



IntesisBox Modbus Server

Panasonic Air Conditioning

User's Manual

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Intesis

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Gateway for Panasonic air conditioning systems integration into Modbus (RTU and TCP) control and monitoring systems.

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

PA-AC-MBS-64

Model supporting up to 64 indoor units.

PA-AC-MBS-128

Model supporting up to 128 indoor units.

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1. Description

1.1 Introduction

IntesisBox Modbus Server – Panasonic AC is a communication gateway for Panasonic air conditioning systems to Modbus slave (RTU and TCP).

This gateway allows integrating a Panasonic AC system inside a supervision/control/automation system through PLC, SCADA, and in general through any device or system with Modbus mastering (TCP or RTU) interface.

IntesisBox connects to the Panasonic CZ-CFUNC2 communication adaptor.

Up to 128 indoor units supported.

This document assumes that the user is familiar with Modbus and Panasonic technologies and their technical terms.

1.2 Integration signals

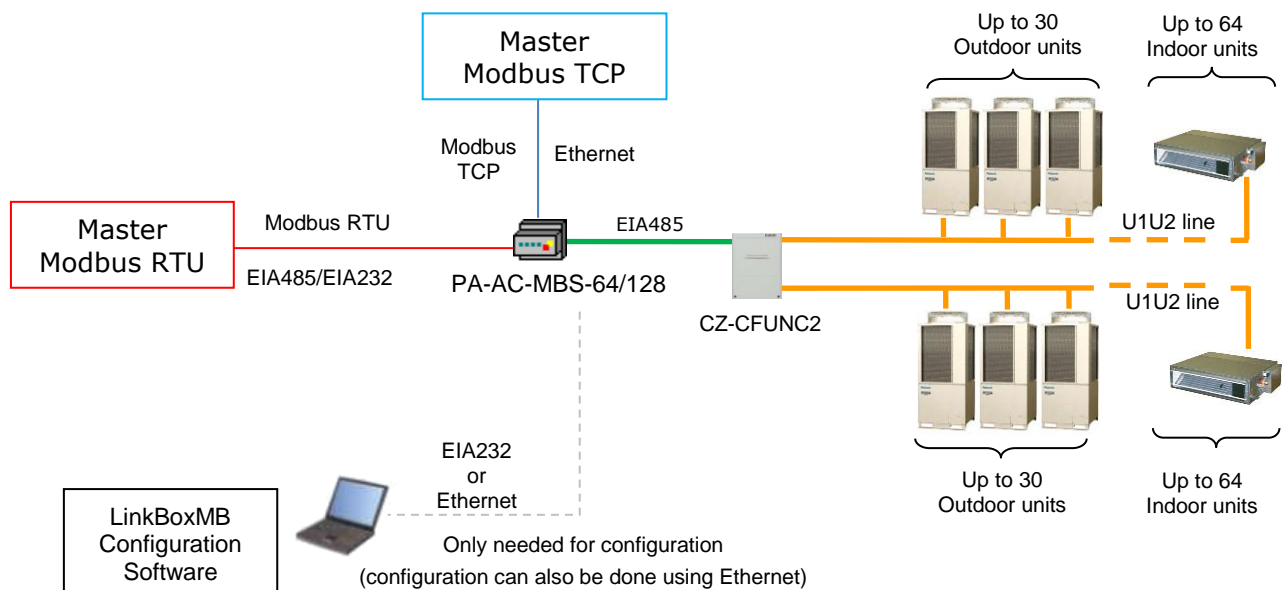
Following is the list of parameters that can be monitored/controlled on the indoor and outdoor units using IntesisBox:

- For all **indoor units** in the system:
 - Adaptor Link 1/2 Error Code (read-only)
 - On/Off (write-only)
 - Operating Mode (write-only)
 - Setpoint Temperature (write-only)
 - Remote Lock (write-only)
 - Fan Speed (write-only)
 - Occupancy (R/W)
 - Occupancy Heat/Cool setpoint (R/W)
 - Unoccupancy Heat/Cool setpoint (R/W)
 - Occupancy Continuous Check (R/W)
 - Occupancy (R/W)
 - Consumption reset (write-only)

- For each **indoor unit** in the system:
 - AC Unit presence in the system (read-only)
 - On/Off (R/W)
 - Operating Mode (R/W)
 - Setpoint Temperature (R/W)
 - Ambient Temperature (read-only)
 - Fan Speed (R/W)
 - Air Direction (R/W)
 - Filter Sign (read-only)
 - Filter Reset (write-only)
 - Error Code (read-only)
 - Remote Lock (R/W)
 - Occupancy (R/W)
 - Yesterday's consumption (read-only)
 - Today's consumption (read-only)
 - Total consumption (read-only)

1.3 Functionality

Every mentioned signal is associated to a predefined fixed Modbus address. Therefore, all the system is seen as a single Modbus slave unit with a fixed Modbus address map.



Different Modbus Modes can active with IntesisBox: Modbus RTU, Modbus TCP or both simultaneously.

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 the Modbus side.

The role of IntesisBox consists in associate the elements of the CZ-CFUNC2 communication adaptor with Modbus registers.

The control of the indoor units through the CZ-CFUNC2 communication adaptor is permitted, so commands toward the CZ-CFUNC2 communication adaptor are permitted. When a write is done from Modbus in a gateway's write-enabled Modbus address, the corresponding order is sent to the associated Panasonic signal.

In the continuous polling of each Indoor Unit, if no response of a certain unit is detected, the corresponding virtual signal inside the gateway will be activated indicating communication error with the Indoor Unit.

1.4 Capacity of IntesisBox

Element	Max.	Notes
Number of indoor units	128 *	Maximum number of AC indoor units that can be controlled
Number of points per indoor unit	15	Modbus addresses per indoor unit
Maximum number of points	2600*	Valid Modbus addresses
Maximum TCP master connections	2	Maximum number of TCP simultaneous Modbus Master connections
Maximum RTU master connections	1	Maximum number of RTU simultaneous Modbus Master connections

*There are different models of *IntesisBox Modbus Server – PANASONIC AC* each with different capacity. The table above shows the capacity for the top model (with maximum capacity).

Their order codes are:

- Model supporting up to 64 Panasonic indoor units. *Ref.: PA-AC-MBS-64*
- Model supporting up to 128 Panasonic indoor units. *Ref.: PA-AC-MBS-128*

2. Modbus interface of IntesisBox

2.1 Functions supported

This part is common for Modbus RTU and TCP.

Modbus functions 03 and 04 (*read holding registers* and *read input registers*) can be used to read Modbus registers.

Modbus function 06 and 16 (*Single Holding Registers* and *Multiple Holding Registers*) must be used to write Modbus registers.

As per Modbus standard specification, register contents are always expressed in MSB..LSB, but can be modified using LinkBoxMB configuration software.

Modbus error codes are fully supported, they will be sent whenever a non-valid Modbus action or address is required.

2.2 Modbus RTU

Baud rate can be selected from 1200, 2400, 4800, 9600, 19200, 38400 and 56700 (Data Bits: 8, parity: none, Stop Bits: 1).

Modbus slave number can be configured. Physical connection (EIA232 or EIA485) can also be selected.

Only the lines RX, TX and GND of the EIA232 connector are used (TX and RX for EIA485).

2.3 Modbus TCP

The TCP port to use can be configured (by default 502 is used).

The IP address, subnet mask and default gateway address to use by IntesisBox can be also configured.

2.4 Address Map

Address map is fixed for each indoor unit and can be consulted as explained in the following tables. Please, remember that in the tables **R/W** stands for *Read* and *Write*, **R** stands for *Read Only* and **W** stands for *Write Only*.

