IntesisBox® BACnet/IP Server
KNX TP-1 (EIB)

User's manual

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Gateway for the integration of KNX TP-1 (EIB) devices into BACnet/IP control systems.

Models available for this gateway, with their following **Order codes**:

IBOX-BAC-KNX-100
Tiny model supporting connection to up to 100 internal data points.

IBOX-BAC-KNX-A
Basic model supporting connection to up to 500 internal data points.

IBOX-BAC-KNX-B
Extended model supporting connection to up to 3000 internal data points.

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1. Description

1.1 Introduction

This document describes the integration of KNX TP-1 (EIB) systems with BACnet ASHRAE 135 – 2001 Annex J - BACnet protocol compatible devices or systems using the gateway IntesisBox BACnet/IP Server - KNX.

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

From now on, and with the aim of easy the read of this document, the words "gateway" or "IntesisBox" are used instead of IntesisBox BACnet/IP Server - KNX. Any other use of the word "gateway" not meaning IntesisBox BACnet/IP Server - KNX will be specifically indicated.

The aim of this integration is to make accessible KNX system signals and resources from a BACnet/IP based control system or device, as if it was a part of the own BACnet system and vice-versa. For this, the gateway acts as a BACnet/IP Server device in its BACnet interface, allowing other BACnet/IP devices to perform subscription (COV) requests, and also read and write its internal points. From the KNX system point of view, the gateway simulates a KNX device and acts as if it was *one more device* into the KNX system.
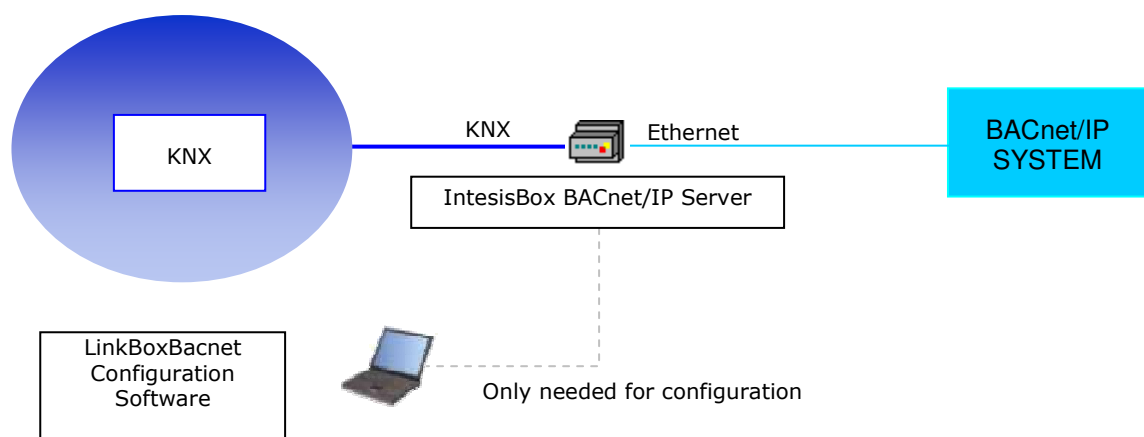

Figure 1.1 Integration of KNX and BACnet/IP using *IntesisBox BACnet/IP Server - KNX* gateway

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1.2 Functionality

The integration operation is as follow:

From the KNX system point of view, in the startup process of the gateway and also after a detection of a KNX bus reset, the gateway polls the KNX signals configured to be updated in this situation and maintain the received values in memory to be served to the BACnet system when requested. Also listen for any KNX telegram related to the internal points configured in it and acts accordingly to the configuration of the related point.

From the BACnet system point of view, after the startup process, the gateway listens for any subscription (COV) request, serves any polling request or performs any writing request of its internal points received from BACnet system. The values received from BACnet become available to be read (and when applicable, written) by the KNX system and vice-versa.

If a signal has been configured as of type "T" Transmit (in the KNX part), any new value for the signal coming from the BACnet system is notified to the KNX system with the corresponding telegram.

When, from the KNX system, a signal is changed (written from any other KNX device for example), the new value is updated in the gateway's memory and, if this signal is associated to a BACnet active subscription then the new value will be sent to the subscripted BACnet device(s).

Also the following functionality is supported by the gateway:

For every point, in the KNX part, one main group address and different listening group addresses can be defined. With this, from KNX, every point can be addressed not only using its main group address but also using the other defined listening addresses for the point.

Any change in a gateway's point with the feature "T" activated (in the KNX part), will force the transmission of this point value with the corresponding telegram to the KNX system.

When the gateway starts up, or after an KNX bus reset, all the points with the feature "U" or "U2" activated (in the KNX part) will be forced to be read in the KNX system to update its values in the gateway's internal memory.

Any point with the feature "W" activated (in the KNX part), can be written in any moment from the KNX system.

Any point with the feature "R" activated (in the KNX part), can be read in any moment from the KNX system.

All the mentioned features (W,R,T,U) related to the KNX interface are deeply explained in section 5.1.2.

KNX EIS (data types) supported are: switching (1 bit), dimming (4 bit), float (16 bit), scaling (8 bit), drive control (1 bit), priority (2 bit), float IEEE (32 bit), counter (8 bit), counter (16 bit), counter (32 bit), ASCII char (8 bit).

1.3 Capacity of IntesisBox

Element	Tiny version	Basic version	Extended version	Notes
Type of BACnet devices				Only those supporting BACnet/IP.
Number of BACnet points	100	500	3000	Maximum number of points that can be defined in the virtual BACnet device inside the gateway.
Number of BACnet subscribers	8	8	8	Maximum number of BACnet subscribers accepted by the gateway.
Number of BACnet subscriptions (COV) requests	1000	1000	6000	Maximum number of BACnet subscriptions (COV) requests accepted by the gateway.
KNX groups	500	500	3000	Maximum number of different KNX group addresses that can be defined.
KNX listening addresses	1000	1000	1000	Maximum number of different KNX group addresses that can be defined as listening addresses, one or more of these listening addresses can be assigned to every point. With this, more than one KNX group address of the KNX system can actuate on the same gateway's point.

There are two different models of *IntesisBox BACnet/IP Server - KNX,* with different capacity every one of them.

- Tiny model supporting connection to up to 100 internal data points.
  Ref.: IBOX-BAC-KNX-100.

- Basic model supporting connection to up to 500 internal data points.
  Ref.: IBOX-BAC-KNX-A.

- Extended model supporting connection to up to 3000 internal data points.
  Ref.: IBOX-BAC-KNX-B.

2. Interfaces

This section gives the reader an idea on how a KNX system/installation is integrated with IntesisBox BACnet. It is not meant to provide an in-depth explanation on how BACnet or KNX technology work as understanding the protocol principles is assumed throughout this document.

