IntesisBox® ASCII Server

BACnet IP client

User manual

v10 r15 eng

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IntesisBox®

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Gateway for the integration of BACnet IP devices into ASCII EIA-232 or TCP/IP enabled control systems.

Order codes:

IBOX-ASCII-BAC-A
Basic model supporting up to 64 BACnet client devices and 500 internal data points.

IBOX-ASCII-BAC-B
Extended model supporting up to 64 BACnet client devices and 4000 internal data points.

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1. Description

1.1 Introduction

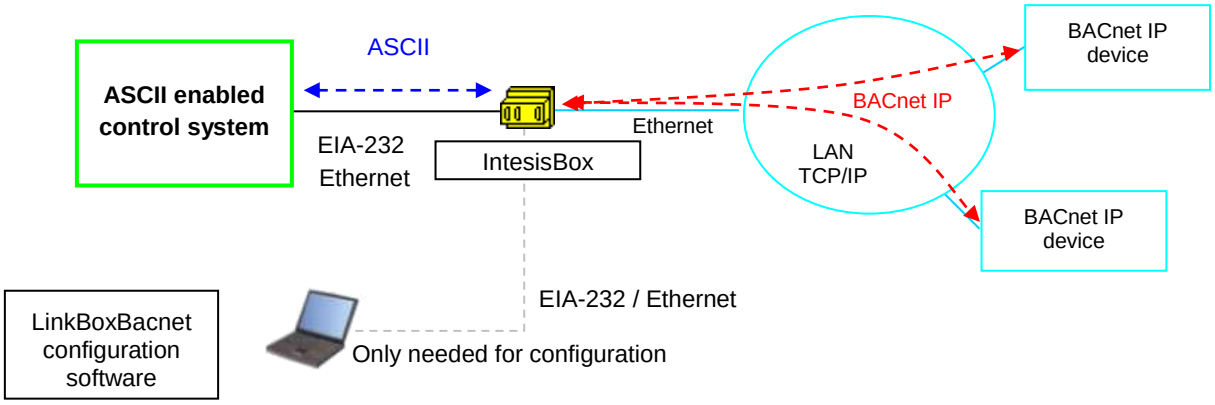
This document describes the integration of ASCII enabled systems with BACnet ASHRAE 135 – 2001 Annex J - BACnet/IP protocol compatible devices or systems using the gateway *IntesisBox ASCII Server - BACnet IP client*.

This document assumes that the user is familiar with BACnet technology and technical terms.

From now on, and with the aim of easy the read of this document, the word "IntesisBox" and "gateway" is used instead of IntesisBox ASCII Server - BACnet IP client gateway. And any other use of the word "gateway" not meaning IntesisBox ASCII Server - BACnet IP client will be specifically indicated.

The aim of this integration is to make accessible signals and resources of any BACnet IP based system or device (for example Daikin VRV AC system) from any system capable to be programmed to read and write simple text messages through EIA-232 serial port or Ethernet TCP/IP port (for example Extron, LiteTouch systems).

For this, 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).



Integration of BACnet and ASCII using *IntesisBox ASCII Server - BACnet IP client* gateway

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1.2 Functionality

The integration operation is as follow:

From the BACnet system point of view, after the start up process, the gateway reads continuously the points configured to be read by polling and also performs all the subscriptions (COV) requests for points configured to be read by subscription, and updates in memory all the values received from the BACnet system. These values received from BACnet become available to be read by the ASCII system in any moment.

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.

Also, whenever a point changes of value (due to a change in the BACnet point associated) the gateway will send an ASCII message informing about new value for the point, but only if the point is configured to send this type of spontaneous messages.

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1.3 Capacity of IntesisBox

Element	Max.* (basic version)	Max.* (extended version)	Notes
Type of BACnet devices			Only those supporting BACnet/IP.
Number of BACnet devices	64	64	Maximum number of BACnet devices accepted by the gateway.
Number of BACnet points	500	4000	Maximum number of points that can be defined in the gateway.

*These maximum values can be extended on demand

There are two different models of *IntesisBox® ASCII Server – BACnet/IP client,* with different capacity each of them.

- Basic model supporting up to 500 internal data points and 64 BACnet client devices. *Ref.: IBOX-ASCII-BAC-A.*
- Extended model supporting up to 4000 internal data points and 64 BACnet client devices. *Ref.: IBOX-ASCII-BAC-B.*

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2. ASCII interface

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

2.1 Description

The gateway can be connected to any *ASCII enabled* device using its EIA-232 interface (DB9 connector DTE) 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 BACnet device associated.

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 into the gateway.

The communication parameters of this ASCII interface are the following:
Baud rate: configurable (1200 bps ... 57600 bps).
Data bits: 8.
Parity: None.
Stop bits: 1.

The ASCII messages used to read/write points into the gateway through this interface are:

Message to read a point's value:

>Daaaa?\r

Where:
aaaa is a 4 digits number indicating the point's address inside the gateway (see point addresses details below in this document).
\r means *carriage return* character (HEX 0D, DEC 13).

Message to write a point's value:

>Daaaa=vv\r

Where:
aaaa is a 4 digits number indicating the point's address inside the gateway (see point addresses details below in this document).

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vv is the desired value for the point (it can be just integer or fractional, decimal point is used to separate integer and fractional parts if the number is fractional).
\r means *carriage return* character (HEX 0D, 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):

>Daaaa=vv\r

Where:
aaaa is a 4 digits number indicating the point's address inside the gateway (see point addresses details below in this document).
vv is the actual value of the point (it can be just integer or fractional, decimal point is used to separate integer and fractional parts if the number is fractional).
\r means *carriage return* character (HEX 0D, DEC 13).

Messages to indicate erroneous actions:

>E01\r Is returned when trying to read a point not configured in the gateway.

>E02\r Is returned when trying to write a point not permitted to be written.

2.2 Points definition

Every point defined in the gateway has the following ASCII features associated to it, which can be configured (optionally or mandatory depending on the feature):

Feature	Description
Signal	Signal or point description. Only for information purposes at user level.
Spontaneous *	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.
Active *	If activated means that the signal is active for the gateway, if not activated is like signal not defined. It allows you to deactivate signals without the need of delete them (useful for future use of this signals).

* Configuration for this feature is mandatory.

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3. BACnet interface

3.1 Description

The BACnet systems 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 their task: analog input, analog output, digital input, etc, up to 23 different types of objects. Every *Object* has different properties, the one more commonly used, and the one used to read and write values in the gateway is the *Present Value* property that 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 signals supported by the gateway:

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.

Multistate signals represent integer values, the same than binary ones but with more than 2 possible statuses. *Input* signals are read only signals.

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

The gateway simulates a virtual BACnet device inside the BACnet system acting as one more device of 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 IP protocol.

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3.2 Points definition

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

Feature	Description
BACnet Device	BACnet device to which belongs the point, from a list of BACnet devices that can be defined in the gateway (up to 64). For every BACnet device defined, a virtual signal is created automatically in the gateway to inform about the communication with the BACnet device, this signal is available also from the ASCII interface like the rest of points.
BACnet object type	BACnet object type for the point. It can be one of the following BACnet object types supported by the gateway: 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. *Consult documentation of BACnet device(s) to integrate for information about BACnet object types of the points desired to integrate.*
BACnet object instance	BACnet object instance for the point. *Consult documentation of BACnet device(s) to integrate for information about BACnet object instance of the points desired to integrate.*
BACnet object property	BACnet object property for the point. The only property permitted is Present_Value. The gateway uses Present_Value property to read/write points into other BACnet devices.

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4. LinkBoxBacnet. Configuration & monitoring tool for IntesisBox

4.1 Introduction

LinkBoxBacnet is a Windows compatible software tool developed specifically to monitor and configure IntesisBox BACnet IP series gateways. It is possible to configure all external protocols available for IntesisBox BACnet IP and to maintain different customer's configurations based on a LinkBoxBacnet project for every different installation. Maintaining always on hard disk a copy of the last configuration files for every external protocol and customer, that is to say for every project.

From LinkBoxBacnet, as well as configure the integration signals list and connection parameters for every external protocol, it is permitted also to select the serial port to use to connect to the gateway and the use of some tools for monitoring and debugging de device. Some of these tools will be explained in this document but only some of them, the rest of available debugging tools and commands will not be explained here because they are for exclusive use under the recommendations of Intesis Software technical support.

LinkBoxBacnet allows configuring all IntesisBox BACnet IP series independently of the external system or protocol used. For every external system, LinkBoxBacnet has a specific configuration window. Periodically, new free versions of LinkBoxBacnet are released incorporating the latest developed integrations for external systems.

4.2 Project definition

The first step to do, in LinkBoxBacnet for a new installation, is to create the installation's project giving a descriptive name to it. When you create a project, a new folder is created with the name of the project containing the configuration files needed depending on the external protocol selected for the project. It is strongly recommended that you create a new project for every installation, if not, overwriting of configuration files of previous installations using the same external protocol may occur, loosing the configuration data for those previous installations. The projects folder is located in AppFolder\ProjectsBacnet, where AppFolder is the installation folder of LinkBoxBacnet (by default C:\Program Files\Intesis\LinkBoxBacnet). Inside the projects folder, a new folder will be created for every project defined in LinkBoxBacnet with the files needed for the project.

When you open LinkBoxBacnet, the project selection window will appear inviting you to select a project or create a new one. A demo project for every external protocol supported is provided with the standard installation of LinkBoxBacnet. You can create a new project or select a demo project based on the external protocol desired, and create a new one from the demo one selected.