2.4.1 Modbus addresses related to IntesisBox and CZ-CFUNC2 communication

Modbus address (base addr is 1)	Modbus register type (R/W)	Signal description and values
1	R	Adaptor Link1 ErrorCode <ul style="list-style-type: none"> 1...255: AC error code; 256: Adaptor Error; 257: Not exist; 258: Scan in process; 259: No error
2	R	Adaptor Link2 ErrorCode <ul style="list-style-type: none"> 1...255: AC error code; 256: Adaptor Error; 257: Not exist; 258: Scan in process; 259: No error

2.4.2 Modbus addresses related to All Indoor Units Controlled/Monitored at once

Modbus address (base addr is 1)	Modbus register type (R/W)	Signal description and values
3	W	OnOff All <ul style="list-style-type: none"> • 0: OFF • 1: ON
4	W	ModeAll <ul style="list-style-type: none"> • 1: Heat • 2: Cool • 3: Fan • 4: Dry • 5: Auto
5	W	Setpoint All <ul style="list-style-type: none"> • -15 °C 60°C • 5 °F ... 140°F
6	W	FanSpeedAll <ul style="list-style-type: none"> • 1: Low • 2: Medium • 3: High • 4: auto
7	W	RemoteLockAll <ul style="list-style-type: none"> • 32: No Lock • 1...31 Lock FAN/AIR/TEM/MOD/ON (Check table below)
8	W	OccupancyAll <ul style="list-style-type: none"> • 1: Occupied • 2: Unoccupied • 3: Disabled
9	R/W	Occ. Cool Setpoint <ul style="list-style-type: none"> • -15 °C 60°C • 5 °F ... 140°F
10	R/W	Occ. Heat Setpoint <ul style="list-style-type: none"> • -15 °C 60°C • 5 °F ... 140°F
11	R/W	Unocc. Cool Setpoint <ul style="list-style-type: none"> • -15 °C 60°C • 5 °F ... 140°F
12	R/W	Unocc. Heat Setpoint <ul style="list-style-type: none"> • -15 °C 60°C • 5 °F ... 140°F
13	R/W	Occ. Continuous Check <ul style="list-style-type: none"> • 0: Disabled • 1: Enabled
14	R/W	Unocc. Deadband Action <ul style="list-style-type: none"> • 0: Off • 1: Current mode
15	W	Consumption Reset <ul style="list-style-type: none"> • 1: Reset

Remote Control Lock table

Remote control lock can be set using the values in the following correspondence table.

OO: On / Off
 OM: Operation Mode
 SP: Set Point
 AD: Air Direction
 FS: Fan Speed

Modbus value	Functions locked
1	--/--/--/--/OO
2	--/--/--/OM/--
3	--/--/--/OM/OO
4	--/--/SP/--/--
5	--/--/SP/--/OO
6	--/--/SP/OM/--
7	--/--/SP/OM/OO
8	--/AD/--/--/--
9	--/AD/--/--/OO
10	--/AD/--/OM/--
11	--/AD/--/OM/OO
12	--/AD/SP/--/--
13	--/AD/SP/--/OO
14	--/AD/SP/OM/--
15	--/AD/SP/OM/OO
16	FS/--/--/--/--
17	FS/--/--/--/OO
18	FS/--/--/OM/--
19	FS/--/--/OM/OO
20	FS/--/SP/--/--
21	FS/--/SP/--/OO
22	FS/--/SP/OM/--
23	FS/--/SP/OM/OO
24	FS/AD/--/--/--
25	FS/AD/--/--/OO
26	FS/AD/--/OM/--
27	FS/AD/--/OM/OO
28	FS/AD/SP/--/--
29	FS/AD/SP/--/OO
30	FS/AD/SP/OM/--
31	FS/AD/SP/OM/OO

2.4.3 Modbus addresses related to each Indoor Unit

Indoor unit number	Modbus address (base addr is 1)	Modbus register type (R/W)	Signal description and values
n*	n x 20 + 1	R	Indoor Unit Exist <ul style="list-style-type: none"> 0: AC Unit Not Exist 1: AC Unit exist
	n x 20 + 2	R/W	Indoor Unit On/Off <ul style="list-style-type: none"> 0: Off 1: On
	n x 20 + 3	R/W	Indoor Unit Mode <ul style="list-style-type: none"> 1: Cool 2: Heat 3: Dry 4: Fan 5: Auto
	n x 20 + 4	R/W	Indoor Unit Setpoint temperature <ul style="list-style-type: none"> -15 °C ... 60°C 5 °F ... 140°F
	n x 20 + 5	R	Room temperature <ul style="list-style-type: none"> -15 °C ... 60°C 5 °F ... 140°F
	n x 20 + 6	R/W	Indoor Unit Fan Speed <ul style="list-style-type: none"> 0: Stop 1: Swing Up/Down 2: Swing Left/Right 3: Swing Up/Down & Left/Right <i>(This parameter is not applicable for ERV units)</i>
	n x 20 + 7	R/W	Indoor Unit Air direction <ul style="list-style-type: none"> 0: Stop 1: Swing Up/Down 2: Swing Left/Right 3: Swing Up/Down & Left/Right
	n x 20 + 8	R	Indoor Unit Filter Sign <ul style="list-style-type: none"> 0: Remote Controller Enabled 1: Remote Controller Disabled
	n x 20 + 9	W	Indoor Unit Filter Reset <ul style="list-style-type: none"> 0: Filter Alarm Not Present 1: Filter Alarm Present
	n x 20 + 10	R/W	Indoor Unit Error Code <ul style="list-style-type: none"> 0: No Error 100-999: Error Code¹
	n x 20 + 11	R/W	Indoor Unit Remote Lock <ul style="list-style-type: none"> 1: Clear Filter Alarm
	n x 20 + 12	R/W	Indoor Unit Occupancy <ul style="list-style-type: none"> 0: Last Command execution OK (or value has been cleared) 1: Last Command execution failed
	n x 20 + 13	R	Indoor Unit Consumption Yesterday <ul style="list-style-type: none"> Yesterday's consumption expressed in kWh
	n x 20 + 15	R	Indoor Unit Consumption Today <ul style="list-style-type: none"> Today's consumption expressed in kWh
n x 20 + 17	R	Indoor Unit Consumption Total <ul style="list-style-type: none"> Total consumption expressed in kWh 	

*n is the indoor unit index value. (1..128). This information can be extracted automatically using the DISC function.

¹ See list of indoor unit error codes and their meaning in section 9

3. LinkBoxMB. Configuration & monitoring tool.

3.1 Introduction

LinkBoxMB is a Windows® compatible software developed specifically to monitor and configure IntesisBox Modbus Server series.

The installation procedure and main functions are explained in the *LinkBoxMB 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 Modbus networks will be covered.

3.2 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 3.1). The *Panasonic Configuration* window will open (see **Figure 3.2**). For integrations with large number of points, there is available an alternative CSV installation procedure explained in the LinkBoxMB User Manual.

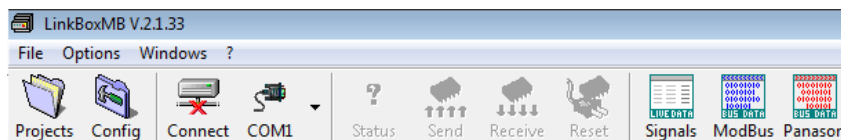


Figure 3.1 LinkBoxMB menu bar

3.2.1 Configuration tab

Select the **Connection** tab to configure the connection parameters. Two subsets of information are shown in this window: Modbus RTU, Modbus TCP and Panasonic interfaces parameters (see **Figure 3.2**).