The IntesisBox behaves as a regular BACnet device inside the BACnet system integrating all the KNX devices. Note that each datapoint defined on IntesisBox will have two associated data types:

- One data-type, related to the BACnet/IP protocol of the IntesisBox
- And another data-type, related to KNX side of IntesisBox

Conversions of data values from KNX to BACnet/IP data-types (and vice versa) are internally performed at application level of IntesisBox, and keeping the highest possible level of precision, with the restrictions of the data-type itself. Further detail on behavior and data-types of the BACnet/IP and KNX interfaces of IntesisBox is given in the following sections.

All configuration of IntesisBox BACnet is done using software tool *LinkBoxBacnet*. This tool, covered in depth in section 5, is used to define the KNX and BACnet related parameters on each of the datapoints defined in IntesisBox.

2.1 BACnet

The IntesisBox integrates all the KNX devices in a single BACnet device. The communication with the other BACnet devices is done via the Ethernet port of the gateway which implements the BACnet ASHRAE 135 – 2001 Annex J - BACnet protocol.

In addition, IntesisBox can be configured to be a BBMD (BACnet Broadcast Management Device). See details in section 5.1.3.

The supported BACnet Objects and Building Blocks can be found in the PICS document available on the web:

http://www.intesis.com/pdf/IntesisBox_BACnet_IP_Server_KNX_PICS.pdf

Configuration of all BACnet/IP parameters of IntesisBox and their links to KNX using LinkBoxBacnet software tool is covered in section 5.1.

2.2 KNX TP-1 (EIB)

IntesisBox BACnet/IP Server - KNX supports the KNX TP-1 physical layer, as defined in the KNX standard. It behaves as one more device of the KNX system, with the same configuration and functional characteristics as other KNX devices.

KNX TP-1 (EIB) bus provides a 30V DC current, which can even directly power certain low-consumption KNX devices. IntesisBox does not drain any significant current from the KNX bus - it has a separate own power supply. Another important electrical aspect is that the KNX TP-1 (EIB) port of IntesisBox is optically isolated (~2500Vrms AC) from all its other ports (EIA232, EIA485, Ethernet) and power supply.

At logical level, all KNX devices feature an interface of communication objects, by which their functionality is abstracted. As a basic example, a KNX interface of an AC indoor unit

would typically consist of an interface of datapoints such as "On/Off", "Setpoint temperature", "Operating mode", etc.

Associations between communication objects from different KNX devices are actually done by means of so-called group addresses.

KNX telegrams within a working KNX installation are always addressed to a certain KNX group address. Typically, whenever a communication object on a KNX device changes its value, the new value is updated to the bus, by sending a "write" telegram addressed to its associated group address. The rest of KNX devices in the installation that have a communication object associated to this group address will act accordingly on reception of the new value.

Other operations are possible. KNX devices can also decide to read the current value of the communication objects, by sending a "read" telegram to a certain group address (previously known to be associated to the targeted comm. object). This operation is performed by many devices on bus start-up or recovery – in this way, the device gets the latest value of the group addresses it has associated right from its start-up.

Each datapoint defined in IntesisBox KNX configuration needs to have at least a single KNX group address associated with it. This group address will be used either for sending updates *to* KNX of the datapoint value (that have been generated on the other BACnet/IP interface of the IntesisBox), or receiving updates *from* KNX of the datapoint value (that will be propagated to the BACnet/IP side in this case)

From the point of view of KNX functionality, each datapoint of IntesisBox can hold following group address associations:

- A single KNX group address with which update/write telegrams will be sent, whenever the datapoint changes (as a result of a change coming from the other interface of IntesisBox, BACnet/IP in this case).
- One or more KNX group addresses from which this datapoint of IntesisBox will be updated/written from the KNX installation (resulting in a change to the other side of IntesisBox, BACnet/IP in this case).
- A single KNX group address from which IntesisBox will read the object value on KNX bus recovery / IntesisBox start-up.

Behavior of IntesisBox' datapoints with regard to their associated group addresses is defined by means of flags (R, W, T, U and U2), explained in section 5.1.2.

Additional to the binding aspect commented above, it is also important to notice that each KNX communication object has a defined *EIS type*. The EIS type of a communication object defines the bit length and coding of the data it represents. Communication objects associated by means of a group address need to match the same EIS type, in order to communicate consistently.

So, at configuration time it is required that for each datapoint configured on IntesisBox an EIS type is defined. Datapoints on IntesisBox BACnet support the following EIS-types:

- EIS1 - Switching (1bit raw)
- EIS2 - Dimming (4bit raw)
- EIS5 – Value (16bit – floating type)
- EIS6 – Scaling (8bit – scaled 0%-100% in values 0-255)
- EIS7 – Drive Control (1bit raw)
- EIS8 – Priority (2bit raw)
- EIS9 – IEEE 754 float (32bit – floating type)
- EIS10 – 16bit Counter (16bit raw)

- EIS11 – 32bit Counter (32bit raw)
- EIS13 – ASCII char (8bit raw)
- EIS14 – 8bit Counter (8bit raw)

ETS3 or ETS4 software tools are not used to configure IntesisBox. Though, it's typical that the choice of which KNX group addresses to use is restricted or defined by an ETS-based project. If that's the case, the KNX installer/integrator needs to provide the set of group addresses prior to doing the configuration of datapoints in LinkBoxBacnet.

Also, a *dummy* ETS application is provided by Intesis Software (section 6), which can be imported into ETS. This application is nor downloadable into IntesisBox BACnet neither usable for IntesisBox configuration. Rather, it poses as a means of having a device in the ETS project representing the IntesisBox BACnet and its own datapoints/communication objects, and to which group addresses are associated.

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3. Quick Setup

1. Install LinkBoxBacnet. Details in section 5

2. Install IntesisBox in the desired installation site (DIN rail mounting inside a metallic industrial cabinet connected to ground is recommended).

