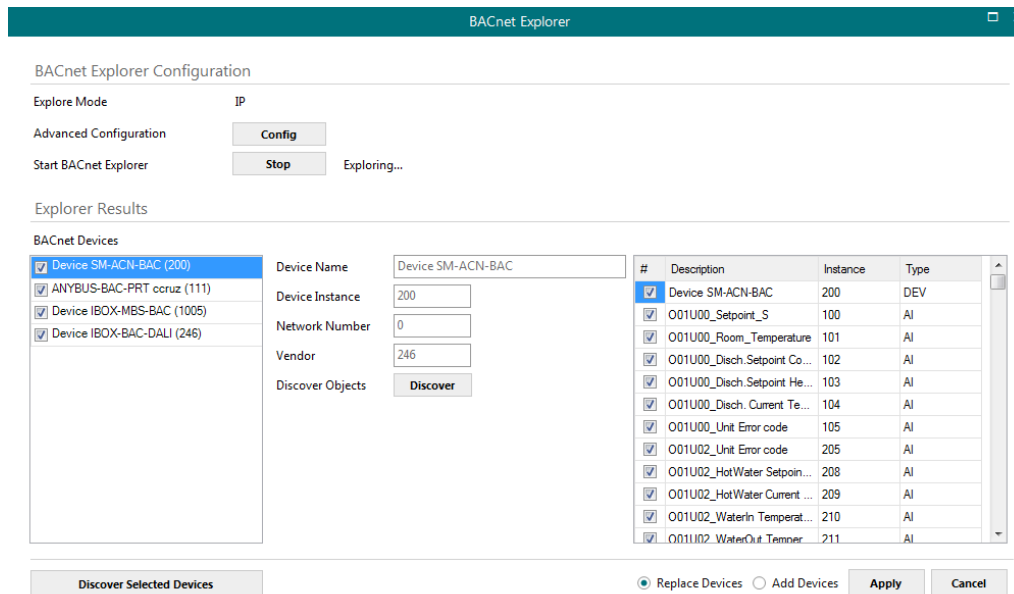
**Figure 5.9** BACnet Explorer sample results on scan dialog

By clicking each of the devices, its Device Name, Instance, Network Number and Vendor Id will be given in the center of the dialog.

Once list of devices is shown, next step is obtaining their list of objects. This can be done in two ways:

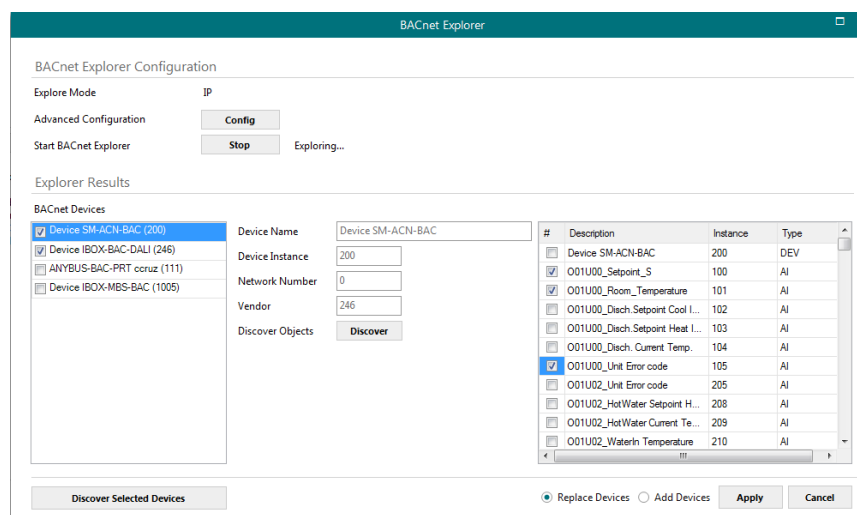
- Selecting a particular device and clicking at **Discover** button
- Checking all devices whose objects are to be scanned and clicking at **Discover Checked Devices** button. This must be used with care when many devices are checked at once. Resulting scan time can become very large.

Either way, when having discovered objects under a BACnet device, they are shown in the list at the right part of the window:



**Figure 5.10** BACnet Explorer showing objects found under a BACnet device

After objects have been discovered, it must be selected both the BACnet devices to be integrated, as well as the signals of each that are desired in the project.



