ENGLISH

M-BUS to BACnet/IP Server Gateway

USER MANUAL
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1. Description and Order Codes

INBACMEB*0100 Protocol Translator Gateway**[1]

M-Bus to BACnet/IP Server Gateway

ORDER CODE	LEGACY ORDER CODE
INBACMEB0200100	IBBACMEB0200100
INBACMEB0500100	IBBACMEB0500100

NOTICE

The order code may vary depending on the product seller and the buyer's location.

[1] *** stands for the Intesis gateway capacity and varies depending on the specific gateway acquired

2. Gateway Capacity

Element	INBACMEB0200100	INBACMEB0500100	Notes
Type of BACnet devices	IP		Communication with BACnet/IP.
Number of BACnet objects	500	1250	Maximum number of points that can be defined in the virtual BACnet device inside the gateway.
Number of BACnet subscription (COV) requests	1000	2500	Maximum number of BACnet subscription (COV) requests accepted by the gateway.
Type of M-Bus devices	M-Bus EIA-485 slave devices		Those supporting the M-Bus EN-1434-3 Standard. Communication over EIA-485.
Number of M-Bus slave devices	20	50	Number of M-Bus slave devices supported by the gateway.
Number of M-Bus signals	500	1250	Number of M-Bus signals (readings in the meters) that can be read from the gateway.

3. General Information

3.1. Intended Use of the User Manual

This manual contains the main features of this Intesis gateway and the instructions for its appropriate installation, configuration, and operation.

The contents of this manual should be brought to the attention of any person who installs, configures, or operates this gateway or any associated equipment.

Keep this manual for future reference during the installation, configuration, and operation.

3.2. General Safety Information

IMPORTANT
Follow these instructions carefully. Improper work may seriously harm your health and damage the gateway and/or any other equipment connected to it.

Only technical personnel, following these instructions and the country legislation for installing electrical equipment, can install and manipulate this gateway.

Install this gateway indoors, in a restricted access location, avoiding exposure to direct solar radiation, water, high relative humidity, or dust.

Preferably, mount this gateway on a DIN rail inside a grounded metallic cabinet, following the instructions in this manual.

If mounting on a wall, firmly fix this gateway on a non-vibrating surface, following the instructions in this manual.

All wires (for communication and power supply, if needed) must only be connected to networks with indoor wiring. All communication ports are considered for indoor use and must only be connected to SELV circuits.

Disconnect all systems from power before manipulating and connecting them to the gateway.

Use SELV-rated NEC class 2 or limited power source (LPS) power supply.

Supply the correct voltage to power the gateway. The admitted range is detailed in the technical specifications table.

Respect the expected polarity of power and communication cables when connecting them to the gateway.

This Intesis gateway is designed for installation in an enclosure. When the device is mounted outside an enclosure, precautions should be taken to avoid electrostatic discharges to the unit in environments with static levels above 4 kV. When working in an enclosure (e.g., making adjustments, setting switches, etc.), typical anti-static precautions should be observed before touching the unit.

Binary inputs, if present, are potential-free contact. Do not connect any voltage.

3.3. Admonition Messages and Symbols

DANGER
Instructions that must be followed to avoid an imminently hazardous situation that, if not avoided, will result in death or severe injury.

WARNING
Instructions that must be followed to avoid a potentially hazardous situation that, if not avoided, could result in death or severe injury.

CAUTION
Instruction that must be followed to avoid a potentially hazardous situation that, if not avoided, could result in minor or moderate injury.

IMPORTANT
Instruction that must be followed to avoid a risk of reduced functionality and/or damage to the equipment or to avoid a network security risk.

NOTE
Additional information which may facilitate installation and/or operation.

TIP
Helpful advice and suggestions.

NOTICE
Remarkable Information.

4. Overview

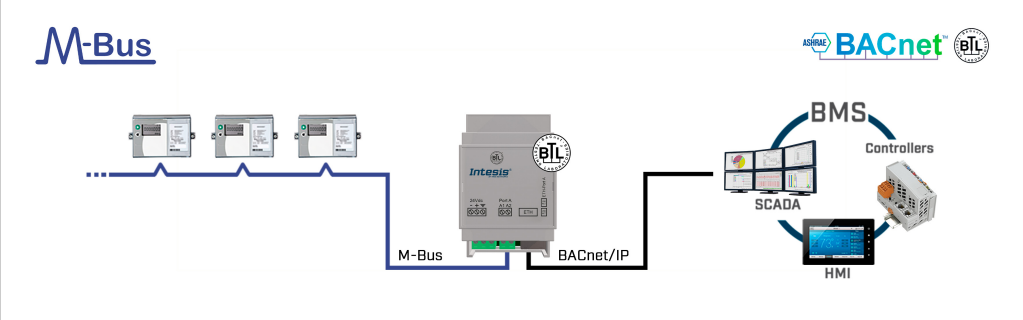
This Intesis® gateway allows to integrate M-Bus devices into BACnet/IP systems easily.