3. Power up and connect the communication cables. Details in section 3.

4. Open LinkBoxBacnet, open a project or create a new one. Details in section 5.

5. Connect to the IntesisBox (details in section 5).

6. (optional) Configure the IntesisBox. Details in section 5.1

7. Check if there is communication in both BACnet and KNX buses (section 5)

8. The IntesisBox is ready to be used in your system.

4. Connection

The device uses a standard enclosure allowing DIN EN60715 TH35 rail mounting. Its plastic meets standard PC UL 94 V0.
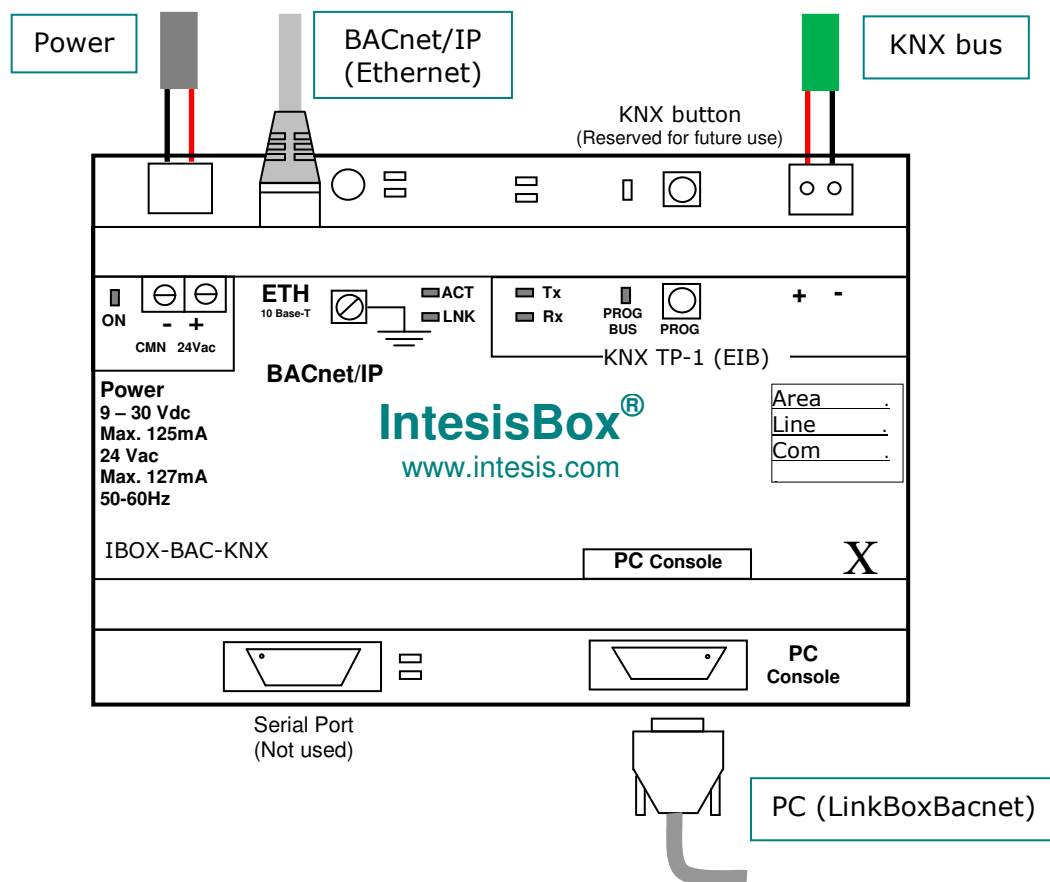

Figure 4.1 Device connection diagram

Ensure proper space for all connectors when mounted.

The items supplied by Intesis Software for this integration are:

- • IntesisBox BACnet/IP Server - KNX hardware
- • Console cable. Standard DB9F-DB9M cable 1.8 meter long.
- • Installation sheet, containing a link to the LinkBoxBacnet software and this manual.

4.1 Power device

The first step to perform is to power up the device. To do so a power supply working with any of the voltage range allowed is needed (check section 6). Once connected the ON led (Figure 4.1) 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 Connect to KNX

Connect + and – terminals of the KNX bus to the IntesisBox KNX connector (Figure 4.1). The polarity is important. Once connected correctly the KNX Tx led (Figure 4.1) will start blinking. If that doesn't happen check that the cable is connected properly.

How to check if there is communication with the KNX bus is explained in the LinkBoxBacnet Manual (section 5).

4.3 Connect to BACnet

Connect the communication cable coming from the network hub or switch to the ETH port (Figure 4.1) of IntesisBox. The cable to be used depends on where the IntesisBox is being connected:

- Connecting directly to a BACnet/IP device: crossover Ethernet UTP/FTP CAT5 cable

- Connecting to a hub or switch of the LAN of the building: 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.

4.4 Connect to PC (LinkBoxBacnet)

This action allows the user to have access to configuration and monitoring of the device (more information can be found in the LinkBoxBacnet User Manual [section5]).Two methods to connect to the PC can be used:

- Ethernet: Using the ETH port (Figure 4.1) of IntesisBox. How to check connectivity is explained in section 4.3.

- Serial cable: To connect the device to the PC the serial cable supplied should be plugged to the PC console port (Figure 4.1).
  The cable is a RS-232 straight cable and its pinout is at explained in Table 4.1.
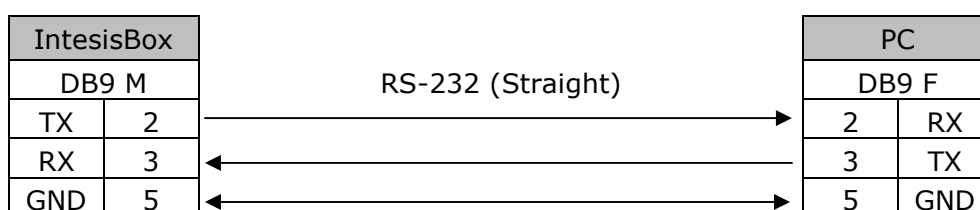
IntesisBox		RS-232 (Straight)	PC	
DB9 M			DB9 F	
TX	2	→	2	RX
RX	3	←	3	TX
GND	5	←	5	GND

Table 4.1 Configuration serial cable pinout

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5. LinkBoxBacnet. Configuration & monitoring of IntesisBox BACnet series

How to install and use the LinkBoxBacnet is explained in its Manual. It can be found in the installation folder (if the Software is already installed) or it can be downloaded from the link that can be found in the installation sheet supplied with the IntesisBox.

In this section only the specific project configuration for IntesisBox BACnet/IP Server - KNX is going to be explained.

The External Protocol in this IntesisBox is KNX

5.1 Project configuration

To configure the integration connection parameters, and the points list, click on *Config* in the *Button Bar (*Figure 5.1*).* The KNX *Configuration* window will be opened. For integrations with a large number of points an alternative CSV based configuration method is explained in in the LinkBoxBacnet Manual.
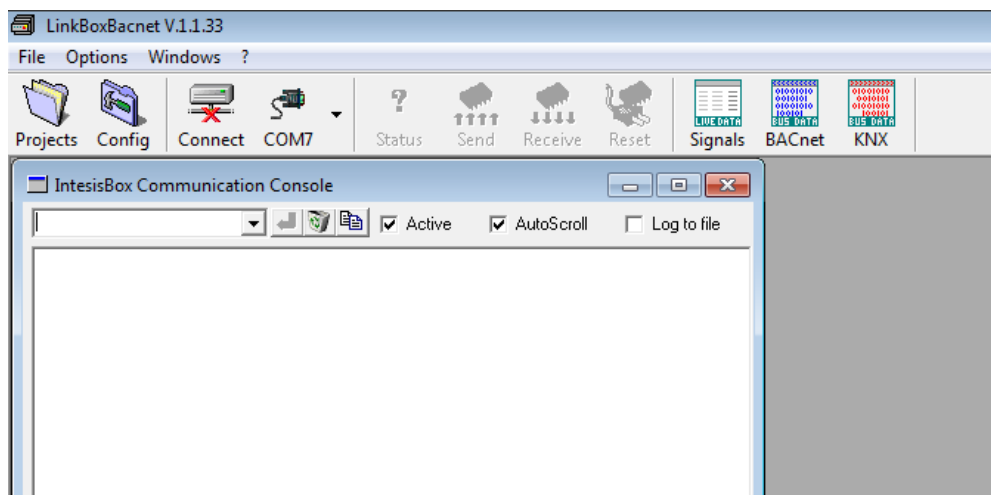

