IntesisBox® BACnet/IP Server
Lonworks

User's manual

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Gateway for the integration of LON devices into BACnet/IP control systems.

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

IBOX-BAC-LON-100
Basic model supporting integration of up to 100 control points and 128 LON devices.

IBOX-BAC-LON-A
Basic model supporting integration of up to 500 control points and 128 LON devices.

IBOX-BAC-LON-B
Extended model supporting integration of up to 3000 control points and 128 LON devices.

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1. Description

1.1 Introduction

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

This document assumes that the user is familiar with LON 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 - LON. Any other use of the word "gateway" not meaning IntesisBox BACnet/IP Server - LON will be specifically indicated.

The aim of this integration is to make accessible LON 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 LON system point of view, IntesisBox acts as a LON client device in its LON interface. The readings of the LON device(s) is performed by IntesisBox by automatic continuous polling.

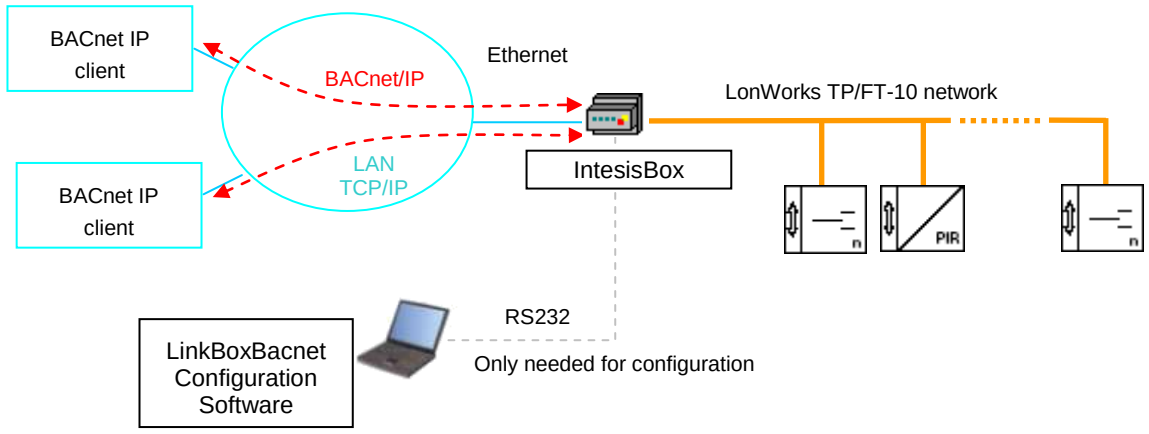

Figure 1.1 Integration of LON and BACnet/IP using *IntesisBox BACnet/IP Server - LON* gateway

1.2 Functionality

The integration operation is as follow:

IntesisBox reads continuously the points configured to be read by polling into the LON devices, and updates in its memory all the values received. With every read, the new values received are updated in the Intesisbox's memory and become available in BACnet side. When a change in any point configured as output in IntesisBox is detected (this is written from the BACnet side), this will be transferred to the Lon device.

In the continuous polling of the LON devices, if a non response of any LON device is detected, the corresponding virtual signal inside IntesisBox will be activated indicating communication error with that LON device. These virtual signals indicating communication status in real time with the LON devices are also accessible from BACnet, like the rest of the points of IntesisBox. *A special virtual signal indicating the correct operation of the LON interface handler inside the IntesisBox is also available from BACnet.*

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1.3 Capacity of IntesisBox

Element	Max. (Tiny version)	Max. (Basic version)	Max. (Extended version)	Notes
Type of BACnet devices				Those supporting BACnet/IP.
Number of BACnet points	100	500	3000	Maximum number of points (BACnet objects) that can be defined into IntesisBox. Each of them can contain an individual field from a LON network variable.
Number of BACnet subscribers	8	8	8	Maximum number of BACnet subscribers accepted by IntesisBox.
Number of BACnet subscriptions (COV) requests	6000	6000	6000	Maximum number of BACnet subscriptions (COV) requests accepted by IntesisBox.
Type of LON devices				Those supporting *Free Topology* channel (FT-10)
Supported number of LON devices	128	128	128	Maximum number of different LON devices that can be defined into IntesisBox (to read/write points into them).

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

- Tiny model supporting connection of up to 100 control points and 128 LON devices. *Ref.: IBOX-BAC-LON-100.*
- Basic model supporting connection of up to 500 control points and 128 LON devices. *Ref.: IBOX-BAC-LON-A.*
- Extended model supporting connection of up to 3000 control points and 128 LON devices. *Ref.: IBOX-BAC-LON-B.*

2. Interfaces

This section gives the reader an idea on how a LON system/installation is integrated with IntesisBox BACnet. It is not meant to provide an in-depth explanation on how BACnet or LON 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 LON 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 LON side of IntesisBox

Conversions of data values from LON 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 LON 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 LON and BACnet related parameters on each of the datapoints defined in IntesisBox.

2.1 BACnet

The IntesisBox integrates all the LON 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.

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_LON_PICS.pdf

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

2.2 LON

LON supported channel: Free Topology (FT-10).

Configurable addressing options (on a 'per device' basis):
- Subnet / node
- Neuron-Id

Network variable sample rate:
- Below 60ms per network variable (each network variable may contain several fields, which will be mapped to different Bacnet points, if needed).

Supported network variable types:
- All standard network variable types published by LonMark International are directly supported by configuration tool, *LinkBoxBacnet*
- Support for user-defined network variable types can be added in each case, by entering their definition in *LinkBoxBacnet*. In this case, following information needs to be provided:
    - Scale factors: *a*, *b* and *c*
    - Number of fields
    - Basic LON data type of each field

2.2.1 Supported basic LON data types

Basic LON data type	Description
Signed short	8-bit signed data
Unsigned short	8-bit unsigned data
Enum	8-bit unsigned data
Signed long	16-bit signed data
Unsigned long	16-bit unsigned data
Signed quad	32-bit signed data
Unsigned quad	32-bit unsigned data
Float	32-bit IEEE float
Bitfield	1 to 8-bit length unsigned bitfield

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 4.
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 LON 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.