The aim of this integration is to make M-Bus devices accessible from a BACnet control system or device to get the same behavior as if the M-Bus device was part of the BACnet installation.

For this, the Intesis gateway acts as a BACnet/IP client device in its BACnet interface, allowing it to read/write points from the BACnet Server device(s). From the M-Bus point of view, the gateway acts as an M-Bus level converter and Master device (EN-1434-3). The gateway performs the readings of the M-Bus slave device(s) by automatic continuous polling, or on demand (to reduce battery consumption).

The gateway configuration is carried out through the Intesis MAPS configuration tool.

Figure 1. Integration of M-Bus devices into BACnet/IP installations



IMPORTANT
This document assumes that the user is familiar with BACnet and M-Bus technologies and their technical terms.

4.1. Inside the Package

Items included:

- Intesis INBACMEB***0100 Protocol Translator Gateway
- Installation guide

4.2. Gateway Main Features

- Embedded level converter. Direct connection to M-Bus devices with no extra hardware required.
- Scan function: detect M-Bus devices and their available registers automatically.
- Import/Export of M-Bus device templates.
- Baud rate configurable within the M-Bus allowed range (300 to 9600 bps. The devices are normally configured at 2400 bps).
- Specific parameters and timeouts are available to maximize compatibility with any possible peculiarity between different meter manufacturers.
- Availability of variables for communication errors, both at meter and general level, helping you to know if the communication with one or more meters has failed.
- Flexible configuration using the Intesis MAPS configuration tool.

4.3. Gateway General Functionality

This gateway acts as a server on its BACnet side and as a master on its M-Bus interface, thus allowing the integration of M-Bus devices into a BACnet system.

The gateway is continuously polling the devices (together or individually), storing in its memory the current status of every signal you want to track, and serving this data to the installation when requested. This continuous polling can be activated/deactivated through a BACnet signal. It is also possible to configure the gateway to make a single polling of the meters (refresh of readings) at startup.

Primary or secondary addressing is allowed for M-Bus devices. When a signal status changes, the gateway sends a write telegram to the installation, waits for the response, and performs the corresponding action.

This action can be: force a polling of a specific M-Bus device or force a polling of all M-Bus devices. This can also be forced from the BACnet side at any time by writing a 1 in the corresponding binary point specially enabled for this purpose.

Other M-Bus information accessible from BACnet, using specific points of the gateway, is:

- Bus activity: Indicates if meters are currently being polled or polling is on standby.
- M-Bus status of every meter: This is sent by the own meter with every poll and indicates the internal status, which is manufacturer specific in every case.

A lack of response from a signal activates a communication error, allowing you to know which signal from which M-Bus device is not correctly working. There is also a general communication error available that will be active whenever the communication with one or more M-Bus meters has failed.

5. Hardware

5.1. Mounting

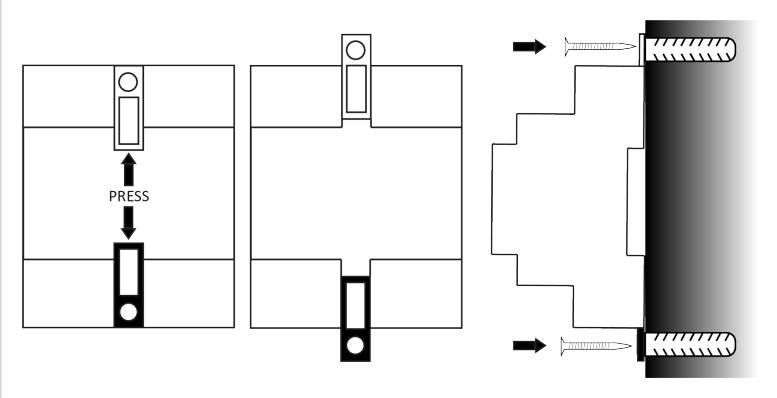
IMPORTANT
Before mounting, please ensure that the chosen installation place preserves the gateway from direct solar radiation, water, high relative humidity, or dust.

NOTE
Mount the gateway on a wall or over a DIN rail. DIN rail mounting inside a grounded metallic cabinet is recommended.

IMPORTANT
Ensure the gateway has sufficient clearances for all connections when mounted. See Dimensions (page 12).

Wall mounting

1. Press the rear panel clips outwards until you hear a *click*.
2. Use the clip holes to screw the gateway to the wall.
3. Make sure the gateway is firmly fixed.

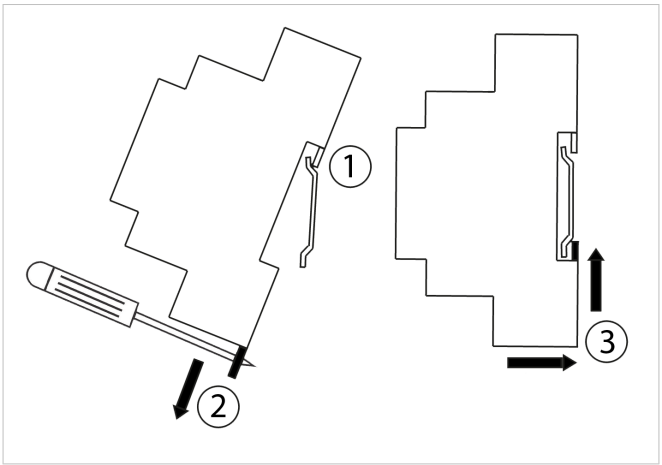


DIN rail mounting

Keep the rear panel clip in its original position.

