# IntesisBox®

# PA-AC-ENO-1i
# PA-AC-ENO-1iC

EnOcean Interface for PANASONIC Air Conditioners
Compatible with Etherea Line

User's Manual

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Issue Date: 02/2012

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Interface for integration of Panasonic air conditioners into EnOcean systems.
Compatible with Etherea line air conditioners commercialized by Panasonic.

2 models are available for this interface, with the following **Order Codes**:

**PA-AC-ENO-1i**
EnOcean communication frequency: 868 MHz
**PA-AC-ENO-1iC**
EnOcean communication frequency: 315 MHz



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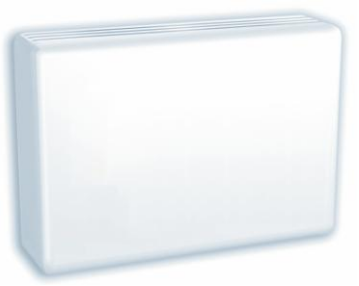
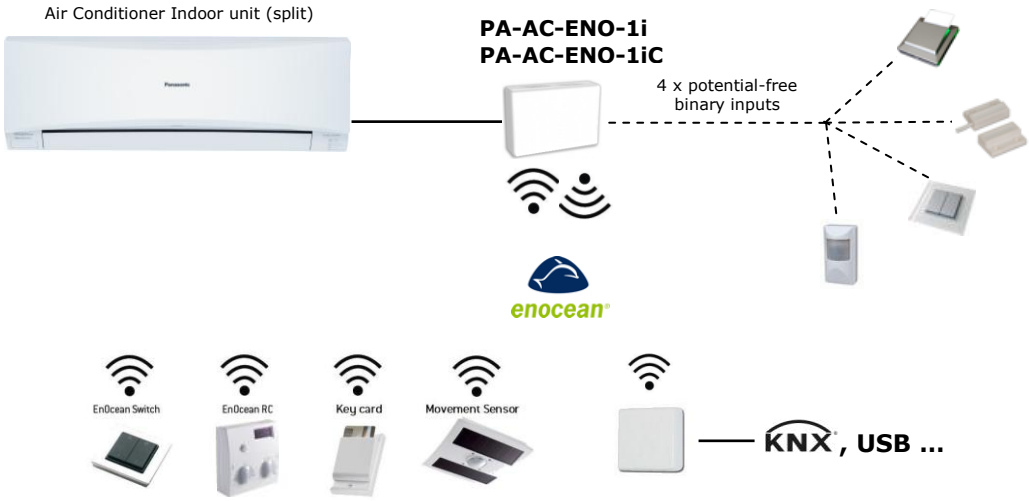
# 1. Presentation



IntesisBox® PA-AC-ENO-1i and IntesisBox® PA-AC-ENO-1iC devices allow a complete and natural integration of Panasonic air conditioners with EnOcean control systems both in their 868 MHz (PA-AC-ENO-1i) and 315 MHz (PA-AC-ENO-1iC) versions.

Compatible with the Etherea AC units commercialized by Panasonic (check section 11).

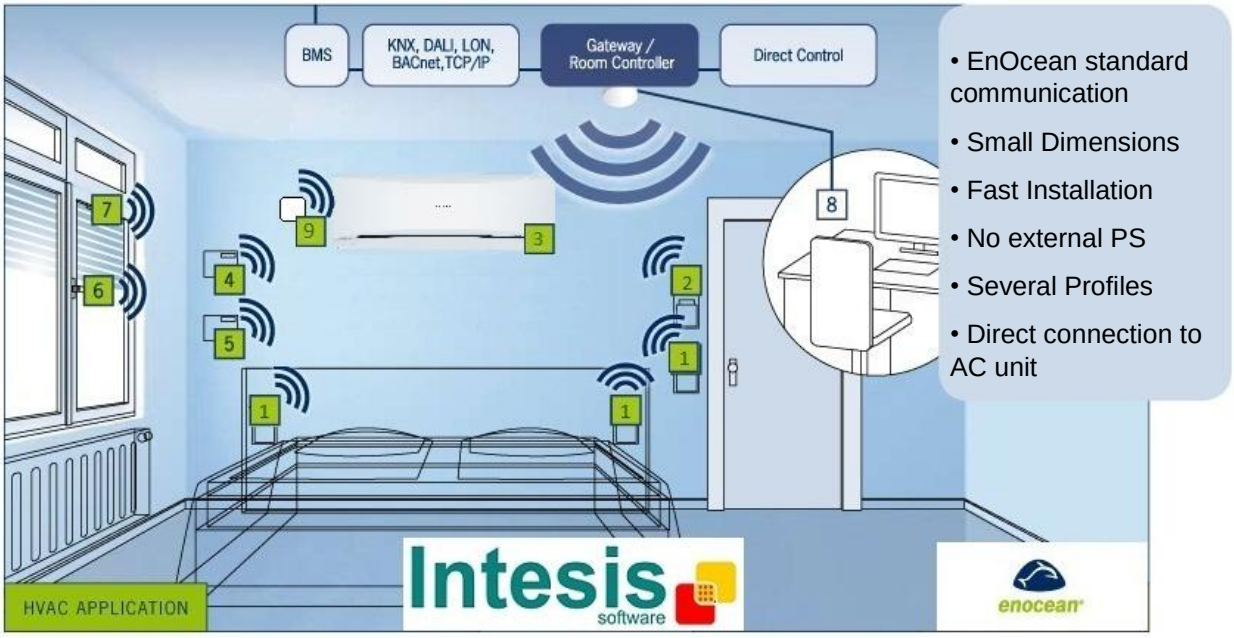



IntesisBox® PA-AC-ENO-1i / 1iC (IntesisBox® from now on) allows monitoring and control, fully bi-directionally, all the functioning parameters of Panasonic air conditioners from EnOcean installations.

- Small dimensions.
- Quick installation and possibility of hidden installation.
- External power not required.
- Direct connection to the AC indoor unit (split unit).
- Fully EnOcean interoperable. Control and monitoring, from sensors or gateways, of the internal variables of the indoor unit and error codes and indication.
- Use the air conditioner ambient temperature or the one measured by an EnOcean temperature sensor or Thermostat.
- AC unit can be controlled simultaneously by the remote control of the AC unit and by EnOcean devices.
- Advanced control functions: use it as a room controller.
- 4 binary inputs. They work as standard EnOcean binary inputs as well as being used to control the AC directly.

## 1.1 Typical Application

In Figure 1.1 it is shown a typical application of IntesisBox® in a hotel room. The different devices that control the AC unit, like switches, key cards, window contacts, are connected to it through the IntesisBox®.




1) Batteryless wireless switches controlling lighting and/or AC

2) Key card switch controls access to a room and turns on AC and lighting when entering a room

3) AC unit connected to IntesisBox®

4) Room temperature sensor

5) Climatic sensors

6) 7) Position sensors – window handle and window contact – cut out heating and air-conditioning when window are open

8) Central control

9) IntesisBox®

**Figure 1.1** Typical application of IntesisBox® in a hotel

Typical transmitting EnOcean devices:

- Thermostat
- Switches
- Key card
- Window contact
- Occupancy sensor
- ...

Typical receiving EnOcean devices:

- Actuators
- Gateway
- ...

# 2. Quick setup

1. Connect the IntesisBox® to the Air conditioner (section 3)

2. Wait for the initialization process to be finished (section 3.4)

3. Configure the IntesisBox®:
    a. Manually (section 4.1)
    b. Remotely using the Intesis Configuration Software (section 5.3)

4. Learn the EnOcean sensors/gateways that will control the IntesisBox®:
    a. Manually (section 4.3)
    b. Remotely using the Intesis Configuration Software (section 5.1)

5. Teach the signals of the IntesisBox® that will be sent to other EnOcean actuators/gateways:
    a. Manually (section 4.2.2)
    b. Remotely using the Intesis Configuration Software (section 5.3)

6. (Optional) Protect the IntesisBox® from an undesired remote access (section 8.8)

7. The device is ready to be used

# 3. Connection and placement

## 3.1 Connection to AC unit

Disconnect mains power from the AC unit. Open the front cover of the indoor unit in order to have access to the internal control board. In the control board locate the socket connector marked as:

**CN-CNT** in Domestic line models

Using the cable that comes with the IntesisBox®, insert one of its connectors, the biggest one, into the socket of the IntesisBox®, and the other connector, the one installed in the largest uncovered part, to the socket **CN-CNT** of the AC unit's electronic circuit. Close the AC indoor unit's front cover again.

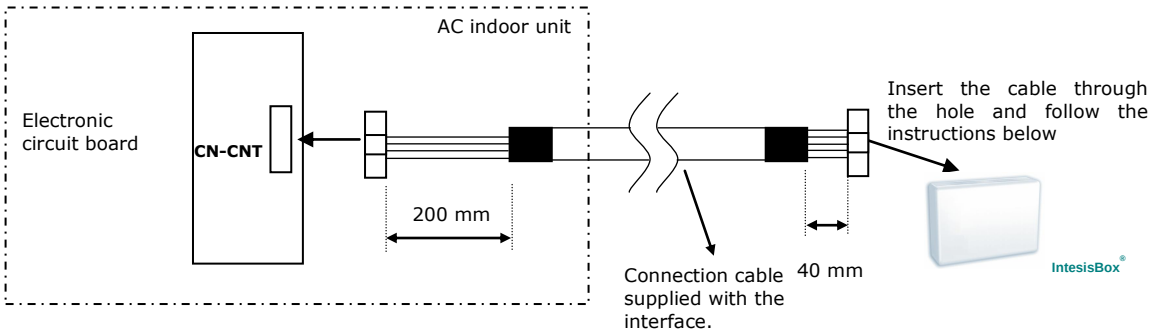



**Figure 3.1** IntesisBox® connection diagram

⚠ ***Important***: Do not modify the length of the cable supplied with the interface, it may affect to the correct operation of the interface

To connect the IntesisBox® to the AC, use the lid hole above the connector K1 as indicated in Figure 3.2:

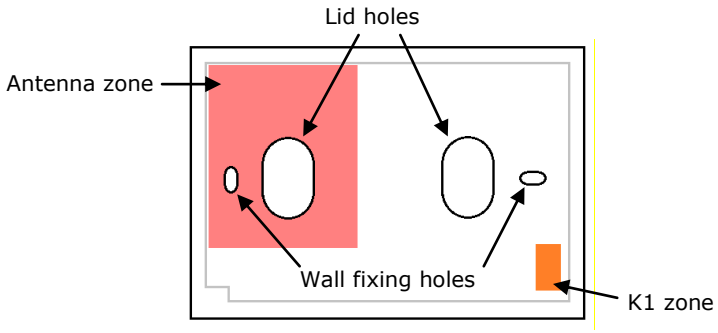



**Figure 3.2** Connection scheme

**Important:** The cable should not be placed on top of the antenna zone (is marked in Figure 3.2) as the performance of the device might be affected. The antenna zone changes depending on the position of the antenna cable (see section 8.9).