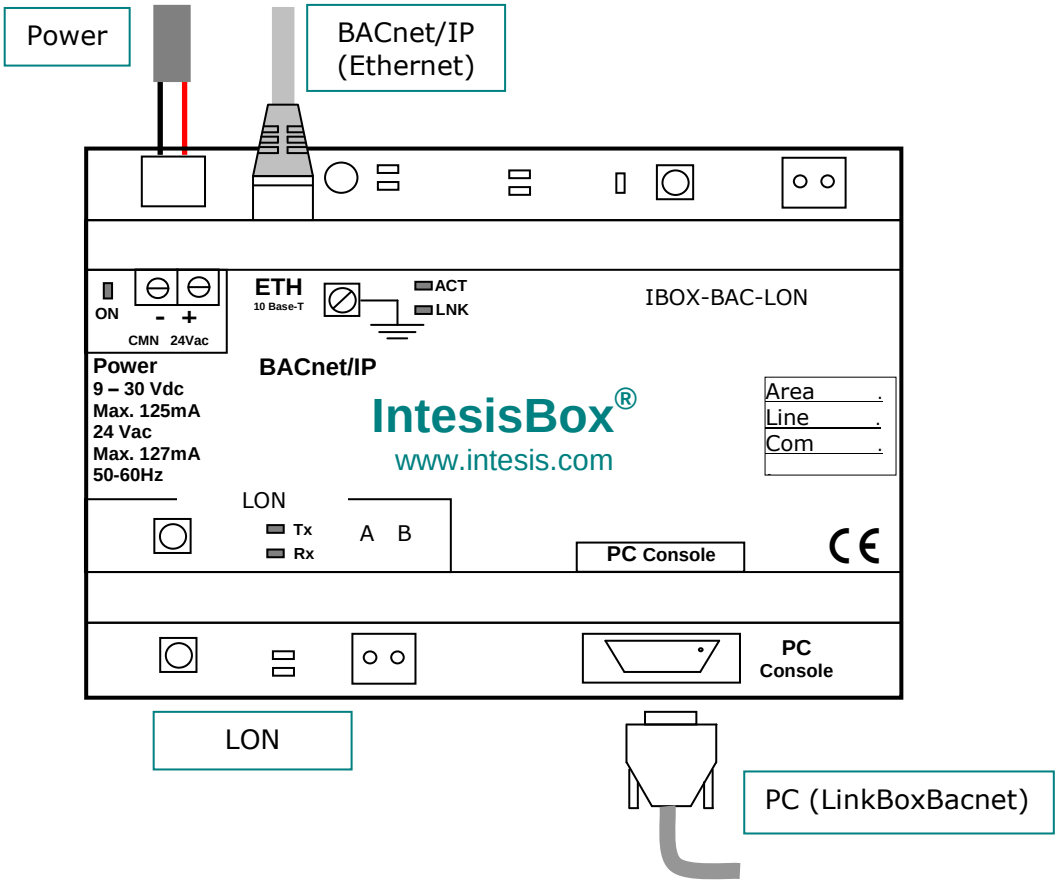


Figure 4.1 Device connection diagram

Ensure proper space for all connectors when mounted.

The items supplied by Intesis Software for this integration are:

- IntesisBox BACnet/IP Server - LON 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 LON

Connect the communication cable coming from the LON network to the port marked as LON of IntesisBox (Figure 4.1).

How to check if there is communication with the LON 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 [section 5]). 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.

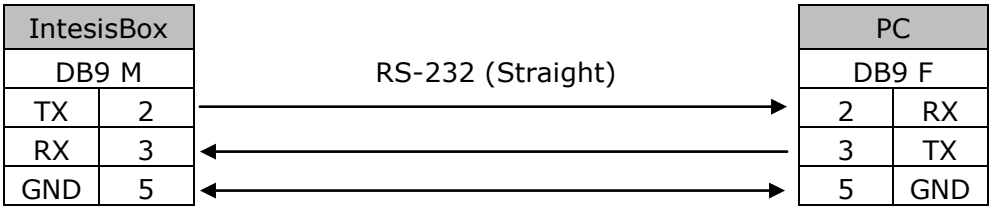


Table 4.1 Configuration serial cable pinout

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 - LON is going to be explained.

The External Protocol in this IntesisBox is LON

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 LON *Configuration* window will be opened. For integrations with a large number of points an alternative CSV based configuration method is explained in the LinkBoxBacnet Manual.

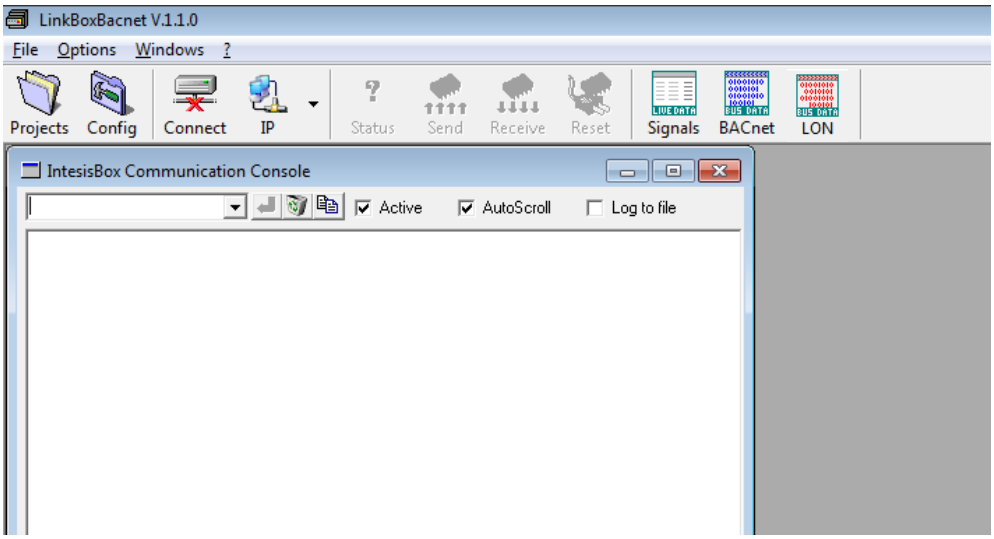


Figure 5.1 Menu and Button Bar in LinkBoxBacnet

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 LON interface.

