IntesisBox® BACnet/IP Server DALI

User's manual

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Intesis software

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

Order code:

IBOX-BAC-DALI

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1. IntesisBox BACnet/IP Server – DALI Description

This document describes the integration of DALI ballasts in BACnet compatible devices and systems (*ANSI/ASHRAE 135 – 2001 / Annex J - BACnet/IP*), with the use of *IntesisBox BACnet/IP Server – DALI* device.

The ending of this device is:

- Providing a DALI physical channel with the necessary bus voltage (about 15V) and current regulation (max. 250mA).
- Setting the proper configuration values of the DALI ballasts (addresses, groups, max/min levels, …).
- Performing control and monitoring of the DALI ballasts in the DALI bus from a BACnet/IP-based control system or device, so that the ballasts become part of the own BACnet system.

A configuration software tool, *LinkBoxBacnet*, is provided with IntesisBox, allowing to perform all setup tasks related to configuration of DALI ballasts, setting needed BACnet/IP parameters (IP address, TCP port, …) as well as providing basic monitoring of the integration at setup time.

Once set up, the gateway acts as a BACnet/IP Server device in its BACnet interface, allowing other BACnet/IP client devices to perform COV subscription requests, and reading or writing its internal BACnet objects. These objects provide control of the DALI ballasts connected to IntesisBox.

This document assumes that the user is familiar with BACnet and DALI technologies and their technical terms.

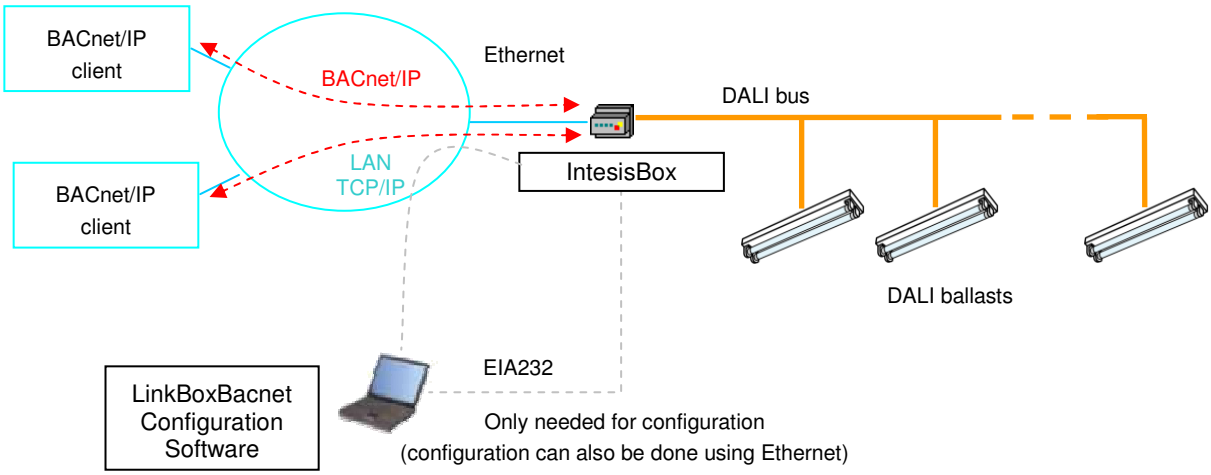

Figure 1 - Integration of DALI ballasts into BACnet/IP using IntesisBox BACnet/IP Server - DALI

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1.1 DALI interface

DALI (Digitally Addressable Lighting Interface) is a standard defining a set of functionalities and requirements to be fulfilled by lighting ballasts. DALI ballasts communicate as well using the same protocol (DALI protocol), defined in the standard and supported by IntesisBox.

From a functional point of view, DALI ballasts provide following features:

- Digital control of actual arc power level (dim level)
  - Controllable either individually, or by previously defined groups of ballasts.
  - Set to arbitrary power/dim levels between OFF and 100%, or previously defined "preset" levels (scenes).
  - Using predefined fade rates/times upon power level change.

- Reporting of their actual status
  - Mainly for detecting failure conditions of the ballast or the installation.

A single DALI channel supports up to 64 ballasts, being this one the maximum number of individual ballasts that can be integrated with a single IntesisBox.

The DALI channel needs a power source, which will be provided by IntesisBox itself. As per the requirements of the standard, nominal bus voltage provided by IntesisBox is 15V, and has a current limiter of 240/250mA.

Each DALI ballast has an own permanent storage memory, where it stores its own configuration values. These values can be read, set and changed using IntesisBox at setup time. They are the following:

- Short Address (Individual address / Address for individual control)
- Random Address (Unique address providing a way of addressing a ballast without assigned individual/short address)
- Physical Minimum Level (read-only/defined by ballast manufacturer)
- Minimum Level
- Maximum Level
- Power-on Level
- System Failure Level
- Fade Rate
- Fade Time
- Group membership (a DALI channel can have up to 16 groups and each ballast can belong to any number of them at the same time)
- Level for scene 0…15 (up to 16 scenes/preset dim levels can be configured within each ballast)

Configuration of all ballast parameters can be done with IntesisBox, using *LinkBoxBacnet* software configuration tool. Usage of this tool is explained in detail in section 3.

Information on DALI technology and a list of existing ballast manufacturers can be found at AG DALI association's website (www.dali-ag.org).

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1.2 BACnet/IP interface

DALI ballasts connected to IntesisBox are accessible by means of its BACnet/IP server interface.

Each DALI ballast is abstracted at BACnet side as a set of BACnet objects, using types *Analog Input* and *Analog Output*. The value they represent is always accessed in IntesisBox by means of its BACnet Property *Present Value*.

For each ballast, following is the list of its related BACnet objects:

Object Name	Description	BACnet Type	Object ID #
Dali D***xx*** PwrLvl	Current arc power level reported by ballast ***xx*** ▪ 0% (off) … 100% / MAX level	Analog Input	***xx***
Dali D***xx*** PwrSet	Requested arc power level on ballast ***xx*** ▪ 0% (off) … 100% / MAX level	Analog Output	***xx***
Dali D***xx*** Sts	Byte value representing ballast ***xx*** status $b_7…b_0$ ▪ Bit b_0: *Status of ballast* ○ 0: Ballast is OK ○ 1: Ballast is in failure ▪ Bit b_1: *Lamp failure* ○ 0: Lamp is OK ○ 1: Lamp is in failure ▪ Bit b_2: *Lamp arc power on* ○ 0: Lamp is OFF ○ 1: Lamp is ON ▪ Bit b_3: *Limit error* ○ 0: Last requested arc power cmd between MIN and MAX level (or OFF) ○ 1: Last requested arc power cmd is out of MIN/MAX level range ▪ Bit b_4: *Fade running* ○ 0: No fade is running (fade is ready) ○ 1: Fade is running ▪ Bit b_5: *Reset state* ○ 0: No reset state ○ 1: Reset state (factory configuration values in ballast) ▪ Bit b_6: *Missing short address* ○ 0: Short address is programmed ○ 1: Missing short address ▪ Bit b_7: *Power failure* ○ 0: No arc power ctrl command received after power-up ○ 1: Arc power control command received after power-up	Analog Input	200 + ***xx***
Dali D***xx*** Cmd	Requested command on ballast ***xx*** ▪ 0 – *Set Arc Power Off* ▪ 1 – *Arc Power 100%* ▪ 2 – *Step Up* ▪ 3 – *Step Down* ▪ 10 – *Set Minimum Arc Power Level*[1] ▪ 11 – *Set Maximum Arc Power Level*[1] ▪ 1***yy*** – *Go to Scene **yy*** ▪ 2***yy*** – *Store Current Level as Scene **yy***[1] ▪ 3***yy*** – *Clear/Remove Scene **yy***[1] ▪ 1***yyy*** – *Set Fade Rate to **yyy** (steps/second)* [1] ▪ 2***yyy*** – *Set Fade Time to **yyy** (seconds)* [1] ▪ 3***yyy*** – *Set Max Level Rate to **yyy** (in %)*[1] ▪ 4***yyy*** – *Set Min Level Time to **yyy** (in %)*[1] ▪ 5***yyy*** – *Set Power-on Level Time to **yyy** (in %)*[1] ▪ 6***yyy*** – *Set System-failure Level to **yyy** (in %)*[1]	Analog Output	200 + ***xx***

[1] This command will overwrite ballast's permanent storage memory. Permanent storage memories have a limited rated number of writes. Therefore, intensive/repetitive use of this command will harm your ballast's permanent storage memory.