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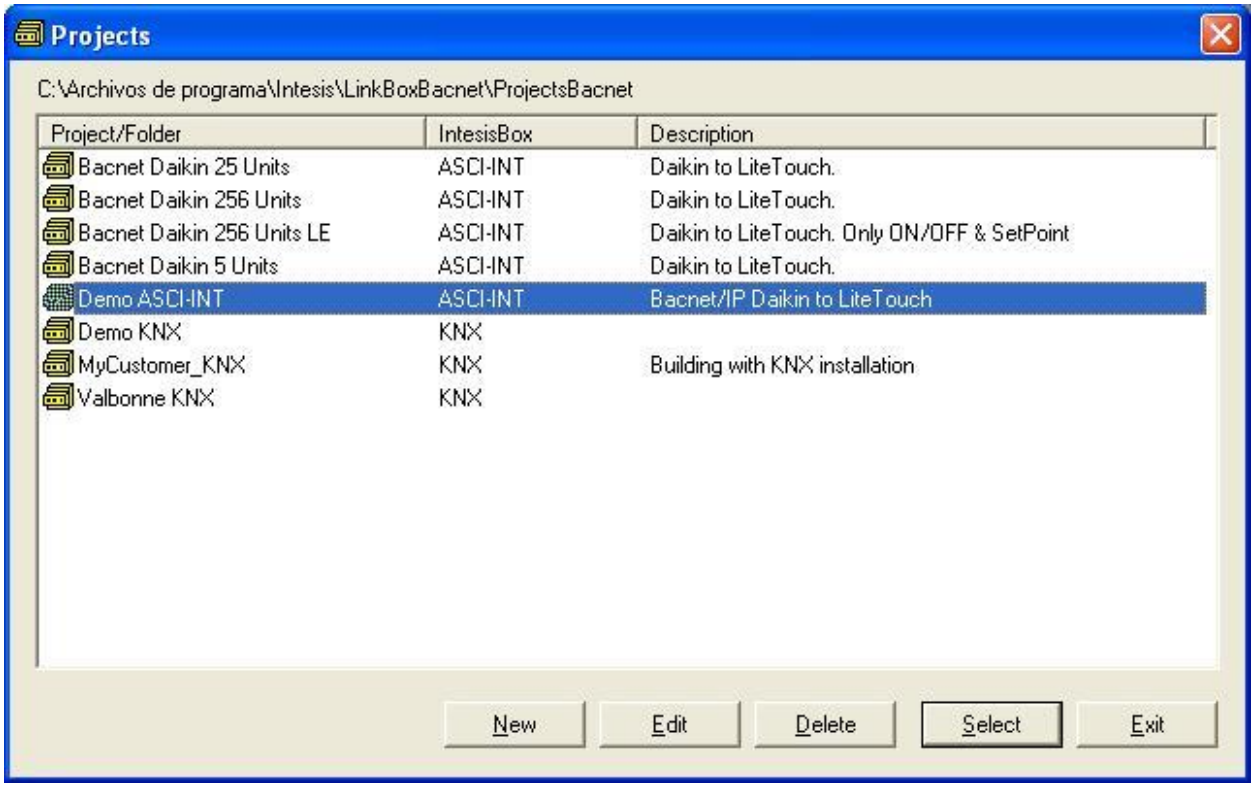
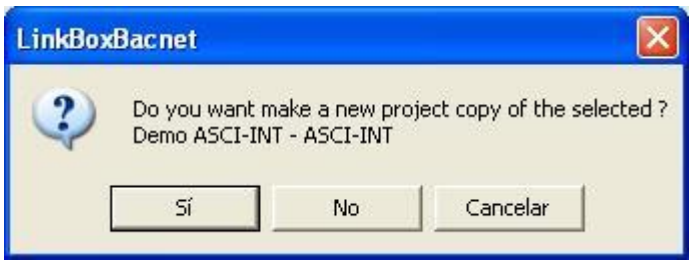


Project selection window

To create a new project, select a project using the same external protocol you want to use in the new project and push *New* button. You will be prompted to create a copy of the selected project (useful for similar installations) or create a new one.



If you select *Yes* you will be prompted to specify a name and a description for the new project that will be based on the same external protocol than the selected one. If you select *No* you can specify a name, a description and an external protocol to use from the list of available external protocols.

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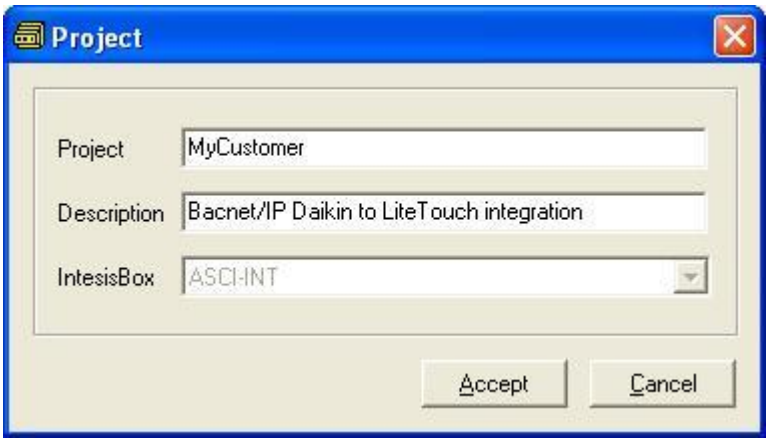

On *Accept*, a new folder will be created inside the projects folder with the name given to the project, this folder will contain the template configuration files if the project is a brand new one, or a copy of the configuration files if it is a copy of a selected one.

A description of the files created for an ASCI-INT protocol based project can be found in section *Files* below in this document.

From all the possibilities of LinkBoxBacnet, only changes in configuration for the integration and configuration file generation can be performed while disconnected from the gateway (working off-line), allowing you to do these tasks in the office more comfortably. Before any monitoring or downloading action to the gateway can be performed, the connection between the gateway and the PC running LinkBoxBacnet must be established (working on-line). To do so follow these steps:

1. Make sure the gateway is powered-up a correctly connected to the ASCII system via the EIA-232 interface or Ethernet interface and to the BACnet system via the Ethernet connection (consult details for connection and pin assignments in section *Connection*s of this document).

2. Connect a free PC serial port to the gateway's serial port marked as ***Pc Console***. (Use the standard serial cable supplied with the IntesisBox or make your own cable following the pin assignments specified in section *Connections* in this document).

   If using the Ethernet connection, connect an Ethernet cable between the ***Pc Console*** port of the IntesisBox and the PC or the corresponding Ethernet interface (Check *Connections* section in this document for more information).

3. If using the ***EIA-232*** Serial port, select in LinkBoxASCII the PC serial port used for the connection to IntesisBox. Use menu Configuration -> Connection.

   If using the ***Ethernet*** (IP/TCP) port, select in LinkBoxASCII the IP option with the corresponding IP.

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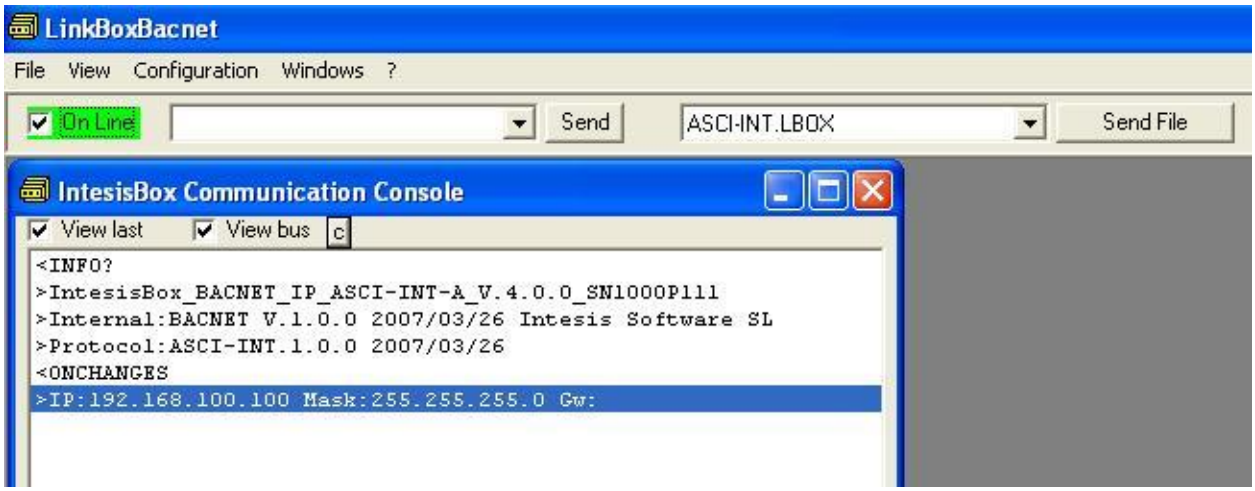
4. Check the checkbox *off-line* under the menu bar (it will change automatically to *on-line*) and LinkBoxBacnet will ask for INFO about the gateway connected to it via the serial connection, if the connection is ok then the gateway will respond with its identification (this can be monitored in the *IntesisBox Communication Console* window, as showed below).



Once connected to the gateway, all the options of LinkBoxBacnet are fully operative.

To monitor the communication between the gateway and the BACnet system, select the menu *View -> Bus -> Bacnet/IP*. The BACnet *communication Viewer* window will be opened. This window shows in real time all the communication frames between the gateway and the BACnet device(s) as well as debugging messages referent to the BACnet/IP protocol sent by the gateway.

