IntesisBox® KNX

Panasonic Air Conditioning

Order Code: **PA-AC-KNX-64**
PA-AC-KNX-128

IntesisBox®

Gateway for integration of Panasonic air conditioning systems into KNX TP-1 (EIB) control systems.

Different models are available for this gateway, with the following **Order Codes**:

PA-AC-KNX-64
Model supporting up to 64 indoor units.

PA-AC-KNX-128
Model supporting up to 128 indoor units.

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Index

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4 / 29

1. Description

1.1 Introduction

IntesisBox® KNX – Panasonic AC is a communication gateway for the integration of Panasonic air conditioning (AC) systems into KNX TP-1 (EIB).

This gateway allows integrating a Panasonic AC system in a supervision/control/automation system through PLC, SCADA and, in general, through any device or system with a KNX TP-1 (EIB) interface.

The aim of this integration is to make accessible several Panasonic air conditioning indoor units communicating with the CZ-CFUNC2 communication adaptor[1] as if they were part of a KNX TP-1 (EIB) system.

Therefore, the *IntesisBox® KNX - Panasonic* acts as a KNX device in the KNX TP-1 (EIB) interface, allowing the KNX system read and write in the communication objects.

1.2 Integration signals

Following is the list of parameters that can be monitored/controlled on the indoor units using IntesisBox®:

- For **each link** in the system:
    - Link Error Code (read-only)

- For **each indoor unit** in the system:
    - Indoor Unit Exist (read-only)
    - On/Off (R/W)
    - Operation Mode (R/W)
    - Set Point Temperature from KNX (write-only)
    - Set Point Temperature from Indoor Unit (read-only)
    - Room Temperature from KNX (write-only)
    - Room Temperature from Indoor Unit (read-only)
    - Fan Speed (R/W)
    - Air Direction control (R/W)
    - Filter Sign Status (read-only)
    - Filter Sign Reset (W)
    - Error Code (read-only)
    - Lock/Unlock remote control (R/W)

Apart from these, the IntesisBox® also implements some extra signals (functions):

- For **all indoor units[2]** in the system:
    - On/Off (write-only)
    - Operation Mode (write-only)
    - SetPoint Temperature (write-only)
    - Fan Speed (write-only)
    - Lock/Unlock remote control (write-only)

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[1] CZ-CFUNC2 is an accessory provided by Panasonic and should be acquired separately.

[2] These signals work as master signals managing all connected units at the same time.

1.3 Functionality

IntesisBox® continuously polls (reads) the Panasonic CZ-CFUNC2 communication adaptor for all configured signals and keeps the updated status of all of them in its memory ready to be served when requested from KNX.

When a change of status is detected in a Panasonic's AC signal, a write telegram is sent to the KNX bus, of the associated *KNX Group*.

When it is received a telegram from the KNX bus, and if its *KNX Group address* is associated to a Panasonic's AC signal, a message is sent immediately to the Panasonic CZ-CFUNC2 communication adaptor to perform the corresponding action in the Panasonic's AC system.

In the continuous polling, if no response is detected, from any of the links, an error code will be sent for each link and for each indoor unit associated to this link. There is also a virtual signal for each AC indoor unit indicating existence of the associated address in the link. This signal will be normally activated if the indoor unit is found in the address list of the link.

Each of the mentioned signals in section 1.2 must be associated to a KNX group address, with this, all the system is seen as *another* KNX device, with the same configuration and functioning characteristics. These addresses are not fixed and can be configured using the LinkBoxEIB tool (see 0).
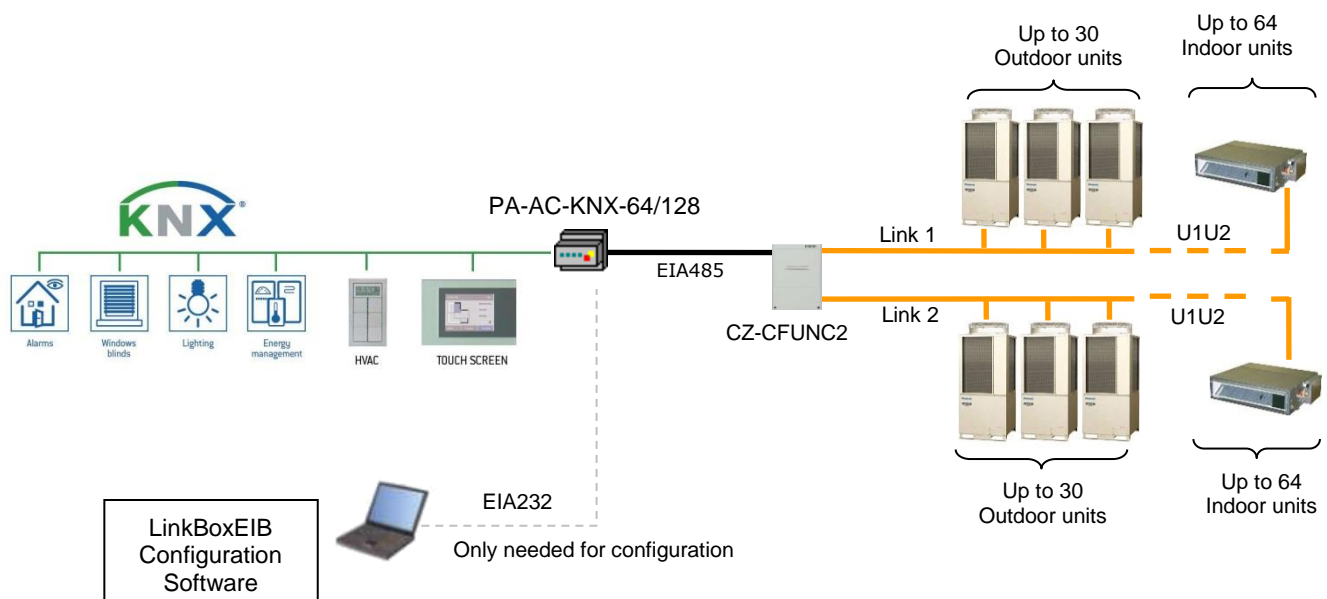
Figure 1.1 Integration of Panasonic AC into KNX TP-1 (EIB) system

1.4 Capacity of IntesisBox®

Element	Max.	Notes
Number of indoor units	128 *	Maximum number of AC indoor units that can be controlled
Main Group Address	4000	Maximum number of communication objects

Table 1.1 IntesisBox® capacity

* There are two different models of *IntesisBox® KNX – Panasonic AC* each one with different capacity. The table above shows the capacity for the top model (with maximum capacity).

Their order codes are:

- PA-AC-KNX-64:
    - Model supporting up to 64 indoor units

- PA-AC-KNX-128:
    - Model supporting up to 128 indoor units

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2. KNX interface of IntesisBox®

2.1 Description

IntesisBox® KNX- Panasonic supports the KNX TP-1 (EIB) physical layer, as defined in the KNX standard. It behaves as *another* 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 a 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 data points 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 data point defined in IntesisBox® KNX configuration needs at least a single KNX group address associated with it. This group address will be used either for sending updates *to* KNX of the data point value (that have been generated on the other PANASONIC interface of the IntesisBox®), or receiving updates *from* KNX of the data point value (that will be propagated to the Panasonic side in this case)

From the point of view of KNX functionality, each data point 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®, PANASONIC in this case).

- One or more KNX group addresses from which this data point of IntesisBox® will be updated/written from the KNX installation (resulting in a change to the other side of IntesisBox®, PANASONIC in this case).

- A single KNX group address from which IntesisBox® will read the object value on KNX bus recovery / IntesisBox® start-up

The behavior of IntesisBox® data points with regarding their associated group addresses is defined by means of flags (R, W, T, U and U2), as explained in section 0.