### 3.2 Connection of binary inputs

Follow the scheme below in order to connect the binary inputs of the K2 connector (check Figure 4.1).

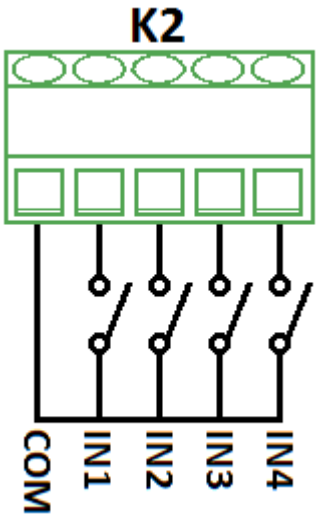



**Figure 3.3** Connection of binary inputs

### 3.3 Placement

The IntesisBox® interface antenna has a better sensibility when the device is placed vertically, and therefore this is the preferred position when placed (antenna zone should be located in the bottom side, floor side, once the device is fixed to the wall).

The coverage distance (see Table 3.1) of the signal emitted by the IntesisBox®, or by any other EnOcean device, is determined by the room geometry and where they are placed. As an example, long narrow corridors with wide walls are an adverse situation. People or other obstacles can reduce the coverage distance too. Therefore, is advised to always think in the worst possible scenario to decide the placement of the device to ensure a good stability in the radio system.

| Coverage distance | Conditions |
|---|---|
| < 30 m | Under ideal conditions: broad room, no obstacles, good antenna design and good antenna positions. |
| < 20 m | The room is filled with furniture and people and penetration through up to 5 dry walls or up to 2 brick walls or up to 2 aero concrete walls. |
| < 10 m | Identical to the previous case but the receiver is placed to a room corner or range along a narrow floor. |
| < 1 m | Metal-reinforced ceilings at upright penetration angle (in strong dependence of reinforcement density and antenna positions). |

**Table 3.1** Device coverage distance

### 3.3.1 Screening zones

It is important not to place the device in a place where the airwaves must go through a metallic object as they create a screening zone where the receivers are not going to be able to receive the EnOcean telegrams. This situation is shown in Figure 3.4a.

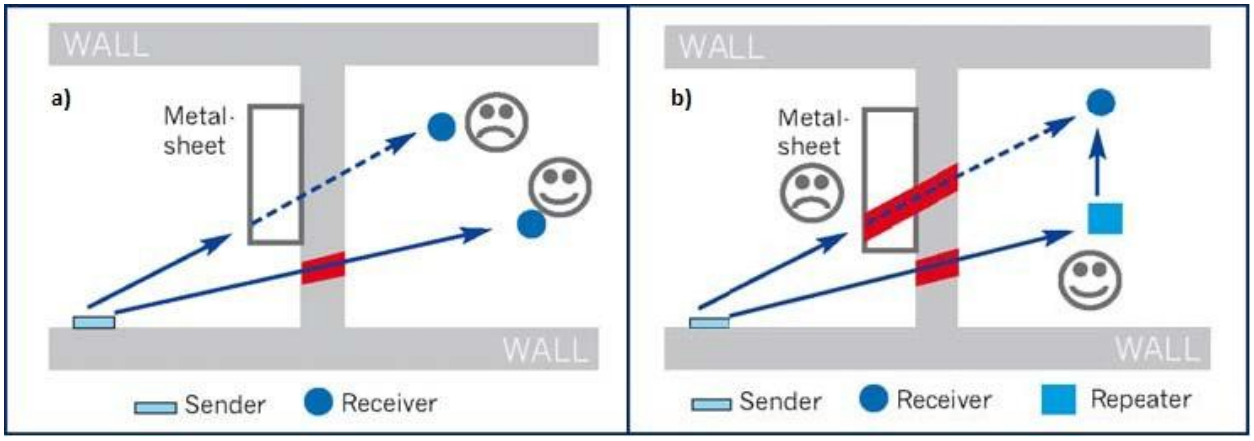



**Figure 3.4** a) Screening zone b) Solution with a repeater

The situation of one of the receivers does not allow it to receive the transceiver telegrams. To solve this situation the use of a repeater outside the screening zone (Figure 3.4b) is recommended. The telegrams will be retransmitted from there to the receiver

### 3.3.2 Penetration Angle

This is the angle in which the airwaves reach a certain object they need to go through. The transmission to the other side of the object would be better as this angle gets closer to 90º, being this the best transmission situation.

In Figure 3.5a it is shown a receiver in a situation where the penetration angle is too close to 0º. The solution to that problem can be seen in Figure 3.5b using a repeater in a different position.

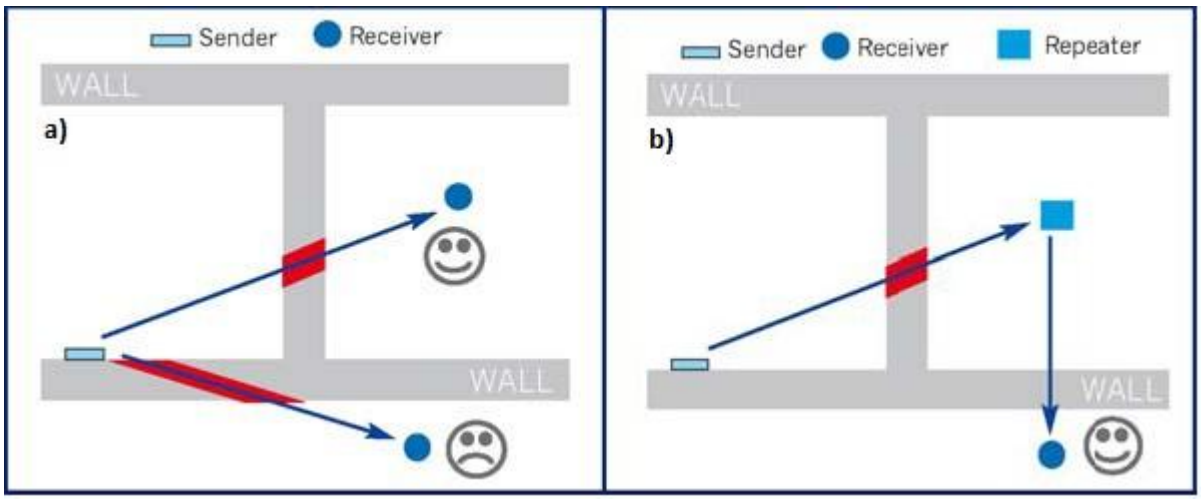



**Figure 3.5** a) Penetration angle b) Solution with a repeater

### 3.3.3 Distance between receiver and sources of interference

The distance between EnOcean receivers, as it is the IntesisBox® and other transmitters (e.g. GSM / DECT / wireless LAN) or high frequency sources of interference (computers, audio and video equipment) should be higher than 50 centimeters.

However, EnOcean transmitters can be installed next to any other high-frequency transmitters without any problem.

### 3.3.4 Use of repeaters

In case of a poor radio reception, it may be helpful to use a repeater. EnOcean repeaters do not require any configuration, only a line-power supply is needed. A poor radio signal is received, refreshed and transmitted again, so nearly a double radio range can be achieved. Special EnOcean repeaters which can be switched to 2-level function allow two repeaters to be cascaded.

In order to configure the IntesisBox® as a repeater see section 5.3.6.

## *3.4 Power up*

Once the IntesisBox® is properly connected and placed, AC unit's main power can be connected again.

Then it will start an initialization process, L1 will be ON during 3 seconds and L2 will be ON during 5 seconds (see the location of the LEDs in Figure 4.1). The normal operation starts when both LEDs are turned OFF again.

It is important to bear in mind that changes made during the initialization process will not have effect until it finishes.

# 4. Manual configuration

## 4.1 Configuration

The IntesisBox® (Figure 4.1) has two sets of switches, a push button and a rotary profile selector in order to configure the behaviour of the device and perform EnOcean actions (explained in Table 4.1, Table 4.2 and following sections).