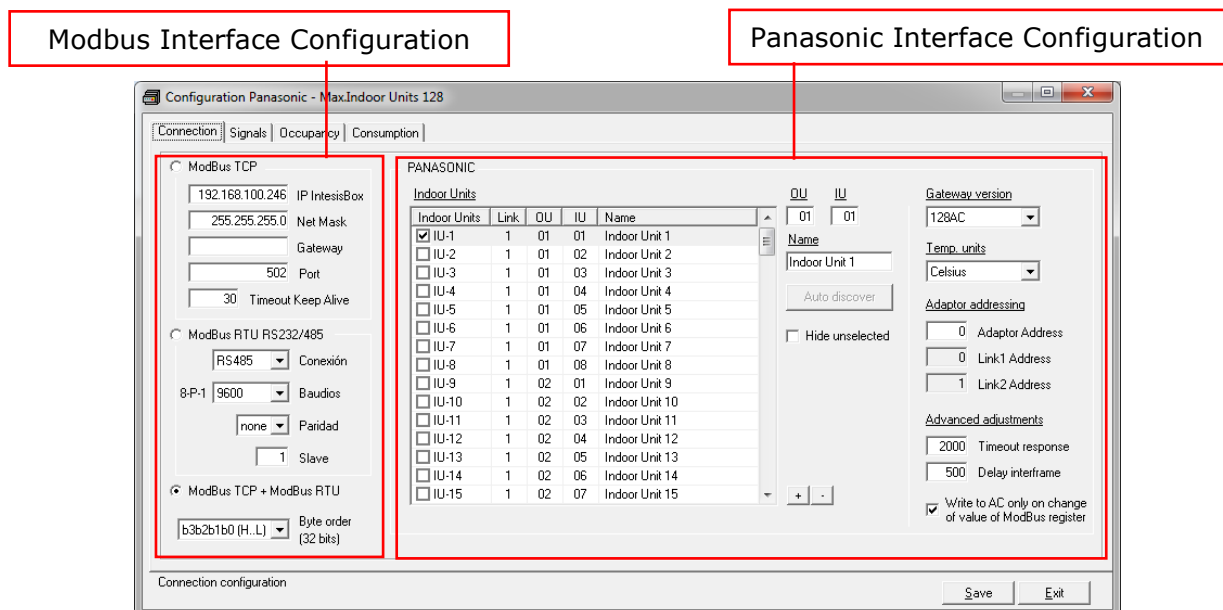


Figure 3.2 LinkBoxMB configuration tab

- Modbus interface configuration parameters:

Figure 3.3 Modbus Interface Configuration

1. Select the type of Modbus communication to use (TCP, RTU or both).

If Modbus TCP is selected, then:

2. **IP IntesisBox:** Enter the IP address for IntesisBox.
3. **Net Mask:** Enter the IP net mask for IntesisBox.
4. **Gateway:** Enter the default gateway address for IntesisBox; leave it blank if no router is needed.
5. **Port:** Enter the TCP port to use (default for Modbus TCP is 502).
6. **Timeout Keep Alive:** Enter the time (expressed in seconds) that IntesisBox will wait, upon no TCP activity, to send a Keep Alive packet. Enter 0 if you don't want IntesisBox to send any Keep Alive packet (default 30 seconds).

If Modbus RTU is selected, then:

7. **Connection:** Select the physical media (EIA232 or EIA485)¹.
8. **Baud rate:** Enter the baud rate of the serial communication.
9. **Parity:** Enter the byte parity of the serial communication.
10. **Slave:** Introduce the Slave number for the Modbus interface.
11. **Byte Order:** Determines the byte order for conversion of the 32 byte data type signals. 3 modes available:

- **b3b2b1b0 (H...L)**
- **b0b1b2b3 (L...H)**
- **b1b0b3b2**

¹ In the LinkBoxMB this connection is labeled as EIA232 and EIA485 respectively.

- Panasonic AC side configuration parameters:

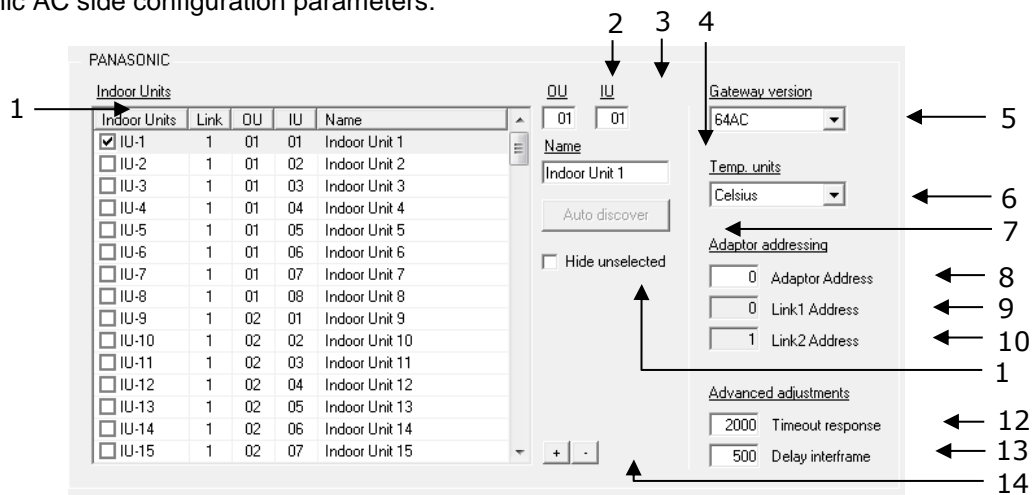


Figure 3.4 Panasonic interface configuration.

- Indoor Units:** List of all indoor units as per gateway capacity. In this list, you can individually enable each of the 128 indoor units available on the system. Use the check box, on the **Indoor Units** column, to identify active units in the project.

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. Select an indoor unit row to edit its properties (fields 2, 3 and 4 of this same section).

NOTE: Addresses for units connected in Link2 begin at IU-65.

- OU:** Address of the corresponding outdoor unit related to the selected Indoor unit. It depends on the values set when installing the Panasonic AC system. Address range vary from 01 to 30.
- IU:** Address of the selected indoor unit. It depends on the values set when installing the Panasonic AC system. Address range vary from 01 to 64.
- Name:** Descriptive name for each indoor unit. It is optional, but recommended to help identifying each indoor unit uniquely.
- Gateway version:** Select here the gateway version you have: 64 AC for PA-AC-MBS-64 or 128 AC for PA-AC-MBS-128. It will affect the maximum number of AC units available.
- Temp. Units:** Use this menu to select your preferences on using Celsius or Fahrenheit.
- Autodiscover:** Press this button, when IBOX is connected to CZ-CFUNC2 and to the PC where LinkBoxMB is running, in order to get automatically the current configuration in the CZ-CFUNC2.
- Adaptor Address:** Adaptor address configured in the CZ-CFUNC2 communication adaptor. Values may vary from 0 to 15 (0 by default). Check the CZ-CFUNC2 setup or use the discover function to check those values. See section XX for more details.
- Link1 Address:** Link1 address configured in the CZ-CFUNC2 for the Link1. Values may vary from 0 to 30 (0 by default). Check the CZ-CFUNC2 setup or use the discover function to check those values. See section XX for more details.

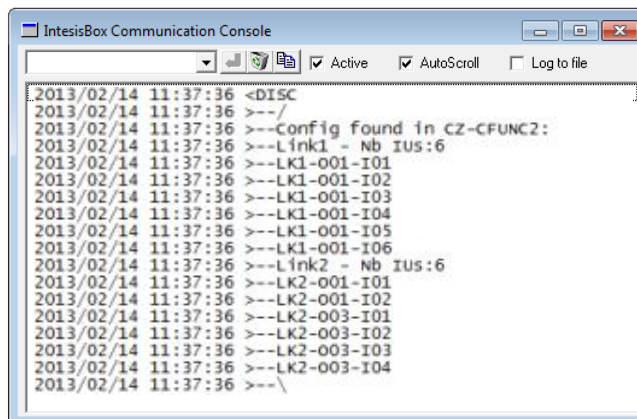
10. **Link2 Address:** Link1 address configured in the CZ-CFUNC2 for the Link1. Values may vary from 1 to 31 (1 by default). Check the CZ-CFUNC2 setup or use the discover function to check those values. See section XX for more details.
11. **Hide unselected:** When enabled, it hides the unselected indoor units.
12. **Timeout response:** 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 500 to 10000 ms (2000 ms by default).
13. **Delay interframe:** Minimum time to wait (in milliseconds) between two consecutive telegrams sent by IntesisBox. Value ranges vary from 10 to 3000 ms (500 ms by default). This value can be modified to reduce the response time.
14. **+/-:** Use the '+' button to select all indoor units (all checkbox active) or use the '-' button to deselect all indoor units (uncheck all checkboxes).