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 data point configured on IntesisBox® an EIS type is defined. Data points on IntesisBox® KNX support the following EIS-types:

- EIS1 - Switching (1bit raw)
- EIS5 – Value (16bit – floating type)
- EIS10 – 16bit Counter (16bit 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 data points in LinkBoxEIB.

Also, a *dummy* ETS application is provided by Intesis Software (section 5), which can be imported into ETS. This application is nor downloadable into IntesisBox® KNX neither usable for IntesisBox® configuration. Rather, it poses as a means of having a device in the ETS project representing the IntesisBox® KNX and its own data points/communication objects, and to which group addresses are associated.

2.2 Communication objects available

Address map is configurable for each indoor unit and can be modified through the supplied software LinkBoxEIB. Next, there are two tables showing different data points/communication objects available either for each indoor unit control or all indoor units control at a time. Please, remember that in the tables *R/W* stands for *Read* and *Write*, *R* stands for *Read Only* and *W* stands for *Write Only.*

2.2.1   Communication objects per each indoor unit:

Property	EIS type	Signal type (R/W)	Description / Status	
IU_Exist	1 – Switching (1bit)	R	**Communication Status** 0 – Communication OK, 1 – Communication ERROR	
OnOff	1 – Switching (1bit)	R/W	**Indoor Unit On/Off** 0 – Off, 1 – On	
Mode[1]	14 – Counter (8bit)	R/W	**Operation Mode** 0 – Cool, 1 – Heat, 2 – Fan, 3 – Dry, 4 – Auto	
	DPT 20.105 (8bit)	R/W	**Operation Mode** 0 – Auto, 1 – Heat, 3 – Cool, 9 – Fan, 14 – Dry	
	DPT 1.100 (1bit)	R/W	**Operation Mode** 0 – Cool, 1 – Heat	
Mode::Cool	1 – Switching (1bit)	R/W	0 – Inactive, 1 – Active	Only one of these objects will be set / read to "1" at the same time (all objects will be updated on bus upon a Mode change)
Mode::Heat	1 – Switching (1bit)	R/W	0 – Inactive, 1 – Active	
Mode::Fan [3]	1 – Switching (1bit)	R/W	0 – Inactive, 1 – Active	
Mode::Dry	1 – Switching (1bit)	R/W	0 – Inactive, 1 – Active	
Mode::Auto	1 – Switching (1bit)	R/W	0 – Inactive, 1 – Active	

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[1] When *Fan* mode is selected, no changes on the Set Point will apply.

Set Point User [1]	5 – Float (2byte)	W	**User Set Point Temperature** From -15ºC to 60 ºC Refers to the temperature introduced in the KNX control system to set the desired temperature.
Set Point Indoor unit	5 – Float (2byte)	R	**Indoor Unit Set Point Temperature** From -15ºC to 60 ºC Refers to the current temperature set in the Indoor Unit as set point temperature.
Room Temp User [4]	5 – Float (2byte)	W	**User Ambient Temperature (only integer numbers)** From -35ºC to 92ºC Refers to the ambient temperature provided by an external KNX sensor or thermostat.
Room Temp Indoor Unit	5 – Float (2byte)	R	**Indoor Unit Ambient Temperature (only integer numbers)** From -35ºC to 92ºC Refers to the ambient temperature provided by the Indoor Unit temperature sensor.

Fan Speed	14 – Counter (8bit)	R/W	**Fan Speed** 0 – Auto, 1 – Low, 2 – Middle, 3 – High	
FanSpeed::Auto	1 – Switching (1bit)	R/W	0 – Inactive, 1 – Active	Only one of these objects will be set / read to "1" at the same time (all objects will be updated on bus upon a FanSpeed change)
FanSpeed::Low	1 – Switching (1bit)	R/W	0 – Inactive, 1 – Active	
FanSpeed::Middle	1 – Switching (1bit)	R/W	0 – Inactive, 1 – Active	
FanSpeed::High	1 – Switching (1bit)	R/W	0 – Inactive, 1 – Active	

Louver	14 – Counter (8bit)	R/W	**Air Direction Control**
			    0 – Off/Auto
			    1 – Horizontal
			    2 – Pos1
			    3 – Pos2
			    4 – Pos3
			    5 – Vertical
			    5 – Swing

Filter Sign Status	1 – Switching (1bit)	R	**Filter Sign Status** 0 – Off, 1 - On
Filter Sign Reset	1 – Switching (1bit)	W	**Filter Sign Reset** 1 – Clear Filter Alarm (When reading always 0)
ErrorCode	10 – Counter (16bit)	R	**Error Code** 0 – No Error, 1..257 – Error Code[2]
RCLockOnOff	1 – Switching (1bit)	R/W	**Lock/ Unlock Remote Controller ON/Off function** 0 – Remote Controller Unlocked 1 – Remote Controller Locked

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[1] When "*SetPoint User"* and *"Room Temp User"* objects are used, the system adjusts the set point temperature according to the values introduced in these registers, ignoring other temperature parameters.

[2] See list of indoor unit error codes and their meaning in section 9.

RCLockMode	1 – Switching (1bit)	R/W	**Lock/ Unlock Remote Controller Mode function** 0 – Remote Controller Unlocked 1 – Remote Controller Locked
RCLockSetpoint	1 – Switching (1bit)	R/W	**Lock/ Unlock Remote Controller Set Point function** 0 – Remote Controller Unlocked 1 – Remote Controller Locked
RCLockLouver	1 – Switching (1bit)	R/W	**Lock/ Unlock Remote Controller Louver function** 0 – Remote Controller Unlocked 1 – Remote Controller Locked
RCLockFanSpeed	1 – Switching (1bit)	R/W	**Lock/ Unlock Remote Controller Fan Speed function** 0 – Remote Controller Unlocked 1 – Remote Controller Locked

2.2.2 Communication objects for central controlling (all units at a time)

Property	EIS type	Signal type (R/W)	Description / Status

Link1_Error Code	1 – Switching (1bit)	R	**CZ-CFUNC2 Link1 Error Code**
			  0 – Communication OK
			  256 – No Communication
			  xxx – Error code

Link2_Error Code	1 – Switching (1bit)	R	**CZ-CFUNC2 Link1 Error Code**
			  0 – Communication OK
			  256 – No Communication
			  xxx – Error code

OnOff_All	1 – Switching (1bit)	W	**Indoor Unit On/Off** 0 – Off, 1 – On
Mode_All	14 – Counter (8bit) DPT 20.105 (8bit) DPT 1.100 (1bit)	W	**Operation Mode** 0 – Cool, 1 – Heat
SetPoint_All	5 – Float (2byte)	W	**Set Point Temperature** (only integer numbers allowed) -15ºC to 60 ºC
Fan Speed_All	14 – Counter (8bit)	W	**Fan Speed** 0 – Auto, 1 – Low, 2 – Middle, 3 – High
RCLockOnOff_All	1 – Switching (1bit)	W	**Lock/ Unlock Remote Controller ON/Off function** 0 – Remote Controller Unlocked 1 – Remote Controller Locked
RCLockMode_All	1 – Switching (1bit)	W	**Lock/ Unlock Remote Controller Mode function** 0 – Remote Controller Unlocked 1 – Remote Controller Locked
RCLockSetpoint_All	1 – Switching (1bit)	W	**Lock/ Unlock Remote Controller Set Point function** 0 – Remote Controller Unlocked 1 – Remote Controller Locked
RCLockLouver_All	1 – Switching (1bit)	W	**Lock/ Unlock Remote Controller Louver function** 0 – Remote Controller Unlocked 1 – Remote Controller Locked
RCLockFanSpeed_All	1 – Switching (1bit)	W	**Lock/ Unlock Remote Controller Fan Speed function** 0 – Remote Controller Unlocked 1 – Remote Controller Locked

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2.2.3 Using a Set Point and Ambient Temperature reference from KNX.