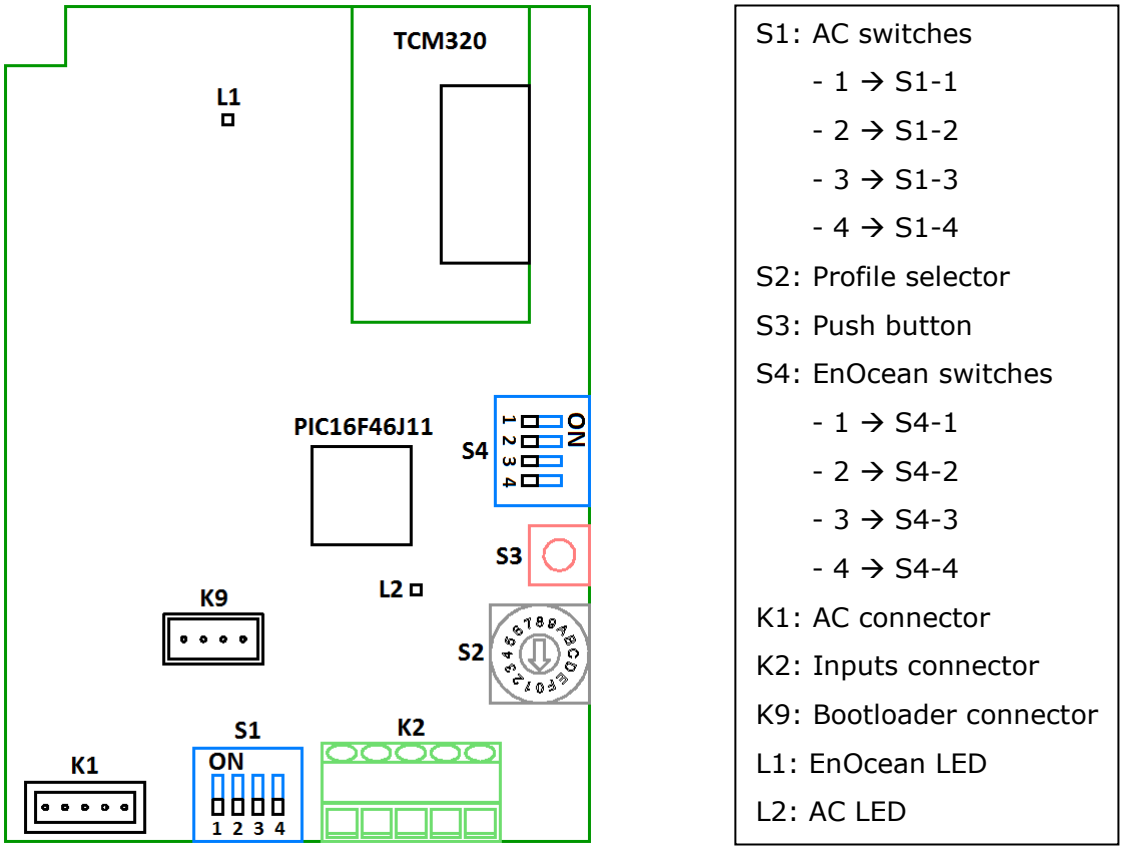



**Figure 4.1** IntesisBox® diagram

**S1** – AC unit configuration: fan mode

| Binary value $b_0...b_3$ | Decimal value | Switches 1 2 3 4 | Description |
|---|---|---|---|
| xxx0 | 0 | x x x ↓ | Indoor unit has no fan mode (default value). |
| xxx1 | 1 | x x x ↑ | Indoor unit has fan mode. |

**Table 4.1** S1 switch configuration

**S4** – EnOcean switches: normal mode, learning mode, erasing mode and remote management enabling/disabling:

| Binary value $b_3...b_0$ | Decimal value | Switches 1 2 3 4 | Description |
|---|---|---|---|
| 00xx | 0 | ↓ ↓ x x | Normal mode (default value). See section 4.2. |
| 01xx | 1 | ↓ ↑ x x | N/A (behaves as normal mode) |
| 10xx | 2 | ↑ ↓ x x | Learning mode. See section 4.3. |
| 11xx | 3 | ↑ ↑ x x | Erasing mode. See section 4.4. |
| xx0x | 0 | x x ↓ x | Remote management enabled (default value). See section 4.5. |
| xx1x | 1 | x x ↑ x | Remote management disabled. |
| xxx0 | 0 | x x x ↓ | N/A |
| xxx1 | 1 | x x x ↑ | N/A |

**Table 4.2** S4 switch configuration

The different actions that can be performed in each mode are described in this section.

## *4.2 Normal mode*

While the normal mode is selected it is possible to set the device to monitor mode and perform the teach-in procedure. These operations will not interfere in the normal behaviour of the device.

### 4.2.1 Monitor mode

Due to the transmitting method (radio) of EnOcean telegrams, is possible that the IntesisBox® is outside the coverage range of one device. For that reason, the interface, as a receiver, has the ability to show when it receives EnOcean telegrams from a linked device when in monitoring mode.

To **activate** the monitoring mode (check Figure 4.1):

1. Make sure that IntesisBox® is working in normal mode (switches S4-1 and S4-2 set to OFF)
2. Press S3 for 5 seconds. The L1 will briefly flash (100ms). From then on, L1 will flash for 100ms each time that a valid telegram from a learnt device is received.

To **disable** the monitoring mode:

1. In order to disable the monitor mode it is necessary to set EnOcean switches (S4) to learning or erase mode. Once S4 is set to normal mode again the monitor mode will be disabled

| Mode | L1 |
|---|---|
| Normal mode (monitor mode enabled) | Off |
| Normal mode (monitor mode disabled) | Flashing (100ms) per telegram received |

**Table 4.3** L1 and monitor mode

### 4.2.2 Teach-in

The IntesisBox®, as an EnOcean transmitter device, has the teach-in procedure implemented. The aim of this procedure is to link the IntesisBox® with other EnOcean devices in order to control them, not the other way around.

So after the teach-in procedure it will be possible, for instance, to get the "IntesisBox® Tx profile 0 (On/Off)" linked to another EnOcean device. Then, each time we turn on or off the AC unit, a signal will be sent from the IntesisBox® and accepted by the other EnOcean device.

All the signals will also be sent periodically according to the IntesisBox® configuration (section 5.3.1).

Table 4.4 shows which signals and EEPs correspond to each Tx profile:

| Profile Index Tx (S2) | Transmission signals | EEP (EnOcean Profile) |
|---|---|---|
| 0 | On/Off | [05-02-01] |
| 1 | Alarm State | [05-02-01] |
| 2 | Set point Temperature | [07-02-05] |
| 3 | Ambient Temperature | [07-02-05] |
| 4 | Ambient Temperature, Set point Temperature, Fan Speed, On/Off | [07-10-01] |
| 5 | AC interface: Mode, fan speed, vane position, sensors and On/Off | [07-20-10] |
| 6 | Set point Temperature, Ambient Temperature | [07-10-03] |
| 7 | AC interface: AC Error code, Error state and disablements | [07-20-11] |
| 8 | Input 1 | [05-02-01] |
| 9 | Input 2 | [05-02-01] |
| A | Input 3 | [05-02-01] |
| B | Input 4 | [05-02-01] |
| C | N/A | |
| D | N/A | |
| E | All. AC profiles | [07-20-10][1] [07-10-03] [07-20-11] |
| F | All. AC profiles | [07-20-10][1] [07-10-03] [07-20-11] |

**Table 4.4** Transmission profiles - signals

[1] Multiteach-in process: The three EEPs are sent one after the other pressing the teach-in button only once. Also a Teach-in of the same signals can be done one by one using profiles 5, 6 and 7. See section 6.5.

To execute the **Teach-in procedure** the next steps need to be followed. References to device components refer to Figure 4.1:

1. Set the switches S4-1 and S4-2 to OFF (normal mode).
2. Set the profile selector (S2) to the desired transmission profile for the teach-in procedure.
3. Press S3 to send a teach-in telegram. There must be a receiving EnOcean device in learning mode for the linking to happen.

Remember that in this procedure the IntesisBox® does not keep information from any of the devices.

In section 14 can be found the description of the supported EEPs in each Tx profile.

## *4.3 Learning mode*

The learning procedure allows the IntesisBox® to be controlled by other EnOcean devices.

The IntesisBox® has 14 reception (Rx) profiles. Each Rx profile is assigned to a control signal of the AC unit. Up to 5 devices can be linked to each profile (see exceptions in Table 4.5).

The profiles are as follow:

| Profile Index Rx (S2) | Signal | Allowed devices in profile |
|---|---|---|
| 0 | On/Off | 5 |
| 1 | Mode | 5 |
| 2 | Fan Speed | 5 |
| 3 | Up/Down Vane position | 5 |
| 4 | Set point Temperature[1] | 5 |
| 5 | Ambient Temperature (virtual) [2 3] | 1 |
| 6 | Window contact | 5 |
| 7 | KEY CARD | 5 |
| 8 | Occupancy sensor | 5 |
| 9 | Up/Down Vane position | 5 |
| A | Left/Right Vane position | 5 |
| B | Ambient temperature (Profiles 5 & F have priority over it)[3] | 1 |
| C & D | N/A | N/A |
| E | All. AC profiles | 5 |
| F | All. AC profile[2] | 5 |

**Table 4.5** Default reception profiles

[1] When the Virtual temperature is turned on, the set point temperature to be written to the AC unit is the Virtual temperature instead of the Set point temperature.
[2] When a device is linked to either of these profiles, the virtual temperature function is turned on automatically. Temperature in profile F will have priority (see section 6.2).
[3] Only one device can be linked to this profile.

### 4.3.1 Learning sensors

When learning sensors it is important to bear in mind that just one signal of the EEP of the sensor is going to be linked each time that the Learning procedure is executed. See an example in section 8.3.

To execute the **Learning procedure** the next steps need to be followed. References to device components refer to Figure 4.1:

1. Set switch S4-1 to ON position and switch S4-2 to OFF (Learning mode). L1 will be ON.

2. Set the profile selector (S2) in the desired position to link the EnOcean transmitters to the reception profile.

3. Push the Teach-in button of the devices that want to be linked, or if they do not have the Teach-in button (as the EnOcean switches) action them.

4. When a valid EnOcean telegram is received L1 turns OFF for 100 ms and then it turns ON again. The maximum number of linked devices in one profile is 5 (check Table 4.5 for special cases). Once this number is reached, no more devices are going to be linked to that profile. The L1 turns OFF when that happens.

5. Once the learning procedure is finished set both S4-1 and S4-2 to OFF for a normal operation of the device. Once that is done L1 turns OFF.

In section 14 can be found the EEPs supported in each Rx profile.

### 4.3.2 Learning gateways

In order to control the IntesisBox® using a gateway, the gateway needs to be learnt by the IntesisBox®. The **Learning procedure** is the following one:

1. Set switch S4-1 to ON position and switch S4-2 to OFF (Learning mode). L1 will be ON.

2. Set the profile selector of the IntesisBox® (S2) to E or F. The difference between them is that using profile F the ambient temperature supplied by the gateway is going to be used instead of the AC one. If no temperature is supplied by the sensor, the IntesisBox® is going to have undesired behaviours.

3. Set the profile selector of the gateway that wants to be linked to F.

4. Push the Teach-in button of the gateway that wants to be linked.

5. When a valid EnOcean telegram is received L1 turns OFF for 100 ms and then it turns ON again. The maximum number of linked devices in one profile is 5. Once this number is reached, no more devices are going to be linked to that profile. The L1 turns OFF when that happens. As a gateway takes 3 devices to be linked, just one will be fully linked in one profile.

6. Once the learning procedure is finished set both S4-1 and S4-2 to OFF for a normal operation of the device. Once that is done L1 turns OFF.

**Important!**

In Profiles E and F up to 5 devices can be linked. It needs to be taken into account that if the devices are linked by the MultiTeach-in procedure (more information in section 6.5) only one is going to be fully linked as it would take 3 of the 5 spaces available.