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 ...).

3.2.1.1 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 LinkBoxMB. 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 3.5).



```
IntesisBox Communication Console
Active AutoScroll Log to file
2013/02/14 11:37:36 <DISC
2013/02/14 11:37:36 >---/
2013/02/14 11:37:36 >---Config found in CZ-CFUNC2:
2013/02/14 11:37:36 >---Link1 - Nb IUS:6
2013/02/14 11:37:36 >---LK1-001-I01
2013/02/14 11:37:36 >---LK1-001-I02
2013/02/14 11:37:36 >---LK1-001-I03
2013/02/14 11:37:36 >---LK1-001-I04
2013/02/14 11:37:36 >---LK1-001-I05
2013/02/14 11:37:36 >---LK1-001-I06
2013/02/14 11:37:36 >---Link2 - Nb IUS:6
2013/02/14 11:37:36 >---LK2-001-I01
2013/02/14 11:37:36 >---LK2-001-I02
2013/02/14 11:37:36 >---LK2-003-I01
2013/02/14 11:37:36 >---LK2-003-I02
2013/02/14 11:37:36 >---LK2-003-I03
2013/02/14 11:37:36 >---LK2-003-I04
2013/02/14 11:37:36 >---\
```

Figure 3.5 *DISC* function on LinkBoxMB 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 3.). This situation is produced when asking for a *DISC* command while *Scan process*, from the communication adaptor CZ-CFUNC2 is still on going.

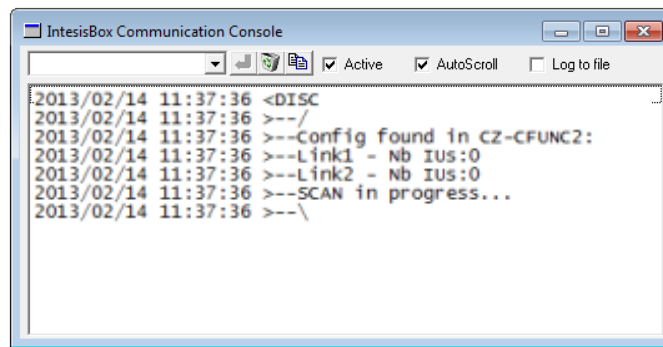


Figure 3.6 DISC function and Scan in progress

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).

3.2.2 Signals tab

In order to know the Modbus map that is going to be used by the interface, the *Modbus map* tab can be consulted.

Content in this tab is just informative: no information has to be set up.

Address/Formula	R/W	Format	Signal	Values
1	R	16 bits unsigned	Adaptor Link1 ErrorCode	259-No error, 1..255-AC error code, 256-Err.adaptor, 257-Not exist, 258-Scan
2	R	16 bits unsigned	Adaptor Link2 ErrorCode	259-No error, 1..255-AC error code, 256-Err.adaptor, 257-Not exist, 258-Scan
3	W	16 bits unsigned	OnOff All	0-Off, 1-On
4	W	16 bits unsigned	Mode All	1-Heat, 2-Cool, 3-Fan, 4-Dry, 5-Auto
5	W	16 bits signed * 10	SetPoint All	-15 to 60 °C / 5 to 140 °F
6	W	16 bits unsigned	FanSpeed All	1-Low, 2-Medium, 3-High, 4-Auto
7	W	16 bits unsigned	RemoteLock All	32-No lock, 1..31-Lock FAN/AIR/TEM/MOD/ON
8	W	16 bits unsigned	Occupancy All	1-Occupied, 2-Unoccupied, 3-Disable
9	R/W	16 bits signed * 10	Occ. Cool SetPoint	-15 to 60 °C / 5 to 140 °F
10	R/W	16 bits signed * 10	Occ. Heat SetPoint	-15 to 60 °C / 5 to 140 °F
11	R/W	16 bits signed * 10	Unocc. Cool SetPoint	-15 to 60 °C / 5 to 140 °F
12	R/W	16 bits signed * 10	Unocc. Heat SetPoint	-15 to 60 °C / 5 to 140 °F
13	R/W	16 bits unsigned	Occ. Continuous Check	0-Disabled, 1-Enabled
14	R/W	16 bits unsigned	Unocc. Deadband Action	0-Off, 1-Current mode
15	W	16 bits unsigned	Consumption Reset	1-Reset
(IU[1..128] * 20) + 1	R	16 bits unsigned	IU Exist	0-Not exist, 1-Exist
(IU[1..128] * 20) + 2	R/W	16 bits unsigned	IU OnOff	0-Off, 1-On
(IU[1..128] * 20) + 3	R/W	16 bits unsigned	IU Mode	1-Heat, 2-Cool, 3-Fan, 4-Dry, 5-AutoHeat, 6-AutoCool
(IU[1..128] * 20) + 4	R/W	16 bits signed * 10	IU SetPoint	-15 to 60 °C / 5 to 140 °F
(IU[1..128] * 20) + 5	R	16 bits signed * 10	IU Room Temperature	-35 to 92 °C / -31 to 198 °F
(IU[1..128] * 20) + 6	R/W	16 bits unsigned	IU FanSpeed	1-Low, 2-Medium, 3-High, 4-Auto
(IU[1..128] * 20) + 7	R/W	16 bits unsigned	IU AirDirection	1-Hor., 2-Pos, 3-Pos, 4-Pos, 5-Ver., 6-Swing, 7-Off/Auto
(IU[1..128] * 20) + 8	R	16 bits unsigned	IU FilterSign	0-Off, 1-On
(IU[1..128] * 20) + 9	W	16 bits unsigned	IU FilterReset	1-Reset
(IU[1..128] * 20) + 10	R	16 bits unsigned	IU ErrorCode	259-No error, 1..255-AC error code, 256-Err.adaptor, 257-Not exist
(IU[1..128] * 20) + 11	R/W	16 bits unsigned	IU RemoteLock	32-No lock, 1..31-Lock FAN/AIR/TEM/MOD/ON
(IU[1..128] * 20) + 12	R/W	16 bits unsigned	IU Occupancy	1-Occupied, 2-Unoccupied, 3-Disable
(IU[1..128] * 20) + 13	R	32 bits float	IU Consumption Yesterday	kWh
(IU[1..128] * 20) + 14	R	32 bits float	IU Consumption Today	kWh
(IU[1..128] * 20) + 15	R	32 bits float	IU Consumption Total	kWh

Figure 3.7 Signals list

- Address Formula:** Formula used by IntesisBox to define the Modbus address for the point. Use this address (obtained with this formula) to access the point from your Modbus master device.
- R/W:** Indicates if the signal is read-only, or if it can be read and written (from the Modbus system point of view).
- Format:** Data format for each signal.
- Signal:** Signal description.
- Values:** Possible values for the signal.