Figure 5.1 Menu and Button Bar in LinkBoxBacnet

5.1.1 Connection configuration

Two subsets of information are configured using this window, the BACnet/IP parameters of the IntesisBox, and the parameters of the KNX interface.
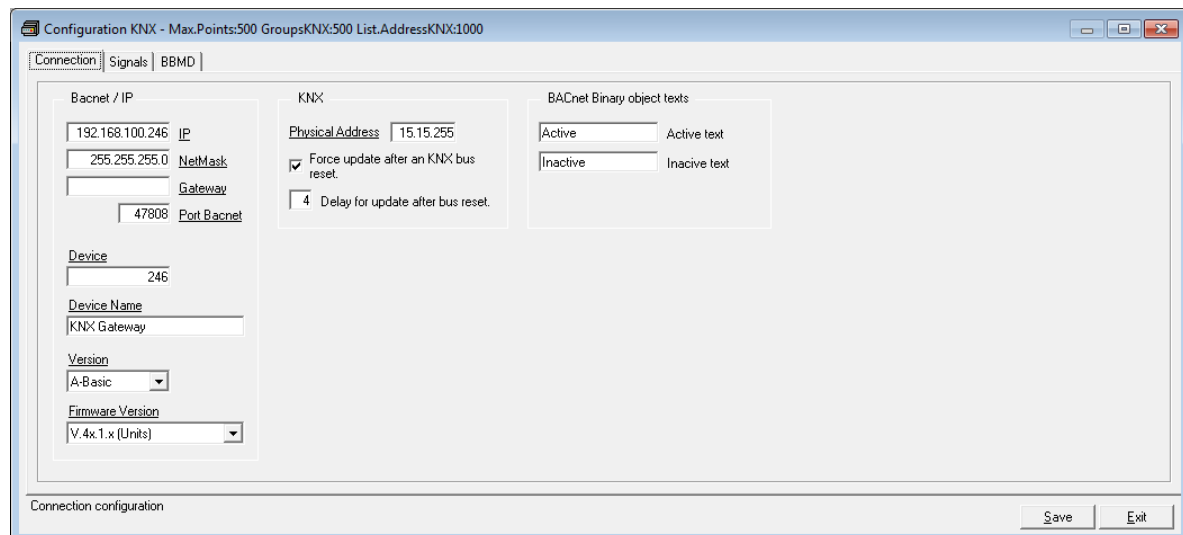
Figure 5.2 Configuration: Connection Tab

BACnet/IP interface configuration parameters:

Figure 5.3 BACnet/IP interface Configuration

- **IP:** Enter the IP address for the gateway (supplied by the network administrator).

- **NetMask**: Enter the IP NetMask for the gateway (supplied by the network administrator).

- **Gateway:** 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 blank if there is no need of router address.

- **BACnet Port:** Enter the BACnet port number used by the gateway (by default 47808, which is BAC0).

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- **Device**: Enter the BACnet device number for the gateway (must be unique inside the BACnet system).

- **Device Name:** Select the BACnet device name for the gateway (by default "KNX Gateway"). This name will be collected by BACnet browsers among others.

- **Version:** Select the gateway model used: tiny,basic or extended. You can check the gateway model in the identification given by the device when it connects to LinkBoxBacnet, it appears in the IntesisBox Communication Console window once connected to the gateway. You can also send the "INFO?" command through IntesisBox Communication Console in order to check it.

  IntesisBox_Bacnet_KNX-**100**_V4x.x.x…   → Tiny model
  IntesisBox_Bacnet_KNX-**A**_V4x.x.x…   → Basic model
  IntesisBox_Bacnet_KNX-**B**_V4x.x.x…   → Extended model

- **Firmware Version:** Select the gateway firmware version. Firmware version appears in the same string as gateway's model:

  IntesisBox_Bacnet_KNX-100_**V4x.x.x**…

KNX interface configuration parameters:
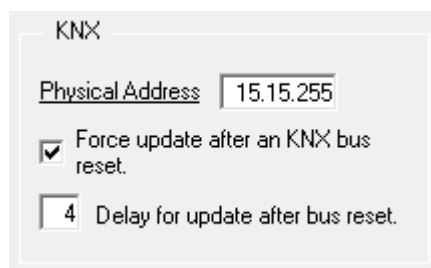
Figure 5.4 KNX interface Configuration

- **Physical Address:** Enter the KNX physical address for the gateway.

- **Force update:** Check this if you want the gateway to update the signals configured as "U" or "U2" after a KNX bus reset. Details about configuring signals as "U" and "U2" in section 5.1.2.

- **Delay:** Delay (in seconds), after gateway start-up or bus reset detection, to start the update process.

BACnet Binary objects texts

Figure 5.5 BACnet Binary object texts

- **Active text:** text for the "Active_Text" property of all the Binary objects.
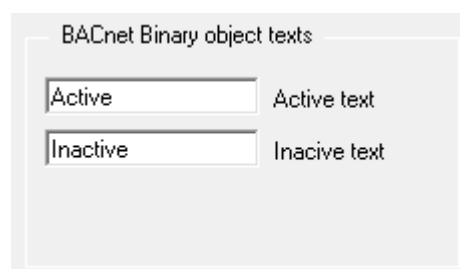
- **Inactive text:** text for the "Inactive_Text" property of all the Binary objects.

5.1.2 Signals configuration

Select the Signals tab (Figure 5.6) to configure the signals list (the IntesisBox internal points). More information about the meaning of the columns can be found in the tables below.