## *4.4 Erasing mode*

In order to delete the devices that have been learnt the erase mode needs to be selected. It is possible to delete the devices one by one, to delete all the devices linked in one Rx profile (Table 4.5) and perform a "return to factory settings".

### 4.4.1 Deleting one by one

To delete the linked devices one by one it will be necessary to have the linked device working properly. To do so follow next lines (the references to device components are specified in Figure 4.1):

1. Set the switches S4-1 and S4-2 to ON. L1 will turn into flashing (100 ms on and 100 ms off).
2. Set the profile selector (S2) to the desired Rx profile (Table 4.5) where the device to be deleted is saved.
3. Push the Teach-in button of the device that want to be deleted, or if they don't have the Teach-in button (as the EnOcean switches) action them. Once the telegram is received L1 will be on for 1 second to show that the device has been deleted correctly from this profile.
4. Once finished, set the switches S4-1 and S4-2 to OFF for a normal operation of the device.

### 4.4.2 Deleting all the devices linked to one profile

A device can break down or be lost, and therefore the above mentioned delete procedure would not be possible to be executed. For that reason all the devices in one profile can be deleted. To do so follow the instructions (the references to device components are specified in Figure 4.1):

1. Set the switches S4-1 and S4-2 to ON. L1 will turn into flashing (100 ms on and 100ms off).
2. Set the profile selector (S2) to the desired Rx profile (Table 4.5).
3. Press the button S3 for 5 seconds. Once that is done the L1 will be on for 1 second to show that all devices in this profile have been deleted.
4. Once finished, set the switches S4-1 and S4-2 to OFF for a normal operation of the device.

### 4.4.3 Return to factory settings

When a return to factory settings is performed, all the devices linked to all the Rx profiles will be deleted. It will also set the configuration to its default values (section 5.4). Follow the steps below in order to perform the return to factory settings (the references to device components are specified in Figure 4.1):

1. Set the switches S4-1 and S4-2 to ON. L1 will turn into flashing (100 ms on and 100ms off).

2. Press the button S3 for 10 seconds. After the first 5 seconds L1 will turn on during 1 second indicating that all the devices in the current Rx profile have been deleted, and then it will continue with the flashing. After 10 seconds pressing S3, L1 and L2 will turn on during 1 second and the device will reset itself.

3. Once finished, set the switches S4-1 and S4-2 to OFF for a normal operation of the device.

## *4.5 Remote management disablement*

In order to prevent the IntesisBox® from being configured remotely, the remote management has to be disabled by setting the switch S4-3 to ON according to Table 4.2. Once the remote management is disabled, the Intesis Configuration Software will not be able to communicate with the IntesisBox®. It still will be possible to configure the IntesisBox® manually.

# 5. Remote configuration

In this section is shown how the IntesisBox® can be configured using the Intesis Configuration Software.

For a more detailed explanation see the documentation of Intesis Configuration Software.

## 5.1 Reception profiles

Reception channels where up to 5 devices can be linked (see exceptions in Table 4.5). The links can be also achieved using the manual learning procedure (section 4.3).

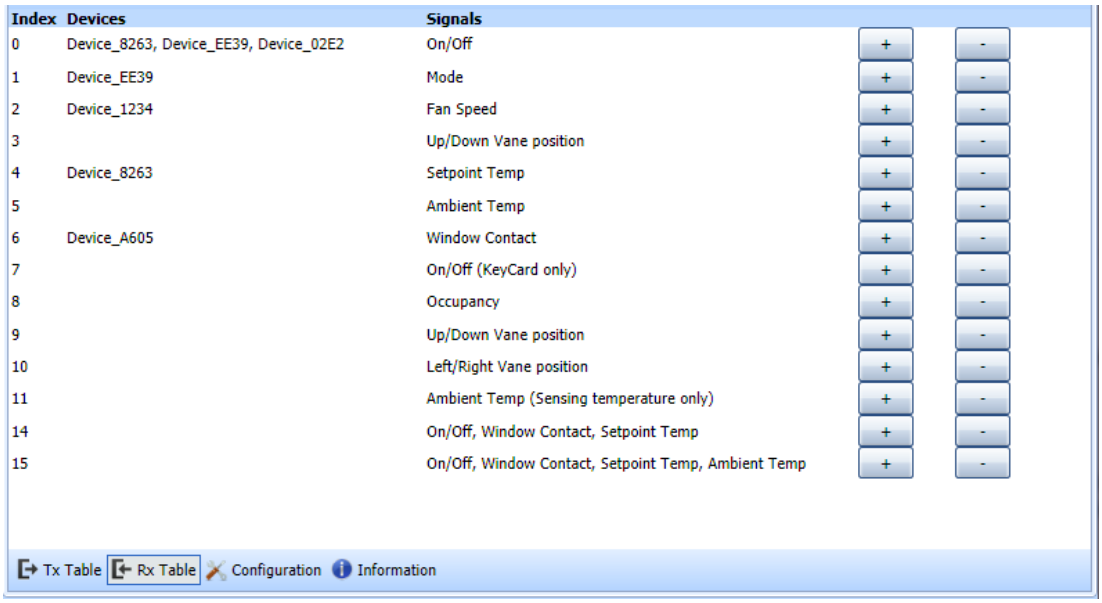



**Figure 5.1** Reception profiles with their associated signals and devices

## 5.2 Transmission profiles

Transmission channels to be used to teach the IntesisBox® into other devices. As in the reception channels, the procedure can be done manually just following the steps of the teach-in procedure (section 4.2.2).

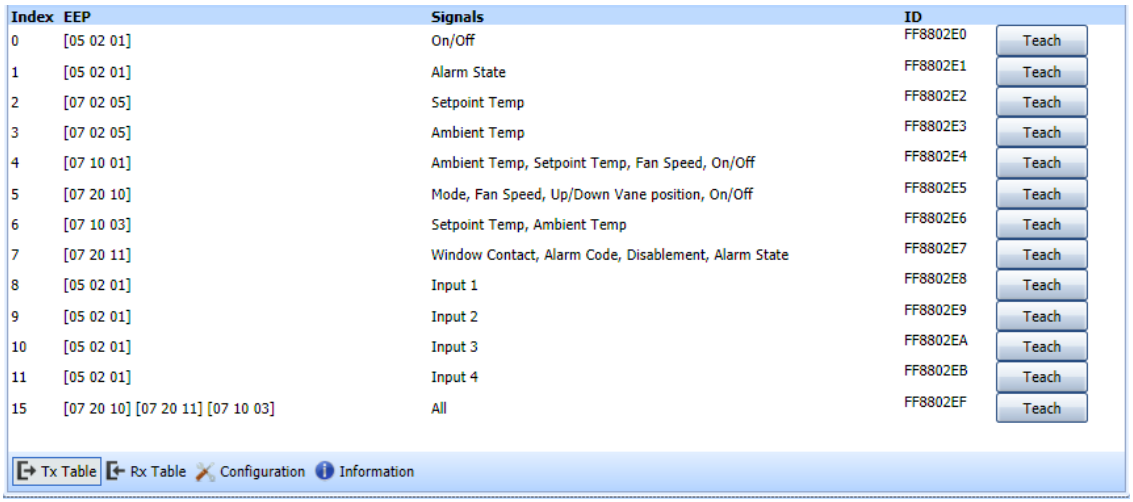



**Figure 5.2** Transmission channels with their EEPs and unique IDs

## *5.3 Configuration*

Using the Intesis Configuration Software it is possible to configure the behaviour of the IntesisBox®, its advanced functionality and the binary inputs.

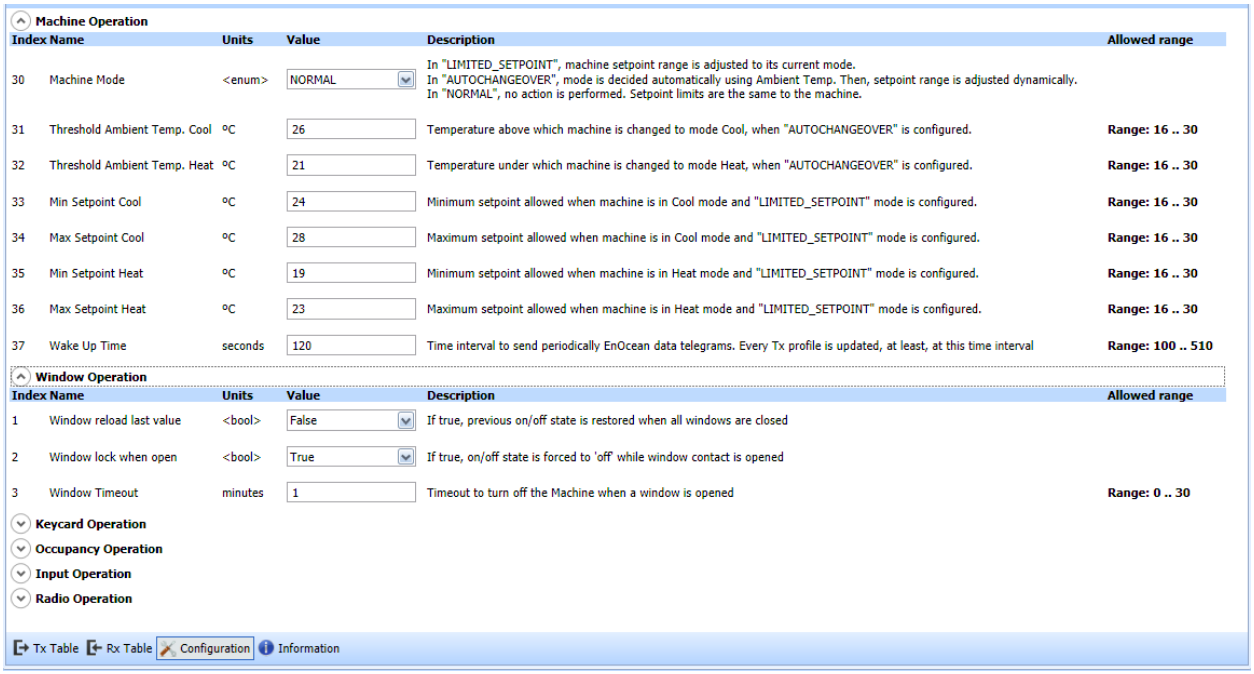



**Figure 5.3** IntesisBox® parameter configuration

Each one of the parameters is explained in the following sections:

### 5.3.1 Machine operation

**Machine mode:** three different operation modes related to the setpoint temperature can be selected:

- NORMAL: no action is performed; the setpoint limits are defined by the AC unit.
- LIMITED SETPOINT: the setpoint range is adjusted depending on the current mode.
- AUTOCHANGEOVER: mode is decided automatically depending on the ambient temperature; setpoint range is adjusted dynamically.