3.2.3 Occupancy tab

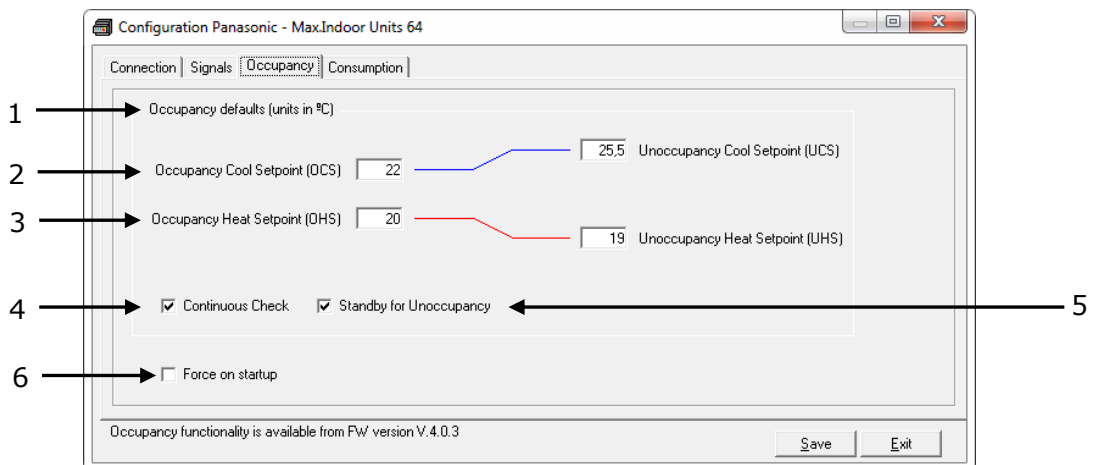


Figure 3.8 Occupancy parameters

1. **Occupancy default (units in °C).** When changing from Celsius to Fahrenheit and vice versa all values are set to its default values.
2. **Occupancy/Unoccupancy Cool Setpoint:** Default value for setpoint temperature to be set when Occupancy/Unoccupancy is enabled and current mode is cool. UCS must always be greater or equal to OCS. Difference between OCS and OHS must be greater or equal to 1°C/2°F. It can be changed later on through Modbus and newer value will persist.
3. **Occupancy/Unoccupancy Heat Setpoint:** Default value for setpoint temperature to be set when Occupancy/Unoccupancy is enabled and current mode is heat. UHS must always be smaller or equal to OHS. Difference between OCS and OHS must be greater or equal to 1°C/2°F. It can be changed later on through Modbus and newer value will persist.
4. **Continuous check:** This checkbox is used to determine if the gateway will check the occupancy conditions constantly (check) or not (unchecked) by default. It can be changed later on through Modbus and newer value will persist.
5. **Standby for Unoccupancy:** This checkbox determines if you wait for Unoccupancy. If unchecked, works as if occupancys signal is enabled. It can be changed later on through Modbus and newer value will persist.
6. **Force on startup:** If checked, values set in the configuration screen will be loaded after a reset. If unchecked, last values selected will be loaded after reset.

3.2.4 Consumption tab

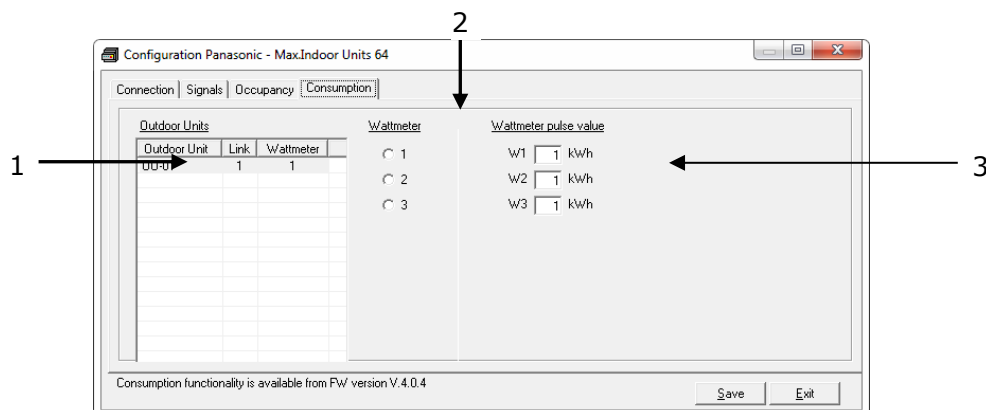


Figure 3.9 Consumption parameters

1. **Outdoor Units:** Displays information for each configured Outdoor Unit and the Wattmeter associated to it. Click on it to apply changes on the Outdoor Unit meter parameters.
2. **Wattmeter:** Select the Wattmeter you want to use for the selected Outdoor unit
3. **Wattmeter pulse value:** Define for each Wattmeter the pulse value in kWh.

3.3 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 LinkBoxMB 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.

3.4 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 3.1). The Signals Viewer window will open (see Figure 3.10).

This window shows all signals active within the gateway with its main configuration parameters and its real time value¹ in the **Value** column.

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.

#	ID	Signal	RW	AddMB	Value	Values description
1	General	Adaptor Link1 ErrorCode	R	1		259-No error, 1..255-AC error code, 256-E
2	General	Adaptor Link2 ErrorCode	R	2		259-No error, 1..255-AC error code, 256-E
3	General	OnOff All	W	3		0-Off, 1-On
4	General	Mode All	W	4		1-Heat, 2-Cool, 3-Fan, 4-Dry, 5-Auto
5	General	SetPoint All	W	5		-15 to 60 °C / 5 to 140 °F
6	General	FanSpeed All	W	6		1-Low, 2-Medium, 3-High, 4-Auto
7	General	RemoteLock All	W	7		32-No lock, 1..31-Lock FAN/AIR/TEM/M
8	General	Occupancy All	W	8		1-Occupied, 2-Unoccupied, 3-Disable
9	General	Occ. Cool SetPoint	RW	9		-15 to 60 °C / 5 to 140 °F
10	General	Occ. Heat SetPoint	RW	10		-15 to 60 °C / 5 to 140 °F
11	General	Unocc. Cool SetPoint	RW	11		-15 to 60 °C / 5 to 140 °F
12	General	Unocc. Heat SetPoint	RW	12		-15 to 60 °C / 5 to 140 °F
13	General	Occ. Continuous Check	RW	13		0-Disabled, 1-Enabled
14	General	Unocc. Deadband Action	RW	14		0-Off, 1-Current mode
15	General	Consumption Reset	W	15		1-Reset
16	IU001(L1-OU01-IU01) - Indoor Unit 1	IU Exist	R	21		0-Not exist, 1-Exist
17	IU001(L1-OU01-IU01) - Indoor Unit 1	IU OnOff	RW	22		0-Off, 1-On
18	IU001(L1-OU01-IU01) - Indoor Unit 1	IU Mode	RW	23		1-Heat, 2-Cool, 3-Fan, 4-Dry, 5-AutoHeat,
19	IU001(L1-OU01-IU01) - Indoor Unit 1	IU SetPoint	RW	24		-15 to 60 °C / 5 to 140 °F
20	IU001(L1-OU01-IU01) - Indoor Unit 1	IU Room Temperature	R	25		-35 to 92 °C / -31 to 198 °F
21	IU001(L1-OU01-IU01) - Indoor Unit 1	IU FanSpeed	RW	26		1-Low, 2-Medium, 3-High, 4-Auto
22	IU001(L1-OU01-IU01) - Indoor Unit 1	IU AirDirection	RW	27		1-Hor., 2-Pos, 3-Pos, 4-Pos, 5-Ver., 6-Swir
23	IU001(L1-OU01-IU01) - Indoor Unit 1	IU FilterSign	R	28		0-Off, 1-On
24	IU001(L1-OU01-IU01) - Indoor Unit 1	IU FilterReset	W	29		1-Reset
25	IU001(L1-OU01-IU01) - Indoor Unit 1	IU ErrorCode	R	30		259-No error, 1..255-AC error code, 256-E
26	IU001(L1-OU01-IU01) - Indoor Unit 1	IU RemoteLock	RW	31		32-No lock, 1..31-Lock FAN/AIR/TEM/M
27	IU001(L1-OU01-IU01) - Indoor Unit 1	IU Occupancy	RW	32		1-Occupied, 2-Unoccupied, 3-Disable
28	IU001(L1-OU01-IU01) - Indoor Unit 1	IU Consumption Yesterday	R	33		kWh
29	IU001(L1-OU01-IU01) - Indoor Unit 1	IU Consumption Today	R	35		kWh
30	IU001(L1-OU01-IU01) - Indoor Unit 1	IU Consumption Total	R	37		kWh

Figure 3.10 LinkBoxMB Signals Viewer

The signals viewer can be used even though only one system is connected to the IntesisBox, Modbus 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 3.11). Changing its value in this way, will make:

- The content of the corresponding Modbus address will be changed to this value.
- If the signal is write-enabled, it will trigger a suitable command to Panasonic AC system.

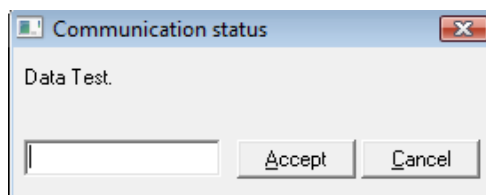


Figure 3.11 Signal value change window

3.5 Files

LinkBoxMB 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.