1. Fit the gateway's top-side clip in the upper edge of the DIN rail.
2. Press the low side of the gateway gently to lock it in the DIN rail.
3. Make sure the gateway is firmly fixed.

NOTE
For some DIN rails, to complete step 2, you may need a small screwdriver or similar to pull the bottom clip down.



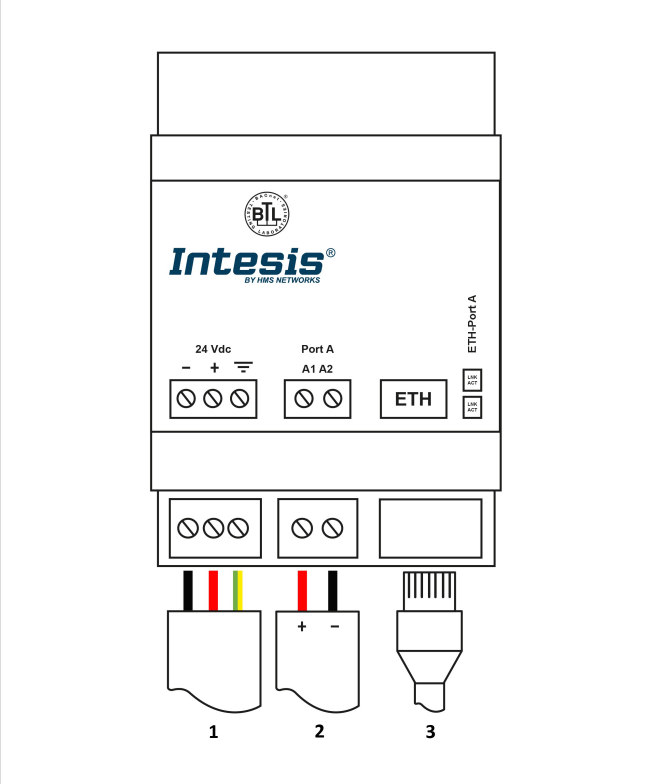
5.2. Connection

CAUTION
Disconnect all systems from power before manipulating and connecting them to the gateway.

IMPORTANT
Keep communication cables away from power and ground wires.

5.2.1. Gateway Connectors

Figure 2. General view of all gateway connectors



1. Power supply: 24 VDC, Max.: 220 mA, 5.2 W

2.Port A: M-Bus port, for M-Bus bus connection.

3. Ethernet port: For BACnet/IP connection.

Port A connectors	M-Bus wires
A1	+
A2	-

NOTE
You can also use the **Ethernet Port** to connect the gateway to the PC for configuration purposes.

NOTE
Mount the gateway in the desired installation site before wiring.

IMPORTANT
Use solid or stranded wires (twisted or with ferrule).

Wire cross-section/gauge for all wire connectors:

- One core: 0.2 to 2.5 mm^2 (24 to 11 AWG).
- Two cores: 0.2 to 1.5mm^2 (24 to 15 AWG).
- Three cores: Not permitted.

NOTE
To know more about each port's specifications, see Technical Specifications (page 11).

5.2.2. Common Connections

5.2.2.1. Connecting the Gateway to the Power Supply

The power supply connector is a green pluggable terminal block (3 poles) labeled as **24Vdc**.

IMPORTANT
- Use a SELV-rated NEC class 2 or limited power source (LPS) power supply.
- Connect the gateway's ground terminal to the installation grounding.
- A wrong connection may cause earth loops that can damage the Intesis gateway and/or any other system equipment.

Apply the voltage within the admitted range and of enough power:

- 24 VDC, Max.: 220 mA, 5.2 W

IMPORTANT
- Respect the polarity labeled on the power connector for the positive and negative wires.

5.2.3. Connection Procedure for M-Bus

The gateway connects directly to the M-Bus system without requiring any external RS-232 or EIA-485 to M-Bus level converter.

Connect the M-Bus bus to connectors A1 (+) and A2 (-) of the gateway's Port A. Respect the polarity.

Remember that the gateway provides 36 VDC M-Bus voltage to the bus, acting also as an M-Bus level converter.

In case no response from the M-Bus device(s) to the frames sent by the gateway is received, check that they are operative and reachable from the network connection used by the gateway.

5.2.4. Connection Procedure for BACnet/IP

NOTE
Remember to check the Common Connections (page 10).

- Connect the BACnet/IP Ethernet cable to the gateway's **Ethernet Port**. The correct cable to use depends on where the gateway is connected:
  - **Connecting directly to a BACnet/IP device:** Use a crossover Ethernet UTP/FTP CAT5 or higher cable.
  - **Connecting to a hub or switch of the LAN of the building:** Use a straight Ethernet UTP/FTP CAT5 or higher cable.