In the list, value ***xx*** poses as the ballast short/individual address, and takes value 0 to 63.

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Additionally, IntesisBox implements two Analog Outputs allowing group-based control of ballasts. See following list:

Object Name	Description	BACnet Type	Object ID #
Dali G***xx*** PwrSet	Requested arc power level on group ***xx*** ▪ 0% (off) … 100% / MAX level	Analog Output	100 + ***xx***
Dali G***xx*** Cmd	Requested command on group ***xx*** ▪ 0 – *Set Arc Power Off* ▪ 1 – *Arc Power 100%* ▪ 2 – *Step Up* ▪ 3 – *Step Down* ▪ 10 – *Set Minimum Arc Power Level*[1] ▪ 11 – *Set Maximum Arc Power Level*[1] ▪ 1***yy*** – *Go to Scene **yy*** ▪ 2***yy*** – *Store Current Level as Scene **yy***[1] ▪ 3***yy*** – *Clear/Remove Scene **yy***[1] ▪ 1***yyy*** – *Set Fade Rate to **yyy** (steps/second)* [1] ▪ 2***yyy*** – *Set Fade Time to **yyy** (seconds)* [1] ▪ 3***yyy*** – *Set Max Level Rate to **yyy** (in %)*[1] ▪ 4***yyy*** – *Set Min Level Time to **yyy** (in %)*[1] ▪ 5***yyy*** – *Set Power-on Level Time to **yyy** (in %)*[1] ▪ 6***yyy*** – *Set System-failure Level to **yyy** (in %)*[1]	Analog Output	300 + ***xx***

[1] This command will overwrite ballasts' permanent storage memory. Permanent storage memories have a limited rated number of writes. Therefore, intensive/repetitive use of this command will harm your ballasts' permanent storage memory.

In the list, value ***xx*** poses as the group number being controlled, and takes value 0 to 15.

Additionally, IntesisBox implements two Analog Outputs allowing broadcast control of all ballasts together. See following list:

Object Name	Description	BACnet Type	Object ID #
Dali All PwrSet	Requested arc power level to all ballasts ▪ 0% (off) … 100% / MAX level	Analog Output	116

Object Name	Description	BACnet Type	Object ID #
Dali All Cmd	Requested command to all ballasts ▪ 0 – *Set Arc Power Off* ▪ 1 – *Arc Power 100%* ▪ 2 – *Step Up* ▪ 3 – *Step Down* ▪ 10 – *Set Minimum Arc Power Level*[3] ▪ 11 – *Set Maximum Arc Power Level*[1] ▪ 1***yy*** – *Go to Scene **yy*** ▪ 2***yy*** – *Store Current Level as Scene **yy***[1] ▪ 3***yy*** – *Clear/Remove Scene **yy***[1] ▪ 1***yyy*** – *Set Fade Rate to **yyy** (steps/second)* [1] ▪ 2***yyy*** – *Set Fade Time to **yyy** (seconds)* [1] ▪ 3***yyy*** – *Set Max Level Rate to **yyy** (in %)*[1] ▪ 4***yyy*** – *Set Min Level Time to **yyy** (in %)*[1] ▪ 5***yyy*** – *Set Power-on Level Time to **yyy** (in %)*[1] ▪ 6***yyy*** – *Set System-failure Level to **yyy** (in %)*[1]	Analog Output	117

[3] This command will overwrite ballasts' permanent storage memory. Permanent storage memories have a limited rated number of writes. Therefore, intensive/repetitive use of this command will harm your ballasts' permanent storage memory.

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Finally, there is a set of 8 *Analog Input* objects reporting, in a compact way, a faulty status of each ballast in the line.

Object Name	Description	BACnet Type	Object ID #
Dali Err D07-00	Byte value $b_7...b_0$ representing status of ballasts with individual/short addresses 0 to 7, in the following way: ▪ Bit b_0: *Status of ballast 0* ○ 0: Ballast OK ○ 1: Ballast not present in bus, ballast failure , lamp failure or not configured in database ▪ Bit b_1: *Status of ballast 1* ▪ … ▪ Bit b_7: *Status of ballast 7*	Analog Input	100
Dali Err D15-08	Byte value $b_7...b_0$ representing status of ballasts with individual/short addresses 8 to 15. (b_0 relates to ballast 8, b_0 to ballast 9, …, b_7 to ballast 15)	Analog Input	101
Dali Err D23-16	Byte value $b_7...b_0$ representing status of ballasts with individual/short addresses 16 to 23. (b_0 relates to ballast 16, b_0 to ballast 17, …, b_7 to ballast 23)	Analog Input	102
Dali Err D31-24	Byte value $b_7...b_0$ representing status of ballasts with individual/short addresses 24 to 31. (b_0 relates to ballast 24, b_0 to ballast 25, …, b_7 to ballast 31)	Analog Input	103
Dali Err D39-32	Byte value $b_7...b_0$ representing status of ballasts with individual/short addresses 32 to 39. (b_0 relates to ballast 32, b_0 to ballast 33, …, b_7 to ballast 39)	Analog Input	104
Dali Err D47-40	Byte value $b_7...b_0$ representing status of ballasts with individual/short addresses 40 to 47. (b_0 relates to ballast 40, b_0 to ballast 41, …, b_7 to ballast 47)	Analog Input	105
Dali Err D55-48	Byte value $b_7...b_0$ representing status of ballasts with individual/short addresses 48 to 55. (b_0 relates to ballast 48, b_0 to ballast 49, …, b_7 to ballast 55)	Analog Input	106
Dali Err D63-56	Byte value $b_7...b_0$ representing status of ballasts with individual/short addresses 56 to 63. (b_0 relates to ballast 56, b_0 to ballast 57, …, b_7 to ballast 63)	Analog Input	107