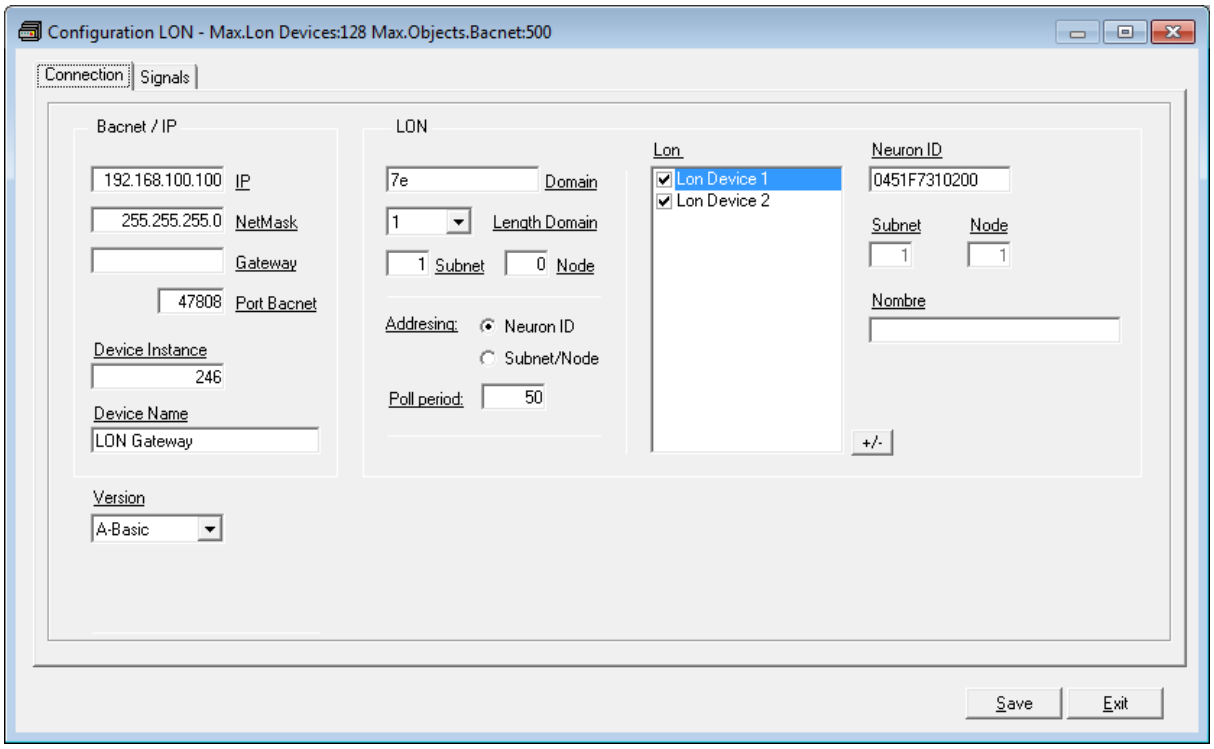


Figure 5.2 Configuration: Connection Tab

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).
- **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 "LON 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

  IntesisBox_Bacnet_LON-**100**… → Tiny model
  IntesisBox_Bacnet_LON-**A**… → Basic model
  IntesisBox_Bacnet_LON-**B**… → Extended model

LON interface configuration parameters:

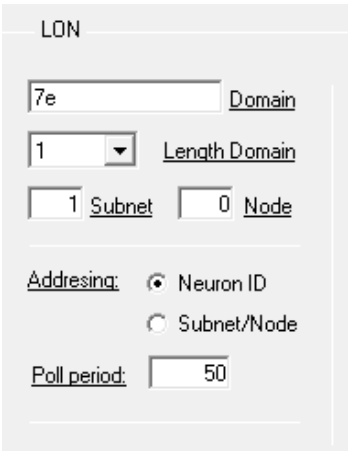


Figure 5.4 Lonworks interface Configuration

- **Domain:** Enter the Domain number for IntesisBox into the LON network.
- **Length Domain:** Enter the length in bytes of the Domain field.
- **Subnet:** Enter the Subnet number for IntesisBox into the LON network.
- **Node:** Enter the Node number for IntesisBox into the LON network.

- **Addressing:** Enter the type of addressing to use by IntesisBox to access the device:
    - Neuron Id: If the devices are not commissioned. Enter the correct Neuron Id numbers of the devices. IntesisBox has embedded tools to help with that process (see section 8.2)
    - Subnet/Node. If the devices are in an already commissioned LON network. Enter the correct Subnet and Node numbers of the devices (this must be supplied by the LON integrator that has commissioned the network).
- **Poll period:** Device's polling cycle time period.

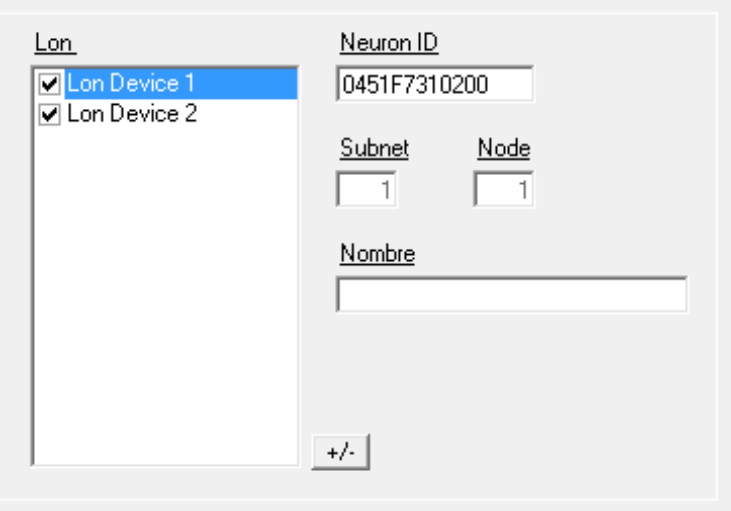


Figure 5.5 Lonworks devices Configuration

- **Lon Device box:** List of LON devices to integrate. Check the devices you want to activate. Select a device to configure its properties.
- **+/-:** Use this button to define the number of LON devices to integrate. (limited to 128 devices).