To be able to use the temperature references for controlling the AC from within KNX, both the external User Ambient Temperature value and the User Set Point Temperature from KNX must be written in the respective communication objects of the gateway.

When both values are written, the following formula shall be applied to calculate a "Virtual Set Point Temperature" and send to the gateway.

$$IU\_Set\_Point = Set\_Point\_User - (Room\_Temp\_User – IU\_Room\_Temp)$$

- ▪ IU_Set_Point: Setpoint temperature sent to AC Indoor Unit.
- ▪ IU_Room_Temp: Ambient temperature provided by AC Indoor Unit.
- ▪ Set_Point_User: Setpoint temperature provided from KNX to gateway.
- ▪ Room_Temp_User: Ambient reference temperature provided from KNX.

The moment the device is working with the virtual temperature, the IU Ambient Temperature object will continue to report the Indoor unit's probe temperature while the actual IU Set Point Temperature reports the result from the calculated Virtual Set Point (Rounded value).

Remark that as long as no Set Point Temperature value is written, the calculation won't be applied!

In the case a Set Point value has been written, but no Ambient Temperature Reference value, then the Set Point value shall be send to the IU without applying the formula. Accordingly, the User Ambient Temperature object shall have the same value as the IU Ambient Temperature.

As an example, consider the following situation.

The user wants: **19°C** ("User Set Point Temperature").
A value sent from KNX sensor reads: **21°C** ("User Ambient Temperature").
The Ambient temp. read by the Indoor unit is: **24°C** ("Indoor unit Ambient Temperature").

In this example, the final setpoint that will be send out to the indoor unit (shown in "Setp. Temp.") will become 19°C – (21°C – 24°C) = **22°C.**

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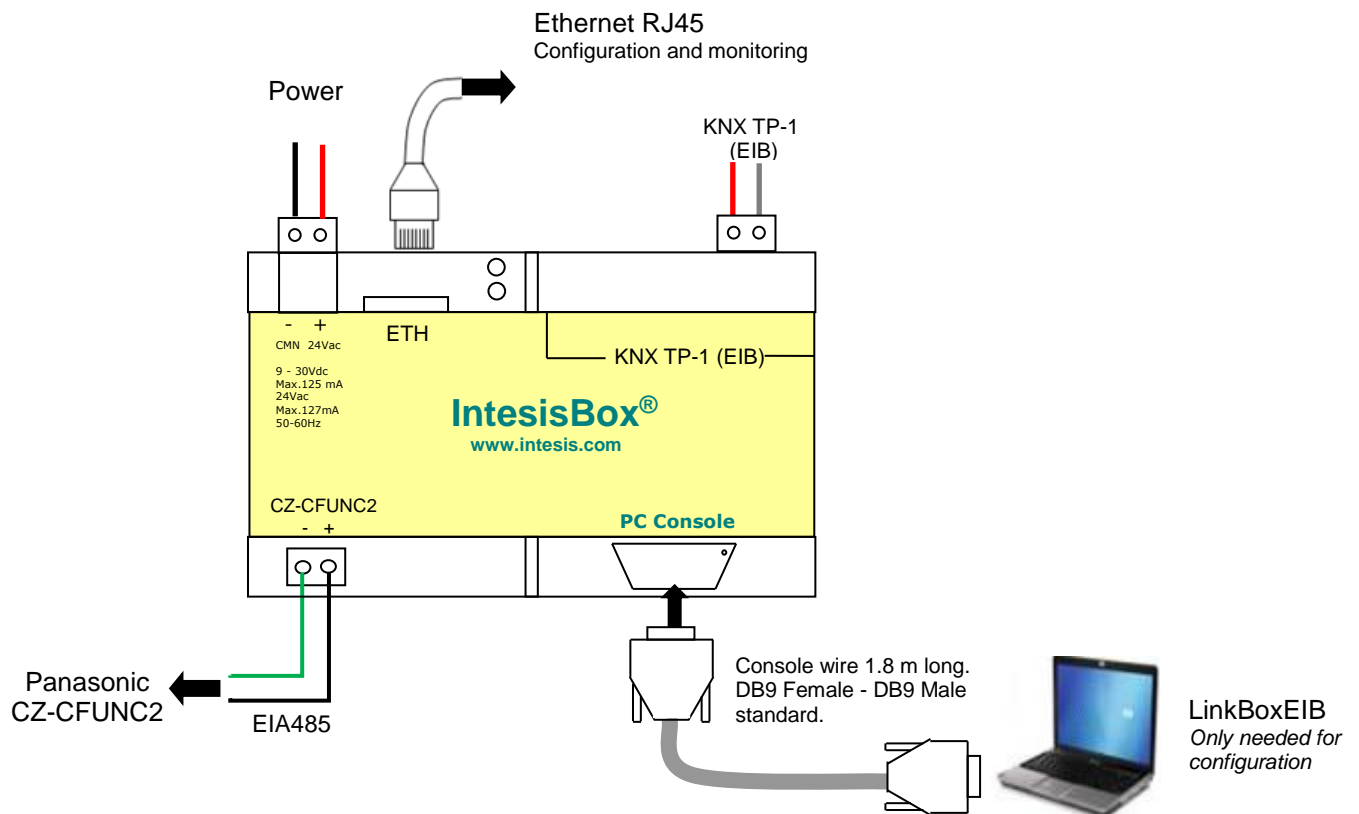# 3. IntesisBox® KNX Device Connections

Figure 3.1 Integration of Panasonic AC into KNX TP-1 (EIB) system

3.1 Connect to Panasonic CZ-CFUNC2 adaptor

Use the EIA485 connector in the left bottom corner of the IntesisBox® device in order to connect the Panasonic adaptor to the IntesisBox®. Remember to follow all safety precautions indicated by Panasonic.

To properly communicate with the IntesisBox®, please check:

- **Initial communication setting** item (8.SCAn.x) is set to '0' (default value).

- **Adaptor number setting** item (1.Ano.xx) matches LinkBoxEIB **Adaptor address** value.

- *Instructions for the Electrical Installer* (CZ-CFUNC2) document for further information.

Modifying some other parameters can affect proper communication.

3.2 Connect to KNX Interface

Connect + and – terminals of the KNX bus to the IntesisBox® KNX connector (C1). The polarity is important.

How to check if there is communication with the KNX bus is explained in the LinkBoxEIB Manual (section 6.3).

To check connectivity and correct functioning, use LinkBoxEIB software (see LinkBoxEIB User Manual).

3.3 Connect to PC (LinkBoxEIB)

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

- Ethernet: Using the ETH port (**Figure 3.1**) of IntesisBox®. How to check connectivity is explained in section 6.3.

- Serial cable: Connect the IntesisBox® device to the PC serial port using the serial cable provided. One end should be connected to the Console EIA232 port of the IntesisBox® device (**Figure 3.1**) and the other end to the PC serial port.
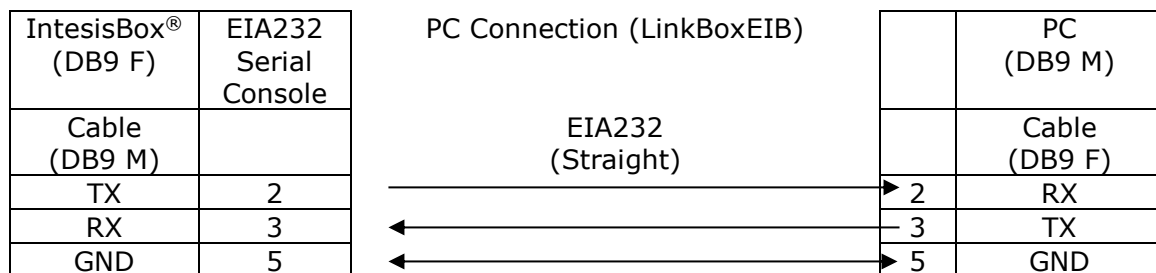
IntesisBox® (DB9 F)	EIA232 Serial Console	PC Connection (LinkBoxEIB)		PC (DB9 M)
Cable (DB9 M)		EIA232 (Straight)		Cable (DB9 F)
TX	2	→	2	RX
RX	3	←	3	TX
GND	5	← →	5	GND

Table 3.1 EIA232 serial connection pin assign

3.4 Power Device

To power up the device, what you need is to plug properly the Power Supply connector to the IntesisBox® device using a proper cable and connecting one end to the power supply connector (see **Figure 3.1**) and the other end to the power line.