IMPORTANT
When commissioning the gateway for the first time, DHCP will be enabled for 30 seconds. After that time, the default IP address 192.168.100.246 will be set.

NOTE
The default UDP port is 47808 (BAC0 in hexadecimal).

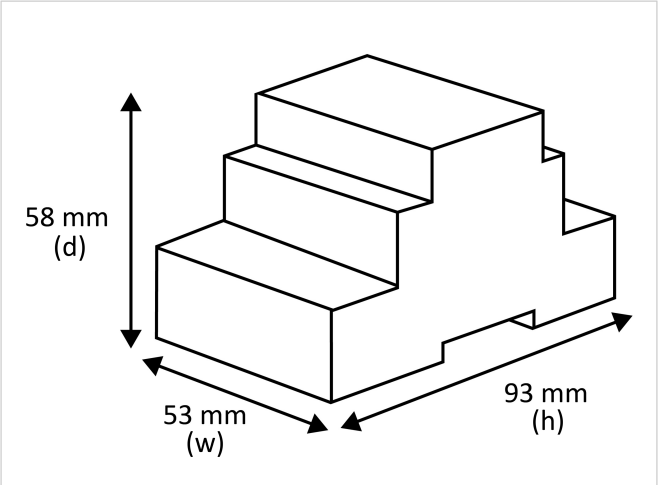
IMPORTANT
If communicating through the LAN of the building, contact the network administrator and make sure traffic on the used port is allowed through all LAN paths.

5.3. Technical Specifications

Housing	Plastic, type ABS (UL 94 V-0). Color: Light Grey. RAL 7035 Net dimensions (HxWxD): 93 x 53 x 58 mm / 3.6 x 2.1 x 2.3"
Mounting	Wall DIN rail (recommended mounting) EN60715 TH35
Terminal wiring **For power supply and low-voltage signals**	Per terminal: solid wires or stranded wires (twisted or with ferrule) Wire cross-section/gauge: One core: 0.2 mm^2 .. 2.5 mm^2 (24 .. 11 AWG) Two cores: 0.2 mm^2 .. 1.5 mm^2 (24 .. 15 AWG) Three cores: Not permitted For distances longer than 3.05 meters (10 feet), use Class 2 cables.
Power	1 x Green pluggable terminal block (3 poles) 24 VDC, Max.: 220 mA, 5.2 W Recommended: 24 VDC, 220 mA
Ethernet	1 x Ethernet 10/100 Mbps RJ45
Port A	1 x M-Bus port: pluggable terminal block (two poles) M-Bus power consumption: • Normal operating level: 90 mA (50 M-Bus unit loads + 20%) • Collision detection: 25 mA • Overload level: 215 mA Voltage rating: 36 VDC
Operational temperature	Celsius: 0 .. 60°C / Fahrenheit: 32 .. 140°F
Operational humidity	5 to 95%, no condensation
Protection	IP20 (IEC60529)
LED indicators	2 x Onboard LED indicators Ethernet Link/Speed

5.4. Dimensions

- **Net dimensions (HxWxD)**
  Millimeters: 93 x 53 x 58 mm
  Inches: 3.6 x 2.1 x 2.3"



IMPORTANT
Ensure the gateway has sufficient clearance for all connections when mounted.

6. M-Bus System

6.1. General Description

The M-Bus ("Meter-Bus") is a European standard for remote reading of heat meters, and it is also usable for all other types of consumption meters, as well as for various sensors and actuators.

M-Bus standards are:

- EN 13757-2 (physical and link layer)
- EN 13757-3 (application layer)

Many manufacturers of energy meters, pulse counters, water meters, electricity meters, etc., add an M-Bus interface to their devices, enabling them to be interconnected and remotely monitored through a 2-wire bus based on the M-Bus standards. There are many manufacturers of these measurement devices incorporating the M-Bus interface, and also some other manufacturers of specific M-Bus communication devices such as bus repeaters, EIA-232/EIA-485 to M-Bus level converters, etc.

6.2. M-Bus Interface

The gateway connects directly to the M-Bus system. No external level converter is required.

Connection to the M-Bus is made via the EIA-485 connection. Notice that the gateway also powers the bus, so no extra hardware is required to connect to M-Bus compatible meters or devices.

6.3. M-Bus Signals

The gateway supports several meter magnitudes and units typically used on the energy, electric, water, and other meters. During the scan, the gateway imports each signal with the units and details provided by the meter. See the details of the units on the Signals tab (page 20) in Intesis MAPS.

The type of signals available from every meter may differ, depending on the manufacturer and model. Please refer to the device's technical documentation to determine the signals available for a given meter to integrate the desired ones.

Besides this, to simplify and speed up the identification of the signals offered by any device (and their type), a scanning function has been embedded in the firmware of the gateway to poll the meter and show details about the signals offered by the device and the corresponding signal code needed in the signals list of the gateway for every one of the signals to integrate, using the Intesis MAPS configuration tool.