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. Multiple consecutive rows can be deleted too.
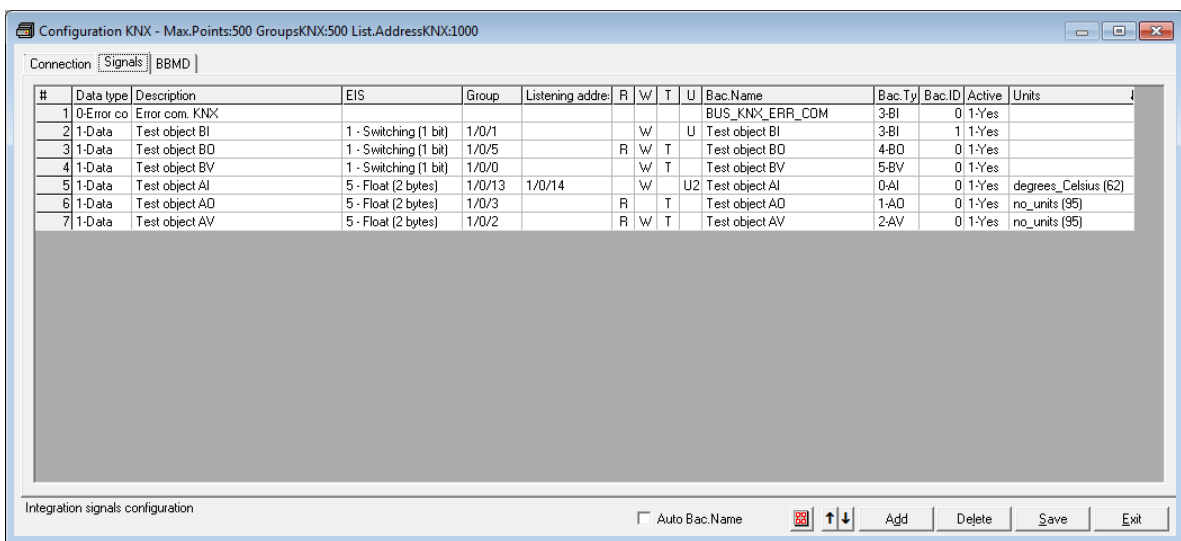
Figure 5.6 Signal list

# (Signal's number)	
Description	Enumeration of the rows in the grid (signals). If clicked on them the whole row will be selected (to be used to delete/add rows
Restrictions	Cannot be edited

Data type	
Description	Select the type of signal
Values	• *Communication Error:* indicate to the BACnet side a communication error within the KNX system • *Data:* for normal signals
Restrictions	Cannot be edited

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Description	
Description	Signal's description (optional). Used to describe the signal at user level. This description entered here is included into the BACnet's *Description* property for the point and thus it will be collected by any BACnet explorer.
Restrictions	30 characters maximum
Comments	If the description gives some good information about the physical location of the KNX point related, it may help during the gateway's integration phase into the BACnet system.

EIS	
Description	KNX data type (Data point) to encode the signal's value. It will depend on the BACnet type of signal associated to it in every case .Edit using the mouse right-button-click pop-up menu available on the column
Values	- Switching (1 bit) - Dimming (4 bit) - Float (16 bit) - Scaling (8 bit) - Drive control (1 bit) - Priority (2 bit) - Float IEEE (32 bit) - Counter (8 bit) - Counter (16 bit) - Counter (32 bit) - ASCII char (8 bit) - Counter (8 bit)
Restrictions	Only the EIS defined in values are allowed.

Group	
Description	Main KNX group address for the signal. Flags *R,W,T,U* explained below will only apply for this main KNX group address, not for listening addresses.
Values	Group address in one of the following formats: • P/I/S • P/S • Single level (value 1 to 32767)
Restrictions	Duplicated groups are not allowed Empty groups are allowed, but only if they have just W activated and one or more listening addresses.

Listening addresses	
Description	KNX group addresses that will be listened by IntesisBox for this signal. If IntesisBox receives a KNX telegram whose destination is one of these listening addresses, the telegram will be taken into account and the corresponding action will be performed on this signal.
Values	Group addresses in one of the following formats: • P/I/S • P/S • Single level (value 1 to 32767) More than one address can be entered, comma separated.
Restrictions	It is not allowed a listening address that is the same as the sending group (circular reference). Listening addresses are not allowed if the flag W is not activated. Without W activated, the listening addresses would not work.

R	
Description	Indicates if this signal is allowed to be read from KNX system.
Values	• "R": flag activated • Blank: flag not activated
Restrictions	Can't be active when the BACnet signal are AI, BI or MI Needs the T flag active and therefore the software activates it automatically Can't be simultaneously active with flag U and it is disabled if that flag is activated. It has no restriction with U2

W
Description	Indicates if this signal is allowed to be written from KNX system.
Values	• "W": flag activated • Blank: flag not activated
Comments	If it is not active, no write on the group address neither on the listening addresses could be done from KNX KNX Update telegrams (responses to Read) are handled in the same way as Write telegrams, in all cases.

T
Description	Indicates if this signal will generate a telegram sending to the KNX system following a change of the signal's value, that is to say, any change of value of this signal in BACnet side will be transmitted to the KNX system if this flag is activated.
Values	• "T": flag activated • Blank: flag not activated
Restrictions	Can't be active when the BACnet signal are AI, BI or MI

U
Description	Indicates if this signal will be updated (sending read requests) whenever IntesisBox starts up or after a KNX bus reset.
Values	• "U": flag activated for the main KNX group address. A read of the main KNX group address will be performed in the KNX system for the update. • "U2": flag activated for the first listening address defined. A read of the first listening address defined for the point will be performed in the KNX system for the update). • Blank: flag not activated
Restrictions	Needs the W flag active and therefore the software activates it automatically When "U" is selected it disables the R flag.
Comments	**DO NOT BE CONFUSED: Philosophy of IntesisBox point's U flag is not the same as KNX device's U flag. In KNX devices, U flag means that the point's value will be updated whenever a write telegram for the group address is received by the device.**

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Bac.Name	
Description	BACnet object name for the signal. This name is included into the BACnet's *Object_name* property for the point and it will be collected by any BACnet explorer. From here a BACnet explorer or supervisor can get the KNX group. That may help during the gateway's integration phase into the BACnet system.
Values	Same as description Following the format: TT_AA_LL_CCC D..D where • TT = BACnet object type abbreviation (see below). • AA = First part of the KNX group address defined for the point. • LL = Second part of the KNX group address defined for the point. • CCC = Last part of the KNX group address defined for the point. • D..D = Point's description entered in column Description.
Comments	It changes from one format to the other when changing the value of *auto Bac Name checkbox*

Bac.Type	
Description	BACnet object name for the signal. This name is included into the BACnet's *Object_name* property for the point and it will be collected by any BACnet explorer. From here a BACnet explorer or supervisor can get the KNX group. That may help during the gateway's integration phase into the BACnet system.
Values	• 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.
Restrictions	When the type is AI, BI or MI the flags R and T are not selectable
Comments	Edit using the mouse right-button-click pop-up menu

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Bac.ID	
Description	BACnet object instance number for the point. It can be manually entered by the user or can be automatically assigned by LinkBoxBacnet when saving the configuration (section 5.1.3)
Restrictions	All the object instance numbers for objects of the same type must be different
Comments	It is recommended to let LinkBoxBacnet assign automatically object instance numbers for the points