Table 3.1 LinkBoxMB 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 LinkBoxMB due, for example, to a failure of the hard disk in the PC where LinkBoxMB was installed.

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

4. Setup process and troubleshooting

4.1 Pre-requisites

It is necessary to have the Modbus master device operative and well connected to the Modbus port of IntesisBox, remember to respect the maximum of 15 meters cable distance if using EIA232 communication.

It is necessary to have the Modbus device operative and well connected to the Modbus port of IntesisBox and the CZ-CFUNC2 communication adaptor with an EIA485 port operative.

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

- IntesisBox Modbus Server device Panasonic AC external protocol firmware loaded.
- LinkBoxMB software to configure IntesisBox.
- Console cable needed to download the configuration to IntesisBox.
- Product documentation.

If requested, Intesis Software can also supply:

- Standard plug-in power supply 220Vac 50Hz to power IntesisBox (European plug type).

4.2 Set-up procedure

1. Install LinkBoxMB 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. The mounting can be on DIN rail or on a stable not vibrating surface (DIN rail mounted inside a metallic industrial cabinet connected to ground beside the Panel is recommended).
3. Connect the communication cable coming from the Modbus IP network or the Modbus RTU network to the port marked as **Ethernet** or **Modbus RTU** of IntesisBox respectively.
4. Connect the communication cable coming from the EIA485 port of the CZ-CFUNC2 communication adaptor to the port marked as **CZ-CFUNC2** of IntesisBox (More details in section 5).
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 LinkBoxMB **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. Power up IntesisBox. The supply voltage can be 9 to 30 Vdc or just 24 Vac. Take care of the polarity of the supply voltage applied.

WARNING! In order to avoid earth loops that can damage IntesisBox and/or any other equipment connected to it, we strongly recommend:

- The use of DC power supplies, floating or with the negative terminal connected to earth.
Never use a DC power supply with the positive terminal connected to earth.
 - The use of AC power supplies only if they are floating and not powering any other device.
7. Connect the communication cable coming from the serial port of your laptop PC to the port marked as **PC Console** of IntesisBox (More details in section 5).
 8. Open LinkBoxMB, create a new project selecting a copy of the one named **DEMO Panasonic** and give it the desired name, select the serial port used to connect to IntesisBox and switch working mode to *on-line*. The IntesisBox identification must appear in the *IntesisBox communication console* window as showed below.
 9. Modify the configuration as desired, save it and download the configuration file to IntesisBox as explained before.
 10. Open the *Modbus Communication Viewer* window and check that there is communication activity, some TX frames and some other RX frames. This means that the communication with the Modbus master device is OK. In case there is no communication activity between IntesisBox and the Modbus device check that it is operative, check the baud rate, and also the communication cable used to connect both devices.
 11. Open the *Panasonic Communication Viewer* window and check that there is communication activity, some RX frames. This means that the communication with the CZ-CFUNC2 communication adaptor is OK. In case of no communication activity between IntesisBox and CZ-CFUNC2 communication adaptor, check that the EIA485 port of CZ-CFUNC2 communication adaptor is operative and well configured and check also the communication cable used to connect both devices.

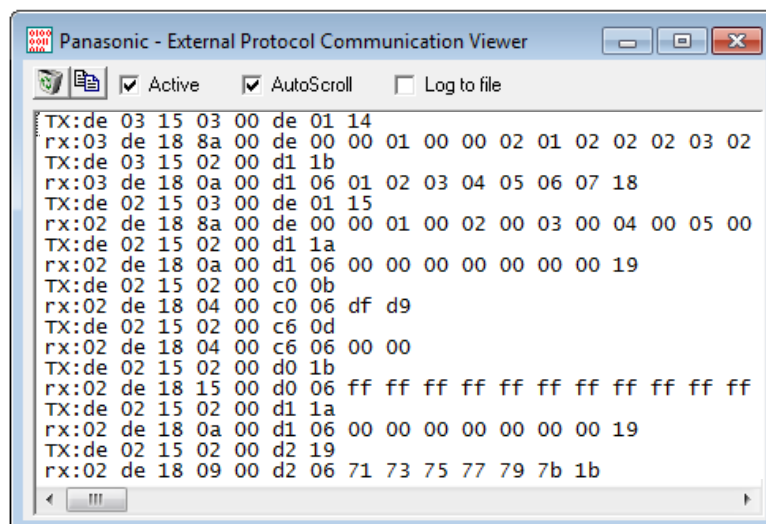


Figure 4.1 Panasonic AC Protocol Communication Viewer

4.3 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.

4.4 Software checking

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

- To check the Modbus communication status, click on the **Modbus** button in the *menu bar* (see Figure 3.1).
- To check the PANASONIC communication status, click on the **PANASONIC** button, also in the *menu bar* (see Figure 3.1).
- To check the signal values in the Modbus registers, click on the **Signals** button, also in the *menu bar* (see Figure 3.1).

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

4.5 Consumptions

The PA-AC-MBS-64/128 gateway includes a functionality to calculate consumptions from the Indoor Units connected to the CZ-CFUNC2.

Consumptions are read during the first stage of the start up. The cycle reads are done each hour and for the first hour a '0' value will be shown.

All consumption data is reset when:

- 1) You force a reset on the consumptions values
- 2) You download a new configuration to the IntesisBox
- 3) If the internal battery runs out of energy or is missing (broken).
- 4) Firmware update is performed.

As device is just checking consumption after each hour, if in that moment there is a communication error, we will miss this read and we won't be able to consider the last hour in our calculations. Remember that you can set your local time using the console command "TIME=YYYY/MM/DD HH:MM:SS".

IMPORTANT: These measures are just for monitoring and management purposes. Data values may not be accurate enough for its use in billing procedures.

4.5.1 Connect a Wattmeter to the CZ-CFUNC2

In order to allow the PA-AC-BAC-64/128 to extract consumption information from the CZ-CFUNC2, Wattmeters need to be connected to the device. These Wattmeters are connected to the digital pulse inputs of the CZ-CFUNC2.

Please, contact your nearest Panasonic distributor and/or check your CZ-CFUNC2 service manual for more information on how to connect the different Wattmeters and compatible models.

4.6 Occupancies

Each indoor unit has its own occupancy signal. Remember that this signals needs to be feed by an external sensor which indicates if there is presence or not (occupancy). This signal is processed directly

in the PA-AC-MBS-64/128 and is not sent to the CZ-CFUNC2, avoiding unnecessary data traveling to the Panasonic system.

When occupancy mode is active, according to current room temperature it will set the mode, setpoint and on/off, for example:

- Room Temperature > OCS: Setpoint = OCS, Mode = Cool, On/Off = On
- Room Temperature < OHS: Setpoint = OHS, Mode = Heat, On/Off = On
- OCS < Room Temperature > OHS: Setpoint = OCS/OHS depending on current mode (if Fan or Dry mode is active => no setpoint is sent), On/Off = On

When unoccupancy mode is active, according to current room temperature it will set the mode, setpoint and on/off, for example:

- Room Temperature > UCS: Setpoint = UCS, Mode = Cool, On/Off = On
- Room Temperature < UHS: Setpoint = UHS, Mode = Heat, On/Off = On
- UCS < Room Temperature > UHS: Setpoint = UCS/UHS depending on current mode (if Fan or Dry mode is active => no setpoint is sent), On/Off = On (if Unoccupancy Deadband Action is = 1)

These checks will be done each time the indoor unit occupancy status is changed, and if **check continuously** checkbox is checked, also each time the room temperature changes.

The configuration set on the occupancy tab is applied from the very first moment the occupancy signal is enabled until the user changes the setpoint, mode or the On/Off signal, which disables occupancy functionality.