7. BACnet System

7.1. General Description

BACnet is a solid standard with many detailed concepts, but for this manual purposes, we will focus on the two most fundamental concepts:

- BACnet client, which is the device that sends service requests to the server.
- BACnet server, which is the device that performs the requested service and reports the result back to the client.

BACnet server devices are represented in the form of *devices* holding *objects*. Usually, every physical device corresponds to a logical one. The objects can be of different types depending on the data and functionality they represent: Analog input, Analog output, Digital input, etc.

NOTE
- Output objects are meant to be written from the BACnet network to the device.
- Input objects are meant to offer status information on the BACnet device.
- Value objects are bidirectional.

Every object has different properties. The most meaningful one is the **Present_Value** property, which indicates the real value of the object. Also, the gateway uses this property to read and write values. Every object of the same type in a device is identified with its associated **object instance**.

NOTE
Refer to the Protocol Implementation Conformance Statement (PICS) document for more information.

NOTE
This model supports BACnet descriptions; this is configurable through the Intesis MAPS configuration tool.

7.2. BACnet Server

7.2.1. Description

NOTICE
When the Intesis gateway acts as a server device, it is classified under the device profile of a BACnet Advanced Application Controller (B-AAC). For further details, check out the product website for the BACnet client PIC statements.

Using the Intesis MAPS configuration tool, you can configure the object type associated with the signal on the other protocol.

To facilitate the translation towards BACnet, the following object type options are available:

Object Type	ID
Analog-Input	0
Analog-Output	1
Analog-Value	2
Binary-Input	3
Binary-Output	4
Binary-Value	5
Calendar	6
Device	8
Multistate-Input	13
Multistate-Output	14
Multistate-Value	19
Notification-Class	15
Schedule	17
Trend-Log	20
Trend-Log-Multiple	27

Every signal of the Intesis gateway can have several objects. These objects and their properties can be configured with the Intesis MAPS configuration tool.

Depending on the field device protocol, you can define the signals using one of the following options:

- Configuring them manually for each or multiple signals at the time.
- Importing a file with the signals of the field devices.
- Scanning the network of the devices if this is supported.

NOTICE
The configuration tool provides default templates that make this signals assignment process easier. Also, you only have to click the **Check table** button on the bottom right corner of the window to know if everything is correct or if there's some mistake. The project is also automatically checked before you transfer it to the gateway.

All objects definition, BIBBs, and details about the implementation can be found on the BACnet server PICS on the product website.

7.2.2. BACnet/IP

The UDP communication port is the main setup parameter for BACnet/IP, besides basic IP settings (IP, netmask, default gateway). The Intesis gateway uses the 47808 (0xBAC0) port by default, which you can change through the configuration tool.

When using BACnet/IP, the gateway can also act as a foreign device to communicate with devices in another network domain. Alternatively, you can set it as a BBMD (Bacnet/IP Broadcast Management Device). This functionality facilitates the communication of devices placed in other networks with the devices in the gateway network.

8. Setup Process with the Configuration Tool

8.1. Prerequisites

For this integration, you need:

- The items delivered by HMS Networks:
  - The Intesis INBACMEB***0100 Protocol Translator Gateway.
  - Link to download the configuration tool.
  - Product documentation.
- The respective M-Bus devices connected to the Port A of the gateway.
- A computer to run the Intesis MAPS configuration tool.
  Requirements:
  - Windows® 7 or higher.
  - Hard disk free space: 1 GB.
  - RAM: 4GB.
- An Ethernet cable.

8.2. Intesis MAPS Configuration and Monitoring Tool

8.2.1. Introduction

Intesis MAPS is a software tool for the configuration and monitoring of the Intesis gateways. It has been designed and developed in-house, ensuring an up-to-date tool to get all the potential of our gateways. It is compatible with Windows® 7 and higher.

The installation procedure and the main functions are explained in the Intesis MAPS user manual. Please also check the Intesis MAPS user manual for specific information about the different parameters and how to configure them.