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4. LinkBoxEIB. Configuration & monitoring tool for IntesisBox® KNX series

4.1 Introduction

LinkBoxEIB is a Windows® compatible software developed specifically to monitor and configure IntesisBox® KNX series.

The installation procedure and main functions are explained in the *LinkBoxEIB User Manual*. This document can be found in the Doc folder, or can be downloaded from the link indicated in the installation sheet supplied with the IntesisBox® device.

In this section, only the specific case of Panasonic indoor unit's integration to KNX networks will be covered.

4.2 Connections configuration

To configure the IntesisBox® connection parameters and to see the points list, press on the *Config* button in the *menu bar* (see Figure 4.1). The *Panasonic Configuration* window will open (see Figure 4.2). For integrations with large number of points, there is available an alternative CSV installation procedure explained in the LinkBoxEIB User Manual.
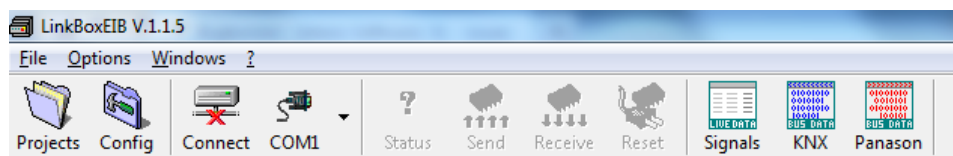

Figure 4.1 LinkBoxEIB *menu bar*

4.2.1 Configuration tab

Select the **Connection** tab to configure the connection parameters. Three subsets of information are shown in this window: EIB (KNX interface), IntesisBoxIP (IP interface for configuration) and Panasonic interface parameters (see Figure 4.2).
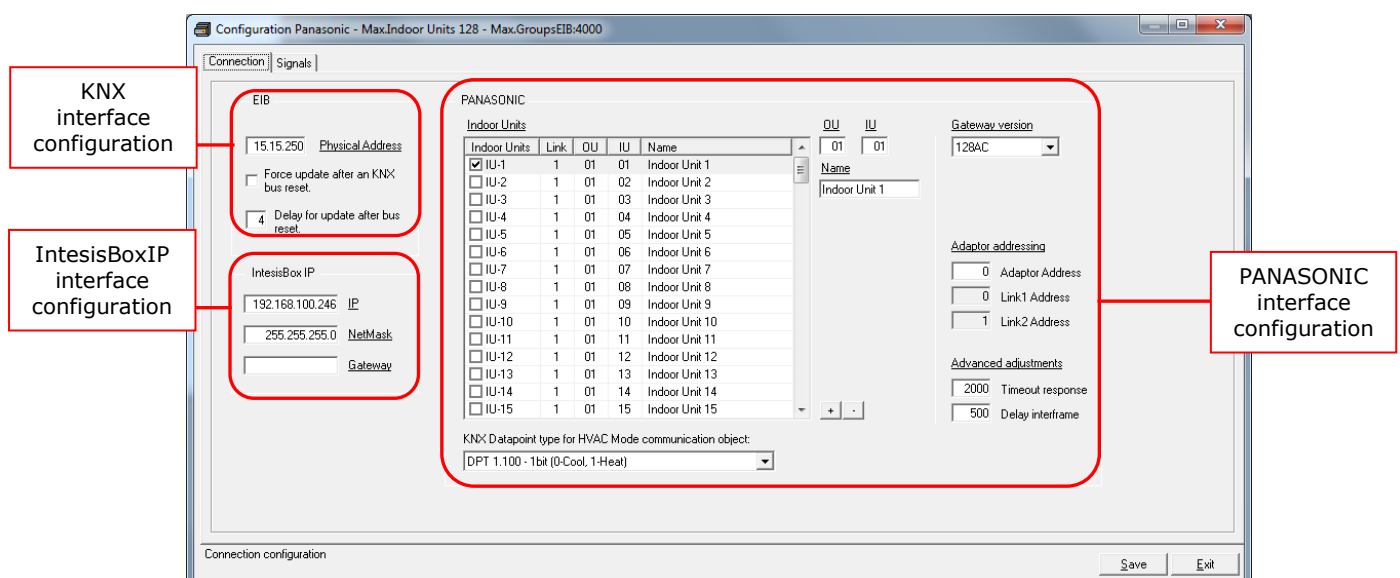

Figure 4.2 LinkBoxEIB configuration tab

Next, there is an explanation for each of the configuration parameters in each mode.

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- KNX interface configuration parameters:

Figure 4.3 KNX interface configuration

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

2. **Force update after a KNX bus reset:** Affects to the KNX groups with the Update feature activated (U).

3. **Delay for update after bus reset:** Enter the desired delay after a bus reset. It is expressed in seconds.

- IntesisBoxIP interface configuration parameters:

Figure 4.4 IntesisBoxIP interface configuration

1. **IP:** Enter the IP address for the gateway.

2. **NetMask:** Enter the IntesisBox® net mask address.

3. **Gateway:** Enter the router or default gateway address if needed. In case you don't want to use it, left blank.

- Panasonic interface configuration parameters:

Figure 4.5 Panasonic interface configuration

1. **Indoor Units:** In this list, you can individually enable each of the 128 indoor units available on the system. The index in the column "Indoor Units" (i.e. the number x in "Indoor Unit xxx") is the reference that will be used later on (in tab "Signals") to refer to this AC indoor unit. You can also change the description name of the Indoor Unit and its address to facilitate integration tasks using **OU**, **IU** and **Name** text boxes.
   NOTE: Addresses for units connected in Link2 begin at IU-65.

2. **OU:** Enter here the desired Outdoor Unit address (from 1 to 30).

3. **IU:** Enter here the desired Indoor Unit address (from 1 to 64).

4. **Name:** Enter here the desired descriptive Indoor Unit name (optional).

5. **Gateway version:** Selection of the *IntesisBox® KNX – Panasonic* gateway you are setting up (*128AC* for *PA-AC-KNX-128, 64 AC* for *PA-AC-KNX-64*).

6. **Adaptor Address:** Enter the configured address for the CZ-CFUNC2 adaptor (from 1 to 15).

7. **Link1 Address:** Enter the configured address for Link1 in the CZ-CFUNC2 adaptor (from 0 to 31).

8. **Link2 Address:** Enter the configured address for Link2 in the CZ-CFUNC2 adaptor (from 0 to 31).

9. **Timeout response:** Maximum amount of time permitted before activating the Communication Error signal. The signal error is not shown after 3 attemps. Time is expressed in milliseconds (ms) and ranges can vary from 500 ms to 10000 ms.

10. **Delay interframe:** Maximum amount of time permitted between End Of Transmission (EOT) and a new frame. It is expressed in milliseconds (ms) and ranges can vary from 10 ms to 3000 ms.

11. **+ / - :** Select or unselect all units in the **Indoor Units** list.

12. **KNX Datapoint type for HVAC Mode communication object:** Select the desired codification so the Mode object matches your integration needs.