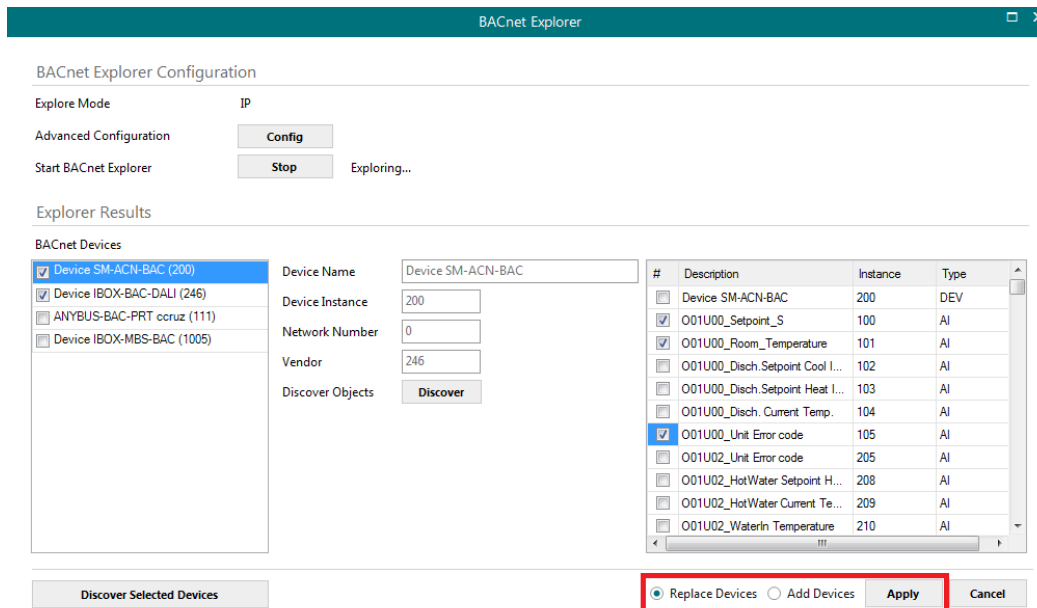
**Figure 5.11** BACnet Explorer with a selection of objects and devices to integrate

In the example above, if Apply button is pressed, two devices will be integrated:

- *Device SM-ACN-BAC (200)*
- *Device IBOX-BAC-DALI (246)*

The BACnet objects that will be integrated in configuration are *O01U00\_Setpoint\_S* and *O01U00\_Room\_Temperature* for *Device SM-ACN-BAC*, and those selected for *Device IBOX-BAC-DALI* (can be seen when device is selected in the list at the left part of the window).

Next step is to transfer those objects to MAPS configuration. To do so, it must be first selected if those selected objects are meant to replace the entire configuration (**Replace Devices** – default) or added to existing signals configuration (**Add Devices**).

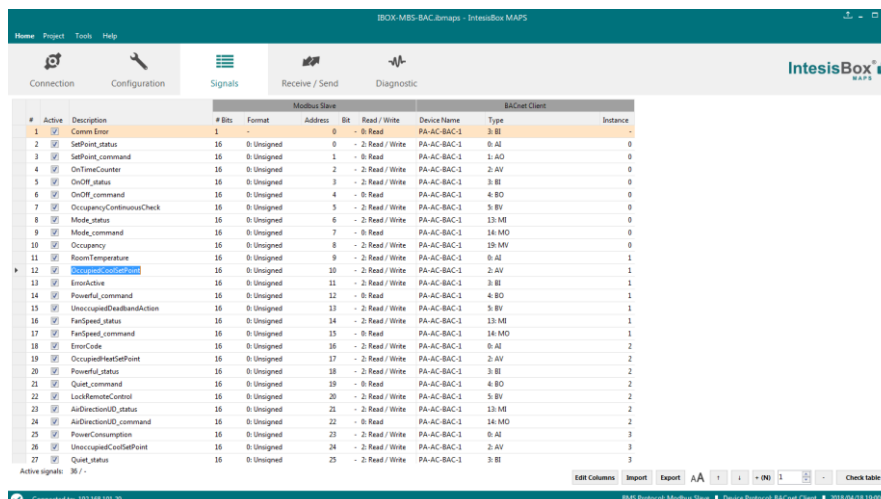


**Figure 5.12 Apply button and selection on whether Replace or Add Devices**

**Apply** button must be pressed then to transfer the results to the signals tab of the configuration.

## 5.2.4 Signals

All available objects, Object Instances, its corresponding ASCII register and other main parameters 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 for ASCII.



**Figure 5.13 IntesisBox MAPS Signals tab**

## 5.2.5 Sending the configuration to IntesisBox

When the configuration is finished, follow the next steps.

- 1.- Save the project (Menu option **Project->Save**) on your hard disk (more information in IntesisBox MAPS User Manual).



2.- Go to tab 'Receive / Send' of MAPS, and in **Send** section, press **Send** button. IntesisBox will reboot automatically once the new configuration is loaded.

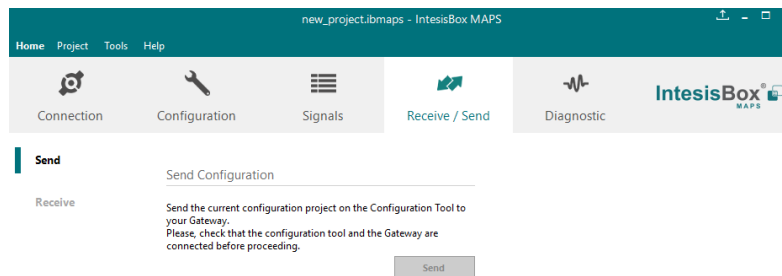


Figure 5.14 IntesisBox MAPS Receive/Send tab

After any configuration change, do not forget to send the configuration file to the IntesisBox using the Send button in the Receive / Send section.