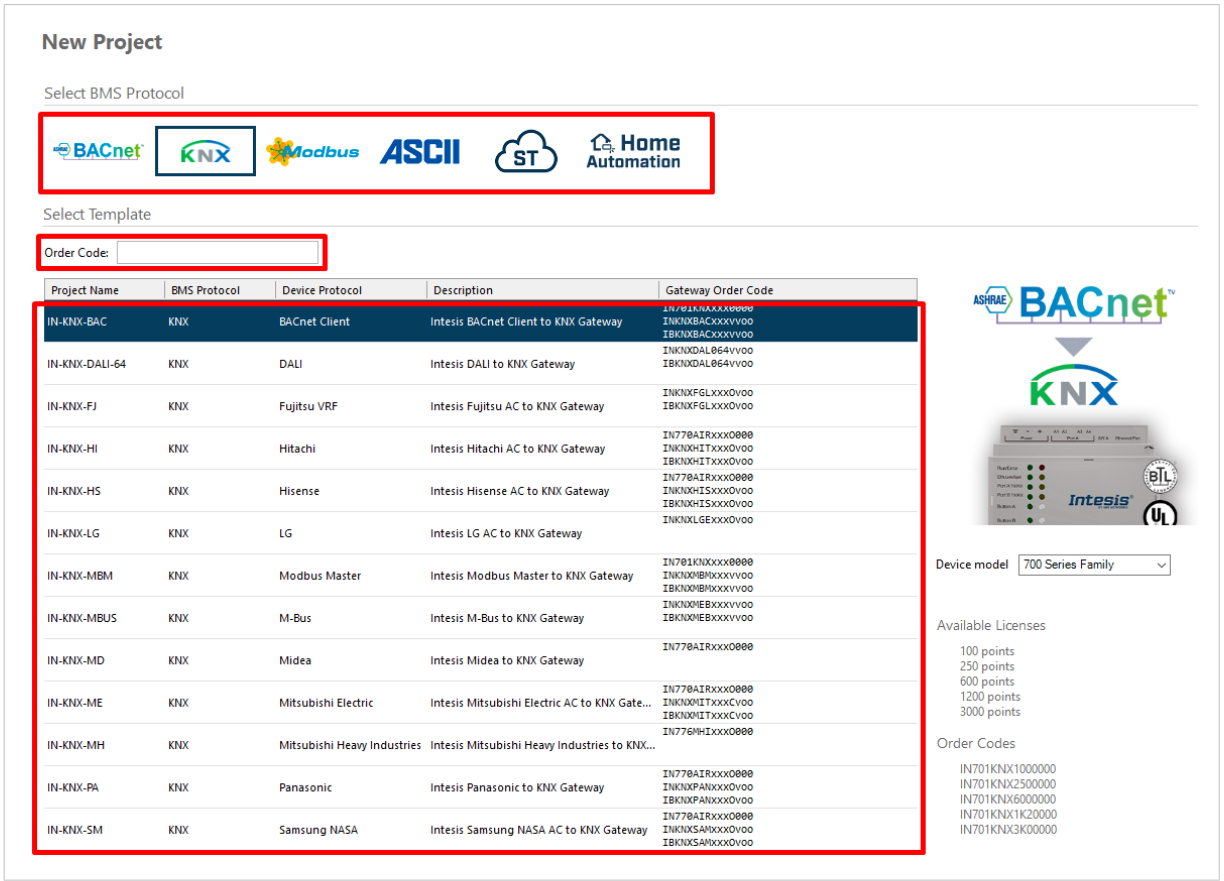
8.2.2. Create a New Project from a Template

1. Open Intesis MAPS.
2. Click **Create New Project** in the **Getting started** menu on the left.
   You can create a project from scratch using a template. To find the appropriate template, filter the search by:
   - Clicking on the protocol logos.
   - Typing the order code in the **Order Code** field.

> **NOTE**
> The order code is printed on the silver label placed on the gateway's right side.

   - Looking for it on the list.

Figure 3. Three possibilities for the template selection



3. Select the desired template.
4. Click **Next** or **double-click the template** on the list.

> **NOTE**
> Templates are just a starting point for your integration. Depending on the type of integration, you may have to modify some parameters.

> **IMPORTANT**
> Don't forget to save your project on your computer before exiting Intesis MAPS. To do so, go to **Project** → **Save** or **Save As**. Later on, you can load the project to Intesis MAPS and continue with the configuration.

8.2.3. Main Menu Overview

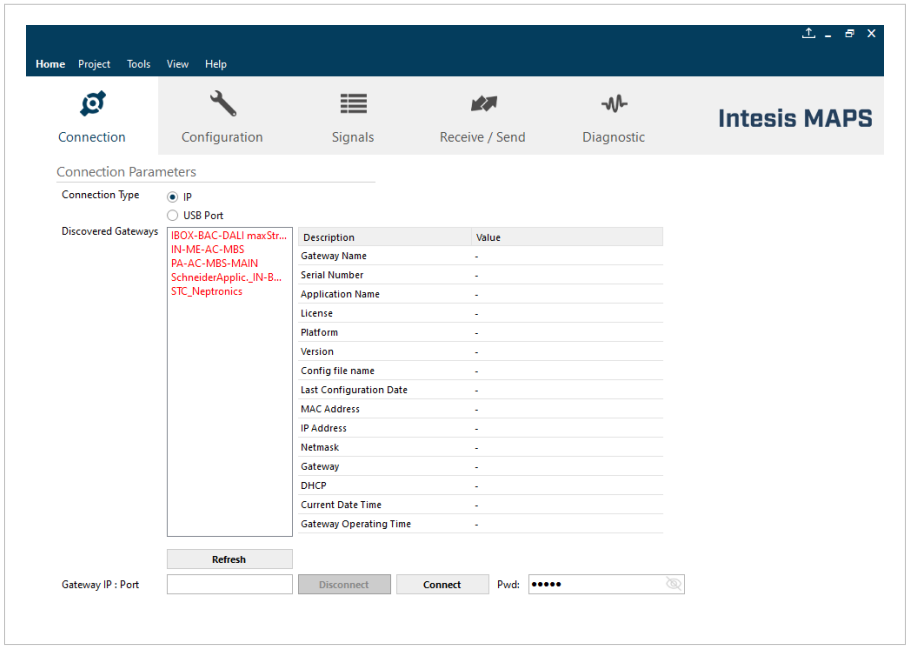
Figure 4. Intesis MAPS main menu

The following sections provide an overview of the five tabs that compose the Intesis MAPS main menu. Through these options, you will configure your project, send it to the gateway, and monitor that everything works fine using the **Diagnostic** tab.