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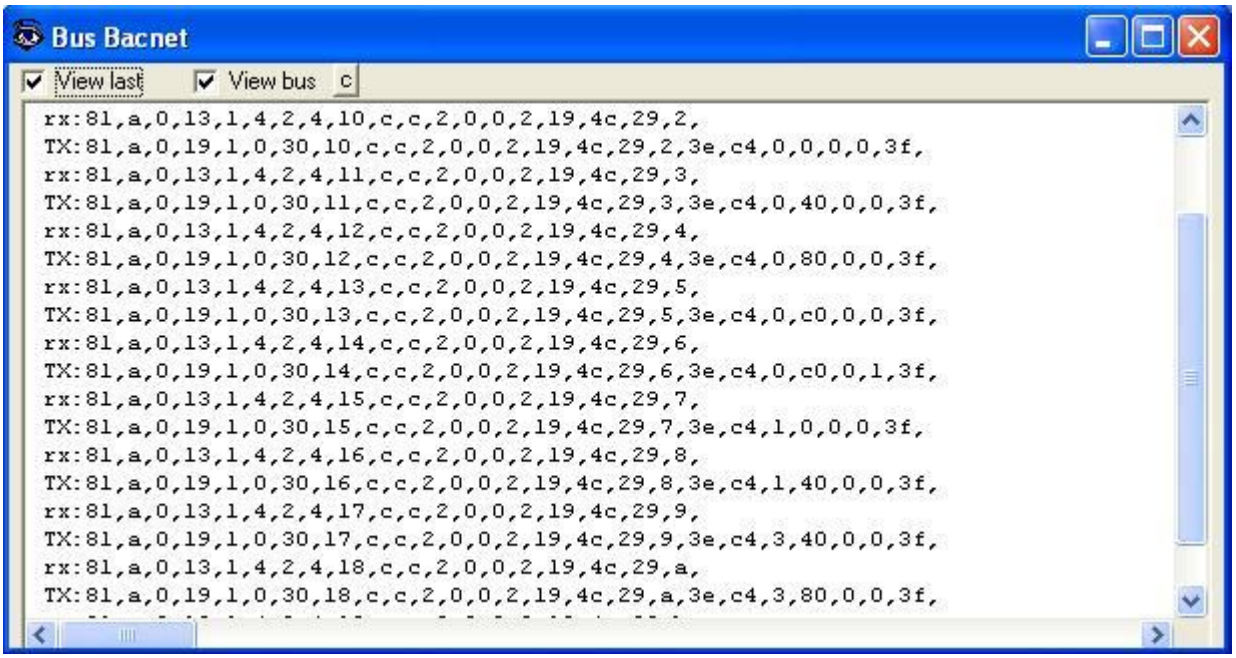
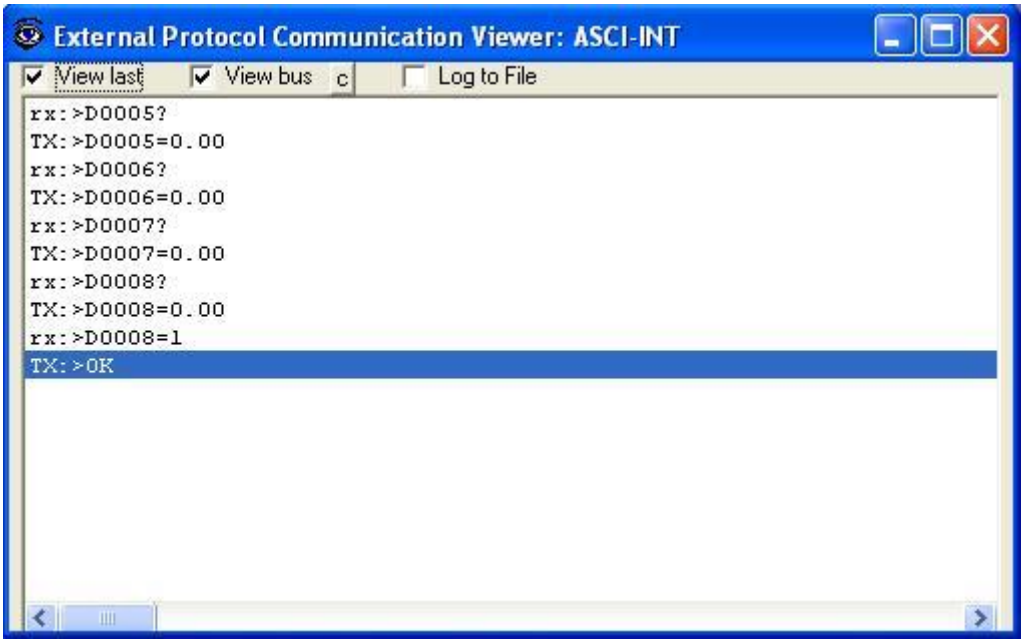


To monitor the communication between the gateway and the ASCII device, select the menu *View -> Bus -> ASCI-INT*. The *ASCII communication viewer* window will be opened. This window shows in real time all the communication frames between the gateway and the ASCII device as well as debugging messages referent to ASCII protocol sent by the gateway.



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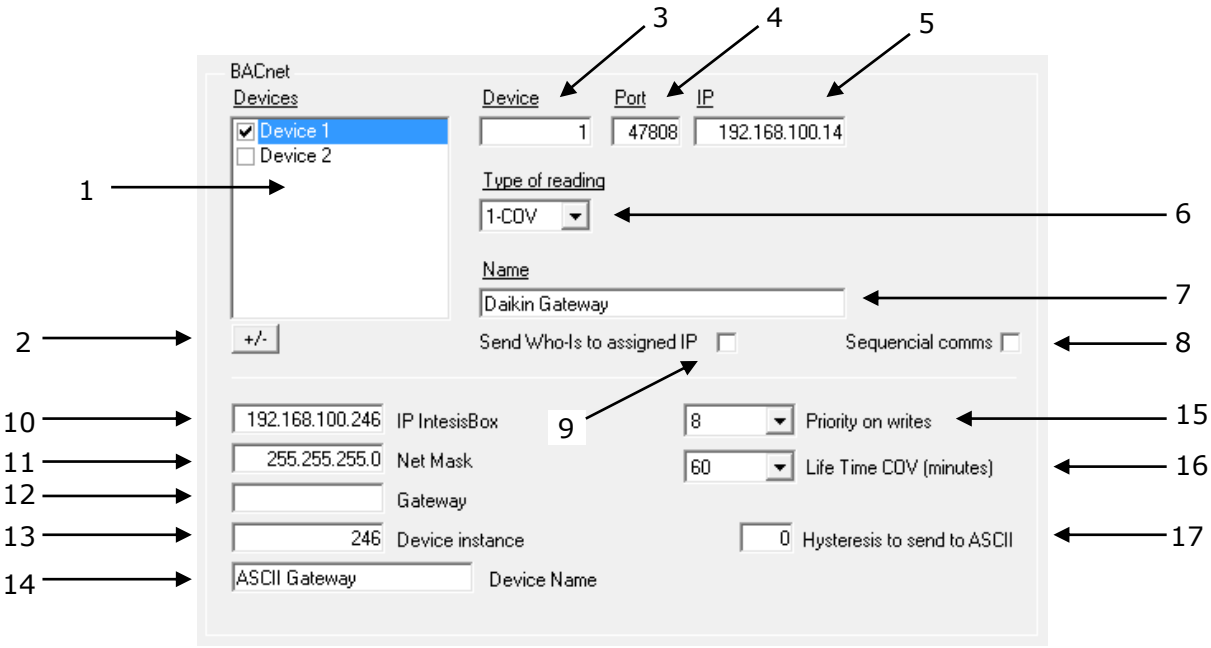
To configure the integration connection parameters, and the signals list, select menu *Configuration -> IntesisBox*. The *ASCII Configuration* window will be opened.

4.3 Connection configuration

Select the Connection tab to configure the connection parameters.

Two kinds of information are configured using this window, the referent to the BACnet/IP interface, and the referent to ASCII interface.

BACnet/IP interface configuration parameters:



BACnet interface Configuration

1. List of BACnet devices to connect to. Check the devices you want to activate. Select a device to configure its properties.

2. Set the total of devices to be used. You will be prompted to save the configuration first, after you can set the amount of BACnet devices.

3. Enter the BACnet device number.

4. Enter the port number used by the BACnet device (by default 47808, which is BAC0).

5. Enter the BACnet device IP address.

6. Enter the type of reading to perform to the BACnet device: Polling (cyclic read property) or by Subscription (COV= Change of value subscription).

7. Enter the BACnet device name (optional, just for identification purposes).

8. If set active, the communications between devices are performed sequential (required for MS/TP router/devices).

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9. If set active, the "Who-Is" will be send to the Device assigned IP, if not set, the "Who-Is" will be Broadcasted over the network. (Broadcasted is the standard method).

10. Enter the IP address for the gateway (supplied by the network administrator).

11. Enter the IP NetMask for the gateway (supplied by the network administrator).

12. Enter the Default Gateway address (router address) in case the gateway (IntesisBox) is in a different sub network than other BACnet devices (supplied by the network administrator). Leave this blank if there is no need of a router address.

13. Enter the Gateway BACnet device number (Default: 246).

14. Enter the Gateway BACnet device name (optional, just for identification purposes).

15. Select the priority to use in BACnet write operations: 1...16 (select "none" for no priority).

16. Select the COV subscriptions life time. COV subscriptions will be renewed at a half of this time. Select value zero (0) for non-time-limited COV's.

17. Enter the minimal difference of the new data received from BACnet to send a write to ASCII (Values: 0..1; Example: 0.5).

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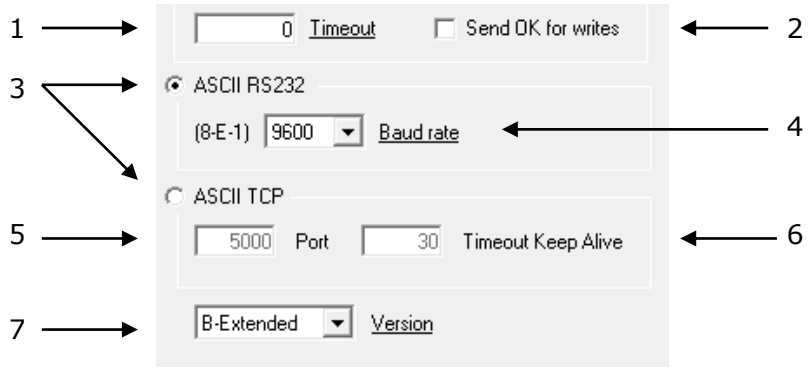
ASCII interface configuration parameters:



ASCII interface Configuration

1. Enter the timeout (in 0..2000 milliseconds) to wait for consecutive spontaneous frames.

2. If set active, after a successful write message from ASCII is received, the gateway will send an **>OK\r** frame.

3. Select the type of ASCII port used: ASCII over EIA-232 (serial connection) or ASCII over Ethernet (TCP/IP connection). (Both ASCII ports cannot be used simultaneously)

4. Enter the baud rate to use. (The rest of parameters are fixed: 8-N-1).

5. Enter the ASCII port number to use for ASCII over Ethernet (TCP/IP).

6. Enter the "Time without activity" (in 0..65535 seconds) to send the "Keep Alive" packet, if set to "0" this function is disabled (no packet will be send).