Active	
Description	Indicates if the signal is active or not for the integration
Values	• 0: Not active • 1: Active

Units	
Description	Select a type for the BACnet Units
Values	• Area: Square Meters, Square Feet, etc. • Electrical: Amperes, Ohms, etc. • Light: Lumens, Luxes, etc. • Mass: Kilograms, Pounds Mass, Tons. • Pressure: Bars, Pascals, etc • Time: Years, Months, etc. • Temperature: Degrees Celsius, Degrees Kelvin, etc. • Etc.
Restrictions	Only for the analog objects
Comments	Edit using the mouse right-button-click pop-up menu

Auto Bac. Name	
Description	Checkbox that controls the *Bac. Name* format
Values	• Checked: special format (Check *Bac. Name* table for details) • Not checked: *Bac. Name* = Description
Comments	Check *Bac. Name* table for details

(Import from ETS)	
Description	Used to import group addresses from ETS files
Values	This button let you select the different import methods (Explained in section 6.2) • Import group Address … (CSV format: 1/1 tab separated) • Import ESF files ...

↑↓	
Description	Buttons to move the selected row (or rows) up or down inside the grid. To move up or down inside the grid a single row or a group of consecutive rows, just select the row or rows using the left button of the mouse and push the desired up or down button.
Comments	This can be done also using the key combinations *ALT+arrow up* or *ALT+arrow down* instead of up or down buttons

Add	
Description	Button that adds a row under the selected one.

Delete	
Description	Buttons to delete the selected row (or rows).

Save	
Description	Save the configuration (details in section 5.1.3)

Exit	
Description	Exits the configuration window (details in section 5.1.3)

5.1.3 BBMD configuration

BBMD functionality is available from firmware version V.41.1.28 and only for versions V.41.1.x.

When BBMD functionality is enabled, IntesisBox also provides support for Foreign BACnet Devices with a maximum of 10 devices.
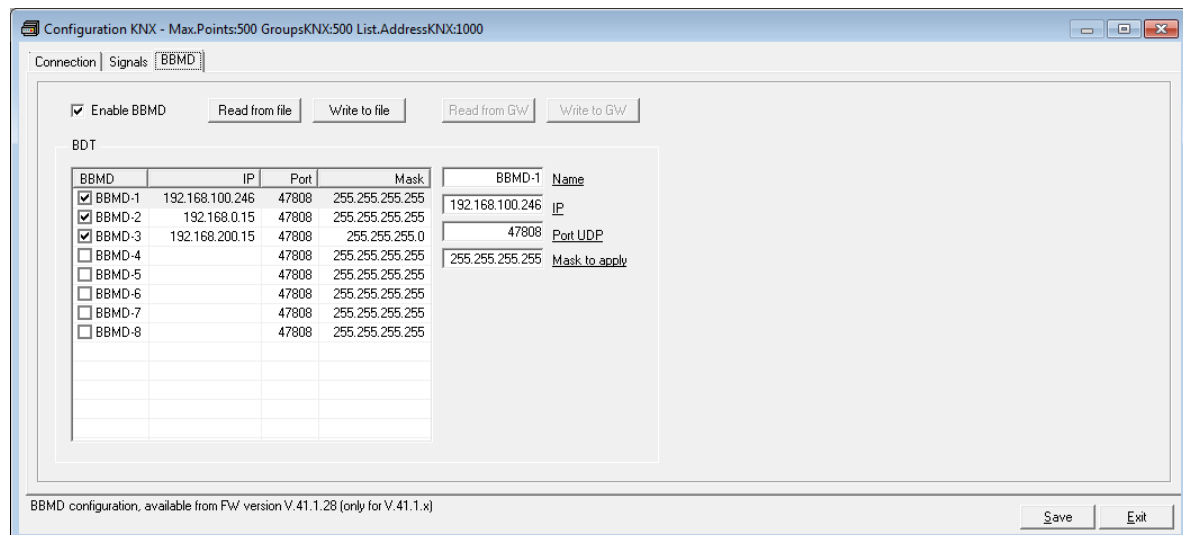
Figure 5.7 BBMD configuration

- **Enable BBMD**: Activating this option, besides its normal operation, the IntesisBox will also behave as a BBMD.

  Take into account that when BBMD functionality is enabled, the Gateway address in Connection tab is supposed to be configured so the IntesisBox can forward BACnet telegrams to external networks.

  When this option is disabled, the rest of elements in the tab will not be visible as they will have no effect on the IntesisBox.

  Remember to press the Save button and send new configuration file to the IntesisBox in order to apply the changes.

- **BDT**: The Broadcast Distribution Table can be defined either through LinkBoxBacnet or using the BVLL Write-Broadcast-Distribution-Table BACnet message. Last BDT written to the IntesisBox will be saved and used from that moment, no matter the way it is been written.

  Maximum number of BDT entries is 8, entries can be activated or deactivated by clicking its related check box. Select a BDT entry in order to change its parameters.

  If IntesisBox's own BDT entry is not configured, the whole BDT will be considered incorrect and will not be accepted.

- **Name:** Identifying name of the related BBMD. This name is optional and it will only be used in LinkBoxBacnet's BDT.

- **IP:** IP address of the related BBMD. Default value is no IP address (empty), but if the BDT entry is activated an IP address must be defined, otherwise the BDT will be considered invalid.

- **Port UDP:** Port UPD of the related BBMD. Default value is "47808".

- **Mask to apply:** Broadcast distribution mask of the related BBMD. Default value is "255.255.255.255".

- **Read from file:** BDT will be overwritten by the last BDT saved in LinkBoxBacnet file "KNX.ini".

- **Write to file:** BDT will be saved in LinkBoxBacnet file "KNX.ini".

- **Read from GW:** BDT will be overwritten by the BDT currently used by IntesisBox.

  This button will be disabled if IntesisBox is not connected to LinkBoxBacnet.

- **Write to GW:** BDT will be written to the IntesisBox and from that moment Intesisbox will use this BDT for BBMD functionality. Bear in mind that IntesisBox's BDT can be overwritten by BACnet means.

  This button will be disabled if IntesisBox is not connected to LinkBoxBacnet

5.1.4 Saving the configuration

When the configuration of the project is finished follow the next steps:

1. Click the button *Save.* Once accepted the pop-up message, that will save the project in the folder on hard disk (more information in LinkBoxBacnet Manual).