8.2.4. Connection Tab

Click the **Connection** button in the menu bar to configure the gateway connection parameters.

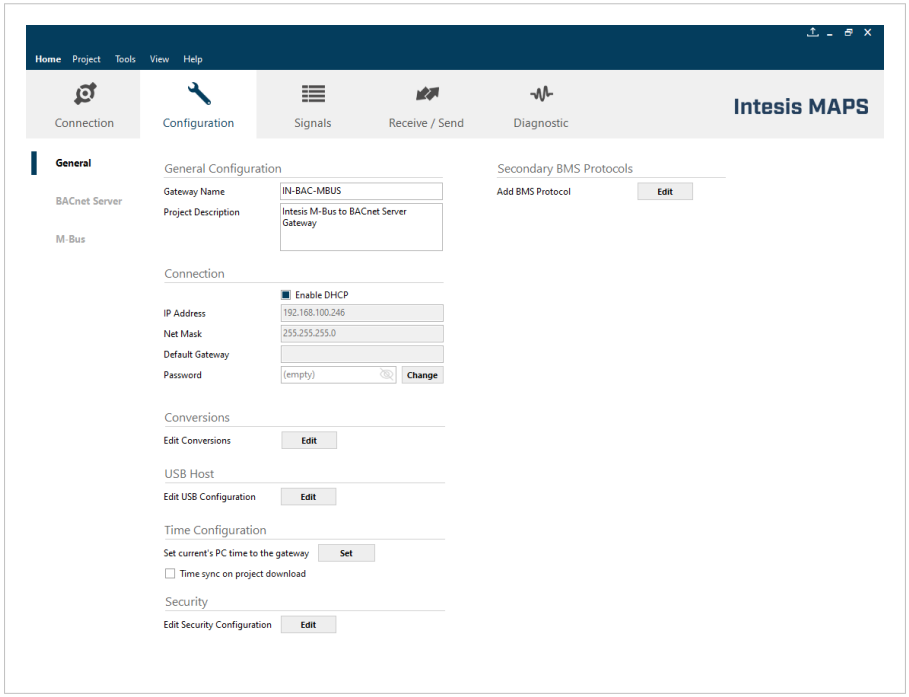
Figure 5. Connection tab window



8.2.5. Configuration Tab

Select the **Configuration** tab to configure the connection parameters. This window contains three subsets of information: General (gateway general parameters), BACnet server (BACnet interface configuration), and M-Bus (M-Bus interface parameters).

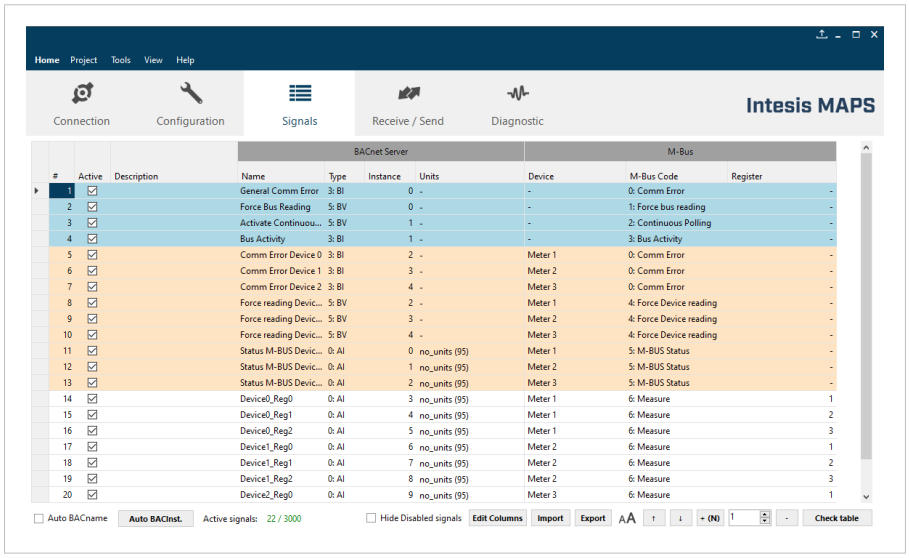
Figure 6. Configuration tab window



8.2.6. Signals Tab

All available objects, object instances, their corresponding BACnet object, 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 Intesis MAPS user manual.

