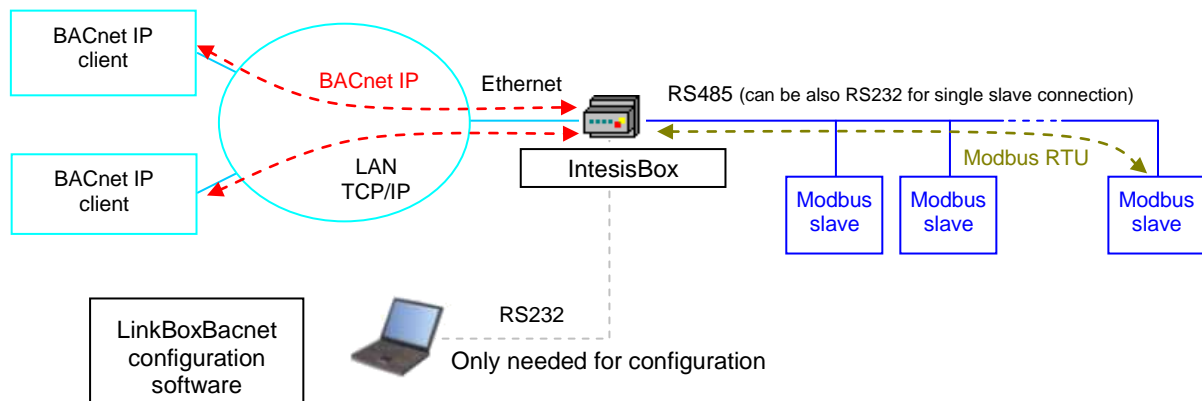# IntesisBox®

BACnet/IP Server - Modbus RTU master

Gateway for integration of Modbus RTU slave devices into BACnet IP based systems.

Integrate any Modbus RTU slave device into your BACnet control system.

The Modbus side of IntesisBox

IntesisBox is a Modbus RTU master device allowing read/write points of other Modbus slave devices and offering these point's values through its BACnet/IP interface. *Points in Modbus slave devices can be read/written from BACnet based systems. IntesisBox supports connection to Modbus RTU devices, either in RS485 2-wire networks, or RS232 point to point connection, software selectable.*

IntesisBox polls continuously the Modbus slave devices. *All the updated readings received from the slave devices are maintained in IntesisBox's memory for immediate interaction with the BACnet system.*

The BACnet side of IntesisBox

IntesisBox simulates a virtual BACnet device inside the BACnet system acting as server device. Other BACnet client devices connected to the BACnet/IP network can read IntesisBox's internal points by continuous polling or they can make subscription requests (COV).

Write of IntesisBox's internal points is also fully allowed from BACnet network. *Any written value will be translated immediately to the Modbus slave device/register associated.*

The configuration of IntesisBox

IntesisBox BACnet/IP Server series are configured using *LinkBoxBacnet,* a software tool for windows™ which is supplied along with the purchase of IntesisBox with no additional cost. *With the installation of LinkBoxBacnet, a Demo project for integration of BACnet system is also installed, using this demo project makes the engineering needed for this integration easy and quick.*

IntesisBox capacity

Element	Max. (Tiny version)	Max. (Basic version)	Max. (Extended version)	Notes
Type of BACnet client devices allowed				Those supporting *BACnet ASHRAE 135 – 2001 Annex J - BACnet/IP protocol*, commonly referred as BACnet/IP.
Number of BACnet subscription requests (COV)	1000	1000	6000	Maximum number of BACnet subscriptions (COV) requests allowed by IntesisBox.
Number of BACnet subscribers	8	8	8	Maximum number of different BACnet subscribers allowed by IntesisBox.
Points	100	500	3000	Maximum number of points that can be defined into IntesisBox.
Type of Modbus slave devices				Those supporting *Modbus RTU protocol*. Communication over RS485 network (2-Wire) or RS232 point to point.
Modbus slave devices	254	254	254	Maximum number of Modbus slave devices allowed by IntesisBox.

There are three different models of *IntesisBox® BACnet IP Server - Modbus RTU master* with different capacity every one of them.