For every LON device defined, one of these Addressing method needs to be defined (dependant on the selection of the Addressing abovementioned):

- **Neuron ID:** Enter the Neuron Id

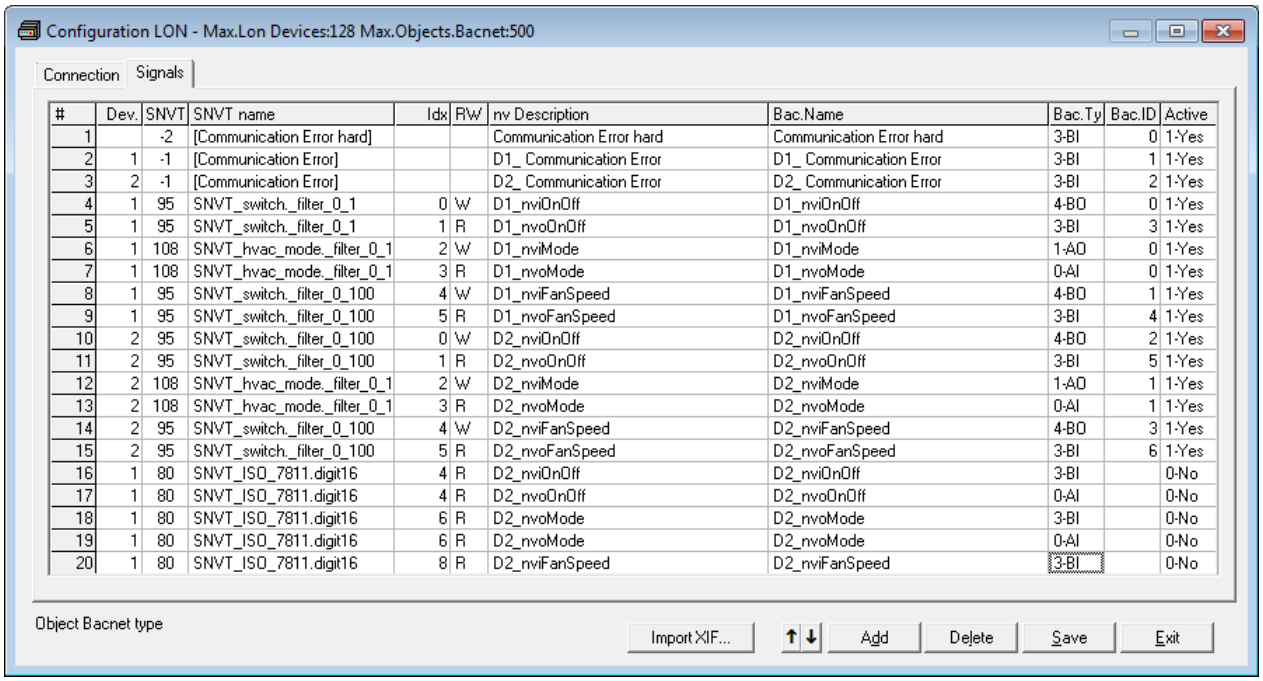
  or

- **Subnet and Node**; Enter the Subnet and Node number of the LON device.
- **Name:** Device name (optional, just for identification purposes).

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.



#	Dev.	SNVT	SNVT name	Idx	RW	nv Description	Bac.Name	Bac.Ty	Bac.ID	Active
1		-2	[Communication Error hard]			Communication Error hard	Communication Error hard	3-BI	0	1-Yes
2	1	-1	[Communication Error]			D1_ Communication Error	D1_ Communication Error	3-BI	1	1-Yes
3	2	-1	[Communication Error]			D2_ Communication Error	D2_ Communication Error	3-BI	2	1-Yes
4	1	95	SNVT_switch._filter_0_1	0	W	D1_nviOnOff	D1_nviOnOff	4-BO	0	1-Yes
5	1	95	SNVT_switch._filter_0_1	1	R	D1_nvoOnOff	D1_nvoOnOff	3-BI	3	1-Yes
6	1	108	SNVT_hvac_mode._filter_0_1	2	W	D1_nviMode	D1_nviMode	1-AO	0	1-Yes
7	1	108	SNVT_hvac_mode._filter_0_1	3	R	D1_nvoMode	D1_nvoMode	0-AI	0	1-Yes
8	1	95	SNVT_switch._filter_0_100	4	W	D1_nviFanSpeed	D1_nviFanSpeed	4-BO	1	1-Yes
9	1	95	SNVT_switch._filter_0_100	5	R	D1_nvoFanSpeed	D1_nvoFanSpeed	3-BI	4	1-Yes
10	2	95	SNVT_switch._filter_0_100	0	W	D2_nviOnOff	D2_nviOnOff	4-BO	2	1-Yes
11	2	95	SNVT_switch._filter_0_100	1	R	D2_nvoOnOff	D2_nvoOnOff	3-BI	5	1-Yes
12	2	108	SNVT_hvac_mode._filter_0_1	2	W	D2_nviMode	D2_nviMode	1-AO	1	1-Yes
13	2	108	SNVT_hvac_mode._filter_0_1	3	R	D2_nvoMode	D2_nvoMode	0-AI	1	1-Yes
14	2	95	SNVT_switch._filter_0_100	4	W	D2_nviFanSpeed	D2_nviFanSpeed	4-BO	3	1-Yes
15	2	95	SNVT_switch._filter_0_100	5	R	D2_nvoFanSpeed	D2_nvoFanSpeed	3-BI	6	1-Yes
16	1	80	SNVT_ISO_7811.digit16	4	R	D2_nviOnOff	D2_nviOnOff	3-BI		0-No
17	1	80	SNVT_ISO_7811.digit16	4	R	D2_nvoOnOff	D2_nvoOnOff	0-AI		0-No
18	1	80	SNVT_ISO_7811.digit16	6	R	D2_nvoMode	D2_nvoMode	3-BI		0-No
19	1	80	SNVT_ISO_7811.digit16	6	R	D2_nvoMode	D2_nvoMode	0-AI		0-No
20	1	80	SNVT_ISO_7811.digit16	8	R	D2_nviFanSpeed	D2_nviFanSpeed	3-BI		0-No