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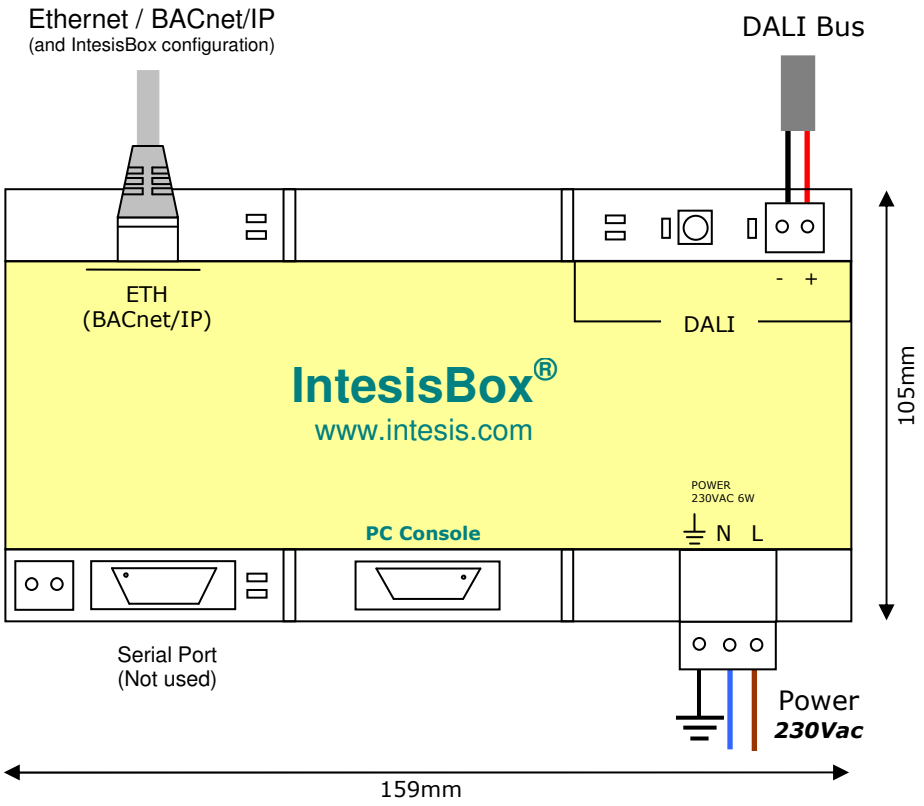
2. Installation and quick-setup

2.1 IntesisBox hardware

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

Sizes are 159mm x 105mm x 58mm.



Ensure proper space for all connectors when mounted.

The items supplied by Intesis Software for this integration are:

- IntesisBox BACnet/IP – DALI hardware
- Console cable. Standard DB9F-DB9M cable 1.8 meter long.
- Installation sheet, containing a hard-link for *LinkBoxBacnet* software download and this manual.

2.2 Quick-setup

Mount IntesisBox in the desired location (follow instructions and recommendations in its installation sheet).

Next sections detail preliminary checks to perform to ensure DALI and Ethernet connectivity.

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2.2.1 DALI connection setup

Connect + and – terminals of the DALI bus of your ballasts to IntesisBox' DALI port. Bus does have polarity, though most DALI ballasts are polarity insensitive.

Having your DALI ballasts powered up, you can perform a quick three-step DALI connectivity test by pressing DALI test button, at the left side of its connector on IntesisBox:

1. Pressing the button once will set your ballasts to their configured maximum arc power level. DALI test red LED next to the button will start blinking, as a way of indicating that the test has started.
2. Pressing again the button will set your ballasts OFF. DALI test LED will remain steadily ON during this stage of the test.
3. And pressing again the button will end up the test, switching DALI test LED steadily OFF and leaving your ballasts at their maximum configured arc power level.

If the button is not pressed during 30s, the test will move on to the next step, until the final step is reached (step 3 above).

While performing this test, IntesisBox will not execute any DALI command that may have been requested from its BACnet/IP interface.

2.2.2 Ethernet connection setup

Although it is not necessary, you may want to check connectivity of your PC against the IntesisBox by means of Ethernet. This will allow you to:

- Configure IntesisBox using *LinkBoxBacnet* tool (explained in section 3)
- Access BACnet/IP server objects from a BACnet client in your PC (BACnet/IP client software is not provided with the device)

IntesisBox comes from factory with configured IP address 192.168.100.254. *LinkBoxBacnet* software tool allows for changing it to the one that suits your Ethernet network configuration, while being connected to IntesisBox – by either the PC Console serial port or the Ethernet / TCP/IP connection itself.

If you need to setup a different IP address before connecting the IntesisBox to the Ethernet network, just skip this section and move on to section 3, where all the configuration process is explained.

In order to setup Ethernet connection of your PC and the IntesisBox, first connect suitable Ethernet cable to IntesisBox:

- Use a crossover Ethernet cable if you are connecting your PC's Ethernet adapter directly to the IntesisBox.
- Or use a straight Ethernet cable if you are to connect to the IntesisBox through a hub or switch in your LAN.

If the IP address of your PC is in the subnet 192.168.100.* you are ready to communicate with IntesisBox. If your PC has an IP address in a different subnet, you will need to add a route in Windows routing table, by doing following:

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Choose "Start->Run…" and enter:

```
cmd.exe
```

This will open up a Windows console shell, with which you can add the route to the IntesisBox with following command line:

```
route add 192.168.100.254 %COMPUTERNAME%
```

In Windows Vista and Windows 7 you will need to run that command from a console shell with administration privileges. Also in these systems, you may have trouble using environment variable `%COMPUTERNAME%`. If this is your case, try issuing the same command changing `%COMPUTERNAME%` for the IP of your PC (you can get the IP from your computer with shell command `ipconfig`).