- Tiny version with capacity of 100 points. *Ref.: IBOX-BAC-MBRTU-100.*

- Basic version with capacity of 500 points. *Ref.: IBOX-BAC-MBRTU-A.*

- Extended version with capacity of 3000 points. *Ref.: IBOX-BAC-MBRTU-B.*

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Sample applications

Integration of any Modbus RTU slave device into BACnet/IP based control systems.
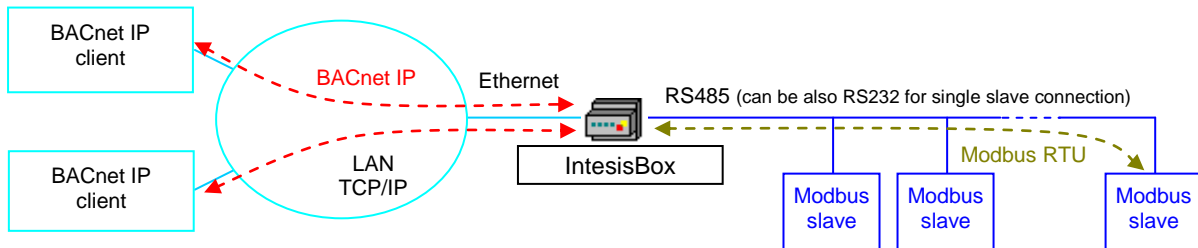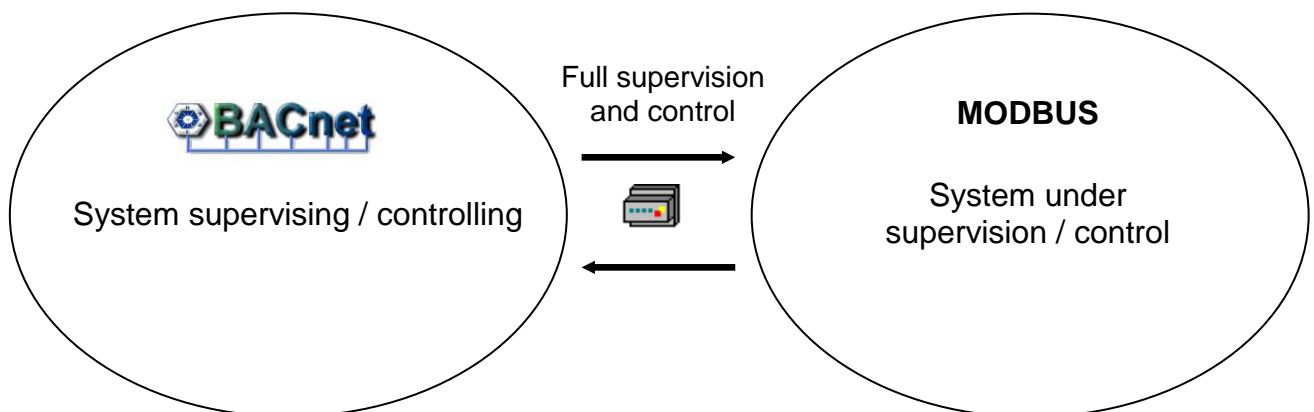
Typical BACnet client devices:

- Building Management Systems (BMS).
- SCADA packages.
- Human Machine Interfaces (HMI).
- Direct Digital Controllers (DDC).
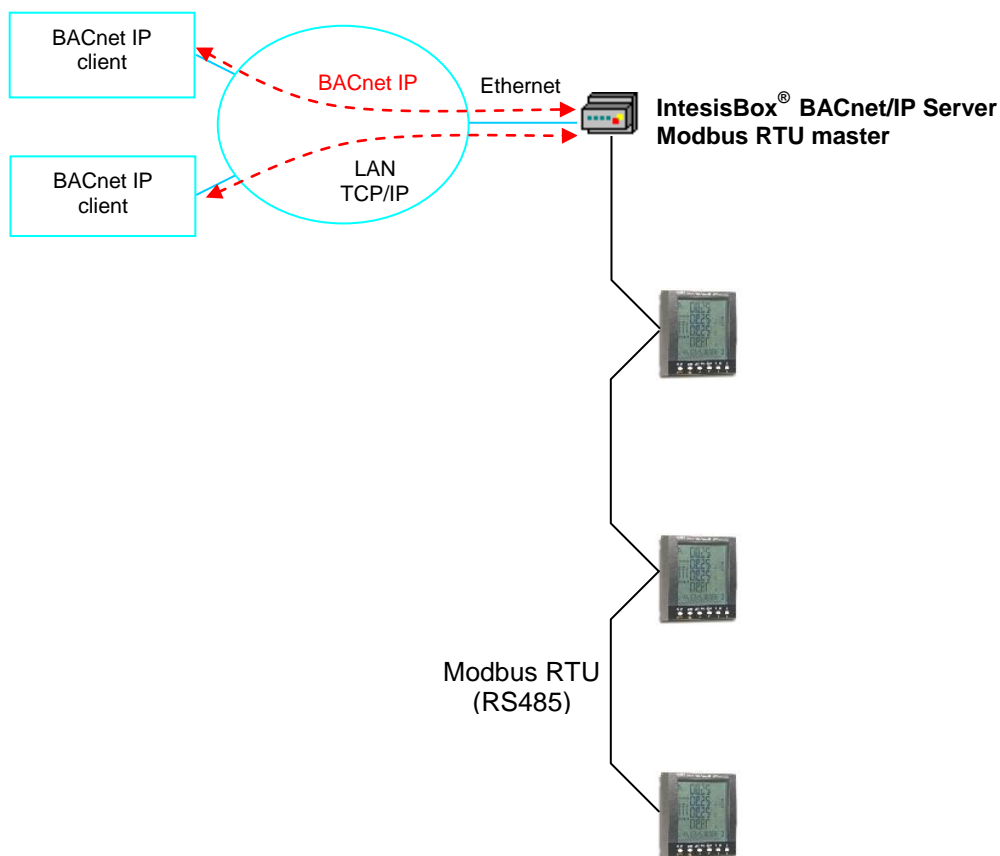- Programmable Logic Controllers (PLC).
- ….

Typical Modbus slave devices:

- Chillers.
- Heaters.
- Air conditioners.
- Thermostats.
- Fan coil controllers.
- Room controllers.
- Power meters.
- Energy meters.
- Building Management Systems (BMS).
- Programmable Logic Controllers (PLC).
- Other protocol based systems available using *IntesisBox Modbus Server* series gateways.
- …

Full supervision and control

System supervising / controlling

MODBUS

System under supervision / control

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Typical applications

Integration of Electricity Meters with Modbus RTU slave port on RS485 into BACnet/IP control systems.

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Modbus interface of IntesisBox

Modbus interface	
Device type	Master.
Modbus modes supported	RTU RS232 or RS485.
Interactivity with Modbus system	• Read: Continuous polling of Modbus devices and points defined. Updated values are available from BACnet. *Polling Timeout and Inter-frame Timeout can be configured for the Modbus interface.* • Write: Whenever a point's value is changed from BACnet system, the new value received is written into the Modbus device/register associated.
Modbus function codes supported	For every point, one of the following Modbus function codes can be used: • 1- Read coils. • 2- Read discrete inputs. • 3- Read holding registers. • 4- Read input registers. • 5- Write single coil. • 6- Write single register. • 15- Write multiple coils. • 16- Write multiple registers.
Modbus data coding formats supported	For every point, one of the following Modbus data coding formats can be used: *Generic:* • 1 bit. • 16 bits unsigned. • 16 bits signed. • 16 bits signed (two's complement). • 32 bits unsigned. • 32 bits signed. • 32 bits signed (two's complement). • 32 bits IEEE. • 32 bits IEEE inverted. *Device Specific:* • Bit coded into 16 bits register. • 32 bits IEEE CIAT. • 32 bits Mod10K unsigned. • 48 bits Mod10K unsigned. • 64 bits Mod10K unsigned. • 32 bits Mod10K signed. • 48 bits Mod10K signed. • 64 bits Mod10K signed. • 32 bits Mod1k ION. • 32 bits ION signed. • 32 bits Invertomatic.
Configuration capabilities	See configuration parameters below.

BACnet interface of IntesisBox

BACnet interface	
Device type	Server
BACnet protocols supported	BACnet ASHRAE 135 – 2001 Annex J - BACnet/IP protocol
Interactivity with BACnet system	• Point's Read/Write allowed. • Subscription requests (COV) allowed.
Configuration capabilities	See configuration parameters below.