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

Dev	
Description	Device number to which belongs the point. Referenced to the list of devices defined in *Connection Tab* (***¡Error! No se encuentra el origen de la referencia.***)
Values	Up to 128
Edit mode	Text edit or AutoEnumeration
Comments	This is just the order of the device (from top to bottom) in the devices list

SNVT	
Description	SNVT Id number according to EIA-709 standard.
Values	Depending on the selection of SNVT Name (next table)
Edit mode	Edit not permitted.
Comments	The *Communication error* virtual signals have always a predefined special SNVT Id numbers -1 and -2.

SNVT Name	
Description	This is the SNVT to select for the point. Select the SNVT desired from a list of all standard SNVTs defined by LonMark International and a few special SNVTs with filter.
Values	Standard SNVTs defined by LonMark International
Edit mode	Single / Multiple Values selection.
Comments	Consult the documentation of the LON devices to integrate for details of which SNVT is used for every point into the device.

Idx	
Description	Index of the variable inside the LON device. Consult the device's documentation to obtain it.
Edit mode	Text edit

RW	
Description	Indicates the variable Read/write condition
Values	*W:* input *R:* output *WR:* input/output
Edit mode	Single / Multiple Values selection.
Comments	*Note that an output variable in the LON device must be defined as R, to be read by the IntesisBox. And an input variable must be defined as W, to be written by the IntesisBox.*

Nv Description	
Description	Signals description name
Edit mode	Text edit
Comments	Optional but recommended to give a descriptive name to each point

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.
Restrictions	Maximum 30 characters
Edit mode	Text edit or Single / Multiple Values selection (importing values from *Nv Description)*
Comments	Optional but recommended to give a descriptive name to each point

Bac.Type	
Description	BACnet object type for the signal.
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.
Edit mode	Single / Multiple Values selection.
Comments	Edit using the mouse right-button-click pop-up menu

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
Edit mode	Text edit or AutoEnumeration
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
Edit mode	Single / Multiple Values selection.

Import XIF…	
Description	Import XIF. Press this button in order to launch the embedded import tool of XIF files. With this tool, any XIF file of a LON device can be imported, and you will be able to select those variables to integrate, among all the available in the LON device, and import them into the datapoints table with an automatic fulfillment of the needed LON parameters of each datapoint.
Comments	Note that an automatic assignment of the most suitable SNVT or filter for each SNVT to import will be done by the tool, but in some cases it requires a manual fine tune after this automatic assignment of filter.

↑↓	
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 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 (LON.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 *LON- 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
00000000	0-AI	0000	D1_nvoMode
00000001	0-AI	0001	D2_nvoMode
04194304	1-AO	0000	D1_nviMode
04194305	1-AO	0001	D2_nviMode
12582912	3-BI	0000	Communication Error hard
12582913	3-BI	0001	D1_ Communication Error
12582914	3-BI	0002	D2_ Communication Error
12582915	3-BI	0003	D1_nvoOnOff
12582916	3-BI	0004	D1_nvoFanSpeed
12582917	3-BI	0005	D2_nvoOnOff
12582918	3-BI	0006	D2_nvoFanSpeed

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

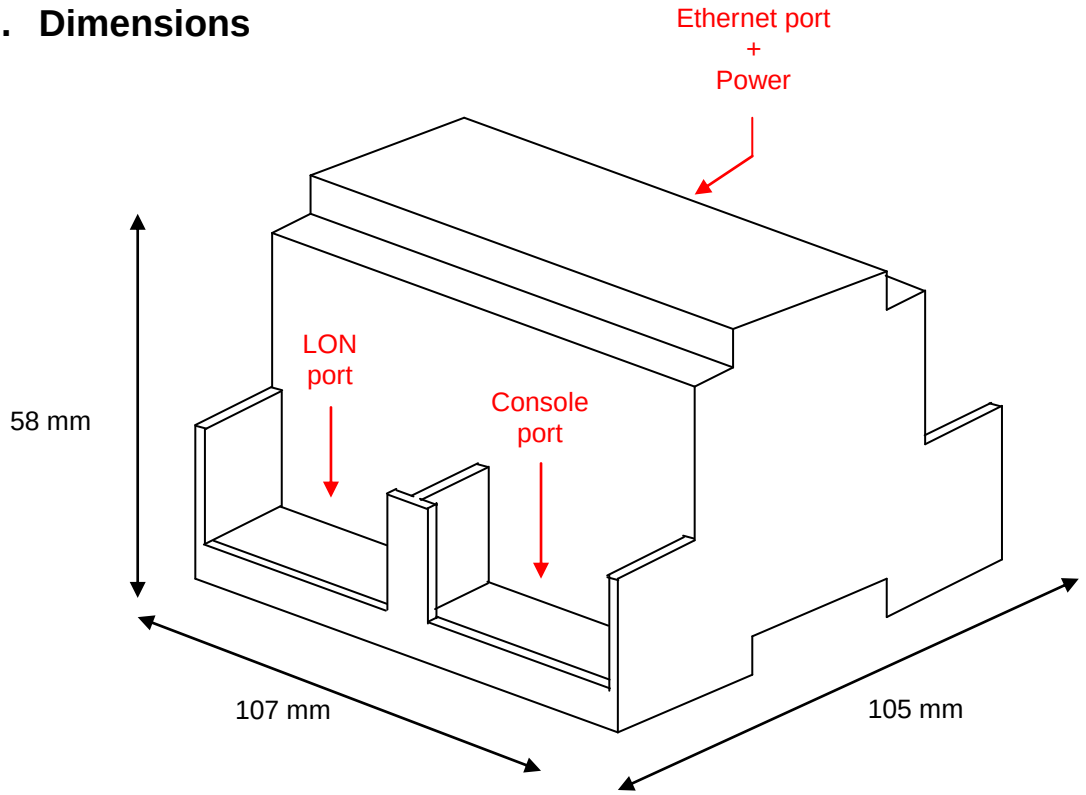
The configuration cannot be received from the gateway to* LinkBoxBacnet*, it can only be sent.