7. Select the gateway model used: Basic or Extended. You can check the gateway model in the identification given by the gateway when it connects to LinkBoxBacnet, it appears in the IntesisBox Communication Console window after clicking on the *Online* checkbox, it is something like this:

   IntesisBox_Bacnet_IP_ASCI-INT-**A**...-> this is the Basic model (up to 500 internal points)
   IntesisBox_Bacnet_IP_ASCI-INT-**B**...-> this is the Extended model (up to 4000 internal points)

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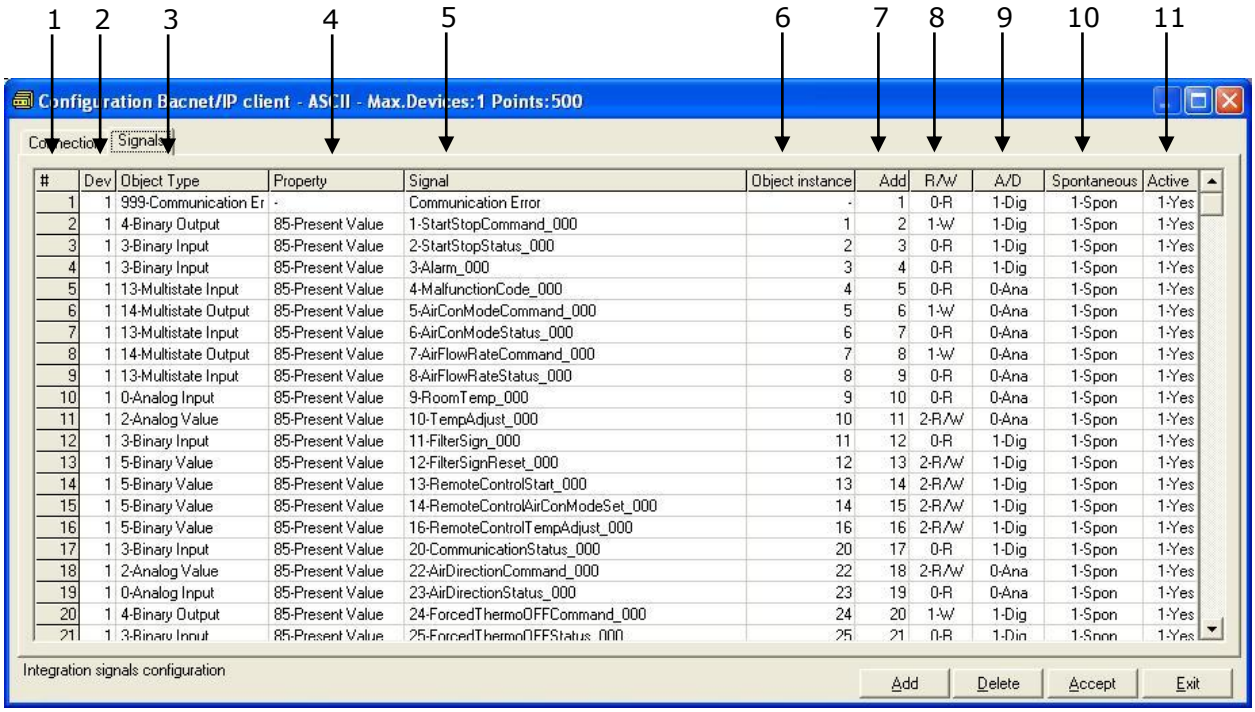
4.4 Signals configuration

Select the Signals tab to configure the signals list (the gateway's internal points).



#	Dev	Object Type	Property	Signal	Object instance	Add	R/W	A/D	Spontaneous	Active
1	1	999-Communication Er	-	Communication Error	-	1	0-R	1-Dig	1-Spon	1-Yes
2	1	4-Binary Output	85-Present Value	1-StartStopCommand_000	1	2	1-W	1-Dig	1-Spon	1-Yes
3	1	3-Binary Input	85-Present Value	2-StartStopStatus_000	2	3	0-R	1-Dig	1-Spon	1-Yes
4	1	3-Binary Input	85-Present Value	3-Alarm_000	3	4	0-R	1-Dig	1-Spon	1-Yes
5	1	13-Multistate Input	85-Present Value	4-MalfunctionCode_000	4	5	0-R	0-Ana	1-Spon	1-Yes
6	1	14-Multistate Output	85-Present Value	5-AirConModeCommand_000	5	6	1-W	0-Ana	1-Spon	1-Yes
7	1	13-Multistate Input	85-Present Value	6-AirConModeStatus_000	6	7	0-R	0-Ana	1-Spon	1-Yes
8	1	14-Multistate Output	85-Present Value	7-AirFlowRateCommand_000	7	8	1-W	0-Ana	1-Spon	1-Yes
9	1	13-Multistate Input	85-Present Value	8-AirFlowRateStatus_000	8	9	0-R	0-Ana	1-Spon	1-Yes
10	1	0-Analog Input	85-Present Value	9-RoomTemp_000	9	10	0-R	0-Ana	1-Spon	1-Yes
11	1	2-Analog Value	85-Present Value	10-TempAdjust_000	10	11	2-R/W	0-Ana	1-Spon	1-Yes
12	1	3-Binary Input	85-Present Value	11-FilterSign_000	11	12	0-R	1-Dig	1-Spon	1-Yes
13	1	5-Binary Value	85-Present Value	12-FilterSignReset_000	12	13	2-R/W	1-Dig	1-Spon	1-Yes
14	1	5-Binary Value	85-Present Value	13-RemoteControlStart_000	13	14	2-R/W	1-Dig	1-Spon	1-Yes
15	1	5-Binary Value	85-Present Value	14-RemoteControlAirConModeSet_000	14	15	2-R/W	1-Dig	1-Spon	1-Yes
16	1	5-Binary Value	85-Present Value	16-RemoteControlTempAdjust_000	16	16	2-R/W	1-Dig	1-Spon	1-Yes
17	1	3-Binary Input	85-Present Value	20-CommunicationStatus_000	20	17	0-R	1-Dig	1-Spon	1-Yes
18	1	2-Analog Value	85-Present Value	22-AirDirectionCommand_000	22	18	2-R/W	0-Ana	1-Spon	1-Yes
19	1	0-Analog Input	85-Present Value	23-AirDirectionStatus_000	23	19	0-R	0-Ana	1-Spon	1-Yes
20	1	4-Binary Output	85-Present Value	24-ForcedThermoOFFCommand_000	24	20	1-W	1-Dig	1-Spon	1-Yes
21	1	3-Binary Input	85-Present Value	25-ForcedThermoOFFStatus_000	25	21	0-R	1-Dig	1-Spon	1-Yes

Signals list

1. *#.* Signal's number (edit not permitted). Every row in the grid corresponds to a signal (point). Signals (rows in the grid) can be added or deleted selecting the desired row and clicking *Add* or *Delete* buttons. Deletion action can be executed for a single row or even for some consecutive rows, all the rows selected will be deleted. This column is used only to enumerate the rows in the grid (signals).

2. *Dev*. device number to which belongs the point. Referenced to the list of devices defined in *Connection Tab*. Note that this is not the device number configured in the BACnet device itself.

3. *Object Type*. BACnet object type for the signal. Edit using the mouse right-button-click pop-up menu available on the column as showed in the figure below. One of the showed object types can be selected:

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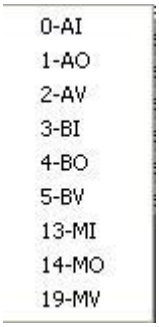

AI = Analog Input.

AO = Analog Output.

AV = Analog Value.

DI = Digital Input.

DO = Digital Output.

DV = Digital Value.

MI = Multistate Input.

MO = Multistate Output.

MV = Multistate Value.

Consult documentation of BACnet device(s) to integrate for information about BACnet object types of the points desired to integrate.

The *Communication error* virtual signals have always a predefined special Object type, not changeable.

4. *Object property*. Is the BACnet object property to use by the gateway to read/write points into BACnet devices. Only Present_Value property available. Edit not permitted.

5. *Signal*. Signal's description. Used to describe the signal at user level.

6. *Object Instance*. Object instance for the point into the BACnet device.

   Consult documentation of BACnet device(s) to integrate for information about BACnet object instances of the points desired to integrate.

7. *Add*. Point's address. To be used by the ASCII messages sent and received through the ASCII interface to refer to the point. For example if the point has address 1, then all the ASCII massages related to this point will contain **0001** in the address field (i.e. **>D0001?\r** to request the actual value of the point).

8. *R/W*. Indicates if the point can be Read, Written or Both, always from the ASCII system point of view. This value is fixed depending on the BACnet object type selected for the point. Edit not permitted.

9. *A/D*. Indicates the type of point, analogue or digital, always from the ASCII system point of view. This value is fixed depending on the BACnet object type selected for the point. Edit not permitted.

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10. *Spontaneous*. Indicates if the gateway will send or not a spontaneous message through the ASCII interface indicating the new value whenever the point's value changes. Possible values: 0-NoSpon, 1-Spon. Edit using the mouse right-button-click menu available on the column.

11. *Active*. Indicates if the signal is active or not for the integration. Possible values: 0-No, 1-Yes. Edit using the mouse right-button-click menu available on the column.