Finally, ping 192.168.100.254 from the command shell so to check that your PC can see IntesisBox in the network:

```
C:\>ping 192.168.100.254

Pinging 192.168.100.254 with 32 bytes of data:

Reply from 192.168.100.254: bytes=32 time<1ms TTL=255
Reply from 192.168.100.254: bytes=32 time<1ms TTL=255
Reply from 192.168.100.254: bytes=32 time<1ms TTL=255
Reply from 192.168.100.254: bytes=32 time=1ms TTL=255

Ping statistics for 192.168.100.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```


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3. LinkBoxBacnet software tool

LinkBoxBacnet is a Windows compatible software tool developed specifically for the monitoring and configuration of IntesisBox BACnet/IP Server series, including IntesisBox BACnet/IP Server – DALI device.

3.1 Installation

Periodically, new free versions of LinkBoxBacnet are released including improvements, fixes, support for new firmware versions of IntesisBox or support for newer products of IntesisBox BACnet/IP Server series family of devices. Check following webpage to ensure that you have latest version of the tool:

http://www.intesis.com/down/bacnet/linkboxbacnet.html

The tool is supplied in the shape of a self-extracting setup utility. Supported operating systems are Windows XP, Windows Vista and Windows 7.

3.2 Offline and Online working modes

LinkBoxBacnet allows both working *Offline*, this is, not having a physical connection to IntesisBox – and also *Online*, meaning that IntesisBox is powered-up and there is an established communication link between IntesisBox and the PC running the software tool.

Being offline allows for creating a new configuration project and editing it – as will be setting BACnet parameters (device name, IP, ..) and configuration values of the DALI ballasts to be integrated (minimum/maximum arc power level, group membership…).

An important part of IntesisBox' configuration job for a particular DALI installation needs to be done *Online*, i.e., being on-site and having EIA232/serial or Ethernet/IP access to the hardware device: According to DALI philosophy, where all ballasts keep their configuration parameters in an own permanent storage memory, LinkBoxBACnet allows commissioning/configuring the ballasts in the installation while being *Online*.

3.3 Project definition

The tool is based on the concept of configuration projects. After starting *LinkBoxBacnet* by clicking its program entry under Windows Start menu, a project manager window will pop up asking the configuration project to open.

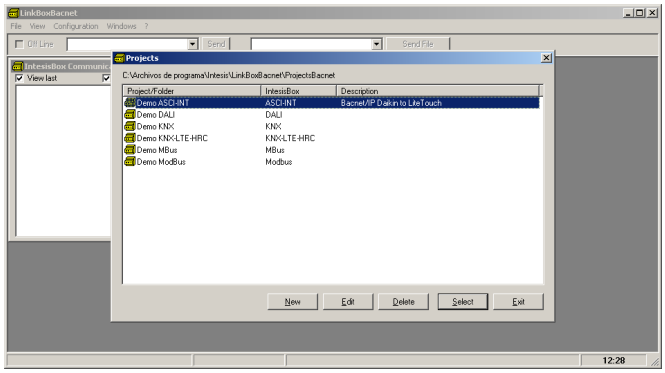

Figure 2 - LinkBoxBacnet start– Projects window

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After installation, LinkBoxBacnet contains a demo/sample configuration project for each of the existing IntesisBox BACnet/IP Server products.

Mark the project "*Demo DALI*" by clicking on it in the list and press button "New". A pop-up will ask whether to create a project as a copy of the selected one (*Demo DALI*), or to create a new project from scratch.

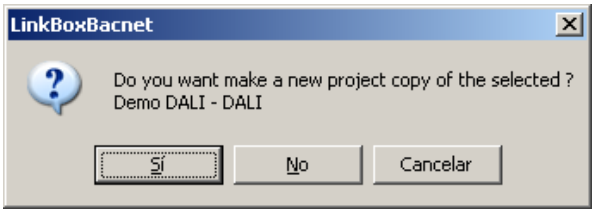

Figure 3 - New project creation prompt

Click *Yes*, and you will be asked a project name and a brief description for it in the following window:

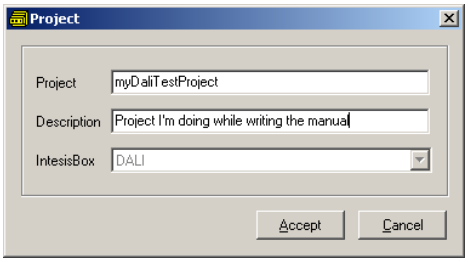

Figure 4 - Project name and description prompt

Having edited these fields, clicking *Accept* will bring you back to the Projects window, this time showing the recently created project in the list.

Mark the project you have just created and click *Select* to open it.

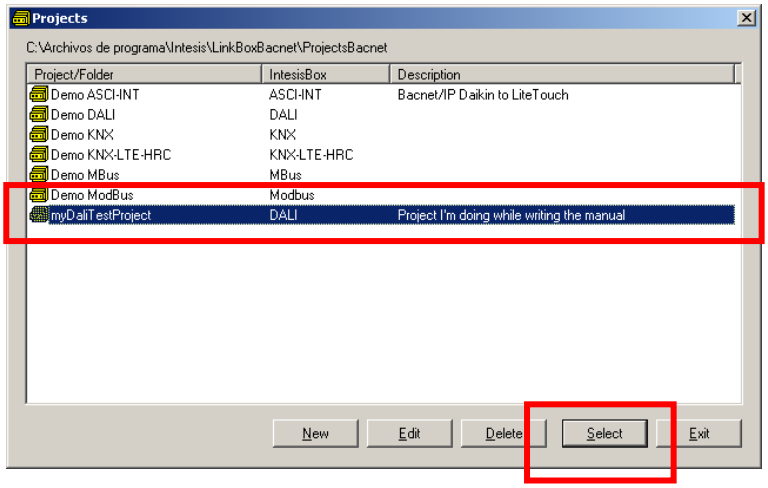

Figure 5 - Opening a project

The configuration project will be opened so that you can start to work with it.

The status bar of *LinkBoxBacnet*'s main window shows project's name and its description, so that you know which project you are working on at any time.

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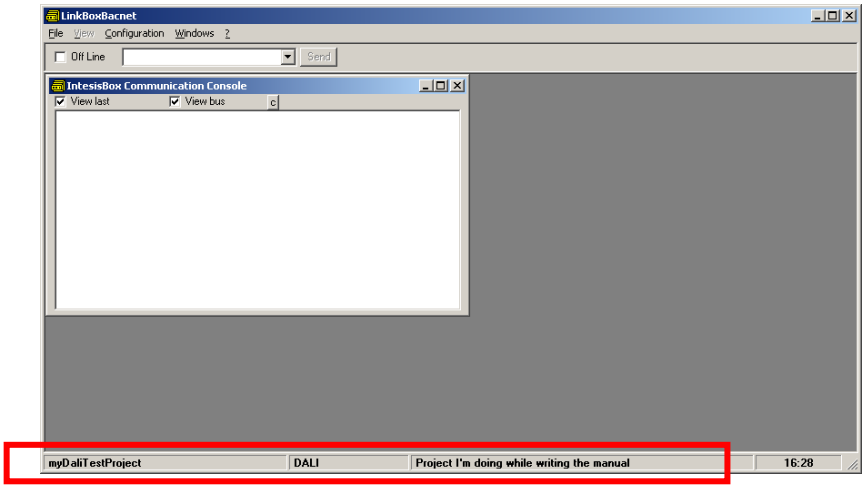

Figure 6 - Project name in LinkBoxBacnet's status bar

For a given project, *LinkBoxBacnet* creates a set of files in a separate folder that contain the configuration data.

You can directly access these files with Windows (file) Explorer. The location of project files differs in Windows XP and Windows Vista/Windows 7.

For Windows XP, you will find them in folder:

```
C:\Program Files\Intesis\LinkBoxBacnet\Projects\ProjectsBacnet\<<your_project_name>>
```

Where <<your_project_name>> stands for the name you have given to the project at the time of creating it

For Windows Vista and Windows 7, the location will be:

```
C:\Users\<<your_user_account>>\AppData\Local\VirtualStore\Program Files\Intesis\LinkBoxBacnet\
ProjectsBacnet\<<your_project_name>>
```

Where <<your_user_account>> stands for the windows user under which you have created the new project, and <<your_project_name>> stands for the name you have given to the project at the time of creating it.

In this folder, you will find following files:

- *Project.ini*: ASCII file containing descriptive information about your project
- *DALI.ini* and *DALI.dat*: ASCII files containing the configuration of the project itself.

It is reasonable that, once you get a working configuration for a certain installation, you perform a backup of these files/their folder from your hard-drive.

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3.4 Editing the configuration project for DALI

3.4.1 IntesisBox Configuration Window

Back into *LinkBoxBacnet* main's window, select menu option *Configuration->IntesisBox…* to access IntesisBox configuration editor window.

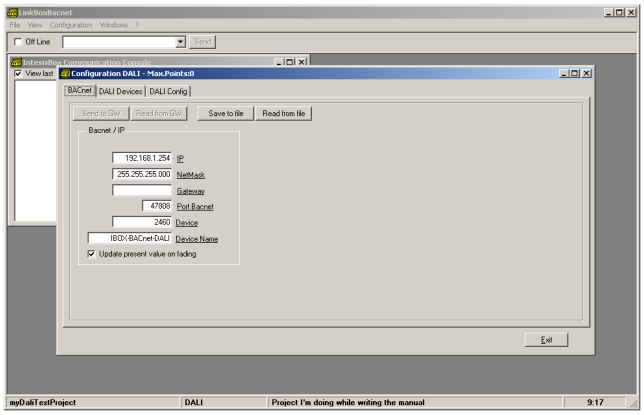

Figure 7 - IntesisBox configuration editor window

There are three tabs in the configuration window:

- **BACnet**: Relates to configuration of IntesisBox' parameters for its BACnet/IP's interface
- **DALI Devices**: Used for the commissioning/setup of the individual/short addresses of the DALI ballasts in the bus
- **DALI Config**: It is used for the management of the set of configuration values of each ballast (min/max level, fade rate/time, group membership, …)

In following sections their usage is explained.

3.4.2 Switching from Offline to Online mode

At this point you might want to change *LinkBoxBacnet* working mode to online – i.e. having a working link between *LinkBoxBacnet* and IntesisBox. This will allow you to exchange configuration values with the device, as you edit them.

In order to do so, select menu option *Configuration->Connection…*. a small window showing the connection parameters will appear.

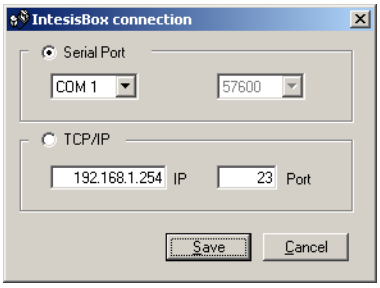

Figure 8 - Connection setting parameters window

In it, you can select the communication parameters of the physical link with IntesisBox, using either a serial port/EIA232 connection or an Ethernet/IP link.

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For Ethernet, default/factory value of the IP configured on IntesisBox is always 192.168.100.254. TCP Port is always 23 and shouldn't be changed.

Once done setting up suitable parameters, click *Save*.

Now, to switch *LinkBoxBacnet* to Online mode, tick the check-box reporting Offline status in the upper left part of the main window. Upon successful connection, status will change to Online with a green background.

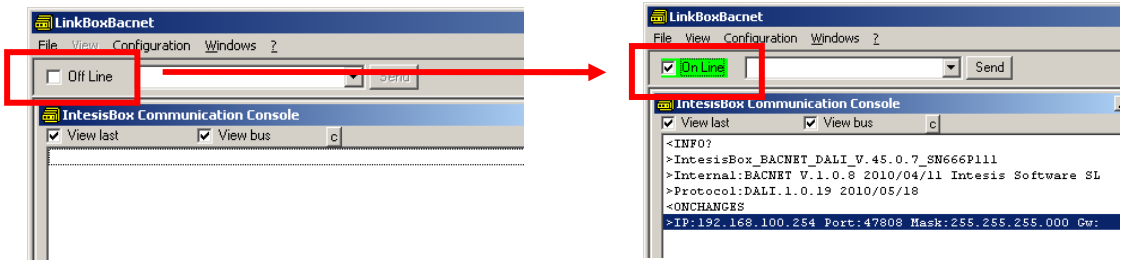

Figure 9 - Switching from Offline to Online mode

By doing that some text will appear in the *IntesisBox Communication Console* window, , as shown in the figure. This window always shows the (ASCII-based) communication between *LinkBoxBacnet* and IntesisBox. At the moment, it shows information on the firmware version loaded on IntesisBox and its configuration status.

Later on, when done with your configuration work using *LinkBoxBACnet*, and leaving your IntesisBox device "stand-alone" in the installation it's specially important that you remember switching to *Offline* mode before disconnecting the physical cable (Ethernet or EIA232) from IntesisBox – otherwise, IntesisBox would remain unnecessarily in the "Online" status, trying to report debugging and configuration information to a non-existing connected PC.

Additionally, in case of using a USB-EIA232 converter, unplugging the USB converter *before* switching to Offline mode may make your system crash, forcing you to reboot your computer.

So, remember switching to switch to Offline mode before leaving the installation, by unmarking the *Online* check-box.

3.4.3 Configuration of short addresses for DALI ballasts

First step to do for proper configuration, is detecting the ballasts present in your DALI bus, and assigning them with an individual/short address.

To do so, being in mode *Online* and with IntesisBox DALI configuration window, select tab *DALI devices*. Configuration window will look like the shot shown below.

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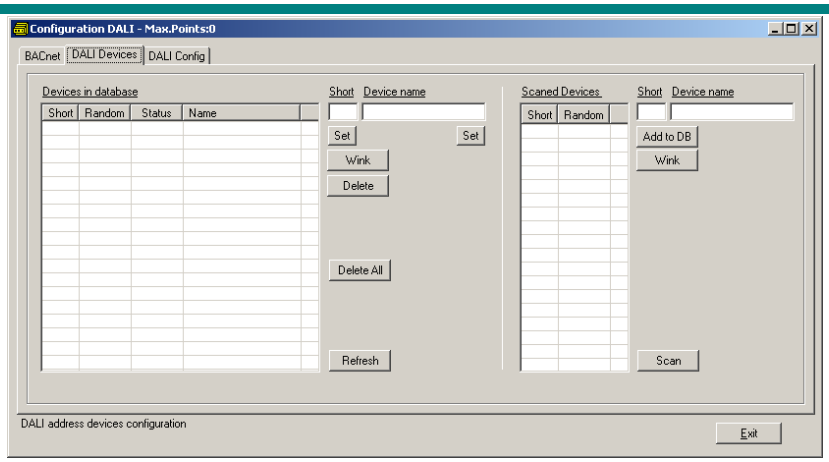

Figure 10 - DALI Devices configuration window

You will use it to scan existing DALI ballasts in your installation, and once found, assign them with a short address.

First, press button Scan in the right part of the window. It will start the process of ballast scanning in the DALI bus, which will take from some seconds up to several minutes (2 or 3 minutes at most), depending on the number of ballasts in your installation.