**Threshold ambient temperature cool:** temperature above which the AC unit will be set to cool mode (when AUTOCHANGEOVER is configured).

**Threshold ambient temperature heat:** temperature under which the AC unit will be set to cool mode (when AUTOCHANGEOVER is configured).

**Min. setpoint cool:** minimum setpoint allowed when AC unit is in cool mode (when LIMITED SETPOINT is configured).

**Max. setpoint cool:** maximum setpoint allowed when AC unit is in cool mode (when LIMITED SETPOINT is configured).

**Min. setpoint heat:** minimum setpoint allowed when AC unit is in heat mode (when LIMITED SETPOINT is configured).

**Max. setpoint heat:** maximum setpoint allowed when AC unit is in heat mode (when LIMITED SETPOINT is configured).

### 5.3.2 Window operation

**Window reload last value:** if true, previous ON/OFF state is restored when all windows are closed.

**Window lock when open:** if true, ON/OFF state is forced to OFF while a window is opened.

**Window timeout:** timeout to turn OFF the AC unit when a window is opened.

### 5.3.3 Keycard operation

**Keycard reload last value:** if true, previous ON/OFF state is restored when a key card is inserted.

**Keycard lock when not inserted:** if true, ON/OFF state is forced to OFF while no key card is inserted.

### 5.3.4 Occupancy operation

**Occupancy duration:** time while the last occupancy signal is considered valid.

**Occupancy 1st action timeout:** if no valid occupancy signal is received during this time, action 1 will be executed.

**Occupancy 1st action:** occupancy action type:
- APPLY_DELTA: it will apply an increment of temperature depending on the mode.
- SWITCH_OFF: the AC unit will be switched OFF.

**Occupancy 1st action delta heat:** if action 1 is configured as APPLY_DELTA, increment to apply in heat mode.

**Occupancy 1st action delta cool:** if action 1 is configured as APPLY_DELTA, increment to apply in cool mode.

**Occupancy 2nd action active:** if true, the 2nd action will be performed as well.

**Occupancy 2nd action timeout:** if no valid occupancy signal is received during this time, action 2 will be executed.

**Occupancy 2nd action:** occupancy action type:
- APPLY_DELTA: it will apply an increment of temperature depending on the mode.
- SWITCH_OFF: the AC unit will be switched OFF.

**Occupancy 2nd action delta heat:** if action 2 is configured as APPLY_DELTA, increment to apply in heat mode.

**Occupancy 2nd action delta cool:** if action 2 is configured as APPLY_DELTA, increment to apply in cool mode.

**Occupancy reload last value:** if true, previous ON/OFF state is restored when the room is occupied.

**Occupancy lock when unoccupied:** if true, ON/OFF state is forced to OFF while the room is unoccupied.

### 5.3.5 Input operation

There are three configurable parameters per each input, so X is valid from 1 to 4 in the following lines:

**Input X inverted:** input X logic inversion, if true input X is inverted.

**Input X function:** input X can be configured in order to behave as:
- NONE: input X is only transmitted to EnOcean, with any other effect.
- ON_OFF: input X is able to change the ON/OFF state of the AC unit.
- WINDOW_CONTACT: input X is used as a window contact.
- KEY_CARD: input X behaves as a key card reader.
- OCCUPANCY: input X is used as an occupancy sensor.

**Input X key card:** input X is transmitted to EnOcean as a key card, which means that just one telegram will be sent per each change on the state of input X.

### 5.3.6 Radio operation

**Repeater enable:** EnOcean repeater function enablement.

**Repeater level:** EnOcean repeater function mode, if repeater is disabled, this parameter is not significant. It can be configured as:

- Disabled: no telegrams will be repeated.
- 1-LEVEL: original telegrams will be repeated.
- 2-LEVEL: original and repeated telegrams will be repeated.

**IR disablement:** disablement of the AC remote control. If this value is true, AC remote control will be overridden by the gateway.

## *5.4 Default values*

| Parameter | Default value | Units |
|---|---|---|
| Machine mode | NORMAL | <enum> |
| Threshold ambient temperature cool | 26 | ºC |
| Threshold ambient temperature heat | 21 | ºC |
| Min. setpoint cool | 24 | ºC |
| Max. setpoint cool | 28 | ºC |
| Min. setpoint heat | 19 | ºC |
| Max. setpoint heat | 23 | ºC |
| Wake up time | 120 | seconds |
| Window reload last value | False | <bool> |
| Window lock when open | True | <bool> |
| Window timeout | 1 | minutes |
| Key card reload last value | False | <bool> |
| Key card lock when not inserted | True | <bool> |
| Occupancy duration | 40 | seconds |
| Occupancy 1st action timeout | 10 | minutes |
| Occupancy 1st action | APPLY _DELTA | <enum> |
| Occupancy 1st action delta heat | -2 | ºC |
| Occupancy 1st action delta cool | 2 | ºC |
| Occupancy 2nd action active | True | <bool> |
| Occupancy 2nd action timeout | 30 | minutes |
| Occupancy 2nd action | SWITCH_OFF | <enum> |
| Occupancy 2nd action delta heat | -3 | ºC |
| Occupancy 2nd action delta cool | 3 | ºC |
| Occupancy reload last value | False | <bool> |
| Occupancy lock when unoccupied | False | <bool> |
| Input 1..4 inverted | False | <bool> |
| Input 1..4 function | NONE | <enum> |
| Input 1..4 key card | False | <bool> |
| Repeater enable | False | <bool> |
| Repeater level | Disabled | <enum> |
| IR disablement | False | <bool> |

**Table 5.1** Default values

# 6. Special Behaviours

In this section it is explained the special behaviour of the IntesisBox® when certain kinds of devices are used: window contacts, thermostats with external temperature sensor, occupancy sensors and key cards. The use of these sensors needs further explanation as the IntesisBox® carries out special operations or assumes previous states. All the explanations in these sections are related to the factory settings of the device.

## *6.1 Window contact*

The IntesisBox® has the functionality to automatically control the turning on and off of the AC indoor unit depending on the state of one or several (up to 5) EnOcean window contacts.

EnOcean window contacts periodically send its state and they do so too after a change in the window state.

When a window contact is associated to the IntesisBox® interface it is assumed that the window is closed until the correct state of the window contact is received.

The AC indoor unit will be turned OFF and disabled if **any** of the window contacts linked to the window contact profile is sending a "window opened" message for a certain period of time (default value: 1 minute). If the AC indoor unit is set to ON (either by an EnOcean device or by the remote control) the IntesisBox® will set it back to OFF.

When all the window contacts are sending a "window closed" message, the AC indoor unit will stay OFF but it will be possible to turn it ON.

The functionality specified on the above lines would only be active when devices are linked in the window contact profile (Table 4.5).

The information about the states of the linked window contacts would be lost if there is a power down in the system, but it will restore itself in a brief period of time as the window contacts send their state periodically.

## *6.2 External temperature sensors. Virtual temperature*

This behaviour is only activated when there is an external temperature device linked to either profile 5 or profile F. If both profiles have a temperature sensor linked, the one in profile F will have priority and the one in profile 5 will be ignored. If no temperature is supplied by the sensor, the IntesisBox® is going to have undesired behaviours.

Three temperatures are involved:

- Set point temperature: It is the set point temperature sent to the AC unit ($S$)
- Virtual Set point temperature: It is the Set point temperature requested by the thermostat ($S_v$)
- Virtual Ambient temperature: It is the ambient temperature measured by the thermostat ($T_v$)

The Set point Temperature sent to the AC indoor unit is calculated with the following formula:

$$S = S_v - ( T_v - S_v ) / 2$$

### 6.3 Key card

Due to the way the key card reader works there is a specific reception profile for it. In this profile (Table 4.5) it is possible to link up to five devices. If the linked device is not a key card the correct behaviour of the IntesisBox® cannot be granted.

When inserting the key card in the reader, the AC unit is enabled (becomes available to be turned on) but it stays OFF. A manual actuation of another device would be needed to turn it ON.

When the key card is removed, the AC unit is disabled and turned OFF, staying in this state until we insert the key card again. If the AC indoor unit is set to ON (either by an EnOcean device or by the remote control) the IntesisBox® will set it back to OFF.

The functionality specified on the above lines would only be active when devices are linked in the key card profile (Table 4.5).

The information about the state of the linked key card would be lost if there is a power down in the system. Therefore it would be needed to set the previous state by actuating the key card.

### 6.4 Occupancy sensors

The IntesisBox® has the functionality to automatically control the behaviour of the AC unit depending on the state of one or several (up to 5) EnOcean occupancy sensors.

When all the occupancy sensors linked to the device are not detecting any occupancy, the IntesisBox® will go to non-presence mode following these steps:

1. Wait a certain time period (default value: 10 minutes) where no action is performed.

2. When this time expires the set point temperature will change depending on the mode. In cool mode the set point would increase 2ºC and in heat mode would decrease 2ºC. If any other mode the set point temperature would not be changed.

3. After a second period of time (default value: 30 minutes) the AC unit will be turned OFF.

If a presence is detected the system will work as follows:

1. After step 2: recovers previous set point temperature.

2. After step 3: recovers previous set point temperature but AC unit remains OFF.

The explained functionality will only be valid if the occupancy sensors are linked in the occupancy profile (Table 4.5).

The information about the state of the linked occupancy sensors would be lost if there is a power down in the system. It will recover as soon as a presence signal is received.

## 6.5 MultiTeach-in procedure

AC units have a lot of parameters to control and supervise and with only one 4BS telegram all this information cannot be fitted in. For this reason the IntesisBox® implements, besides standard Teach-in, a MultiTeach-in procedure where more than one EEP is sent at the same time in order to be linked. In the next lines this procedure is going to be further explained.

This procedure is performed only when the profile selector (S2) is set to profiles E or F (the ones that implement the HVAC generic EEPs). The way it is implemented is simple. A different Base ID is assigned to each EEP and it is actually performing 3 consecutive Teach-in procedures. This allows devices that support the 3 EEP's to automatically link them.