4.7 256, 257 and 258 Error

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

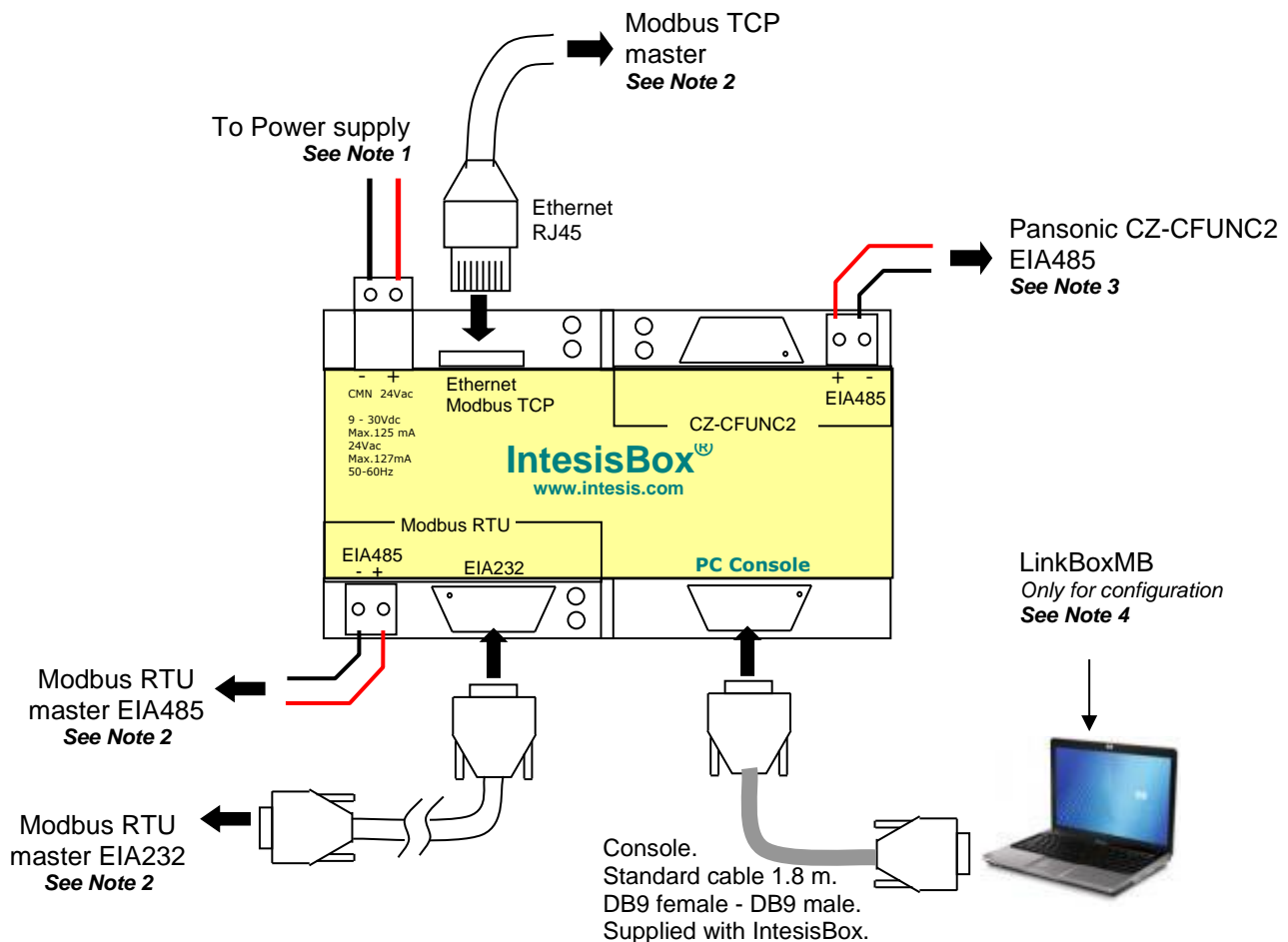
During scanning process, error 258 is shown to indicate that this process is ongoing. If during the scanning process one of the adaptors is not answering, the error code for the adaptor will be 256 (communication error). If it answers, it will keep the 258 value.

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.

For each polling cycle each Modbus register is updated. The update cadence depends on the number of units in the Panasonic AC system. Therefore, the polling process can last several minutes.

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 its current value.

5. Connections



Notes:

- Must use NEC Class 2 or Limited Power Source (LPS) and SELV rated power supply.

If using DC power supply:

 - Respect polarity applied of terminals (+) and (-). Be sure the voltage applied is within the range admitted (9 to 30 Vdc). The power supply can be connected to earth but only through the negative terminal, never through the positive terminal.

If using AC power supply:

 - Make sure the voltage applied is of the value admitted (24 Vac). Do not connect any of the terminals of the AC power supply to earth, and make sure the same power supply is not supplying any other device.
- Modbus connection. Only one Modbus connection type can be used simultaneously, Modbus TCP, Modbus RTU EIA485, or Modbus RTU EIA232, this must be configured within LinkBoxMB software.

 - Modbus TCP:** Connect the cable coming from the Modbus TCP master device to the connector ETH of IntesisBox, use a crossover ethernet CAT5 cable if connecting directly to the Modbus TCP master device, or a straight ethernet CAT5 cable if connecting to a switch or hub of the LAN of the building. If connecting using the LAN of the building contact the network administrator and make sure that TCP/IP traffic and the TCP port used (502 by default) are allowed through all the LAN path.
 - Modbus RTU EIA485:** Connect the EIA485 bus to the connector Modbus RTU EIA485 of IntesisBox. Respect the polarity. Remember the characteristics of the standard EIA485 bus: maximum distance of 1200 meters, maximum 32 device connected, and a 120 ohms terminator resistor in each end of the bus. IntesisBox comes with an internal bus byasing circuit which incorporates internal bus terminator resistor, and thus if you connect IntesisBox in one end of the bus then it is not necessary to install additional 120 ohms resistor in that end.
 - Modbus RTU EIA232:** Connect the serial EIA232 cable coming from the Modbus RTU master device to the Modbus RTU EIA232 connector of IntesisBox, this is a male DB9 connector (DTE) in which only lines TX, RX and GND are used, see pinout details in the user's manual. Respect the maximum distance of 15 meters for this EIA232 line.
- CZ-CFUNC2:** Connect the serial cable EIA485 coming from the Panasonic CZ-CFUNC2 interface module to the CZ-CFUNC2 EIA485 connector of IntesisBox.
IMPORTANT: To properly communicate with the IntesisBox®, please check that the **Initial communication setting** item (8.SCAN.x) is set to '0' (default value).
IMPORTANT: Please check the **Adaptor number setting** item (1.Ano.xx) matches LinkBoxMB Adaptor address value

Check the Instructions for the Electrical Installer (CZ-CFUNC2) document for further information.
 Modifying some other parameters can affect proper communication..
- Use the software LinkBoxMB to configure IntesisBox. Consult the user's manual for details.