Once scan is finished, a set of ballasts and their current address will appear in the list of *Scanned Devices*. The figure below shows the result of scanning a DALI bus with two ballasts.

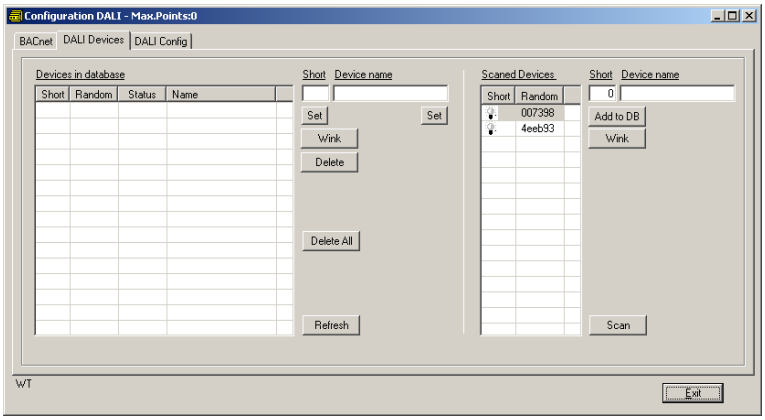

Figure 11 - DALI Devices window with two scanned ballasts

There is a field telling the Random Address of each ballast, which is a unique identifier in the bus for them, and another field telling their Short Address. It is possible and likely that your ballasts at the time have no assigned short address – in this case the Short Address field in the list will appear empty (like in the shot above).

Now you should assign a short address (ranging 0 to 63) to each of the ballasts that have been discovered in the bus. Before that, you might want to identify the physical location of each ballast, so to assign a short address based on its location in the installation. In order to be able to physically identify each ballast, select it from the list and press button *Wink*. Wink operation will send suitable DALI commands on the bus to force a change between minimum and maximum arc power level of the ballast for some seconds, so that you can find it.

Once identified and decided which address you want to assign to a particular ballast, select it from the list of scanned ballasts and fill in fields *Short* and *Device name* in the right part

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of the window (text boxes in the right part of *Scanned Devices* list). *Short* stands for short/individual address, and should be a number between 0 and 63. *Device name* can be any name that is meaningful to you to identify this ballast later on. Finally, press button *Add to DB* to add the ballast to the ballast database.

This will make the ballast disappear from the list of scanned ballasts and appear in the list *Devices in Database*, like shown below.

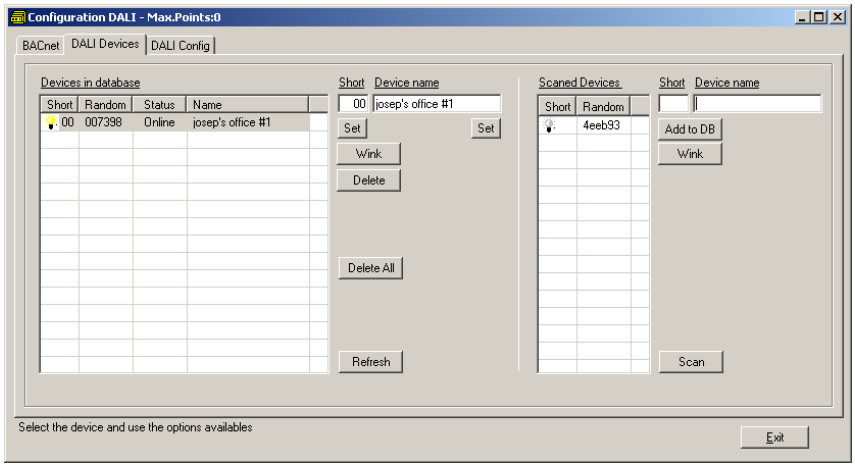

Figure 12 – Ballast added into database

The ballast database is the list of ballasts with assigned short address that IntesisBox continuously monitors for checking their status.

Proceed to add the remaining scanned ballasts until you have them all added into the database. Keep in mind that short addresses assigned to each of the ballasts in the channel must be unique.

Once you have a ballast in the database, you can perform following operations, using their corresponding buttons:

- Change its short address (by using proper text box and button under label *Set*, next to the *Devices in database* list).
- Change the name for identifying it (also by using proper text box and button under label *Set*, next to the *Devices in database* list).
- *Wink* it, in order to test it or locate it physically.
- *Delete* it from the database – this will remove ballasts' short address from the database, and the ballast will appear in the list of *Scanned Devices* over again.
- *Delete All* ballasts from database – same as previous option, but for all ballasts in the database.
- *Refresh* the database. This option retrieves the database from a working IntesisBox you have just connected *LinkBoxBacnet* to, so to know the list of addressed ballasts it is monitoring.

After adding ballasts into the database, or Refreshing the database itself, you will also get feedback on the current communication status of the ballast:

- Ballast is *Online* when IntesisBox detects it in the bus (i.e., ballast answers DALI poll requests triggered from IntesisBox). Shown also by icon in field for short address.
- Ballast is *Offline* when IntesisBox does not detect it in the bus (i.e., ballast does not answer DALI poll requests triggered from IntesisBox). Shown also by icon in field for short address.

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Current status of the ballasts though, is not updated automatically – you need to press button *Refresh* to obtain it at the moment you want to check it.

Remember that DALI ballasts locally keep their configuration parameters and short address in their own permanent storage memory, as well as does the IntesisBox itself – in particular, this means that if you physically disconnect a ballast from the DALI bus controlled by the IntesisBox, the ballast will still keep its short address and configuration values.

3.4.4 Ballast configuration values

The configuration parameters for the ballasts are accessible by clicking on tab *DALI Config* in *IntesisBox Configuration* window.

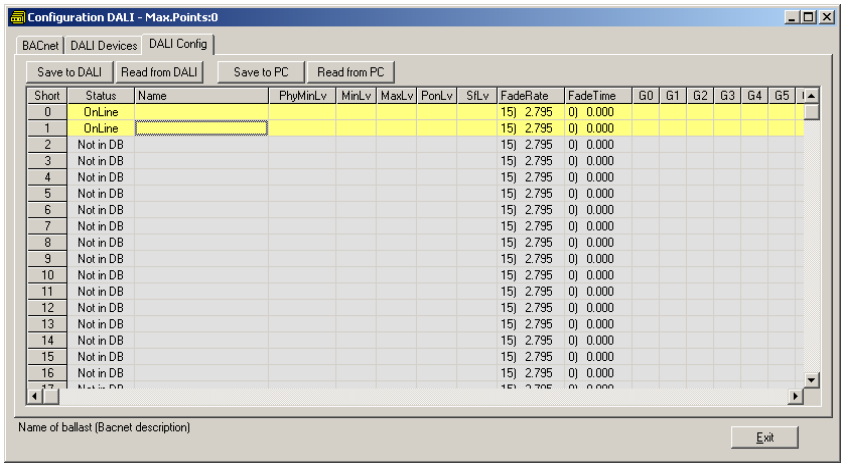

Figure 13 - DALI Ballast Configuration parameters window

At first, you will get a list of ballasts 0 to 63 (ordered by their short address) and an indication if they are Online or Offline. Press button *Read from DALI* to obtain current configuration of all ballasts present in database.