It might happen that the device in learning mode does not support the MultiTeach-in procedure. In that case profiles 5, 6 and 7 can be used in order to perform the Teach-in one by one due to the fact that these profiles have the same EEPs as profile E or F.

It needs to be taken into account that used in this profile the IntesisBox® is working as if it was three different EnOcean devices at a time.

If this procedure is performed in the opposite way (the IntesisBox® is in Learning mode in profile E or F) 3 devices positions would be taken, implying that only 1 device using MultiTeach-in would be able to be fully linked in each profile. If tried again with another device only 2 of the different EEPs are going to be stored.

## 6.6 Binary inputs

The device IntesisBox® has four potential-free binary inputs. Each one of these inputs can be configured to behave according to the following functionalities:

a) NONE: Input sate is sent but no other action is performed.
b) ON_OFF: Input is able to change the ON/OFF state of the AC unit.
c) WINDOW_CONTACT: Input is used as a window contact.
d) KEY_CARD: Input behaves as a key card reader.
e) OCCUPANCY: Input is used as an occupancy sensor.

By default, the four inputs are configured as NONE.

## 6.7 Setpoint

When a device is linked to Rx profile 4, E or F, it will be able to modify the setpoint temperature of the AC unit. Nevertheless the following differences between these profiles must be taken into account (check the supported EEPs for each profile in section 14):

- *Profile E & F:* the setpoint temperature is sent through one byte of the EEP (0...255), and its scale will always be 0...40ºC.
- *Profile 4:* the setpoint can be sent either by a rocker switch (it will increment/decrement the setpoint) or through one byte of the EEP (0...255). In case of an EEP which sends one byte for the setpoint, its scale will be MIN.SETPOINT...MAX.SETPOINT. Depending on the mode of the AC unit and the configuration of machine mode (see section 5.3.1), the value of MIN. SETPOINT and MAX. SETPOINT could change. Therefore the scale of the setpoint in profile 4 might change depending on the AC unit's mode and machine mode's configuration.

# 7. Status monitoring

The interface IntesisBox® has three LEDs that show information about the operation of the device.

The LED L1 (see Figure 4.1) is associated to the EnOcean section and the LED L2 to the AC one (AC LED).

## *7.1 L2 (yellow): AC monitoring*

In Table 7.1 it is shown how the AC LED L2 behaves and its meaning

| Device status | LED (L2) state | ON / OFF Period | Meaning |
|---|---|---|---|
| Turning on | Pulse | ON during 5 seconds | Initialization process after start up or reset |
| During normal operation | Flashing | 100ms ON<br>1900ms OFF | Normal Operation |
| During normal operation | Blinking | 500ms ON<br>500ms OFF | AC unit error / communication error |

**Table 7.1** IntesisBox® state and AC LED

## *7.2 L1 (green): EnOcean monitoring*

EnOcean LED L1 will behave according to the following table:

| Device status | LED (L1) state | ON / OFF Period | Meaning |
|---|---|---|---|
| Turning on | Pulse | ON during 3 sec | Initialization process after start up or reset |
| Learning mode | ON | ON | Devices can be learnt in the selected profile |
| Erasing mode | Blinking | 100ms ON<br>100ms OFF | Erase mode,<br>see section 4.4 |
| Comm. monitoring enabled | Flashing | 100ms ON | A telegram has been received in normal mode,<br>see section 4.2 |

**Table 7.2** EnOcean LED

# 8. How to?

## 8.1 Check if my AC unit can be controlled with the IntesisBox®

See section 11.

## 8.2 Disable AC remote controller

There are a two ways to perform this functionality:

a) Set the "IR disablement" parameter to true using the Intesis Configuration Software (see section 5.3.6).

b) Sending a telegram using the EEP [07-20-11], in receive mode, setting the bit DB0.2 to 1 (see section 12). It is important to bear in mind that the transmitter device needs first to be learnt by the IntesisBox®.

## 8.3 Link sensors to the IntesisBox®

It can be done either manually (section 4.3.1) or remotely (section 5.1).

It is important to know that just one signal of the EEP of the sensor is going to be linked. See an example of how an Intesis thermostat (IS-TK04PST) will behave depending on the way it is linked:

- If an IS-TK04PST is linked to the Rx profile 0 (On/Off), it will only be possible to turn on or off the AC unit connected to the IntesisBox® using the IS-TK04PST's switch. It will not be possible to change the fan speed, setpoint or ambient temperature.
- If the IS-TK04PST is linked now to Rx profile 2 (fan speed), the fan speed will be changed by the IS-TK04PST's fan speed switch. At this point the IS-TK04PST is linked to both signals, so it will change the fan speed and it will turn on or off the AC unit.
- The IS-TK04PST will be fully functional if it is linked to the corresponding profiles:
    - On/Off -> Rx profile 0
    - Fan speed -> Rx profile 2
    - Set point -> Rx profile 4
    - Ambient temperature -> Rx profile 5

## 8.4 Control & monitor the IntesisBox® from a gateway

In order to control the IntesisBox® from a gateway it will be necessary to learn this gateway first. To monitor the IntesisBox® from a gateway, the Teach-in procedure will have to be executed.

a) Learn the gateway in profile E or F. See section 4.3.2.

b) Teach profile F to the gateway. See section 4.2.2.

## 8.5 Control & monitor the IntesisBox® from a software application

a) Control the IntesisBox® from a software application:

Follow the steps in section 4.3.2 (learning gateways) and instead of steps 3 and 4 (selecting profile F and pressing the Teach-in button of the gateway), three Teach-in telegrams corresponding to EEPs 07-20-10, 07-20-11 and 07-10-03 must be sent by the software application.

See the description of the Teach-in telegrams structure in section 12.

b) Monitor the IntesisBox® from a software application:

Teach profile F to the software application. See section 4.2.2.

## 8.6 Configure parameters

The IntesisBox® parameters can be configured using the Intesis Configuration Software (section 5.3).

## 8.7 Check if the devices have been correctly learnt

a) Using the Intesis Configuration Software, load the reception profiles and check that the device has been learnt in the correct profile.

b) Enable monitor mode (section 4.2.1) and check if the device has been learnt or. It will not be possible to know if it is learnt in the desired profile.

## 8.8 Protect the IntesisBox® from undesired remote access

It can be achieved either by remote configuration or using the switch S4-3. Even both protection methods can be performed:

a) If using remote configuration: See Intesis Configuration Software documentation.

b) If using manual configuration: Section 4.5.

## 8.9 Improve radio coverage of IntesisBox®

It is important to set the antenna cable as much straight as possible, trying to avoid angles in this cable and with no loops.

Changing the location of the antenna cable might improve the radio coverage of the IntesisBox®, which will depend on the position of the IntesisBox®.

# 9. Technical data and dimensions

| | |
|---|---|
| **Enclosure** | ABS (UL 94 HB). 2,5 mm thickness |
| **Dimensions** | 70 x 100 x 28 mm |
| **Weight** | 80g |
| **Colour** | White |
| **Power supply** | 12V, 55mA typical<br>Doesn't require external power supply (supplied by the AC Unit) |
| **Mounting** | Wall. |
| **LED indicators (internal)** | 1 x AC unit state<br>1 x EnOcean state |
| **Binary inputs** | 4 x Potential-free binary inputs (dry contacts)<br>Signal cable length: 5m unshielded, may be extended up to 20m with twisted.<br>Compliant with the following standards:<br>IEC61000-4-2 : level 4 - 15kV (air discharge) - 8kV (contact discharge)<br>MIL STD 883E-Method 3015-7 : class3B |
| **Configuration** | Manual procedures: Teach-in and Learning<br>Remote wireless Configuration from PC |
| **Operating Temperature** | From -25ºC to 85ºC |
| **Operating humidity** | <93% HR, no condensation |
| **Stock humidity** | <93% HR, no condensation |
| **RoHS conformity** | Compliant with RoHS directive (2002/95/CE). |
| **Certifications** | PA-AC-ENO-1i:<br>• CE conformity to EMC directive (2004/108/EC) and Low-voltage directive (2006/95/EC)<br>  ○ EN 61000-6-2<br>  ○ EN 61000-6-3<br>  ○ EN 60950-1<br>  ○ EN 50491-3<br>PA-AC-ENO-1iC:<br>• FCC (*ID: SZV-STM300C)*<br>• IC (ID*: 5713A-STM300C)* |

**Table 9.1** Technical data

## 10. Dimensions

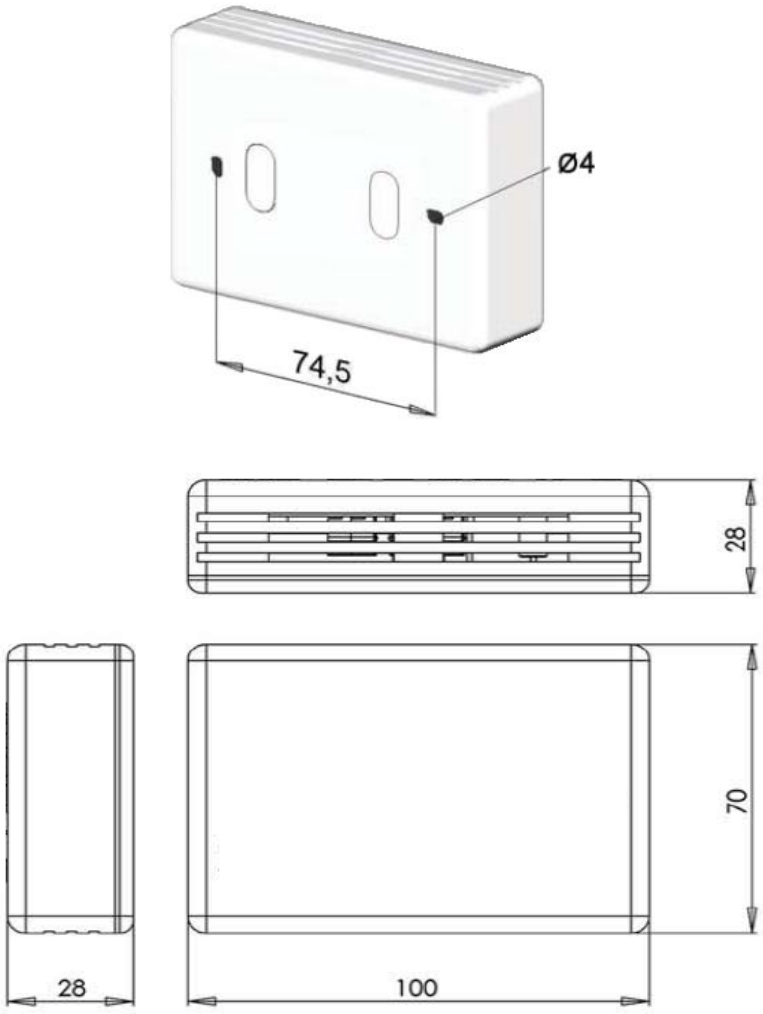



**Figure 10.1** IntesisBox® dimensions in mm

## 11. AC Unit Types compatibility

A list of Panasonic indoor unit model references compatible with PA-AC-ENO-1i / 1iC and their available features can be found in:

http://www.intesis.com/pdf/IntesisBox_PA-AC-xxx-1_AC_Compatibility.pdf

# 12. AC profile data (Generic HVAC interface)

In this section the *Generic HVAC interface* EEPs (07-20-10 and 07-20-11) applied to the IntesisBox® are explained. These two EEPs along with the *Room Operating Panel* EEP 07-10-03 can transmit and receive all the AC information.