6. Mechanical & electrical characteristics

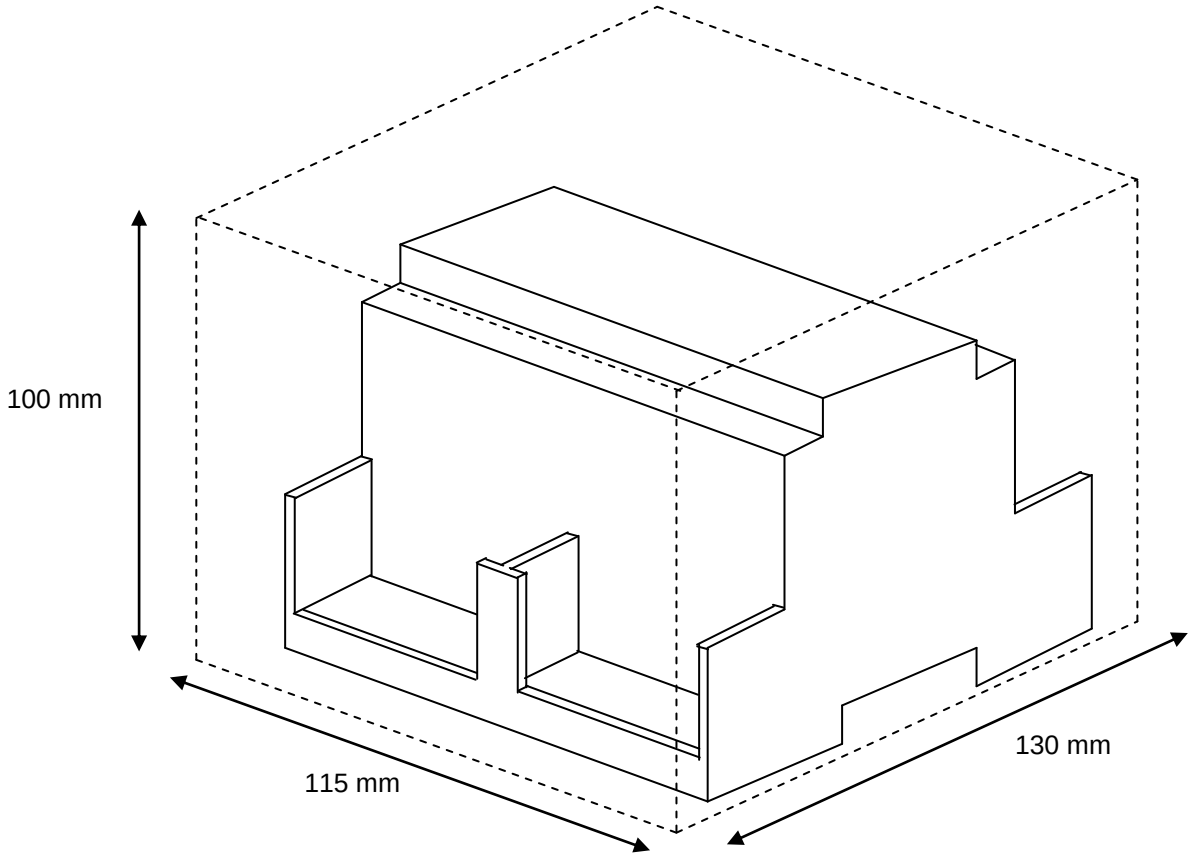
Enclosure	Plastic, type PC (UL 94 V-0). Dimensions: 107mm x 105mm x 58mm.
Colour	Light Grey. RAL 7035.
Power	9 to 30Vdc +/-10%, Max.: 125mA. 24Vac +/-10% 50-60Hz, Max.: 127mA Must use a NEC Class 2 or Limited Power Source (LPS) and SELV rated power supply. Plug-in terminal block for power connection (2 poles).
Mounting	Wall. DIN rail EN60715 TH35.
LON Port	1 x LON (TP-FT/10) (2 poles plug-in screw terminal block).
BACnet/IP port	1 x Ethernet 10Base-T (RJ45).
LED indicators	1 x Power. 2 x LON port activity (Tx, Rx). 2 x Ethernet port link and activity (LNK, ACT). 1 x LON service.[1]
Console port	EIA232. (DB9 female connector, DCE). SELV Ethernet connector
Configuration	Via console port.[1]
Firmware	Allows upgrades via console port.
Operational temperature	0°C to +70°C
Operational humidity	5 to 95%, non condensing
Protection	IP20 (IEC60529).
RoHS conformity	Compliant with RoHS directive (2002/95/CE).
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] 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.