Specifications

BACnet Conformance Class Supported: Class 3
Data Link Layer Option: BACnet IP, (Annex J)

Segmented Requests/Responses Not Supported

BACnet Standard Application Services Supported and more details are explained in BACnet IP Server KNX PICS (protocol implementation conformance statement)
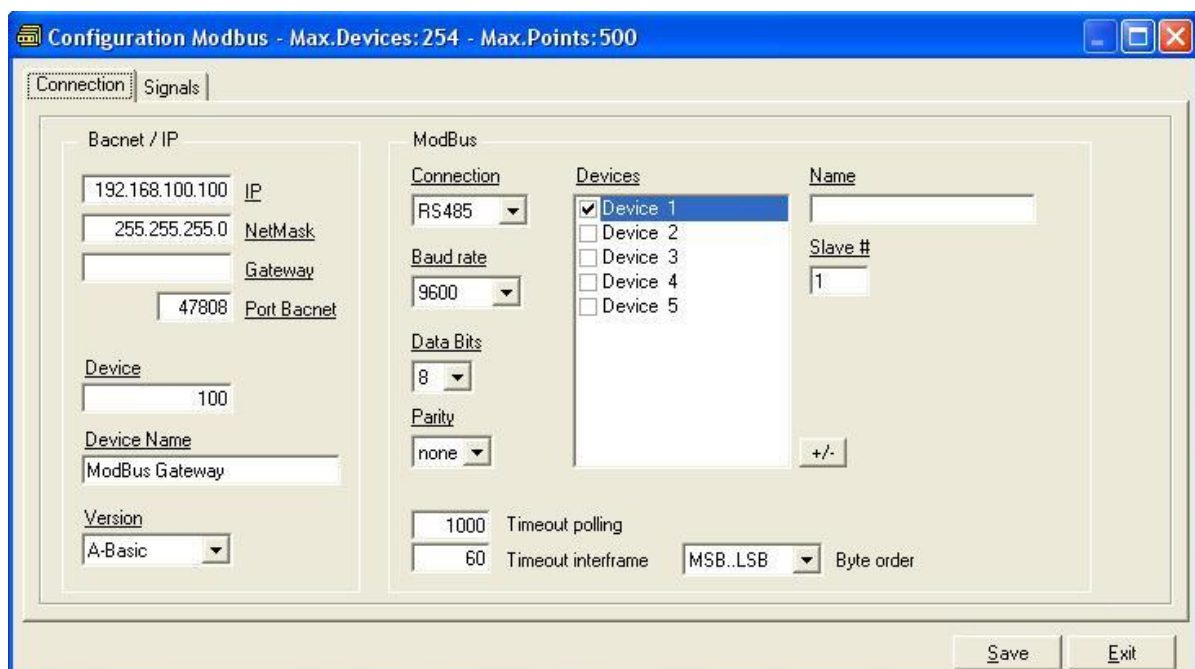http://www.intesis.com/pdf/IntesisBox_BACnet_IP_Server_Modbus_RTU_master_PICS.pdf

BACnet Standard Object Types Supported

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.