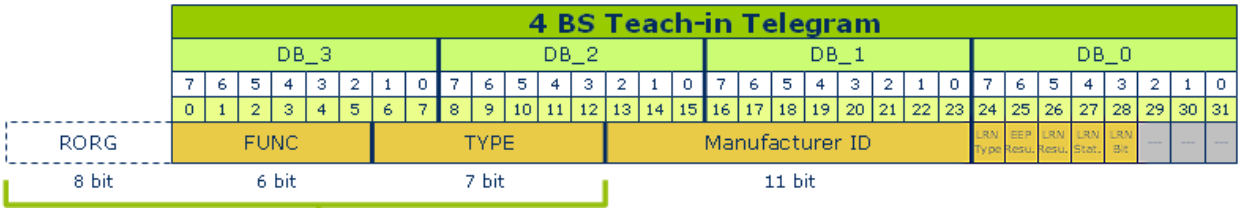
Following description will only apply for profiles E and F.

## *12.1 EEP: 07-20-10*

**ORG = 07 (4 BS)**
**FUNC = 20 (HVAC Components)**
**TYPE = 10 (Generic HVAC interface – Functions: Mode, vane position, fan speed, sensors and on/off)**

EEP for Generic HVAC interface – Functions: Mode, vane position, fan speed, sensors and on/off: With this EEP plus the already existing EEP 07-10-03 and 07-20-11 all the information of AC indoor unit can be sent and received allowing a much easier and complete control of these units.

**Teach-In**
The teach-in telegram has the same structure as a normal 4BS telegram.
See EnOcean Equipment Profiles (EEP) v2.1 and use the following structure.




| | | |
|---|---|---|
| DB_3.7 ... DB_3.2: | Function: same as teach-in telegram heating valve = 20 | |
| DB_3.2 ... DB_2.3: | Type: same as teach-in telegram actuator = 10 | |
| DB_2.2 ... DB_1.0: | Manufacturer: Intesis Software ID = 0x019 | |
| DB_0.7: | LRN TYPE = 0b1 (type 1 with profile, manufacturer Id) | |
| DB_0.6: | EEP result; EEP supported = 0b1, EEP not supported = 0b0 | |
| DB_0.5: | LRN result; ID stored = 0b1, ID deleted (not stored ) = 0b0 | |
| DB_0.4: | TA: teach-in answer = 0b1 | |
| DB_0.3: | LRN Learn button | 0b0 Teach-in telegram<br>0b1 Data telegram |
| DB_0.2 ... DB_0.0: | Not used | |

## EEP: 07-20-10 (CONTINUATION)

**DATA BYTES**

**Receive mode**: Commands received by the HVAC interface

| | | | |
|---|---|---|---|
| DB_3 | Mode[1] | 0 | Auto |
| | | 1 | Heat |
| | | 3 | Cool |
| | | 9 | Fan only |
| | | 14 | Dehumidification (dry) |
| | | 15 ... 32 | Not supported |
| | | 33 … 254 | Reserved |
| | | 255 | N/A[2] |
| DB_2.7 ... DB_2.4 | Vane Up/Down position | 0 | Auto |
| | | 1 | Position 1 |
| | | 2 | Position 2 |
| | | 3 | Position 3 |
| | | 4 | Position 4 |
| | | 5 | Position 5 |
| | | 6 | Not supported |
| | | 7 ... 10 | Reserved |
| | | 11 ... 14 | Not supported |
| | | 15 | N/A |
| DB_2.3 ... DB_2.0 | Fan Speed | 0 | Auto |
| | | 1 | Low |
| | | 2 | Mid1 |
| | | 3 | Mid2 |
| | | 4 | Mid3 |
| | | 5 | High |
| | | 6 ... 14 | Sets the value to max. fan speed |
| | | 15 | N/A |
| DB_1 | Not used | | |
| DB_0.3 | Learn Button | 0b0 | Teach-in telegram |
| | | 0b1 | Data telegram |
| DB_0.2 ... DB_0.1 | Room occupancy | 00: | Occupied |
| | | 01: | StandBy (waiting to perform action) |
| | | 10: | Unoccupied (action performed) |
| | | 11: | Off (no occupancy and no action) |
| DB_0.0 | On/Off | 0b0 | Off |
| | | 0b1 | On |

[1] Other modes don't apply to this AC interface. If any other received it would behave as if it had received and N/A
[2] N/A stands for No Action. It keeps the current value of the parameter

## EEP: 07-20-10 (CONTINUATION)

**Transmit mode**: Commands sent by the HVAC interface

| | | | |
|---|---|---|---|
| DB_3 | Mode[1] | 0 | Auto |
| | | 1 | Heat |
| | | 3 | Cool |
| | | 9 | Fan only |
| | | 14 | Dehumidification (dry) |
| | | 15 ... 32 | Not supported |
| | | 33 … 254 | Reserved |
| | | 255 | N/A[2] |
| DB_2.7 ... DB_2.4 | Vane Up/Down position | 0 | Auto |
| | | 1 | Position 1 |
| | | 2 | Position 2 |
| | | 3 | Position 3 |
| | | 4 | Position 4 |
| | | 5 | Position 5 |
| | | 6 | Not supported |
| | | 7 ... 10 | Reserved |
| | | 11 ... 14 | Not supported |
| | | 15 | N/A |
| DB_2.3 ... DB_2.0 | Fan Speed | 0 | Auto |
| | | 1 | Low |
| | | 2 | Mid1 |
| | | 3 | Mid2 |
| | | 4 | Mid3 |
| | | 5 | High |
| | | 6 ... 14 | Not supported |
| | | 15 | N/A |
| DB_1 | Not used | | |
| DB_0.3 | Learn Button | 0b0 | Teach-in telegram |
| | | 0b1 | Data telegram |
| DB_0.2 ... DB_0.1 | Room occupancy | 00: | Occupied |
| | | 01: | StandBy (waiting to perform action) |
| | | 10: | Unoccupied (action performed) |
| | | 11: | Off (no occupancy and no action) |
| DB_0.0 | On/Off | 0b0 | Off |
| | | 0b1 | On |

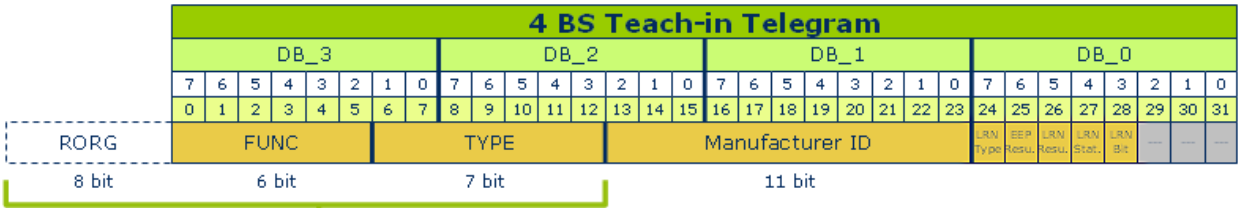
[1] Other modes don't apply to this AC interface. It will only send this ones
[2] N/A: it is send when the value of the parameter is not known

## 12.2 EEP: 07-20-11

**ORG = 07 (4 BS)**
**FUNC = 20 (HVAC Components)**
**TYPE = 11 (Generic HVAC interface – Error control: AC Error code, Error states and disablements)**

EEP for Generic HVAC interface – Functions: : Error control: AC Error code, Error states and disablements: With this EEP plus the already existing EEP 07-10-03 and 07-20-10 all the information of AC indoor unit can be sent and received allowing a much easier and complete control of these units.

**Teach-In**
The teach-in telegram has the same structure as a normal 4BS telegram.
See EnOcean Equipment Profiles (EEP) v2.1 and use the following structure.




| | | |
|---|---|---|
| DB_3.7 ... DB_3.2: | Function: same as teach-in telegram heating valve = 20 | |
| DB_3.2 ... DB_2.3: | Type: same as teach-in telegram actuator = 11 | |
| DB_2.2 ... DB_1.0: | Manufacturer: Intesis Software ID = 0x019 | |
| DB_0.7: | LRN TYPE = 0b1 (type 1 with profile, manufacturer Id) | |
| DB_0.6: | EEP result; EEP supported = 0b1, EEP not supported = 0b0 | |
| DB_0.5: | LRN result; ID stored = 0b1, ID deleted (not stored ) = 0b0 | |
| DB_0.4: | TA: teach-in answer = 0b1 | |
| DB_0.3: | LRN Learn button | 0b0 Teach-in telegram<br>0b1 Data telegram |
| DB_0.2 ... DB_0.0: | Not used | |

## EEP: 07-20-11 (CONTINUATION)

**DATA BYTES**

**Receive mode**: Commands received by the HVAC interface

| | | | |
|---|---|---|---|
| DB_3 | Not used | | |
| DB_2 | Not used | | |
| DB_1.7 ... DB_1.1 | Not used | | |
| DB_1.0 | External disablement | 0b0 | Not disabled |
| | | 0b1 | Disabled |
| DB_0.3 | Learn Button | 0b0 | Teach-in telegram |
| | | 0b1 | Data telegram |
| DB_0.2 | Disable remote controller | 0b0 | Enable Remote controller |
| | | 0b1 | Disable Remote controller |
| DB_0.1 | Window contact | 0b0 | Windows opened |
| | | 0b1 | Windows closed |
| DB_0.0 | Not used | | |