Additional configuration parameters should generally be left to their default value. They only might need to be tuned in some very specific cases (installations with large number of units, scenarios with large bursts of commands sent at once …)

4.2.2   *Discover function*

IntesisBox® offers the possibility to check the current setup of your Panasonic project. By means of a discover function, our gateway will discover all devices connected to the CZ-CFUNC2 communication adaptor.

In order to activate this function, you must use the communication console from LinkBoxEIB. In there, you must introduce the command *DISC*. Once this is done, our gateway will show all units connected in the Panasonic system and its topology (see Figure 4.6).
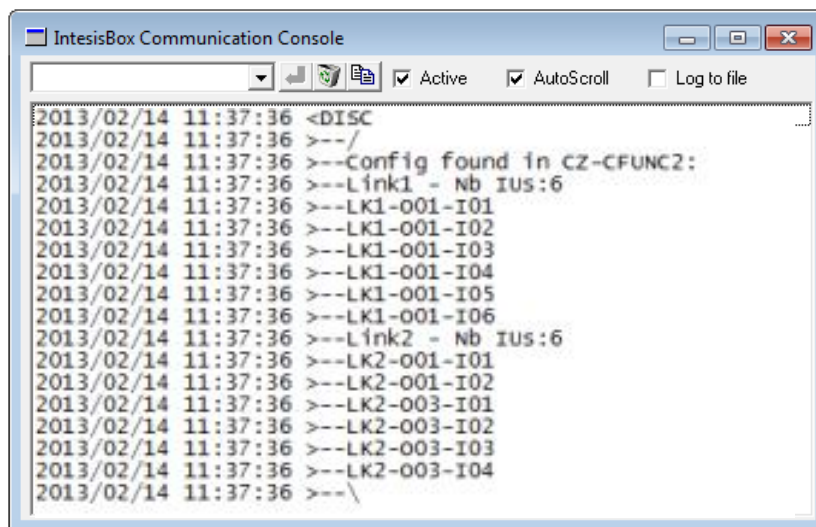

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Figure 4.6 *Disc* function on LinkBoxEIB console

In case the scan process is not finished, no indoor units will appear in the list and the number of units per link will be '0'. This behavior is associated to a "SCAN in progress..." message in the communication console and an indication of '0' indoor units per link (see Figure 4.7). This situation is produced when asking for a *DISC* command while *Scan process*, from the communication adaptor CZ-CFUNC2 is still on going.
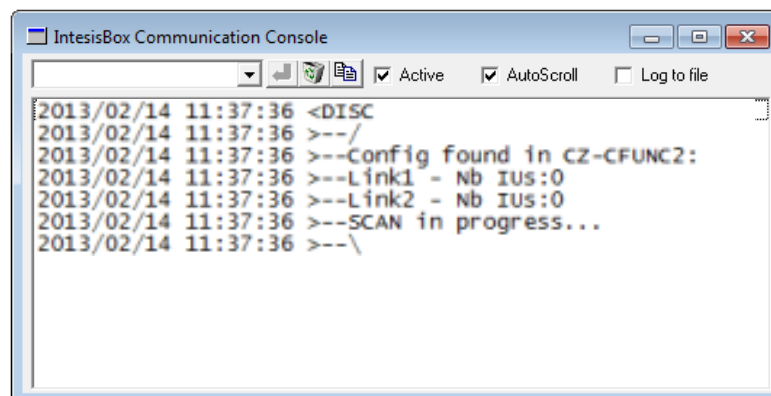

Figure 4.7 *Disc* function and Scan in progress

When the Scan process is in progress, error 258 is also enabled. Therefore, if you see error 258 active, please wait for the Scan process to finish (2 minutes approximately).

4.2.3 *Signals*

Select the Signals tab to configure the signals list (the IntesisBox® internal points).

Figure 4.8 Signal list

1. **IU:** Indoor Unit identifier.

2. ***Property*:** Identifies the different signals available per every PANASONIC group. An identification code is given to every different signal into the PANASONIC group, identifying every signal with an individual code. In section 2.2, an explanation of every signal is given. A contextual menu appears using mouse right button click over the column showing all the possible signal codes.

3. **Signal:** Signal's descriptive name (optional). Useful to identify the signal. The default descriptive name corresponds to the signal's code, but can be edited or modified.

4. **EIS:** KNX data type (Data point) to encode the signal's value. It will depend on the PANASONIC type of signal associated to it in every case. Edit using the mouse right-button-click pop-up menu available on the column. Only the EIS defined in values are allowed.

5. **Group:** 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. Formats supported are P/I/S and P/S.

6. **Listening addresses:** 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 (if W is active). Formats supported are P/I/S and P/S, comma separated.

7. **Communication object flags:**

   R: Indicates if this signal is allowed to be read from KNX system ("R" flag activated, "blank" flag not activated).

   W: Indicates if this signal is allowed to be written from KNX system ("W" flag activated, "blank" flag not activated).

   T: 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 PANASONIC side will be transmitted to the KNX system if this flag is activated ("T" flag activated, "blank" flag not activated).

   U: Indicates if this signal will be updated (sending read requests) whenever IntesisBox® starts up or after a KNX bus reset ("U" flag activated for the main group address, "U2" activated for the listening group address, "blank" flag not activated).[1]

---

[1] 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.

8. **Active:** Indicates if the signal is active or not for the current configuration ("1-Yes" signal active, "0-No" signal not active).

See section 2.2 for further detail on available signals and the possible values on each one.

4.3 Sending the configuration to IntesisBox®
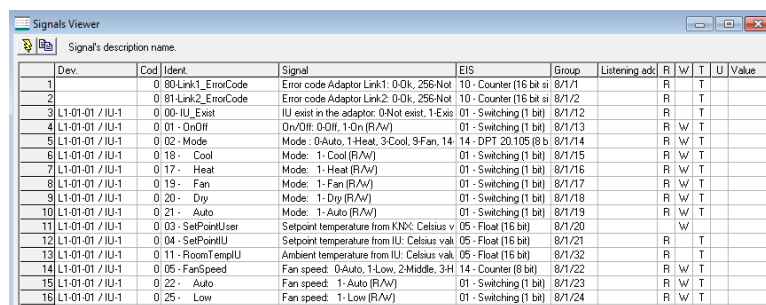
When the configuration is finished, follow the next steps.

1.- Click on **Save** button to save the project to the project folder on your hard disk (more information in LinkBoxEIB User 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 (PANASONIC.Lbox) containing the configuration for the gateway will be generated and saved also into the project folder.

   b.- If **NO** is selected, remember that the binary file with the project needs to be generated before the IntesisBox® starts to work as expected.

3.- Once in the configuration window again, click on **exit**. Configuration file is ready to be sent to the IntesisBox® device.

4.- Press the **Send File** button to send the binary file to the IntesisBox® device. The process of file transmission can be monitored in the IntesisBox® Communication Console window. IntesisBox® will reboot automatically once the new configuration is loaded.

After any configuration change, do not forget to send the configuration file to the IntesisBox® using button Send File.

4.4 Signals viewer

Once the gateway is running with the correct configuration, to supervise the status of the configured signals, press the **Signals** button on the *menu* bar (see Figure 4.1). The Signals Viewer window will open (see Figure 4.9).

This window shows all signals active within the gateway with its main configuration parameters and its real time value[1] in the **Value** column.

Figure 4.9 LinkBoxEIB Signals Viewer

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[1] In case you connect to the IntesisBox® when it's been running for a certain time, you should press the *Refresh* button to get updated values. After pressing *Refresh*, all signal values will keep continuously updated until the connection is closed.

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The signals viewer can be used even though only one system is connected to the IntesisBox®, KNX or Panasonic AC. Therefore, it becomes convenient for supervision and testing the system.