Figure above shows the configuration grid as it appears when first accessing this tab, figure below shows how it looks like after having read ballast configuration parameters from the bus.

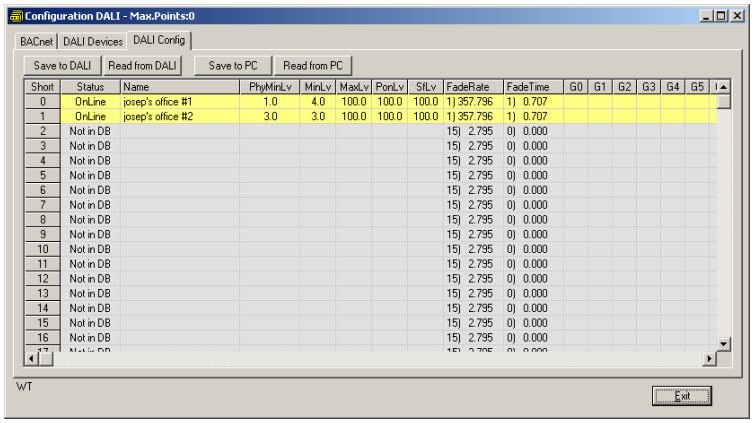

Figure 14 - Ballast configuration parameters have been read from bus

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In this window you can change the configuration parameters for all ballasts, in the following manner:

- Change its minimum arc power level (*MinLv*), maximum arc power level (*MaxLv*), power-on level (*PonLv*) or system-failure level (*SflLv*) by double clicking its corresponding text box and editing its value. Place a value between ballast's physical minimum level (*PhyMinLv*) and 100%.
- Change its *fade rate* or *fade time* by right clicking its corresponding cell and selecting the value from the contextual menu.
- Add or remove the ballast from one of the 16 possible groups (values G0 to G15) by right-clicking the corresponding cell and selecting the group number. It's also possible to change group membership by simply double-clicking the cell corresponding to the group you want the ballast to be added to/removed from.
- Change the level for each of the 16 possible scenes of the ballast by double clicking its corresponding text box S0 to S15, and entering a value between ballast's physical minimum level (*PhyMinLv*) and maximum arc power level (*MaxLv*). Leave this cell empty if you don't want the ballast to have an assigned value for a particular scene S0 to S15 (default).

Change of a certain parameter value for several ballasts at the same time is possible, by selecting multiple cells under the same title – use shift-holding selection or keep mouse button pressed while moving the mouse through all the rows you want to change. Then right-click the selection and change the value from the contextual menu.

Physical minimum level of a ballast is the minimum dim level that the ballast is able to be dimmed to, as per its design. This value is defined by its manufacturer and cannot be changed.

Once done with the changes, they need to be sent to the bus. I.e., the configuration will not take effect until ballasts in the installation are effectively programmed with the chosen values. To do so, click button *Save to DALI*. This will send all configuration values to each of the ballasts, so that they keep their values in their own permanent storage memory.

At this point, configuration of the ballasts can and should be saved to the project, by pressing button *Save to PC*. This will update local file *DALI.dat* of your project on hard-disk, keeping a record of the configuration you have just edited or sent to the ballasts.

Note that you can edit any of the rows in this window, even if its corresponding ballast is not present in IntesisBox' database. This is so, so that you can edit a whole configuration for the ballasts without being in the installation/being in *Offline* mode in *LinkBoxBacnet*. Thus, being *Offline* or *Online*, you can press buttons *Save to PC* and *Read from PC* to store and recover a configuration from your project folder.

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3.4.5 BACnet configuration

BACnet and Ethernet/IP configuration parameters are accessed in tab *BACnet* of *IntesisBox Configuration* window.

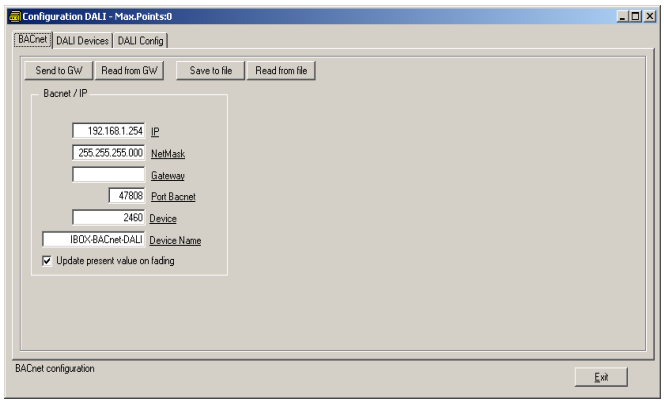

Figure 15 - BACnet and IP configuration parameters

Here you can setup following parameters:

- *IP address* of IntesisBox at its Ethernet port, which will be used for both BACnet/IP and *LinkBoxBacnet* access to the device. Default is 192.168.100.254.
- *Netmask* indicating the IP address range. Default is 255.255.255.0.
- *Default gateway* of your IP network. Is left empty by default.
- *TCP port* that will be used for BACnet. Default is 47808 (0xBAC0 in hex)
- *Device number* in the BACnet network. Default is 2460.
- *Device name* in the BACnet network. Default is IBOX-BACnet-DALI.
- *Update present value on fading* check:
  - If this check-box is enabled, BACnet's Analog Input *DALI PwrLvl* for each installed ballast will be always updated (even while the ballast is fading its own arc power level value). In section 1.2 you can find a the list of BACnet objects associated to each ballast.
  - If this check-box is not enabled, BACnet's Analog Input *DALI PwrLvl* will not be updated for a ballast that is performing a fading (i.e., arc power value will only be shown when the ballast is not fading). In section 1.2 you can find a the list of BACnet objects associated to each ballast.

Once you have changed these parameters, you can and send them to IntesisBox with the button *Send to GW*, and/or store them in your PC (in project's folder) using button *Save to file*.