2. You will be prompted to generate the configuration file to be sent to the gateway,

   a. If *YES* is selected, the binary file (KNX.LBOX) containing the configuration for the gateway will be generated and saved also into the project folder.

   b. If *NO* is selected the binary file needs to be created before following the next steps. To do so open the Configuration window (section 5.1) and restart from step 1

3. A pop-up message will show up asking if you want to **preserve the Object instance numbers. BE CAREFUL** using this feature.

   a. If **NO** is selected all the object instance numbers for the points will be automatically reconstructed and thus loosing previous instance numbers, if defined. **ONLY** USE this option **for a brand new configuration** not previously running in the gateway and therefore not yet integrated into the BACnet system

   b. Select **Yes** for configurations **previously running** in the gateway and **already integrated into the BACnet system** that had been extended with a few more points that **must respect the previously defined object instance numbers**. All the points with object instance numbers defined will be respected. LinkBoxBacnet will automatically assign object instance numbers to ones without it.

4. As the final step, a pop-up message will ask if you want to see the BACnet points list report, If you select *Yes,* a text file called *KNX- BACNET OBJECT LIST.TXT* will be generated and saved into the project folder containing a report of all the point's BACnet information (for informative purposes at user level). The file will be also opened in the notepad, it looks like this:

```
ObjIdent      ObjType      OInst  ObjName
12582912      3-BI         0000   BUS_KNX_ERR_COM
00000000      0-AI         0000   AI_01_0_013 Test object AI
```

URL   http://www.intesis.com
Email   info@intesis.com
tel   +34 938047134

```
04194304      1-AO        0000   AO_01_0_003 Test object AO
08388608      2-AV        0000   AV_01_0_002 Test object AV
12582913      3-BI        0001   BI_01_0_001 Test object BI
16777216      4-BO        0000   BO_01_0_005 Test object BO
20971520      5-BV        0000   BV_01_0_000 Test object BV
54525952      13-MI       0000   MI_01_0_007 Test object MI
58720256      14-MO       0000   MO_01_0_008 Test object MO
79691776      19-MV       0000   MV_01_0_009 Test object MV
```

5. Once in the configuration window again, click on exit. The configuration is ready to be sent to the IntesisBox (check LinkBoxBacnet Manual)

The configuration cannot be received from the gateway to** LinkBoxBacnet**, it can only be sent.

6. IntesisBox® and ETS

6.1 Integration of IntesisBox® in ETS

As explained the IntesisBox® is configured with the LinkBoxBacnet but in some projects it might be needed to integrate the gateway in the ETS project, for example to allow the line couplers have a correct configuration of their filter tables. To do so a Dummy device can be used in ETS to simulate the IntesisBox and associate also to this dummy device all group addresses used in IntesisBox

In   http://www.intesis.com/down/eib/Dummy_Intesis.zip   an   ETS   project   containing   a Dummy device can be downloaded for this purpose. To use it with your ETS project follow these steps:

1) Import the pr3/pr5 file in ETS and follow the instructions

   - ETS3: menu File →Import.
   - ETS4: Projects →Import projects

2) Open the project named Dummy Intesis.

3) In this Dummy Intesis project, in topology tree, you will find the device "Dummy Intesis". Select this device (click on it) and copy it (menu Edit→Copy)

4) Open your target project, select the desired line and paste the device there (menu Edit → Paste).

Once that is done the group addresses can be configured. To do so the same addresses configured in the LinkBoxBacnet need to be written in the right data type.

6.2   Import ETS files to LinkBoxBacnet

Group addresses (CSV format: 1/1 tab separated) and Esf files can be imported from ETS to LinkBoxBacnet. This allows the integration of the ETS group addresses in your IntesisBox. How to access to this functionality is explained in section 5.1.2. Both importation methods open a new window (Figure 6.1). The only difference between them is the information contained in the file and therefore the values that are imported in the LinkBoxBacnet project.
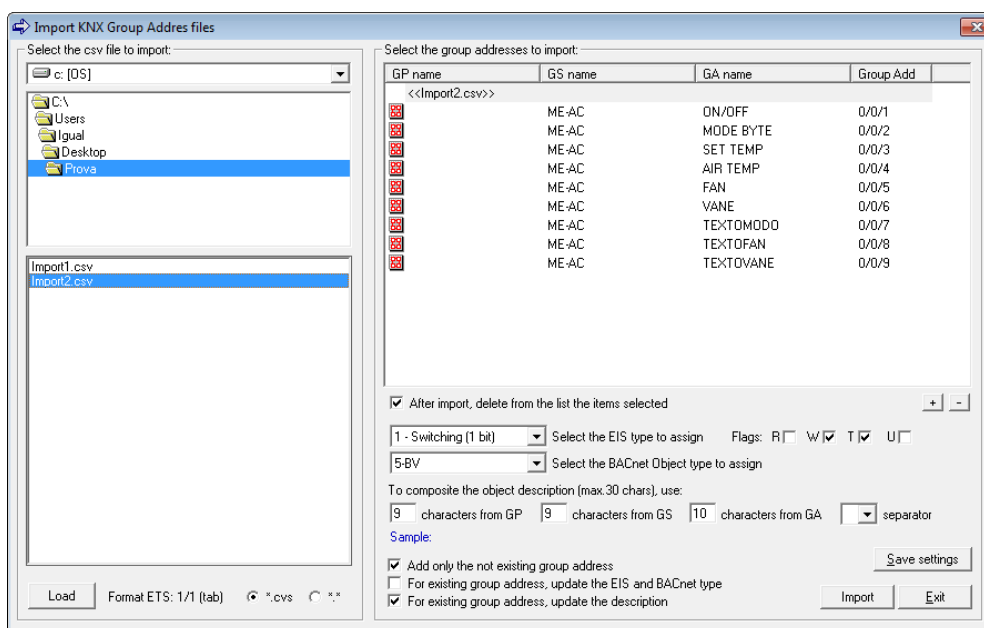

Figure 6.1 Import ETS files window

To Load the file with the group addresses use the File explorer (Figure 6.2). Select the desired file and click on "Load". The file is going to be imported and showed in the File content section (Figure 6.3)
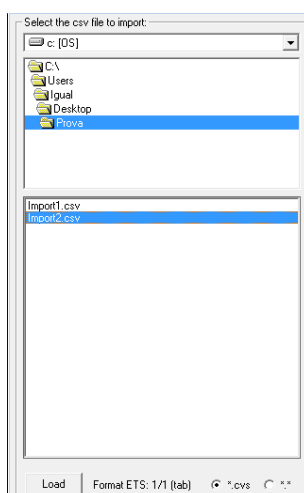