In order to force a specific value to a signal, double-click its row in the table. This will display a dialog in which the desired value can be entered (see Figure 4.10). Changing its value in this way, will make:

- The content of the corresponding KNX group address will be changed to this value.
- If the signal is write-enabled, it will trigger a suitable command to Panasonic AC system.
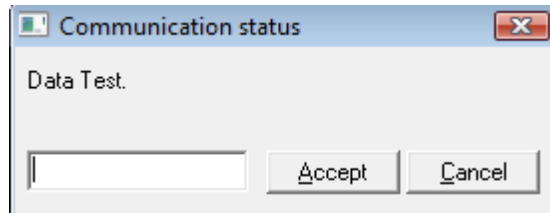
Figure 4.10 Signal value change window

4.5 Files

LinkBoxEIB saves the integration configuration in the following files inside the project folder:

PROJECT.INI	INI file containing general information related to the project.
PANASONIC.INI	INI file containing information related with the values configured through the "Connection" tab in IntesisBox® configuration.
PANASONIC.LBOX	Binary file created from the information in the files described above. This is the file downloaded to the IntesisBox®.
PANASONIC.dat	ASCII file containing the configuration of the project signals. It is the one to be used for bulk point configuration.

Table 4.1 LinkBoxEIB generated files during Project creation

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

The configuration cannot be uploaded from the gateway to LinkBoxEIB, it can only be downloaded.

5. IntesisBox® and ETS
5.1 Integration of IntesisBox® in ETS

As explained the IntesisBox® is configured with the LinkBoxEIB 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®.

The dummy device can be downloaded from:
http://www.intesis.com/down/eib/Dummy_Intesis.zip

6. Setup process and troubleshooting

6.1 Pre-requisites

It is necessary to have the KNX bus operative and well connected to the KNX port of IntesisBox®.

Connectors, connection cables, PC for LinkBoxEIB, and other auxiliary material, if needed, are not supplied by Intesis Software for this standard integration. Items supplied by Intesis Software for this integration are:

- IntesisBox® KNX device with full Panasonic CZ-CFUNC2 compatibility without extra components.
- Power supply to power IntesisBox® (European plug type).
- Access to LinkBoxEIB software download site to configure IntesisBox®.
- Console cable needed to download the configuration to IntesisBox®.
- Product documentation.

6.2 *Setup* procedure

1. Install LinkBoxEIB on your laptop, use the setup program supplied for this and follow the instructions given by the Installation Wizard.

2. Install IntesisBox® in the desired installation site. For your convenience, check external enclosure measures (see 7) before deciding where to place the IntesisBox® device.

3. Connect the communication cable coming from the KNX bus to the IntesisBox® KNX port (See 0 for more information on connection procedure).

4. Connect to the Panasonic CZ-CFUNC2 communication adaptor through the EIA485 cable to the IntesisBox® port marked as CZ-CFUNC2 (see 3.1).

5. Select the appropriate scan mode for the CZ-CFUNC2 communication adaptor. To properly communicate with the IntesisBox®, please check:

    - **Initial communication setting** item (8.SCAn.x) is set to '0' (default value).

    - **Adaptor number setting** item (1.Ano.xx) matches LinkBoxEIB **Adaptor address** value.

    - *Instructions for the Electrical Installer* (CZ-CFUNC2) document for further information.

    Modifying some other parameters can affect proper communication.

    Please, remember that scanning procedure is only carried out when powering the IntesisBox® device.

6. Connect the IntesisBox® device to the power line (see 3.4).

7. Connect the communication cable coming from the serial port of your laptop/desktop PC to the IntesisBox® port marked as EIA232 Console (see 3.3).

8. Open LinkBoxEIB and proceed as explained in section 4.

6.3 Troubleshooting

If IntesisBox® is not working properly or even not working at all, please check the following conditions to be accomplished.

6.3.1 Physical checking

First point to look at to make sure that IntesisBox® is not working properly is to check physical connections:

> 1.- Make sure that the power plug is correctly connected and current is available in the power line.

> 2.- Check EIA485 cable connection.

6.3.2 Software checking

Once physical connections have been checked, if functioning problems still remain, please use the LinkBoxEIB tool to monitor the working status of the device.

- To check the KNX communication status, click on the **KNX** button in the *menu bar* (see Figure 4.1).
- To check the PANASONIC communication status, click on the **PANASONIC** button, also in the *menu bar* (see Figure 4.1).
- To check the signal values in the KNX communication objects, click on the **Signals** button, also in the *menu bar* (see Figure 4.1).

Further information regarding the monitoring procedure and the information provided in each window can be consulted in the LinkBoxEIB Manual.

6.3.3 Power cycle issue

When there is a power blackout, it is important to keep in mind that the device power up order. Ideally, both devices should start up at the same time.

To make it easier, it is recommended to have both devices plugged in the same power line, so both will turn on at a time. In case this is not possible, please make sure that first you turn on the CZ-CFUNC2 communication adaptor and later the IntesisBox®.

6.3.4 256, 257 and 258 Error

Those errors are used by IntesisBox® to check proper communication between CZ-CFUNC2 and the PA-AC-KNX-64/128 device and to confirm the presence of indoor units in the adaptor link.

During scanning process, error 258 is shown to indicate that this process is ongoing. If during the scanning process one of the adaptors is not answering, the error code for the adaptor will be 256 (communication error). If it answers, it will keep the 258 value.

After this first tracking cycle, every indoor unit is checked one by one. If the indoor unit is not found, a 257 error will be shown for that indoor unit. Error 257 prevails in front of error 256.

During normal functioning period (polling), after setup process, if there is an error in any adaptor or indoor unit this error will be shown in the proper communication object with is current value.

7. Mechanical & Electrical features

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: 0.5 … 2.5mm^2 2 cores: 0.5 … 1.5mm^2 3 cores: not permitted
Mounting	Wall mount ready. DIN rail EN60715 TH35.
CZ-CFUNC2 Port	1 x EIA485 Plug-in screw terminal block (2 poles)
Ethernet Port	1 x Ethernet 10Base-T (RJ45)
KNX Port	1 x KNX TP1 (EIB) port opto-isolated. Plug-in terminal bloc (2 poles). TNV-1
LED indicators	1 x Power. 2 x KNX port activity (Tx, Rx) 2 x Ethernet port (LNK, ACT)
Console port	EIA232. DB9 female connector (DCE). SELV
Configuration	Via console port.[1]
Firmware	Allows upgrades via console port.
Operational temperature	0°C to +40°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

Table 7.1 IntesisBox® Mechanical and Electrical Characteristics

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[1] Standard cable DB9male-DB9 female 1,8 meter long is supplied with the device for connection to a PC COM port for configuring and monitoring the device. The configuration software, compatible with Windows® operating systems, is also supplied.