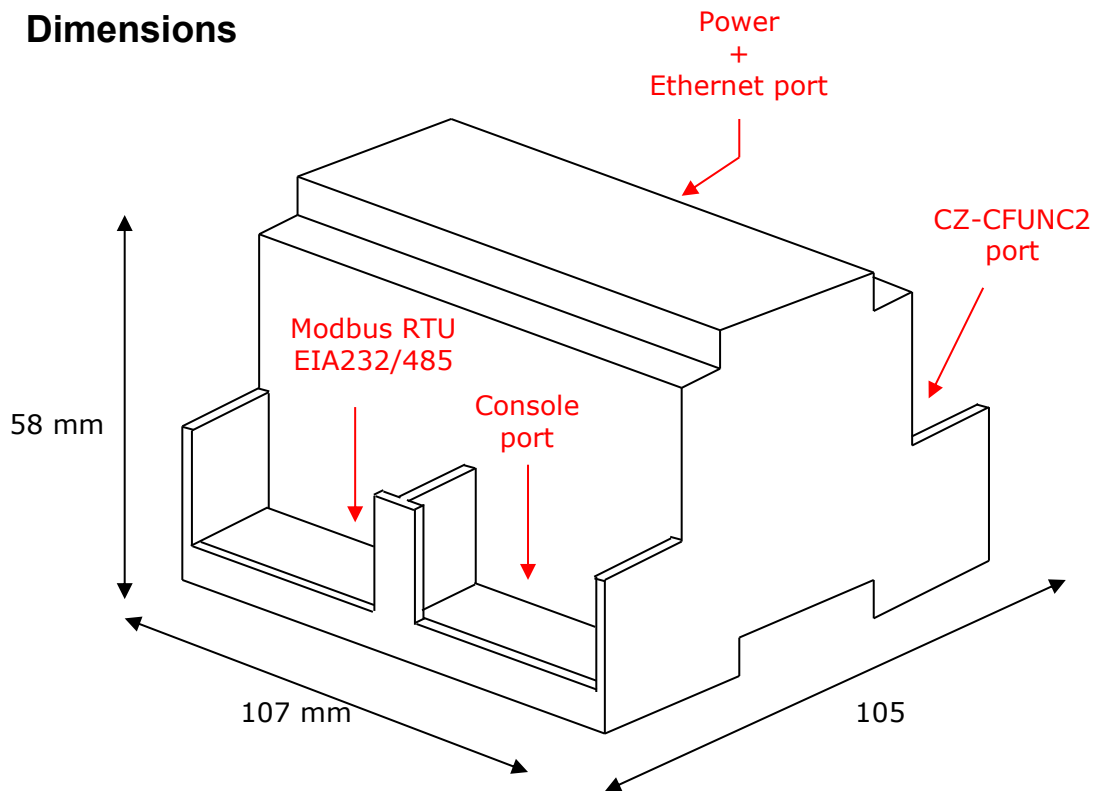
6. Mechanical & Electrical characteristics



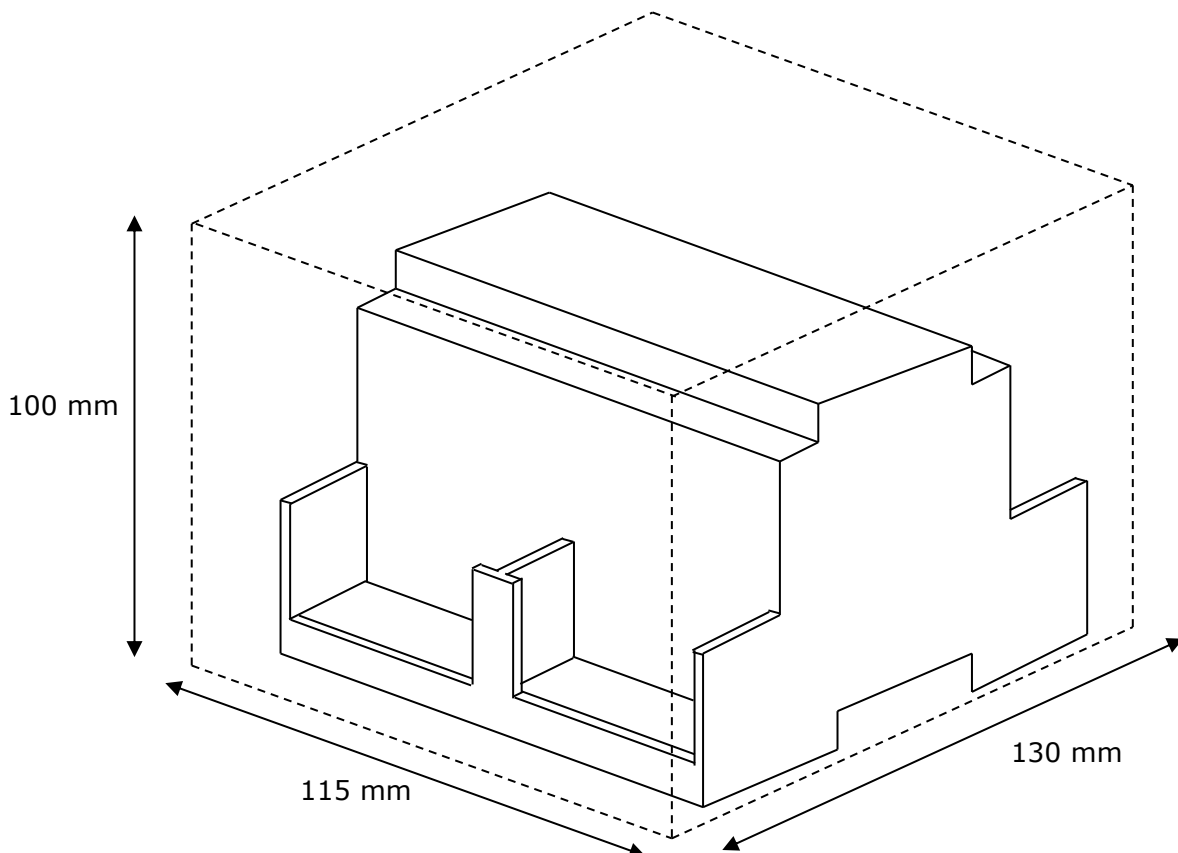
Enclosure	Plastic, type PC (UL 94 V-0). Dimensions: 107mm x 105mm x 58mm.
Color	Light Grey. RAL 7035.
Power	9 to 30Vdc +/-10%, Max.: 125mA. 24Vac +/-10% 50-60Hz, Max.: 127mA Must use a NEC Class 2 or Limited Power Source (LPS) and SELV rated power supply. Plug-in terminal block for power connection (2 poles).
Terminal wiring (for power supply and low-voltage signals)	Per terminal: solid wires or stranded wires (twisted or with ferrule) 1 core: 0.5mm ² ... 2.5mm ² 2 cores: 0.5mm ² ... 1.5mm ² 3 cores: not permitted
Mounting	Wall. DIN rail EN60715 TH35.
Modbus TCP port	1 x Ethernet 10Base-T (RJ45).
Modbus RTU ports	1 x Serial EIA232 (DB9 male DTE). SELV 1 x Serial EIA485 (Plug-in screw terminal block 2 poles). SELV
CZ-CFUNC2 (PANASONIC) port	1 x EIA485. Plug-in screw terminal block (2 poles). SELV
LED indicators	1 x Power. 2 x Serial port Modbus RTU activity (Tx, Rx). 2 x Serial port CZ-CFUNC2 activity (Tx, Rx). 2 x Ethernet port Modbus TCP link and activity (LNK, ACT).
Console port	EIA232. DB9 female connector (DCE). SELV
Configuration	Via console port.
Firmware	Allows upgrades via console port.
Operational temperature	0°C to +70°C
Operational humidity	5% to 95%, non condensing
Protection	IP20 (IEC60529).
RoHS conformity	Compliant with RoHS directive (2002/95/CE).
Norms and standards	CE conformity to EMC directive (2004/108/EC) and Low-voltage directive (2006/95/EC) EN 61000-6-2 EN 61000-6-3 EN 60950-1 EN 50491-3

¹ Along with the device it is also supplied a standard DB9 male - DB9 female 1.8 m. cable for configuring and monitoring the device using a PC via serial COM port. The configuration software LinkBoxMB, compatible with MS Windows[®] operating systems, is also supplied with the device.

7. Dimensions



Recommended available space for its installation into a cabinet (wall or DIN rail mounting), with space enough for external connections:



8. AC Unit Types compatibility

A list of Panasonic unit model references compatible with PA-AC-MBS-64/128 and their available features can be found in:

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

9. Error codes for Indoor and Outdoor Units

Below you can find a list of error codes from Panasonic air conditioning system.

Error Code	Error in Control Panel	Error category	Error Description
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
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
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)	
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	Compressor 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 mismatched
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	Indoor unit fault, Fan motor thermal overload	

226	P02	Problems	Outdoor unit fault, Compressor motor thermal overload, over or under voltage
227	P03		Outdoor unit fault, Compressor discharge temperature too high (Comp1) over 111 °C. 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		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
257	N/A	Indoor Unit doesn't exist	
258	N/A	Scan in progress	
259	N/A	N/A	No active error