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Configuration tool

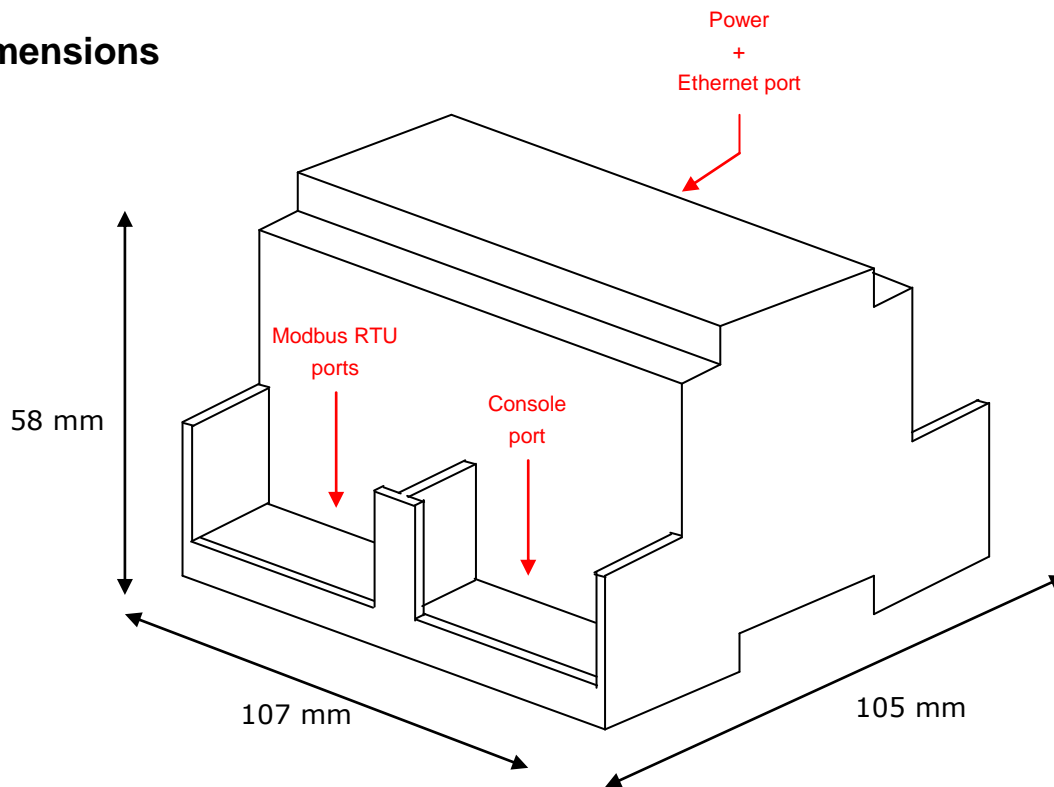| LinkBoxBacnet	• Visual engineering tool, easy of use, for gateway's configuration and supervision compatible with Microsoft Windows operating systems, supplied with the gateway free of charge. • Multi-window tool allowing to supervise simultaneously the communication activity with both protocols (systems), real time values for all the signals allowing to modify any value (very useful for test purposes), console window showing debug and operation status messages, and configuration windows to configure all the gateway's parameters and signals. • Signals configuration in plain text files (tab separated) for easy and quick configuration using Microsoft Excel (very useful in projects with a lot of points). • Allows configuring the gateway's parameters and signals while in off-line (not connected to the gateway). • Connection to the gateway for download the configuration and supervision by using serial COM port of the PC (serial cable supplied with the gateway). • Allows configuring all the external protocols available for IntesisBox® BACnet IP Server series. • Upgrades for this software tool available free of charge whenever a new protocol is added to the IntesisBox® BACnet IP Server series. • Multi-project tool allowing having in the engineer's PC the configuration for all the sites with different IntesisBox® BACnet IP Server series gateways. • Multi-language tool, all the language-dependent strings are in a plain text file (tab separated) for easy modification or addition of new languages. • A list of system commands is available to send to the gateway for debugging and adjust purposes (Reset, Date/time consultation/adjust, Firmware version request…).

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Mechanical & Electrical characteristics

Enclosure	Plastic, type PC (UL 94 V-0). Dimensions: 107mm x 105mm x 58mm.
Color	Light Grey. RAL 7035.
Power	9 to 30Vdc +/-10% 1.4W. 24Vac +/-10% 1.4VA. Plug-in terminal bloc for power connection (2 poles).
Mounting	Wall. DIN rail EN60715 TH35.
Modbus RTU ports	1 x RS485. Plug-in screw terminal block (2 poles). 1 x RS232. DB9 male connector (DTE).
BACnet IP port	1 x Ethernet 10BT RJ45.
LED indicators	1 x Power. 2 x Modbus port activity (Tx, Rx). 2 x Ethernet port (LNK, ACT).
Console port	RS232. DB9 female connector (DCE).
Configuration	Via console port.[1]
Firmware	Allows upgrades via console port.
Operational temperature	0°C to +70°C
Operational humidity	5% to 95%, non condensing
Protection	IP20 (IEC60529).
RoHS conformity	Compliant with RoHS directive (2002/95/CE).
Certifications	CE

[1]   Standard cable DB9male-DB9female 1,8 meters long is supplied with the device for connection to a PC COM port for configuring and monitoring the device. The configuration software, compatible with Windows® operating systems, is also supplied.

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Dimensions

Power + Ethernet port

Modbus RTU ports

Console port

58 mm

107 mm

105 mm

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

100 mm

115 mm

130 mm

Intesis software

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