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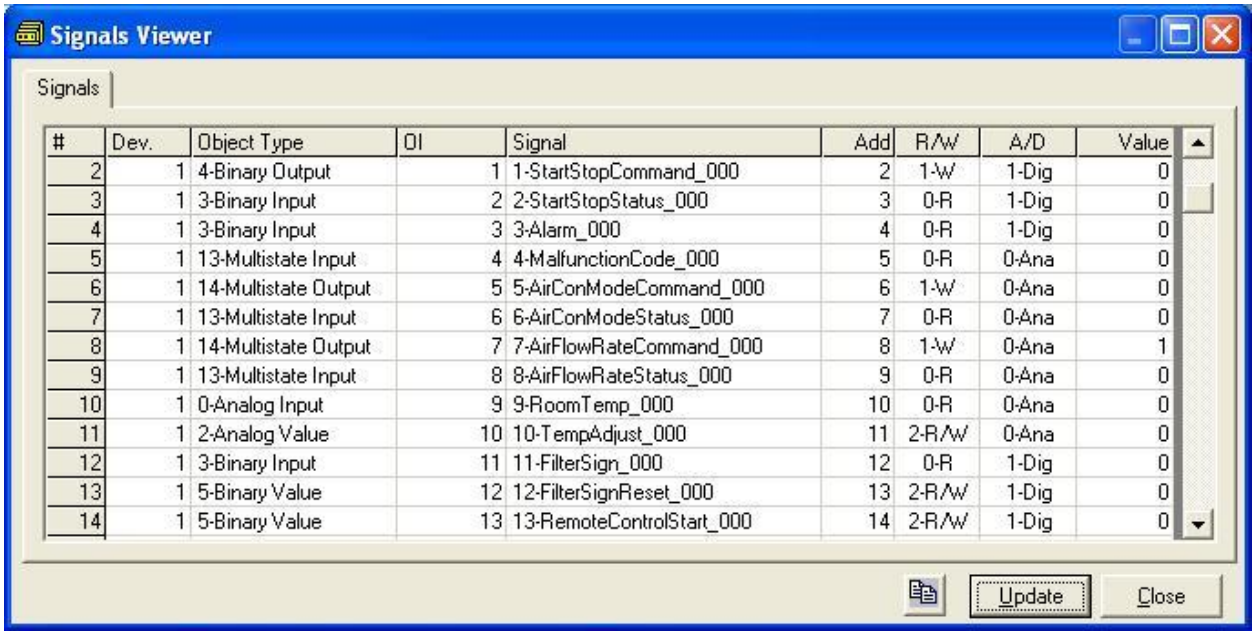
4.5 Saving the configuration and sending it to IntesisBox

When the configuration is finished, click on button *Save* to save it to the project folder on hard disk. You will be prompted to generate the configuration file to send to the gateway, if you select *Yes*, the binary file containing the configuration for the gateway will be generated and saved also into the project folder.

Once the configuration has been saved and the configuration file for the gateway has been generated, to send this configuration file to the gateway, click on the button *Send File*. The process of file transmission can be monitored in the IntesisBox Communication Console window. If the file transmission is ok, IntesisBox will reboot automatically with the new configuration loaded.

4.6 Signals viewer

Once the gateway is running with the correct configuration and communicating with ASCII and BACnet systems, it is possible to view the readings of the integration signals and even force a change in any signal value from LinkBoxBacnet. To do so, select menu View -> Signals. The Signals Viewer window will be opened. This window shows all the active gateway's signals with its main configuration parameters and its real time value in the column Value.



#	Dev.	Object Type	OI	Signal	Add	R/W	A/D	Value
2	1	4-Binary Output	1	1-StartStopCommand_000	2	1-W	1-Dig	0
3	1	3-Binary Input	2	2-StartStopStatus_000	3	0-R	1-Dig	0
4	1	3-Binary Input	3	3-Alarm_000	4	0-R	1-Dig	0
5	1	13-Multistate Input	4	4-MalfunctionCode_000	5	0-R	0-Ana	0
6	1	14-Multistate Output	5	5-AirConModeCommand_000	6	1-W	0-Ana	0
7	1	13-Multistate Input	6	6-AirConModeStatus_000	7	0-R	0-Ana	0
8	1	14-Multistate Output	7	7-AirFlowRateCommand_000	8	1-W	0-Ana	1
9	1	13-Multistate Input	8	8-AirFlowRateStatus_000	9	0-R	0-Ana	0
10	1	0-Analog Input	9	9-RoomTemp_000	10	0-R	0-Ana	0
11	1	2-Analog Value	10	10-TempAdjust_000	11	2-R/W	0-Ana	0
12	1	3-Binary Input	11	11-FilterSign_000	12	0-R	1-Dig	0
13	1	5-Binary Value	12	12-FilterSignReset_000	13	2-R/W	1-Dig	0
14	1	5-Binary Value	13	13-RemoteControlStart_000	14	2-R/W	1-Dig	0

It is possible to force a specific value to any signal for test purposes, to do so just double click on the row and select the desired value and Accept in the Data Test window.

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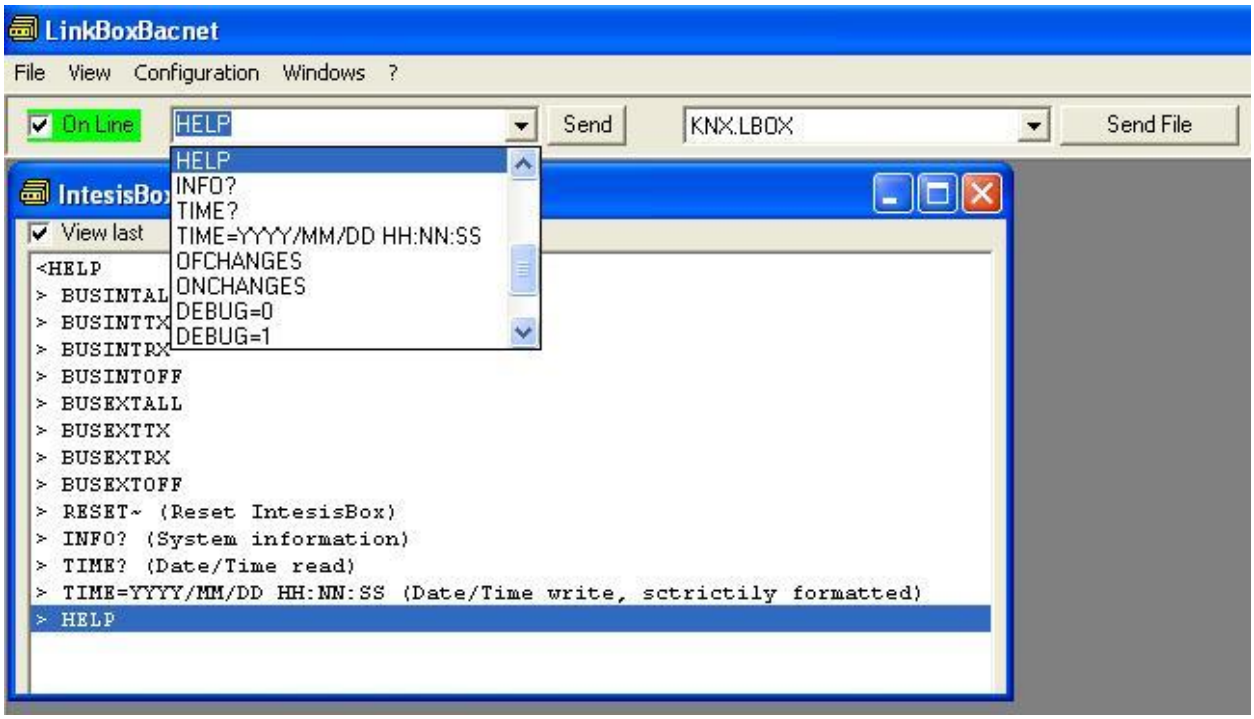
4.7 System commands

LinkBoxBacnet includes an option to send to IntesisBox a set of system commands for debugging and control purposes; this list is available in the commands list as shown in the figure below. To send a command to IntesisBox just select it from the list, or type it with the correct format, and press *Enter* or click on button *Send*. IntesisBox will act accordingly with the command received; the process can be monitored in the IntesisBox Communication Console window. The use of some of these commands can be critical for IntesisBox normal functioning, having this in mind use only these commands following the recommendations of Intesis Software technical support. A list of the more commonly used commands and the way to use them will be returned by IntesisBox after sending the HELP command.



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4.8 Files

LinkBoxBacnet saves the IntesisBox configuration in the following files inside the project folder:

PROJECT.INI	.ini file containing general information referent to the project
ASCI-INT.INI	.ini file containing the information referent to the connection window and other special adjustments
ASCI-INT.DAT	Text file (tab separated values) with the signals information (signals list). This file can be edited (with Excel for example) to change the configuration quicker and easier. Later on, when selecting *Configuration -> IntesisBox* in LinkBoxBacnet, if the changes have been made respecting the correct format, all the changes in the configuration done from Excel can be seen in the signals list.
ASCI-INT.LBOX	Binary file created from the information in the files described above. This is the file uploaded to the gateway.

It is strongly recommended to back up the project folder containing these files in external media, once the installation process is finished. This way you will be able to do future configuration changes in case of reinstallation of LinkBoxBacnet due, for example, to a failure of the hard disk in the PC where LinkBoxBacnet was previously installed.

The configuration cannot be downloaded from the gateway to LinkBoxBacnet, only can be uploaded; the upload file ASCI-INT.LBOX does not contain all the integration information, as for example the signals description.

4.9 Functionality considerations

IntesisBox returns some useful information about internal parameters in response to an INFO command:

Referent to IntesisBox:
- Firmware version and serial number.
- Protocols versions.

Referent to BACnet side:
- IP address configured.
- NetMask configured.
- Default Gateway configured.

* See *Release notes* of the latest firmware version for up to date information on *IntesisBox ASCII - BACnet IP client* gateway and *LinkBoxBacnet* functionality.

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5. Setup process and troubleshooting

5.1 Pre-requisites

It is necessary to have the ASCII enabled device operative and ready to be connected to the ASCII interface of IntesisBox. The ASCII massages to use to communicate to the gateway (see format above in this document) should be configured in the ASCII enabled device.

It is necessary to have an Ethernet 10BT network connection near IntesisBox (network hub or switch port) with all BACnet/IP devices connected to this Ethernet network.