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Power

Ethernet port

KNX port

CZ-CFUNC2 port

Console port

58 mm

107 mm

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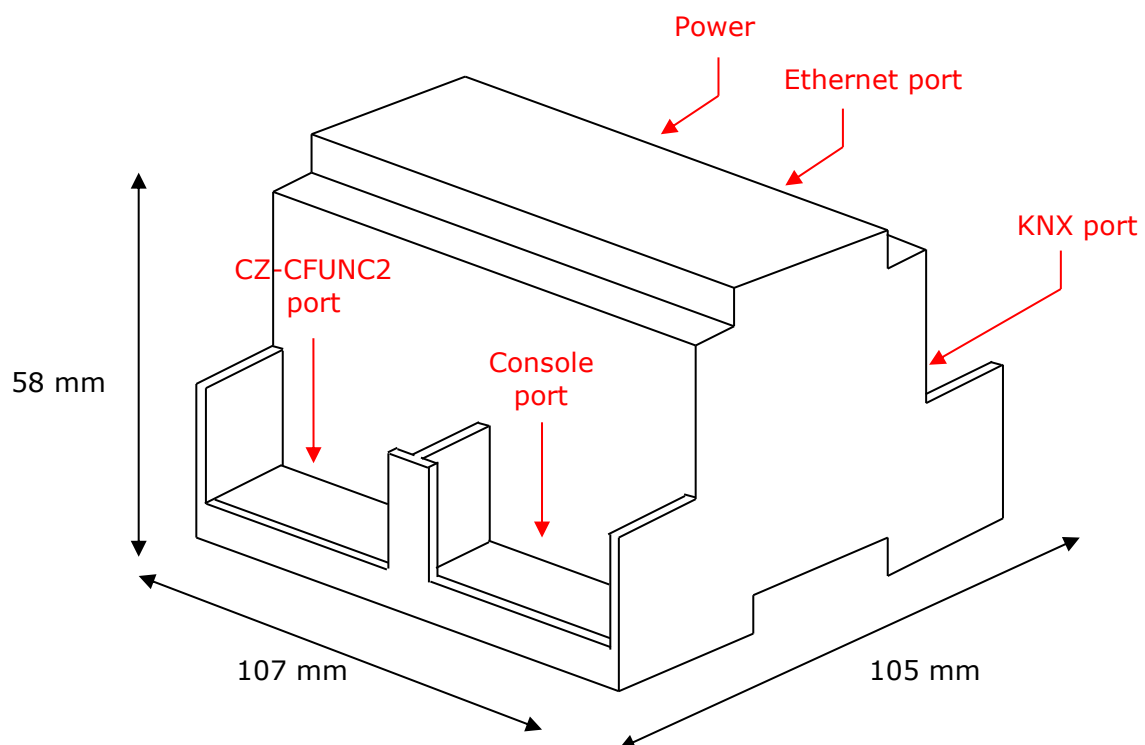
Free space recommended in the install location of the device, with spacing enough for external connections.

100 mm

115 mm

130 mm
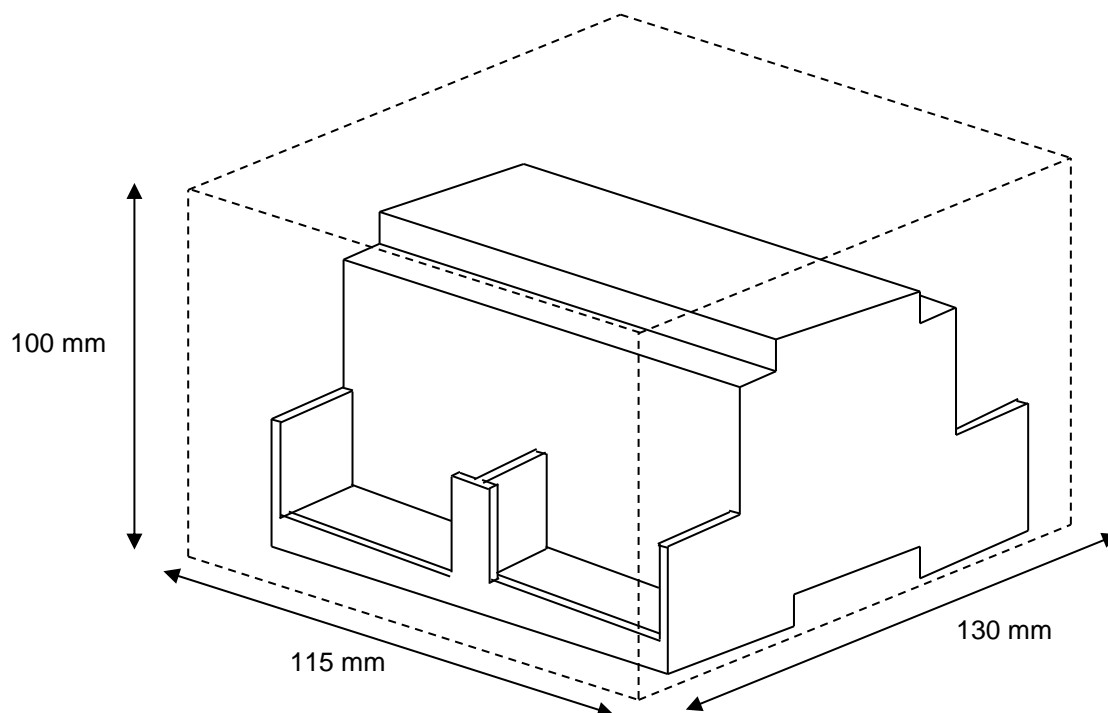
IntesisBox®

8. AC Unit Types compatibility

Please, check compatibility list at to know which Panasonic ECOi and PACi are compatible with our gateway.

http://www.intesis.com/pdf/IntesisBox_PA-RC2-xxx-1_Panasonic_Compatibility.pdf

9. Error codes

This list contains all possible values shown in KNX communication objects for "Error Code".

Error Code	Error in Control Panel	Error category	Error Description
0	N/A	IntesisBox	No active error
1	A01	GHP Engine Issues	GHP - Engine oil pressure fault
2	A02		GHP - Engine oil level fault
3	A03		GHP - Engine over speed
4	A04		GHP - Engine under speed
5	A05		GHP - Ignition power supply failure
6	A06		GHP - Engine start up failure
7	A07		GHP - Fuel gas valve failure
8	A08		GHP - Engine stalled
9	A09		GHP - Engine overload
10	A10		GHP - High exhaust gas temp
11	A11		GHP - Engine oil level failure
12	A12		GHP - Throttle actuator fault
13	A13		GHP - Fuel gas valve adjustment failure
14	A14		GHP - Engine oil pressure sensor fault
15	A15		GHP - Starter power output short circuit
16	A16		GHP - Starter motor locked
17	A17		GHP - Starter current (CT) coil failed
19	A19		GHP - Wax Valve (3 Way) fault
20	A20		GHP - Cooling water temp high
21	A21		GHP - Cooling water level fault
22	A22		GHP - Cooling water pump fault
23	A23		GHP - Engine crank angle sensor failure
24	A24		GHP - Engine cam angle sensor failure
25	A25		GHP - Clutch fault
26	A26		GHP - Misfire
27	A27		GHP - Catalyst temperature fault
28	A28		GHP - Generator fault
29	A29		GHP - Converter fault
30	A30		GHP - Fuel gas pressure low
33	C01	Central Controller Issues	Duplicated setting of control address
34	C02		Central control number of units mis-matched
35	C03		Incorrect wiring of central control
36	C04		Incorrect connection of central control
37	C05		System Controller fault, error in transmitting comms signal, i/door or o/door unit not working, wiring fault
38	C06		System Controller fault, error in receiving comms signal, i/door or o/door unit not working, wiring fault, CN1 not connected correctly
44	C12		Batch alarm by local controller
48	C16		Transmission error from adaptor to unit
49	C17		Reception error to adaptor from unit
50	C18		Duplicate central address in adaptor
51	C19		Duplicate adaptor address