7. Dimensions



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

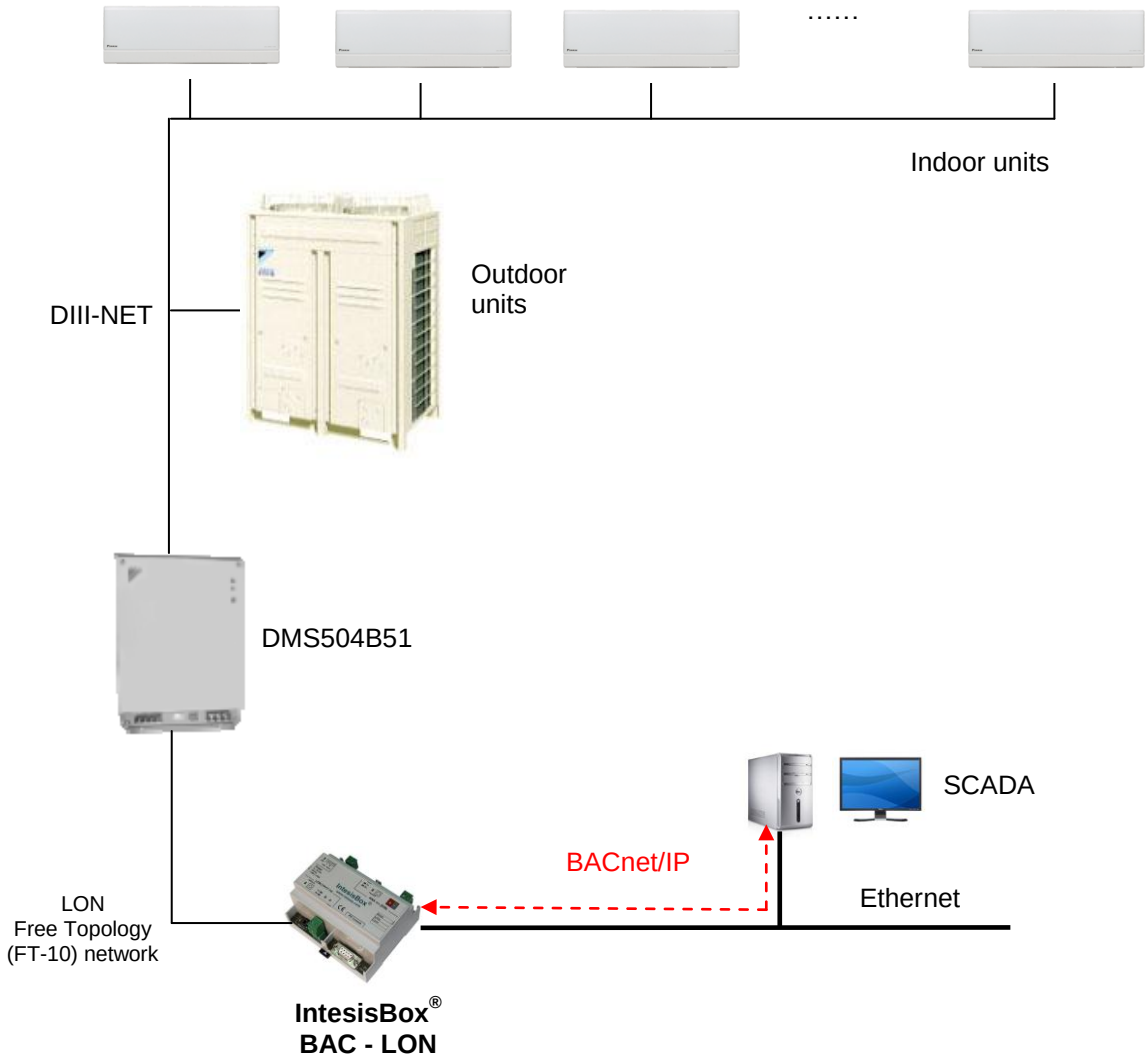


8. Annexes

8.1 Integration of DAIKIN VRV air conditioning systems with BACnet

One of the main applications of *IntesisBox BACnet/IP Server - LON* is the integration of Daikin VRV air conditioning systems with BACnet building control systems.

For this application, Daikin VRV Air Conditioning system must be equipped with Daikin LON gateway (model DMS504B51), this Daikin gateway is normally commissioned by Daikin technical personnel, contact your nearest Daikin distributor for details.



8.1.1 Using LinkBoxBacnet to configure and setup the integration

The DMS504B51 LON gateway from Daikin allows to monitor / control up to 64 VRV indoor units. It is important to consult Daikin documentation to configure successfully the integration.

With LinkBoxBacnet, it comes an example project called **DEMO LON Daikin** which contains the definition of all available variables to integrate the full capacity of the DMS504B51 (64 indoor units).

Using this Demo project as template, it will only be necessary to activate those signals needed for your integration and enter for them the corresponding BACnet parameters according to your BACnet installation, this makes the enginnering needed to set up this integration very easy and quick.

The signals available for every VRV internal unit are showed in the following list.

nvoOnOff_01 (Status OnOff: 0-Off, 1-On)
nvoHeatCool_01 (Status Mode: 0-Auto, 1-Heat, 3-Cool, 9-Vent)
nvoSetpoint_01 (Status SetPoint: 20..35ºC Cool, 15..30ºC Heat)
nvoSpaceTemp_01 (Status Temp: -10..50ºC)
nvoFanSpeed_01 (Status Fan: 50-Weak, 100-Strong)
nvoFiltersign_01 (Status Filter: 0-Ok, 1-Filter sign)
nvoFailure_01 (Status Fail: 0-Ok, 1-Fail)
nvoErrStatus_01 (Status Error Code: 0-No error,1..23114-Error)
nvoThermo_01 (Status Thermo: 0-Off, 1-On)
nvoWattmeter_01 (Status kwh)
nvoRejOnOff_01 (Status: 0-Permited, 1-Prohibited)
nvoRejMode_01 (Status: 0-Permited, 1-Prohibited)
nvoRejSetpoint_01 (Status: 0-Permited, 1-Prohibited)
nvoHvacExist_01 (Status: 0-No connection, 1-Ok, 2-Error communication)
nvoThermoOff_01 (Status ThermoOff: 0-Reset, 1-Set)
nviOnOff_01 (Status OnOff: 0-Off, 1-On)
nviHeatCool_01 (Command Mode: 0-Auto, 1-Heat, 3-Cool, 9-Vent)
nviSetpoint_01 (Status SetPoint: 20..35ºC Cool, 15..30ºC Heat)
nviFanSpeed_01 (Command Fan: 50-Weak, 100-Strong)
nviFSReset_01 (Command Filter Reset: 0..1 Reset Filter Sign)
nviRejOnOff_01 (Command: 0-Permited, 1-Prohibited)
nviRejMode_01 (Command: 0-Permited, 1-Prohibited)
nviRejSetpoint_01 (Command: 0-Permited, 1-Prohibited)
nviThermoOff_01 (Coomand ThermoOff: 0-Reset, 1-Set)

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.