Figure 7. Signals tab for the BACnet server - M-Bus integration



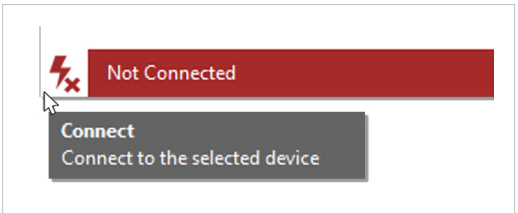
8.2.7. Receive/Send Tab

Send:

Once you have finished setting the parameters, you have to send the configuration to the gateway:

Follow these steps:

1. Click the **Send** button.
   a. If the gateway is still factory-set, you will be prompted to save the project on your PC. Once saved, the configuration is automatically sent to the gateway.
   b. If you have already saved the project, the configuration is automatically sent to the gateway.
2. Connect again with the gateway after sending the file.



NOTICE
The gateway will reboot automatically once the new configuration is loaded. This process may take a few seconds.

Receive:

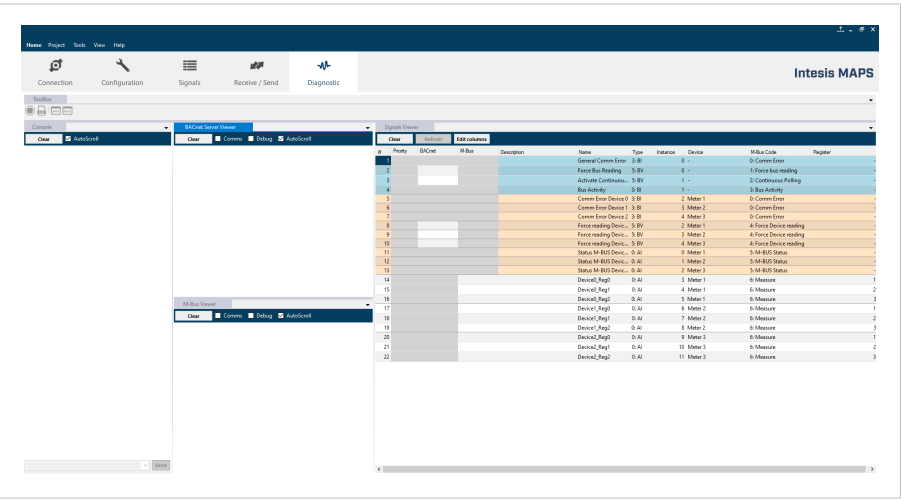
Use this function to get the configuration of a gateway, for example, when you need to change some parameters of a gateway already mounted in an installation.

Once the configuration is completed and sent, the gateway is already operative. Even so, you should check that everything is working correctly by entering the Diagnostic tab.

8.2.8. Diagnostic Tab

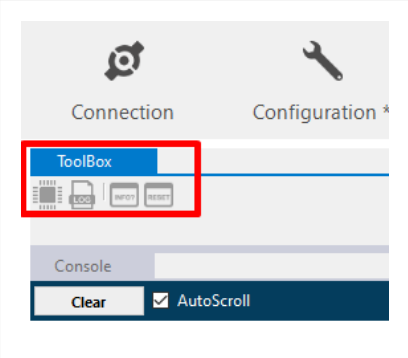
IMPORTANT
Connection with the gateway is required to use the diagnostic tools.

Figure 8. Diagnostic tab window. Find the ToolBox between the upper tabs bar and the Console view. Below it, from left to right: Console viewer, Protocol viewers (one above the other), and the Signals viewer



This section has two main parts:

ToolBox



Use the tools section to:

- Check the current hardware status of the gateway.
- Save communication logs to a ZIP file for diagnostic purposes.
- Get information on the gateway.
- Reset the gateway.

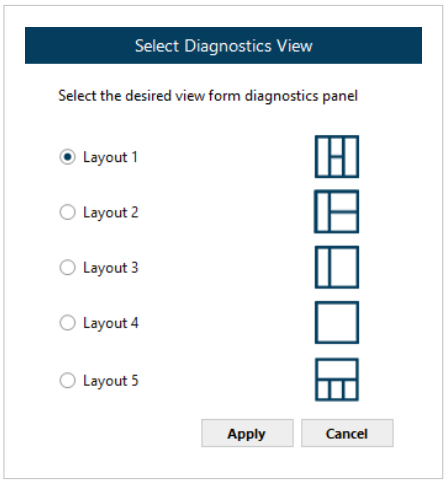
Viewers

Intesis MAPS provides several viewers:

- A generic console viewer for general information about communications and the gateway status.
- A viewer for both protocols to check their current status.
- A signals viewer to simulate the BMS behavior or check the system's current values.

The layout of these viewers can be modified:

- Using the **Select Diagnostics View** option from the **View** menu:



NOTE
Layouts 3 and 4 offer two different tabbed options:

- Fixed console to the left and tabbed browser for the other viewers
- Full tabbed browser

- Clicking and dragging the border of a viewer. To do so, place the cursor over the edge of a viewer. On the vertical edges, the cursor changes to ↔ to adjust the width, and on the horizontal edges, the cursor changes to ↕ to adjust the height.