## 5.2.6 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.

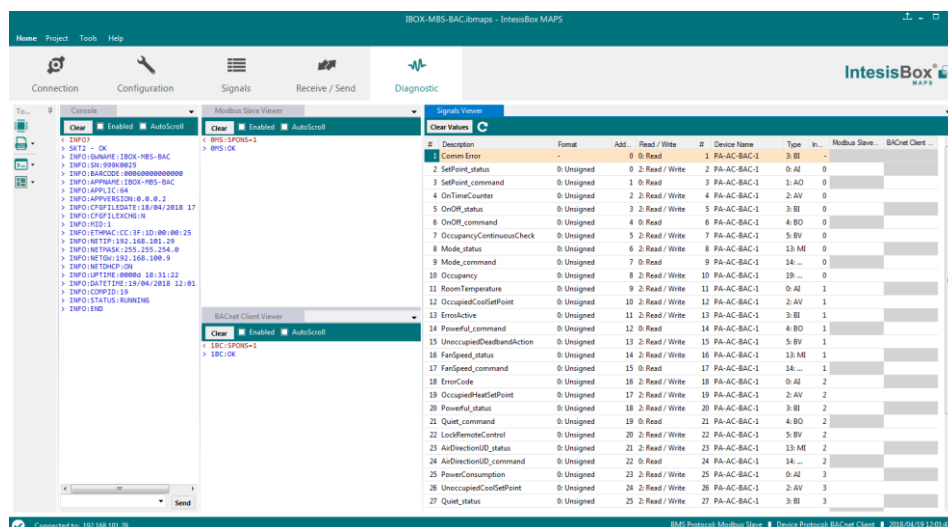


Figure 5.15 Diagnostic

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



### 5.3 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, ASCII Serial, connect the communication cable coming from the EIA485 port or the EIA232 port of the ASCII installation to the port marked as Port B of IntesisBox (More details in section 2).

If using, ASCII TCP/IP, connect the communication cable coming from the Ethernet port of the ASCII installation to the port marked as Ethernet of IntesisBox (More details in section 2).

4. 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 2).

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 2).

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 Ethernet of IntesisBox (More details in section 2). Using a hub or switch may be required.

If you want to connect using USB, connect the Ethernet cable from the laptop PC to the port marked as USB of IntesisBox (More details in section 2).

7. Open IntesisBox MAPS, create a new project selecting a template for **IBOX-ASCII-BAC**.
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, enable COMMS and check that there is communication activity, some TX frames and some other RX frames. This means that the communication with the Centralized Controller and ASCII Master devices is OK. In case there is no communication activity between IntesisBox and the Centralized Controller and/or ASCII devices, check that those are operative: check the baud rate, the communication cable used to connect all devices and any other communication parameter.

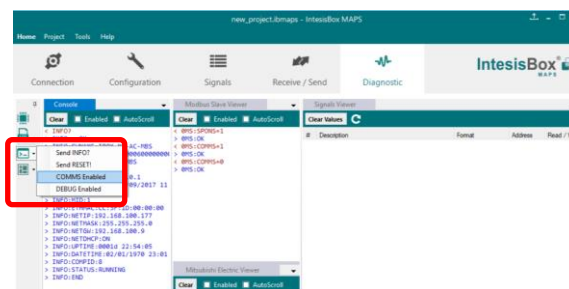


Figure 5.16 Enable COMMS

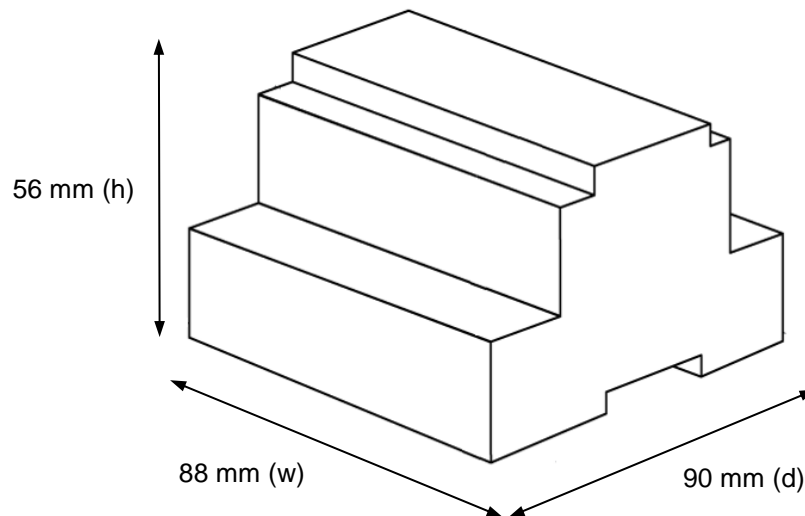
## 6 Electrical & Mechanical Features



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

100 mm

## 7 Dimensions



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