Connectors, connection cables, PC for LinkBoxBacnet, and network hub or switch are not supplied by Intesis Software for this standard integration. The items supplied by Intesis Software for this integration are:

- IntesisBox gateway with ASCII protocol and BACnet IP Client protocol firmware loaded.
- Console cable. Standard DB9F-DB9M cable 1.8 meters long.
- LinkBoxBacnet software.
- Product documentation.

5.2 Setup procedure

1. Install LinkBoxBacnet on your laptop.

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

3. Connect the EIA-232 or Ethernet cable coming from the ASCII enabled device c port marked as **ASCII EIA-232** or **ASCII TCP/IP** respectively of IntesisBox. Respect always the maximum distance of 15 meters for this cable. (See details for this bus cable in section *Connections* of this document).

4. Connect the communication cable coming from the network hub or switch to the port marked as **ETH** of IntesisBox. (See details for this communication cable in section *Connections* of this document).

5. Power up IntesisBox using a standard power supply 220/125VAC-12VDC/300mA for example.

   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 AC power supplies only if they are floating and not powering any other device.

6. Connect the EIA-232 cable coming from the serial port of your laptop PC to the port marked as **Pc Console** of IntesisBox. If you prefer using the Ethernet connection, connect the PC to the **Pc Console** port of the IntesisBox. (See details for this communication cable in section *Connections* of this document).

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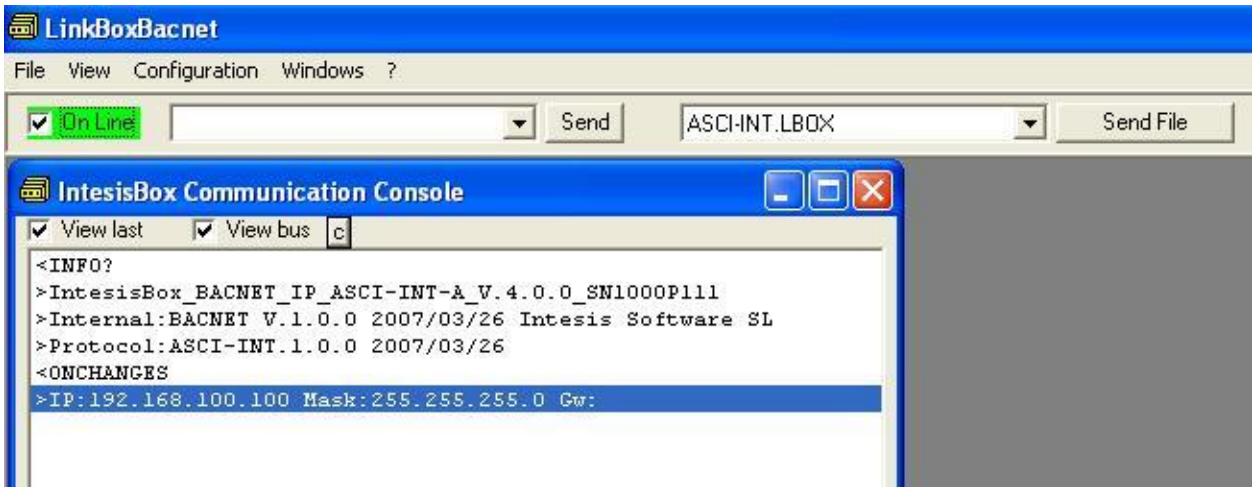
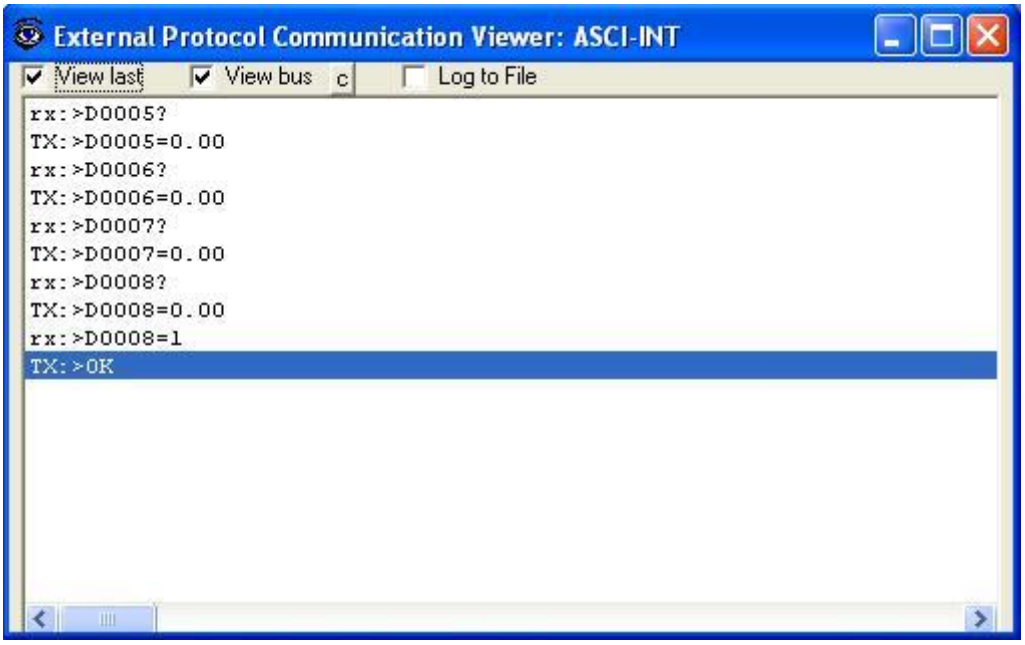
7. Open LinkBoxBacnet, create a new project selecting a copy of the one named **DEMO ASCI-INT** and give it the name desired, select the serial port used to connect to the gateway (menu Configuration -> Connection) and switch working mode to *on-line* (checkbox *off-line/on-line*). The IntesisBox identification must appear in the *IntesisBox communication console* window as showed below.



8. Open the *ASCII Communication Viewer* window (menu View -> Bus -> ASCII), force some point's polling from the ASCII device connected to IntesisBox, and check that there is communication activity, some TX frames and some other RX frames. This means that the communication with the ASCII device is ok. In case there is no communication activity between IntesisBox and the ASCII device check that ASCII device is operative and well connected to the IntesisBox.



9. Open the *BACnet Protocol Communication Viewer* window (menu View -> Bus -> Bacnet/IP) and check that there is communication activity, some TX frames and some other RX frames as showed in the figure below. This means that the communication with the BACnet system is ok.

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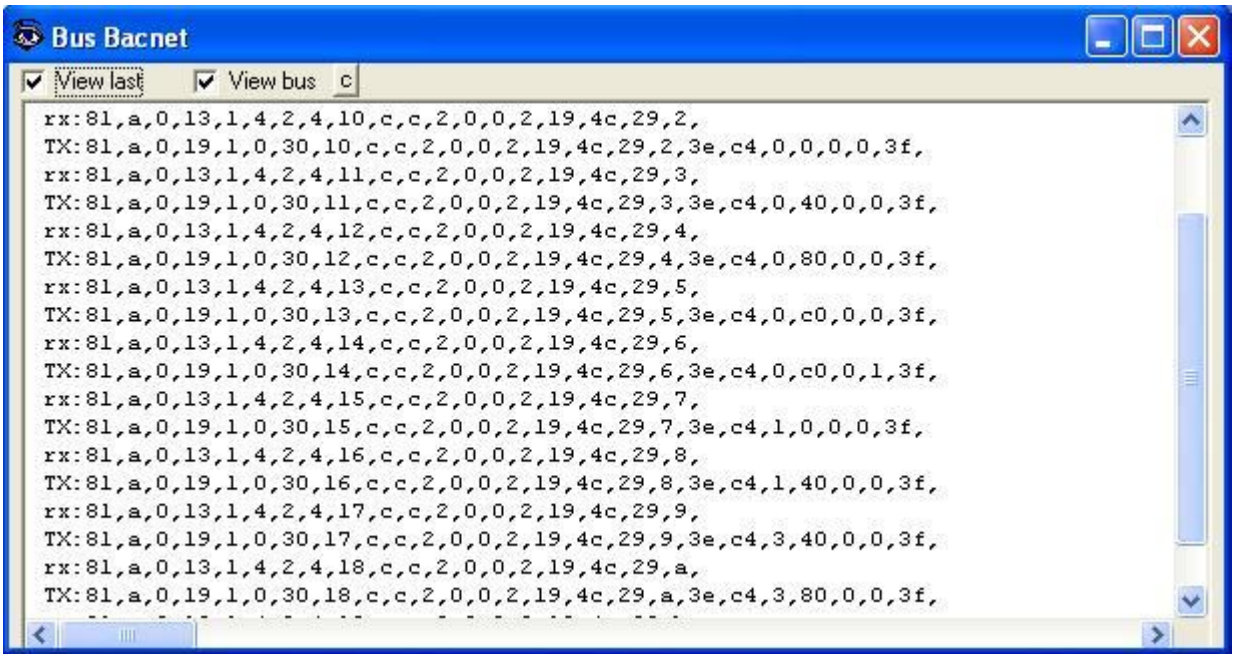

In case there is no response from the BACnet devices to the frames sent by IntesisBox check that they are operative and reachable from the network connection used by IntesisBox, check the IntesisBox's BACnet IP interface using any commercial BACnet browser connected to the same Ethernet network. See details for the communication cable between IntesisBox and BACnet system in section *Connections* of this document.

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6. Configuring the integration in just two steps

6.1 Importing BACnet points list and configuring IntesisBox

The first step is to obtain, from the technical documentation of the BACnet device(s) to integrate, the following information:

- Device number.
- A list of all the points wanted to be integrated, this list must contain for every point:
  - Signal's descriptive name.
  - BACnet object type.
  - BACnet object instance.

Once this information has been collected, you can begin to configure the gateway:

- Create a New ASCI-INT based project as explained above.
- If there are few points to integrate you can use directly LinkBoxBacnet to add the points and introduce the BACnet parameters into the appropriate columns, if a lot of points have to be integrated it is recommended to use Excel to update the file containing the signals list (ASCI-INT.DAT), we will explain here this process using Excel.
- Open the ASCI-INT.DAT file located under the project folder with Excel. This is a text file with Tab separated fields, so configure accordingly the filters to open tab separated fields text files in Excel.
- Introduce the point's parameters collected from the BACnet device(s) documentation into the appropriate columns of the file, adding as many rows to the file as points required. See example of file opened with Excel below.