Figure 6.2 File explorer

Once the file has been loaded the importation can be done. To do so Select the desired lines, configure the parameters (details in the following lines) and click on "Import". A pop-up message with the summary of the importation shows up once it's been done.
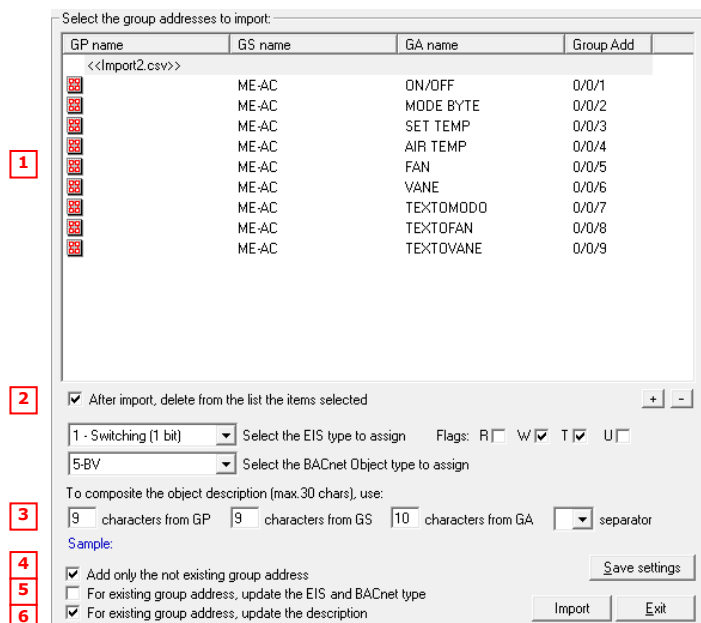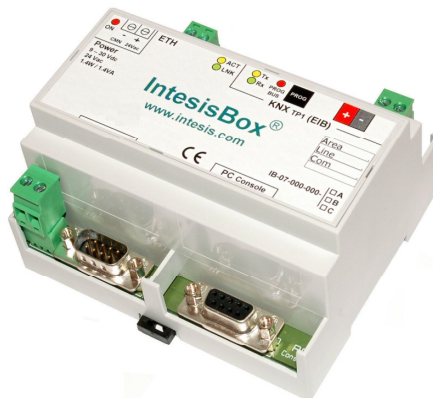

Figure 6.3 File contents and Group addresses selection

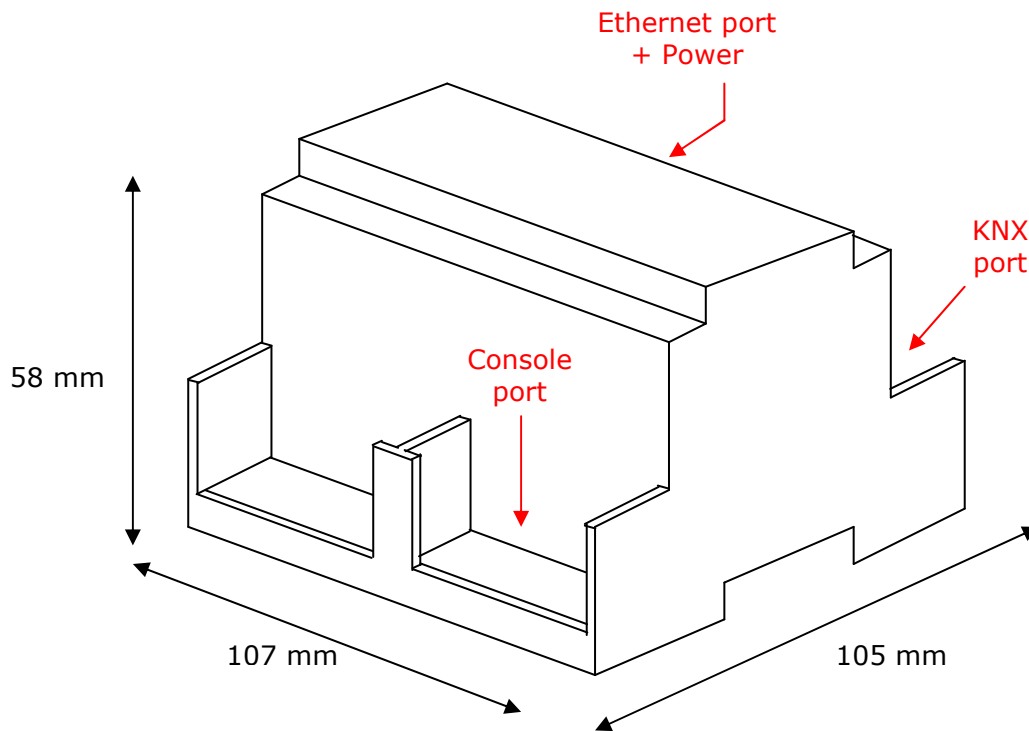| [1]	File information. The information can be sorted by columns (clicking on the header).
[2]	Once a group address its been imported it is not showed anymore (unless the file is reloaded)
+ -	Select/deselect all the group addresses
EIS type	Same functionality and restrictions as described in the corresponding table in section 5.1.2
R, W, T, U	
Bacnet Object	
[3]	Number of characters from each string (GP, GS and GA names) that are going to compose the object description
[4]	If ticked, it prevents to import already existing addresses.
[5]	If ticked, when a group address already exist it updates its EIS and Bacnet type.
[6]	If ticked, when a group address already exist it updates the its description
Save settings	Save the current settings (file path, import parameters ...) for future imports (only for the working project).
Import	Transfer the selected rows (with the defined parameters) to the LinkBoxBacnet project.
Exit	Closes the window.

7. 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%, Max.: 125mA. 24Vac +/-10% 50-60Hz, Max.: 127mA Must use a NEC Class 2 or Limited Power Source (LPS) and SELV rated power supply. Plug-in terminal block for power connection (2 poles).
Terminal wiring (for power supply and low-voltage signals)	Per terminal: solid wires or stranded wires (twisted or with ferrule) 1 core: $0.5mm^2$... $2.5mm^2$ 2 cores: $0.5mm^2$... $1.5mm^2$ 3 cores: not permitted
Mounting	Wall. DIN rail EN60715 TH35.
BACnet/IP port	1 x Ethernet 10Base-T (RJ45).
KNX port	1 x KNX TP-1 (EIB) port opto-isolated. Plug-in terminal block (2 poles). TNV-1
LED indicators	1 x Power. 2 x KNX port activity (Tx, Rx). 2 x Ethernet port link and activity (LNK, ACT). 1 x KNX programming/bus.[1]
Push buttons	1 x KNX programming.[1]
Console port	EIA232. DB9 female connector (DCE). SELV
Configuration	Via console port.[2] Via Ethernet
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).
Norms and standards	CE conformity to EMC directive (2004/108/EC) and Low-voltage directive (2006/95/EC) EN 61000-6-2, EN 61000-6-3,EN 60950-1, EN 50491-3

[1] Not operational for the moment. Reserved for future use.
[2] 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.

URL http://www.intesis.com
Email info@intesis.com
tel +34 938047134

8. Dimensions

Ethernet port
+ Power

KNX
port

Console
port

58 mm

107 mm   105 mm

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

100 mm

115 mm   130 mm

Intesis
software

URL   http://www.intesis.com
Email info@intesis.com
tel   +34 938047134