52	C20		Mix of PAC & GHP type units on adaptor
53	C21		Memory fault in adaptor
54	C22		Incorrect address setting in adaptor
55	C23		Host terminal software failure
56	C24		Host terminal hardware failure
57	C25		Host terminal processing failure
58	C26		Host terminal communication failure
60	C28		Reception error of S-DDC from host terminal
61	C29		Initialization failure of S-DDC
63	C31		Configuration change detected by adaptor
65	E01	Addressing and Communication Problems	Remote control detecting error from indoor unit, Address not set/Auto address failed. Check interconnecting wiring etc. Re-address system.
66	E02		Remote detecting error from indoor unit,
67	E03		Indoor unit detecting error from remote,
68	E04		Indoor seeing error from outdoor. Qty of i/d units connected are less than qty set. Check; all i/d units are ON, reset turn off all units wait 5min power up
69	E05		Indoor unit detecting error from outdoor unit, Error in sending comms signal
70	E06		Outdoor unit detecting error from indoor unit, Error in receiving comms signal
71	E07		Outdoor unit detecting error from indoor unit, Error in sending comms signal
72	E08		Incorrect setting indoor/controller, Indoor address duplicated
73	E09		Incorrect setting indoor/controller, Remote address duplicated or IR wireless controller not disabled
74	E10		Indoor unit detecting error from 'option' plug, Error in sending comms signal
75	E11		Indoor unit detecting error from 'option' plug, Error in receiving comms signal
76	E12		Auto addressing failed, Auto address connector CN100 shorted during auto addressing
77	E13		Indoor unit failed to send signal to remote controller
78	E14		Setting Failure, Duplication of master indoor units
79	E15		Auto addressing failed, Number of indoor units connected are less than number set
80	E16		Auto addressing failed, Number of indoor units connected are more than number set
81	E17		Group control wiring error, Main indoor unit not sending signal for sub indoor units
82	E18		Group control wiring error, Main indoor unit not receiving signal for sub indoor units
84	E20		Auto addressing failed, No indoor units connected
88	E24		Auto addressing failed, Error on sub outdoor unit
89	E25		Auto addressing failed, Error on outdoor unit address setting
90	E26		Auto addressing failed, Quantity of main and sub outdoor units do not correspond to the number set on main outdoor unit P.C.B.
93	E29		Auto addressing failed, Sub outdoor unit not receiving comms for main outdoor unit
95	E31		Between units, Comms failure with MDC, does E31 remain after power is re-instated? If so replace PCB. & power PCB
97	F01	Sensor Faults	Indoor Heat Exch inlet temp sensor failure (E1)
98	F02		Indoor Heat Exch freeze temp sensor failure (E2)
99	F03		Indoor Heat Exch outlet temp sensor failure (E3)
100	F04		Outdoor Discharge temp sensor failure (TD) or (DISCH1)
101	F05		Outdoor Discharge temp sensor failure (DISCH2)

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102	F06		Outdoor Heat Exch temp sensor failure (C1) or (EXG1)
103	F07		Outdoor Heat Exch temp sensor failure (C2) or (EXL1)
104	F08		Outdoor Air temp sensor failure (TO)
106	F10		Indoor inlet temp sensor failure
107	F11		Indoor outlet temp sensor failure
108	F12		Outdoor Intake sensor failure (TS)
109	F13		GHP - Cooling water temperature sensor failure
112	F16		Outdoor High pressure sensor failure
113	F17		GHP - Cooling water temperature sensor fault
114	F18		GHP - Exhaust gas temperature sensor fault
116	F20		GHP Clutch coil temperature fault
119	F23		Outdoor Heat Exch temp sensor failure (EXG2)
120	F24		Outdoor Heat Exch temp sensor failure (EXL2)
125	F29		Indoor EEPROM error
126	F30		Clock Function (RTC) fault
127	F31		Outdoor EEPROM error
129	H01	Compress or Issues	Compressor Fault, Over current (Comp1)
130	H02		Compressor Fault, Locked rota current detected (Comp1)
131	H03		Compressor Fault, No current detected (Comp1)
133	H05		Compressor Fault, Discharge temp not detected (Comp1)
134	H06		Compressor Fault, Low Pressure trip
135	H07		Compressor Fault, Low oil level
136	H08		Compressor Fault, Oil sensor Fault (Comp1)
139	H11		Compressor Fault, Over current (Comp2)
140	H12		Compressor Fault, Locked rota current detected (Comp2)
141	H13		Compressor Fault, No current detected (Comp2)
143	H15		Compressor Fault, Discharge temp not detected (Comp2)
149	H21		Compressor Fault, Over current (Comp3)
150	H22		Compressor Fault, Locked rota current detected (Comp3)
151	H23		Compressor Fault, No current detected (Comp3)
153	H25		Compressor Fault, Discharge temp not detected (Comp3)
155	H27		Compressor Fault, Oil sensor fault (Comp2)
156	H28		Compressor Fault. Oil sensor (connection failure)
159	H31		Compressor Fault. IPM trip (IMP current on temperature)
193	L01	Incorrect Settings	Setting Error, Indoor unit group setting error
194	L02		Setting Error, Indoor/outdoor unit type/model miss-matched
195	L03		Duplication of main indoor unit address in group control
196	L04		Duplication of outdoor unit system address
197	L05		2 or more controllers have been set as 'priority' in one system - shown on controllers set as 'priority'
198	L06		2 or more controllers have been set as 'priority' in one system - shown on controllers not set as 'priority'
199	L07		Group wiring connected on and individual indoor unit
200	L08		Indoor unit address/group not set
201	L09		Indoor unit capacity code not set
202	L10		Outdoor unit capacity code not set
203	L11		Group control wiring incorrect
205	L13		Indoor unit type setting error, capacity
207	L15		Indoor unit paring fault
208	L16		Water heat exch unit setting failure
209	L17		Miss-match of outdoor unit with different refrigerant
210	L18		4-way valve failure
211	L19		Water heat exch unit duplicated address
213	L21		Gas type setup failure
225	P01		Indoor unit fault, Fan motor thermal overload

226	P02		Outdoor unit fault, Compressor motor thermal overload, over or under voltage
227	P03		Outdoor unit fault, Compressor discharge temperature too high (Comp1) over 111 ºC. Low on ref gas, exp valve, pipework damage.
228	P04		Outdoor unit fault, High pressure trip
229	P05		Outdoor unit fault, Open phase on power supply. Check power on each phase, inverter pcb, control pcb
233	P09		Indoor unit fault, Ceiling panel incorrectly wired
234	P10		Indoor unit fault, Condensate float switch opened
235	P11		GHP - Water Heat exch low temp (frost protection) fault
236	P12		Indoor unit fault, Fan DC motor fault
238	P14		Input from leak detector (If fitted)
239	P15		Refrigerant loss, high discharge temp and EEV wide open and low compressor current draw.
240	P16		Outdoor unit fault, Open phase on compressor power supply
241	P17	Indoor Unit Problems	Outdoor unit fault, Compressor discharge temperature too high (Comp2) over 111 degC. Low on ref gas, exp valve, pipework damage.
242	P18		Outdoor unit fault, By-pass valve failure
243	P19		Outdoor unit fault, 4 way valve failure, i/door temp rises in cooling or fills in heating. Check wiring, coil, pcb output, valve operation.
244	P20		Ref gas, high temp/pressure fault, heat exch temp high C2, 55-60 degC, cooling over-load, sensor fault.
246	P22		Outdoor unit fan motor fault, fan blade jammed, check connections, does fan turn freely, motor resistance 30-40ohm on each pair, no fan fault, yes pcb fault.
250	P26		Outdoor unit fault, Compressor overcurrent - check winding resistance, Inverter failure - check internal resistance term HIC + & - to UVW 200-300Kohm or more
252	P29		Outdoor unit fault, Inverter circuit fault - Motor-current Detection Circuit (MDC) fault, check comp windings, sensors C1 & TS, if ok possible pcb failure.
253	P30		Indoor unit fault, System controller detected fault on sub indoor unit
255	P31		Simultaneous operation multi control fault, Group controller fault
256	N/A	IntesisBox	Error in the communication of PA-AC-KNX-64/128 device with the CZ-CFUNC2 communication adaptor.
257	N/A		Indoor Unit doesn't exist
258	N/A		Scan in process

Table 9.1 Error codes

In case you detect an error code not listed, contact your nearest PANASONIC technical support service.