PROTOCOLO=55-ASCI-INT										
VERSION=1.0										
CAMPOS=11										
#	Dev.	Object Type	Property	Signal	Object instance	Add	R/W	A/D	Spontaneous	Active
1	1	999-Communication Error	-	Communication Error	-	1	0-R	1-Dig	1-Spon	1-Yes

Follow these indications when filling the columns:

- Column 1: Auto-enumerate in increasing order (1,2,3…).
- Column 2: Enter the device number to which belongs the point (referenced the list of devices defined in *Connection Tab* as explained in section 4.3, note that this is not the device number configured in the BACnet device itself).
- Column 3: Enter the BACnet object type for the point, with the correct format (see section 4.4 for details about correct formats). Consult BACnet device documentation for details about object types for every point.
- Column 4: Enter always "85-Present Value".
- Column 5: Enter the descriptive name of the point
- Column 6: Enter the BACnet object instance for the point, a number. Consult BACnet device documentation for details about object instances for every point.
- Column 7: Enter the point's address, a number between 1 and 9999, do not duplicate addresses. We recommend you to auto-enumerate in increasing order (1,2,3…).
- Column 8: Enter the signal direction for the point (0-R, 1-W, 2-R/W) according to the BACnet object type also entered for the point, with the correct format (see section 4.4 for details about correct formats).

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- Column 9: Enter the signal type for the point (0-Ana, 1-Dig) according to the BACnet object type also entered for the point, with the correct format (see section 4.4 for details about correct formats).
- Column 10: Enter the "Spontaneous configuration" for the point (0-NoSpon, 1-Spon) according to the functionality desired for the point, with the correct format (see section 4.4 for details about correct formats and functionality).
- Column 11: Enter always "1-Yes".

- Save the modified file with Excel maintaining its original format (text file with Tab separated fields).
- Open the configuration window from LinkBoxBacnet as explained above.
- Do not forget to enter the ASCII interface parameters and BACnet interface parameters in *Connection Tab* as explained above.
- Select *Signals Tab*, and you should see here all the new rows introduced previously using Excel in ASCI-INT.DAT file.
- Save the configuration, and generate the gateway configuration.
- Download the configuration file to the gateway as explained above.

6.2 Configuring the ASCII system to access the gateway's points

Once the gateway is configured and working, then the last step to do is configuring the ASCII system to be able to write/read ASCII messages according to the format accepted by the gateway and having in mind the address configured for every point. This must be done by the engineer in charge of configuring and commissioning the ASCII system (LiteTouch for example).

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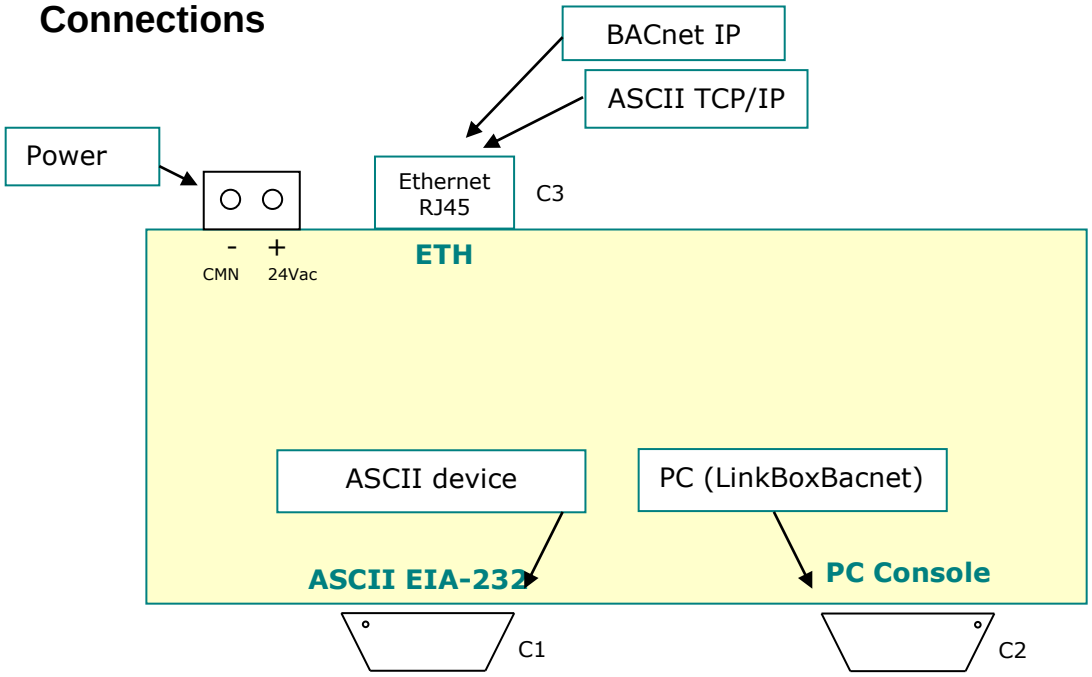
7. Connections



IntesisBox (DB9 M)	C1	ASCII (EIA-232) Connection		LiteTouch (DB9 M)
Cable (DB9 F)		EIA-232 (Crossed)		Cable (DB9 F)
RX	2	←	2	RX
TX	3	→	3	TX
GND	5	↔	5	GND

IntesisBox (DB9 F)	C2	PC (LinkBoxBacnet) Connection		PC (DB9 M)
Cable (DB9 M)		EIA-232 (Straight)		Cable (DB9 F)
TX	2	→	2	RX
RX	3	←	3	TX
GND	5	↔	5	GND

IntesisBox (RJ45 F)	C3	BACnet Connection		BACnet Device (RJ45 F)
Cable (RJ45 M)		Ethernet		Cable (RJ45 M)
		Cable UTP/FTP Cat5 Crossed		1 BACnet device
		Cable UTP/FTP Cat5 Straight	Hub	x BACnet devices

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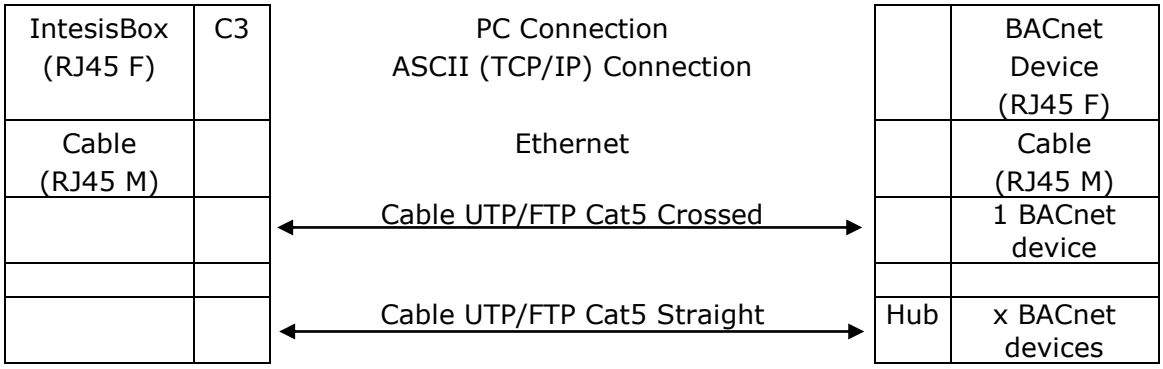

8. BACnet IP interface specifications

BACnet Conformance Class Supported: Class 3

BACnet Standard Application Services Supported:

	Initiate Requests	Executes Requests
ConfirmedCOVNotification		X
Subscribe COV	X	
UnconfirmedCOVNotification		X
ReadProperty	X	
WriteProperty	X	
Who-Is		X

BACnet Standard Object Types Supported:

Analog Input
Analog Output
Analog Value
Binary Input
Binary Output
Binary Value
Multi-state Input
Multi-state Output
Multi-state Value

Data Link Layer Option: BACnet IP, (Annex J)

No Segmented Requests/Responses Supported

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9. Mechanical & electrical characteristics

Enclosure	Plastic, type PC (UL 94 V-0). Dimensions: 107mm x 105mm x 58mm.
Colour	Light Grey. RAL 7035.
Power	9 to 30Vdc +/-10% 1.4W. 24Vac +/-10% 1.4VA. Plug-in terminal block for power connection (2 poles).
Mounting	Surface. Wall. DIN rail EN60715 TH35.
ASCII port	1 x EIA-232. (DB9 male connector DTE)
BACnet IP port	1 x Ethernet 10BT RJ45.
LED indicators	1 x Power. 2 x ASCII port activity (Tx, Rx). 2 x Ethernet port link and activity (LNK, ACT).
Console port	EIA-232. DB9 female connector (DCE).
Configuration	Via EIA-232 serial port or Ethernet TCP/IP port
Firmware	Allows upgrades via console port.
Operational temperature	-40°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