Take into account that, if you change the IP parameters of the IntesisBox, and you are holding an Ethernet/IP connection with it for communicating with *LinkBoxBacnet*, you will need to update *LinkBoxBacnet's* connection parameters to match accordingly (see section 3.4.2).

You can also read the actual configuration for these parameters in IntesisBox using button *Read from GW*, or read your currently stored project configuration (from file *DALI.ini* in project folder) using button *Read from file*.

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3.5 Signals viewer

While being *Online*, *LinkBoxBacnet* allows for monitoring and changing the actual values of the BACnet objects it exposes to the BACnet network.

Menu option *View->Signals…* will show the *Signals Viewer* window, as shown below.

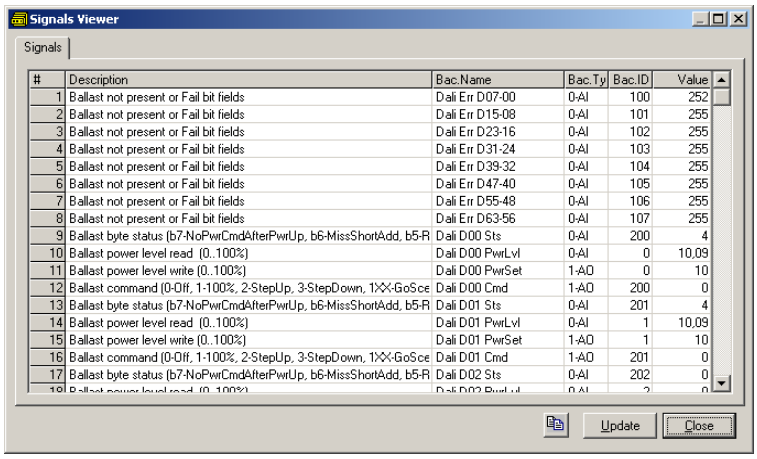

Figure 16 - Signals viewer window

In this window, click *Update* button to ensure that you are viewing latest values read by IntesisBox. After that, BACnet objects' values shown in this window will be constantly updated as they change.

For those objects of type Analog Output, you can change their value by double-clicking the cell under title *Value* and entering a new value for it.

Any change of value that happens either at DALI or BACnet/IP side will be reflected in real-time by the signals viewer. This makes it a convenient tool for early checking of your installation, at the time of integrating the ballasts within a BACnet network.

3.6 Bus viewers

Bus viewers provide a mean of checking activity on each of the buses of IntesisBox, BACnet/IP and DALI.

Access them with menu options *View->Bus->BACnet/IP…* and *View->Bus->DALI…*.

For BACnet/IP viewer, take into account that, given the server nature of IntesisBox, no activity will occur unless a BACnet/IP client is connected and triggering a BACnet service to the IntesisBox (or, the IntesisBox is notifying a change of value of a successfully subscribed object).

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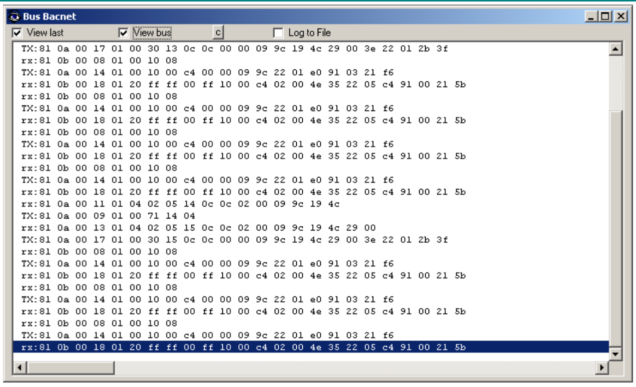

Figure 17 - BACnet bus viewer

Use the bus viewer at the time of setting up your BACnet/IP client device in the IP network, to check that IntesisBox is effectively receiving an answering data at BACnet/IP side.

In the case of DALI, IntesisBox acts as a DALI master, constantly polling each of the ballasts from its database. So, constant activity will be shown at DALI bus viewer.

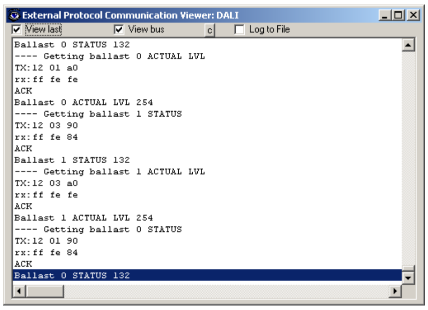

Figure 18 - DALI bus viewer

Both bus viewers allow for logging the shown data in a file, for later analysis or support request. To do so, tick check-box *Log to File* in the upper part of each window.

Logs will be stored in your project folder, with the names Bac0.log and DALI.log for BACnet and DALI respectively.

Old log files are never deleted on logging newer information. Instead, newer log information is appended at the end of each file.

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4. Mechanical & electrical characteristics

Enclosure	Plastic, type PC (UL 94 V-0). Dimensions: 159mm 105mm x 58mm.
Color	Light Grey / RAL 7035.
Supply Voltage	230Vac +/-10% 6W (3-pole plug-in terminal block – line, neutral and earth)
Mounting	Wall. DIN rail EN60715 TH35.
DALI bus power source	15Vdc +/-2% 250mA. (DALI bus is powered from IntesisBox)
DALI port	1 x DALI electrically isolated (2-pole plug-in terminal block).
Ethernet port (BACnet/IP, device config)	1 x Ethernet 10BT RJ45.
LED indicators	1 x Power indicator. 2 x DALI activity (Tx, Rx). 2 x Ethernet link & activity (LNK, ACT). 1 x DALI bus power 1 x DALI test[1]
Push buttons	1 x DALI test[1]
Console port	EIA232. DB9 female connector (DCE).
Configuration	Via Ethernet or serial console port.[2]
Firmware	Allows upgrades via console port.
Operational temperature	0°C to +60°C
Operational humidity	25-90% at 50ºC, non condensing
Protection	IP20 (IEC60529).
RoHS conformity	Compliant with RoHS directive (2002/95/CE).
Certifications	CE

[1] DALI test push-button and LED are meant to perform a quick test of your DALI line and connected ballasts.

[2] Standard cable DB9 male-DB9 female 1,8 meters long is supplied with the device for connection to a PC COM port for configuring and monitoring the device using the serial port (Ethernet is also possible). The configuration software, compatible with Windows® operating systems, is also supplied.

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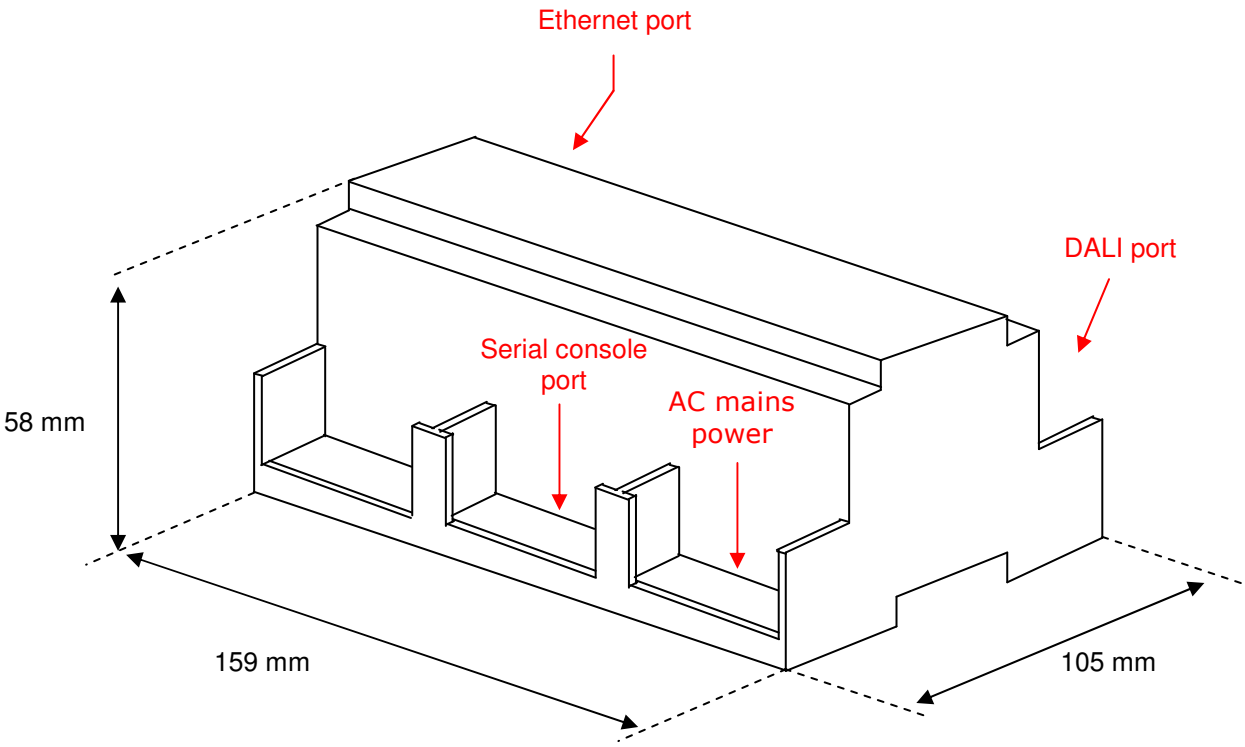
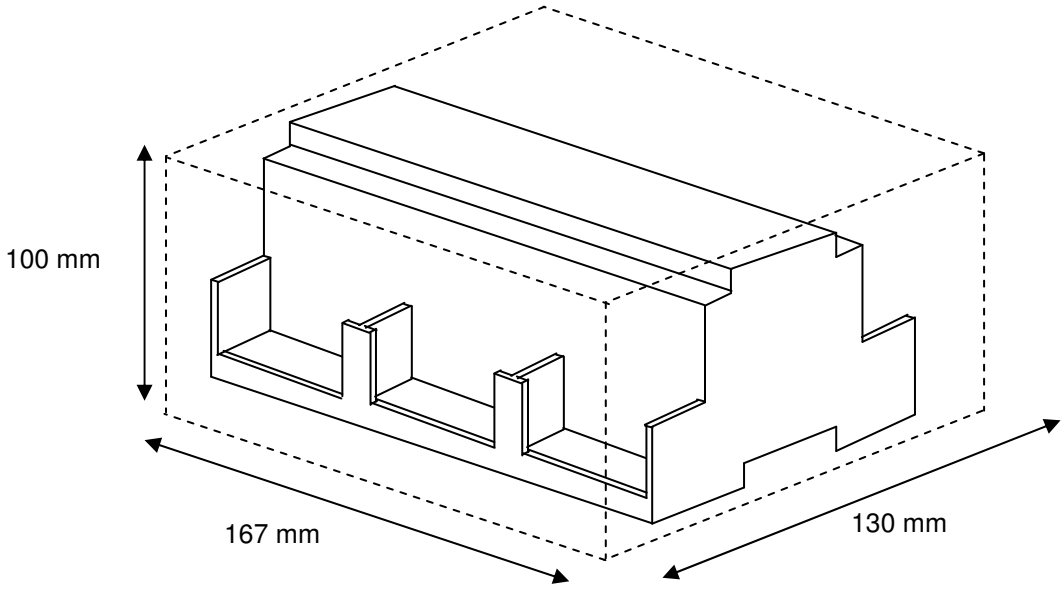
5. Dimensions

External dimensions



Free space recommended in the install location of the device, with spacing enough for external connections.



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