Also available sample projects for other Air Conditioning brands (Mitsubishi Electric, Mitsubishi Heavy Industries, Toshiba, LG, Sanyo…), ask us for details.

8.2 How to setup LonWorks' device address in IntesisBox and how to declare LonWorks devices as commissioned using LinkBoxBacnet

LonWorks devices, as is the case of the DMS504B51 LON gateway for Daikin VRV systems, have a unique identifier called Neuron ID that is normally specified somewhere in the case or in the circuit board of the device, if you do not have the Neuron ID of your LonWorks device then you can get it using LinkBoxBacnet

Additionally, any Lonworks device must be commissioned to start working, this is normally done using any Lonworks standard commissioning tool such as LonMaker. In case your Lonworks device is not commissioned and you do not have any Lonworks standard commissioning tool to do it, then you can use also LinkBoxBacnet and IntesisBox to do it in a single step, see the instructions below for details of both procedures.

To do so ensure following setup:

-Connect the IntesisBox at Lonworks TP/FT-10 bus (section 4.2)

-Connect the IntesisBox to your PC (section 4.4)

-Power-on IntesisBox

Now follow these steps:

1. Execute LinkBoxBacnet and select suitable Lonworks project
2. Connect to the IntesisBox (check LinkBoxBacnet User manual for details)
3. The Lonworks device you are to connect should have a so-called "*Service Pin Button*" accessible. Press it. This will send a device identification message (*Service Pin Message)* to IntesisBox, which will be shown in IntesisBox Communication Console:
4. In this message, the tag ***NeId**:[xxxxxxxxx]* poses as a unique identifier, in hexadecimal format (*Neuron Id*) for the LonWorks device we want to integrate. Note down this number, since we will need it in the configuration.

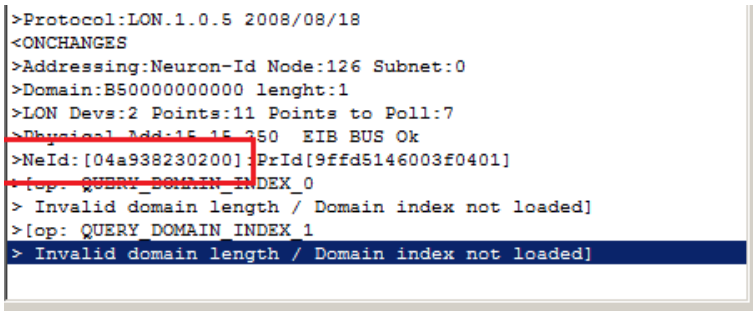


Figure 8.1 Neuron Id example. Neuron Id is *04a938230200*

5. Use this Neuron ID in the Connection configuration tab (section 5.1.1)

6. In this same tab ensure following settings for Lonworks:
   - **Domain:** Any value is fine for this case. B5 is the factory value
   - **Length Domain:** 1
   - **Subnet:** 0
   - **Node:** 126
   - **Addressing:** Neuron Id
   - Select de device and write the Neuron ID in the **Neuron ID** text box
7. Save the changes
8. Send the configuration to the gateway
9. Once downloaded, we will check if communication at Lonworks side is properly working. This can be done checking the messages in the External Protocol Communication viewer (Figure 8.2)

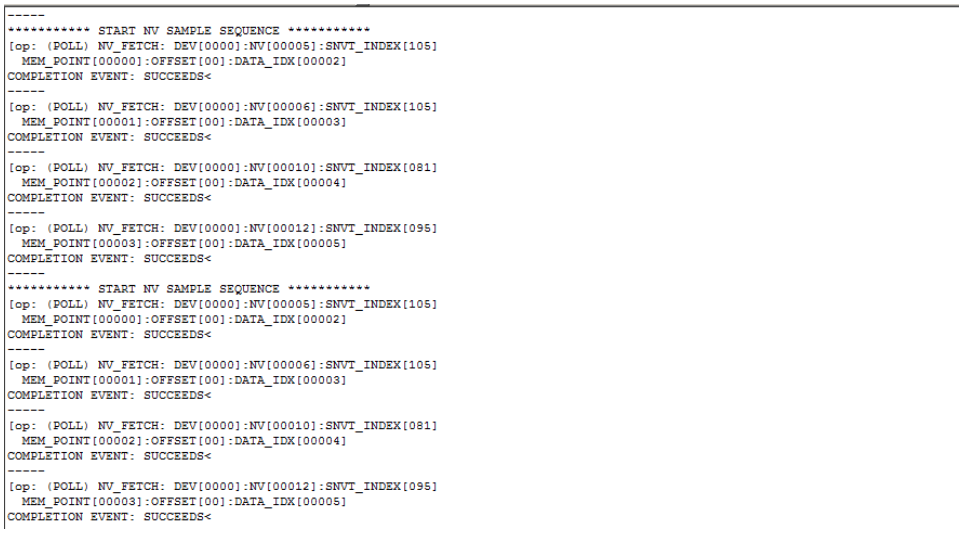


Figure 8.2 Lonworks communication telegrams

These pose as the query commands the IntesisBox is triggering to the Lonworks device being integrated.

Note that for each request (NV_FETCH request) there is a response from the device, represented by the COMPLETION EVENT: SUCCEEDS< keywords.

10. Finally, and solely in the case that your LonWorks device is placed in stand-alone (i.e. directly communicating with intesisBox and not integrated within a Lonworks network), you should declare the LonWorks device as commissioned. In order to do that, go to the Command textBox, and type the command COMIT and press *Send*.

    This will result in some text at IntesisBox Communication Console, similar to the one below (Figure 8.3)

Figure 8.3 COMIT result

If all this process worked, now you are ready to communicate with your Lonworks device.