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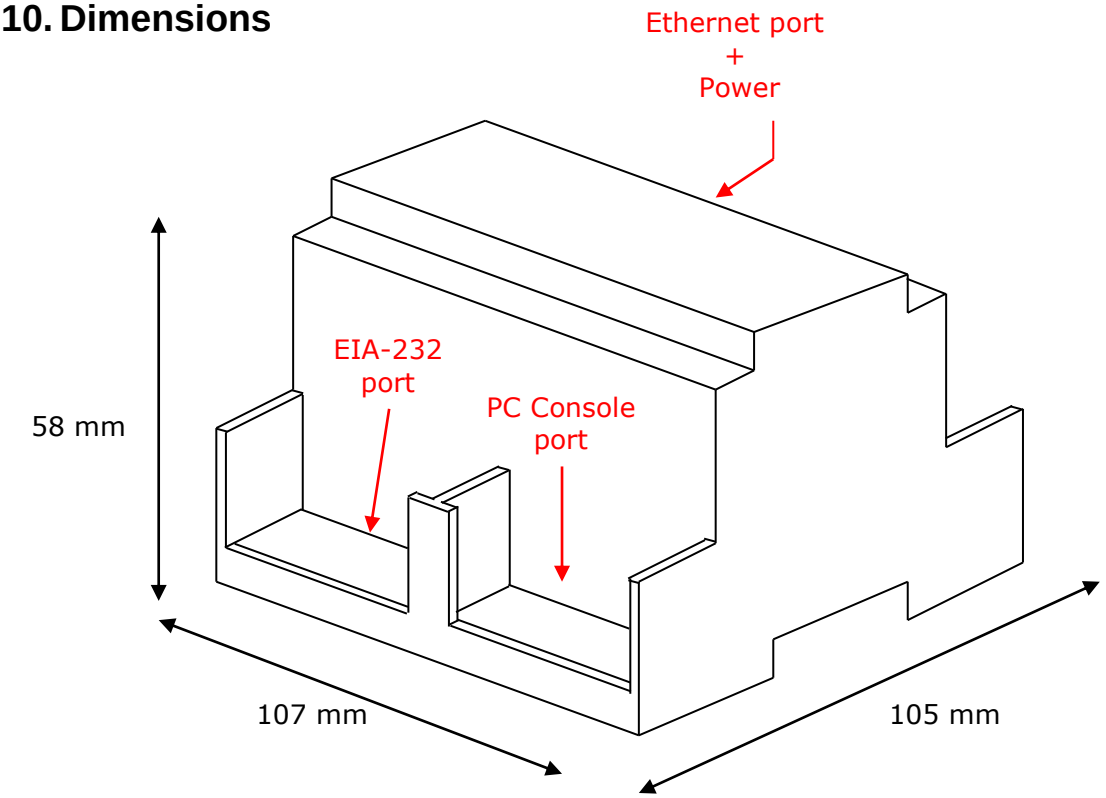
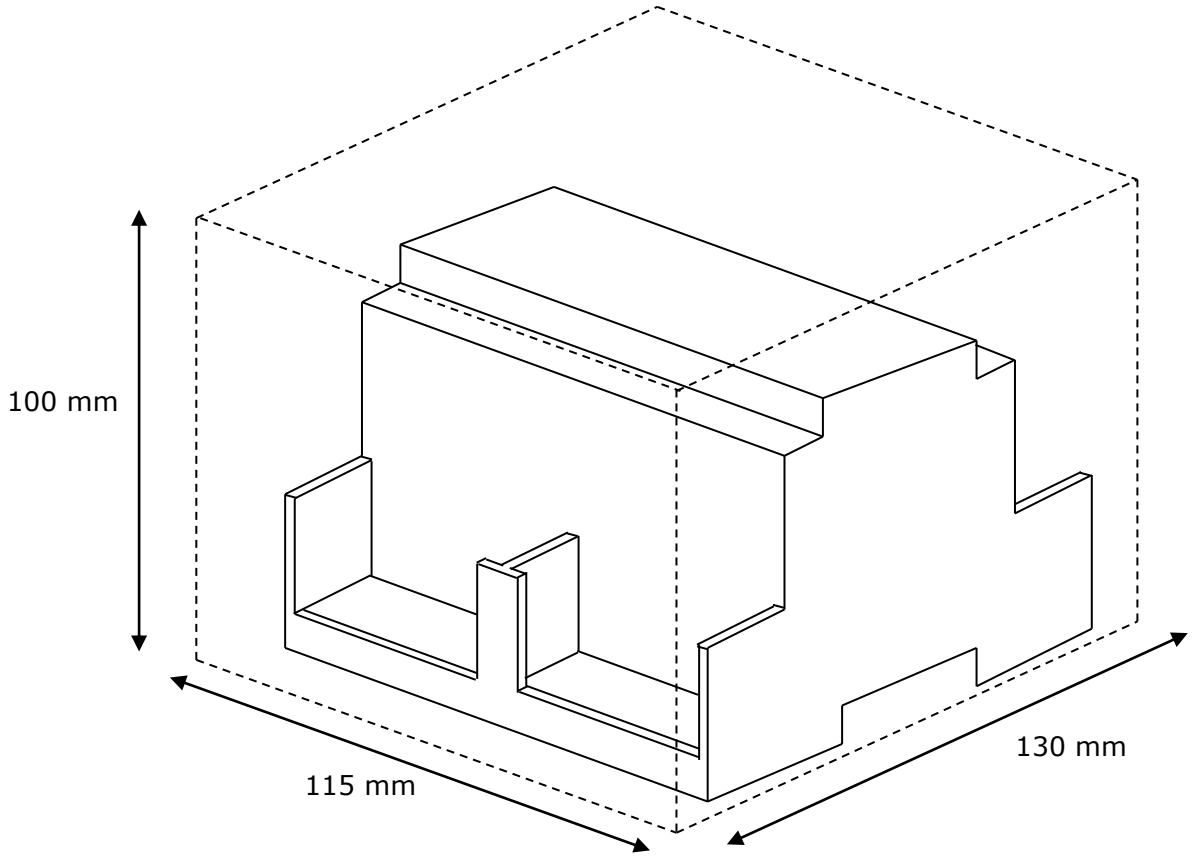
10. Dimensions



Free space recommended for device installation into a cabinet (wall or DIN rail mounting), with enough space for external connections:



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11. Annexes

11.1 Daikin DMS502A51 BACnet Gateway for Daikin Air Conditioning VRV system

This gateway allows connecting up to 256 VRVs in 4 groups of 64 (with the corresponding cards). It is important to consult Daikin documentation to configure successfully the integration.

The signals available for every VRV internal unit are showed in the following list. As an example, a selection of *Addresses* for internal points in the gateway have been selected, and also the appropriate values for fields *R/W* and *A/D* (depends on the object type of every signal). Note that Property field must be always *85-Present Value*.

Object Type	Property	Signal	Object instance	Add	R/W	A/D
4-Binary Output	85-Present Value	1-StartStopCommand_000	1	2	1-W	1-Dig
3-Binary Input	85-Present Value	2-StartStopStatus_000	2	3	0-R	1-Dig
3-Binary Input	85-Present Value	3-Alarm_000	3	4	0-R	1-Dig
13-Multistate Input	85-Present Value	4-MalfunctionCode_000	4	5	0-R	0-Ana
14-Multistate Output	85-Present Value	5-AirConModeCommand_000	5	6	1-W	0-Ana
13-Multistate Input	85-Present Value	6-AirConModeStatus_000	6	7	0-R	0-Ana
14-Multistate Output	85-Present Value	7-AirFlowRateCommand_000	7	8	1-W	0-Ana
13-Multistate Input	85-Present Value	8-AirFlowRateStatus_000	8	9	0-R	0-Ana
0-Analog Input	85-Present Value	9-RoomTemp_000	9	10	0-R	0-Ana
2-Analog Value	85-Present Value	10-TempAdjust_000	10	11	2-R/W	0-Ana
3-Binary Input	85-Present Value	11-FilterSign_000	11	12	0-R	1-Dig
5-Binary Value	85-Present Value	12-FilterSignReset_000	12	13	2-R/W	1-Dig
5-Binary Value	85-Present Value	13-RemoteControlStart_000	13	14	2-R/W	1-Dig
5-Binary Value	85-Present Value	14-RemoteControlAirConModeSet_000	14	15	2-R/W	1-Dig
5-Binary Value	85-Present Value	16-RemoteControlTempAdjust_000	16	16	2-R/W	1-Dig
3-Binary Input	85-Present Value	20-CommunicationStatus_000	20	17	0-R	1-Dig
2-Analog Value	85-Present Value	22-AirDirectionCommand_000	22	18	2-R/W	0-Ana
0-Analog Input	85-Present Value	23-AirDirectionStatus_000	23	19	0-R	0-Ana
4-Binary Output	85-Present Value	24-ForcedThermoOFFCommand_000	24	20	1-W	1-Dig
3-Binary Input	85-Present Value	25-ForcedThermoOFFStatus_000	25	21	0-R	1-Dig
4-Binary Output	85-Present Value	26-EnergyEfficiencyCommand_000	26	22	1-W	1-Dig
3-Binary Input	85-Present Value	27-EnergyEfficiencyStatus_000	27	23	0-R	1-Dig
3-Binary Input	85-Present Value	28-ThermoStatus_000	28	24	0-R	1-Dig
3-Binary Input	85-Present Value	29-CompressorStatus_000	29	25	0-R	1-Dig
3-Binary Input	85-Present Value	30-IndoorFanStatus_000	30	26	0-R	1-Dig
3-Binary Input	85-Present Value	31-HeaterStatus_000	31	27	0-R	1-Dig

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To calculate the *Object Instance* use the following formula:

Object Instance = (Indoor Unit Number X 256) + Point Number

Indoor Unit Number: 0..255
Point Number: 1..31

Example:

Indoor Unit Number: 1 (Remember 256 numbered 0..255)
Point Number: 9-RoomTemp

Object Instance = (1 X 256) + 9 = 265

Note: In the Daikin system configuration, sometimes the VRVs are configured as masters and sometimes as slaves, the ones configured as slaves do not accept commands because they work in parallel with their masters.

Important: With the standard installation of *LinkBoxBacnet*, there will be created some example projects containing signals configuration for integration of Daikin VRV systems with Daikin DMS502A51 BACnet Gateway.

Are the following:

BACnet Daikin 256 units. 256 VRV units with all the signals.

Create a copy of the project most suitable for your application and, after that, it will only be necessary to activate and select an internal *Point Address* for those signals needed for your integration.

Requirements: The information needed to configure the integration is:

- The Daikin Gateway must be configured in mode BACnet/IP
- IP address of the Daikin Gateway
- Net Mask of the Daikin Gateway
- UDP Port of the Daikin Gateway
- Device number of the Daikin Gateway
- List of all the VRVs of the installation containing the physical location in the building and the number (0..255) for every VRV

List of the slave VRVs and their corresponding masters (no commands supported by these slave VRVs

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