**Transmit mode**: Commands sent by the HVAC interface

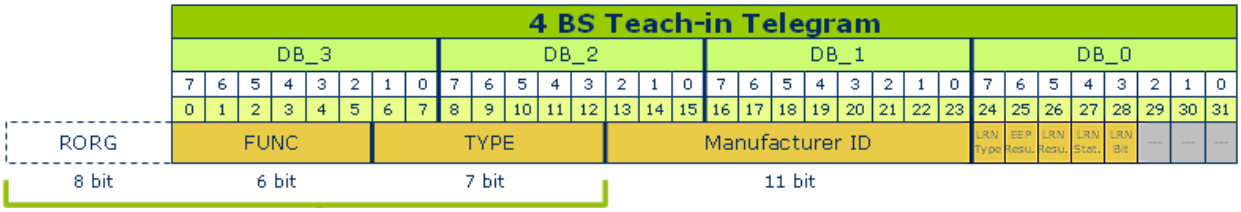
| | | | |
|---|---|---|---|
| DB_3 | Error code HI | | Generated by A.C (Table 13.1) |
| DB_2 | Error code LO | | Generated by A.C (Table 13.1) |
| DB_1.7 ... DB_1.4 | Reserved | 0x00 | |
| DB_1.3 | Other disablement | 0b0 | Not Used |
| DB_1.2 | Window contact disablement | 0b0 | Not disabled |
| | | 0b1 | Disabled |
| DB_1.1 | Key card disablement | 0b0 | Not disabled |
| | | 0b1 | Disabled |
| DB_1.0 | External disablement | 0b0 | Not disabled |
| | | 0b1 | Disabled |
| DB_0.3 | Learn Button | 0b0 | Teach-in telegram |
| | | 0b1 | Data telegram |
| DB_0.2 | Disable remote controller | 0b0 | Enable Remote controller |
| | | 0b1 | Disable Remote controller |
| DB_0.1 | Window contact | 0b0 | Windows opened |
| | | 0b1 | Windows closed |
| DB_0.0 | Alarm State | 0b0 | OK |
| | | 0b1 | Error |

## 12.3 EEP: 07-10-03

**ORG = 07 (4 BS)**
**FUNC = 10 (Room Operating Panel)**
**TYPE = 03 (Temperature Sensor, Set Point Control)**

EEP for Room Operating Panel – Functions: Temperature Sensor, Set Point Control: With this EEP plus the already existing EEP 07-20-11 and 07-20-10 all the information of AC indoor unit can be sent and received allowing a much easier and complete control of these units.

**Teach-In**
The teach-in telegram has the same structure as a normal 4BS telegram.
See EnOcean Equipment Profiles (EEP) v2.1 and use the following structure.




| | | |
|---|---|---|
| DB_3.7 ... DB_3.2: | Function: same as teach-in telegram heating valve = 20 | |
| DB_3.2 ... DB_2.3: | Type: same as teach-in telegram actuator = 11 | |
| DB_2.2 ... DB_1.0: | Manufacturer: Intesis Software ID = 0x019 | |
| DB_0.7: | LRN TYPE = 0b1 (type 1 with profile, manufacturer Id) | |
| DB_0.6: | EEP result; EEP supported = 0b1, EEP not supported = 0b0 | |
| DB_0.5: | LRN result; ID stored = 0b1, ID deleted (not stored) = 0b0 | |
| DB_0.4: | TA: teach-in answer = 0b1 | |
| DB_0.3: | LRN Learn button | 0b0 Teach-in telegram<br>0b1 Data telegram |
| DB_0.2 ... DB_0.0: | Not used | |

**DATA BYTES**

| | | | |
|---|---|---|---|
| DB_3 | Not used | | |
| DB_2 | Set Point[1] | 0 ... 255 | Set Point (0 ... 40ºC) |
| DB_1 | Temperature[2] | 255 ... 0 | Temperature (0 ... 40ºC) |
| DB_0.7 ... DB_0.4 | Not used | | |
| DB_0.3 | Learn Button | 0b0 | Teach-in telegram |
| | | 0b1 | Data telegram |
| DB_0.2 ... DB_0.0 | Not used | | |

[1] Scaling with values 0 ... 40 ºC only apply with profiles E and F.
[2] While no sensor is linked to the IntesisBox®, a value of 0xFF will be sent indicating "no valid temperature".

# 13. Error Codes

| EnOcean Error Code | Error in RC | Abnormality / Protection control | Abnormality Judgment | Problem | Check Location |
|---|---|---|---|---|---|
| 0 | H00 | No memory of failure | — | No error | — |
| 65535 (-1 if signed) | — | — | — | Error in the communication of PA-AC-ENO-1i device with the AC unit | • Indoor/gateway connection wire |
| 8209 | H11 | Indoor/outdoor abnormal communication | After operation for 1 minute | Indoor/outdoor communication not establish | • Indoor/outdoor wire terminal<br>• Indoor/outdoor PCB<br>• Indoor/outdoor connection wire |
| 8210 | H12 | Indoor unit capacity unmatched | 90s after power supply | Total indoor capability more than maximum limit or less than minimum limit, or number of indoor unit less than two. | • Indoor/outdoor connection wire<br>• Indoor/outdoor PCB<br>• Specification and combination table in catalogue |
| 8212 | H14 | Indoor intake air temperature sensor abnormality | Continuous for 5s | Indoor intake air temperature sensor open or short circuit | • Indoor intake air temperature sensor lead wire and connector |
| 8213 | H15 | Compressor temperature sensor abnormality | Continuous for 5s | Compressor temperature sensor open or short circuit | • Compressor temperature sensor lead wire and connector |
| 8214 | H16 | Outdoor current transformer (CT) abnormality | — | Current transformer faulty or compressor faulty | • Outdoor PCB faulty or compressor faulty |
| 8217 | H19 | Indoor fan motor mechanism lock | Continuous happen for 7 times | Indoor fan motor lock or feedback abnormal | • Fan motor lead wire and connector<br>• Fan motor lock or block |
| 8227 | H23 | Indoor heat exchanger temperature sensor abnormality | Continuous for 5s | Indoor heat exchanger temperature sensor open or short circuit | • Indoor heat exchanger temperature sensor lead wire and connector |
| 8229 | H25 | Indoor E-Ion abnormality | Port is ON for 10s during E-Ion off | — | • E-Ion PCB |
| 8231 | H27 | Outdoor air temperature sensor abnormality | Continuous for 5s | Outdoor air temperature sensor open or short circuit | • Outdoor air temperature sensor lead wire and connector |
| 8232 | H28 | Outdoor heat exchanger temperature sensor 1 abnormality | Continuous for 5s | Outdoor heat exchanger temperature sensor 1 open or short circuit | • Outdoor heat exchanger temperature sensor 1 lead wire and connector |
| 8240 | H30 | Outdoor discharge pipe temperature sensor abnormality | Continuous for 5s | Outdoor discharge pipe temperature sensor open or short circuit | • Outdoor discharge pipe temperature sensor lead wire and connector |
| 8242 | H32 | Outdoor heat exchanger temperature sensor 2 abnormality | Continuous for 5s | Outdoor heat exchanger temperature sensor 2 open or short circuit | • Outdoor heat exchanger temperature sensor 2 lead wire and connector |
| 8243 | H33 | Indoor / outdoor misconnection abnormality | — | Indoor and outdoor rated voltage different | • Indoor and outdoor units check |
| 8244 | H34 | Outdoor heat sink temperature sensor abnormality | Continuous for 2s | Outdoor heat sink temperature sensor open or short circuit | • Outdoor heat sink sensor |
| 8246 | H36 | Outdoor gas pipe temperature sensor abnormality | Continuous for 5s | Outdoor gas pipe temperature sensor open or short circuit | • Outdoor gas pipe temperature sensor lead wire and connector |
| 8247 | H37 | Outdoor liquid pipe temperature sensor abnormality | Continuous for 5s | Outdoor liquid pipe temperature sensor open or short circuit | • Outdoor liquid pipe temperature sensor lead wire and connector |

| | | | | | |
|---|---|---|---|---|---|
| 8248 | H38 | Indoor/Outdoor mismatch (brand code) | — | Brand code not match | • Check indoor unit and outdoor unit. |
| 8249 | H39 | Abnormal indoor operating unit or standby units | 3 times happen within 40 minutes | Wrong wiring and connecting pipe, expansion valve abnormality, indoor heat exchanger sensor open circuit | • Check indoor/outdoor connection wire and connection pipe<br>• Indoor heat exchanger sensor lead wire and connector<br>• Expansion valve and lead wire and connector |
| 8257 | H41 | Abnormal wiring or piping connection | — | Wrong wiring and connecting pipe, expansion valve abnormality | • Check indoor/outdoor connection wire and connection pipe<br>• Expansion valve and lead wire and connector. |
| 8280 | H58 | Indoor gas sensor abnormality | Continuous for 6 hours | Indoor gas sensor open or short circuit | • Indoor gas sensor<br>• Indoor PCB |
| 8281 | H59 | ECO patrol sensor abnormality | Continuous for 70s | ECO patrol sensor open or short circuit | • ECO patrol sensor<br>• ECO patrol and Indoor PCB |
| 8292 | H64 | Outdoor high pressure sensor abnormality | Continuous for 1 minutes | High pressure sensor open circuit during compressor stop | • High pressure sensor<br>• Lead wire and connector |
| 8343 | H97 | Outdoor fan motor mechanism lock | 2 times happen within 30 minutes | Outdoor fan motor lock or feedback abnormal | • Outdoor fan motor lead wire and connector<br>• Fan motor lock or block |
| 8344 | H98 | Indoor high pressure protection | — | Indoor high pressure protection (Heating) | • Check indoor heat exchanger<br>• Air filter dirty<br>• Air circulation short circuit |
| 8345 | H99 | Indoor operating unit freeze protection | — | Indoor freeze protection (Cooling) | • Check indoor heat exchanger<br>• Air filter dirty<br>• Air circulation short circuit |
| 12305 | F11 | 4-way valve switching abnormality | 4 times happen within 30 minutes | 4-way valve switching abnormal | • 4-way valve<br>• Lead wire and connector. |
| 12311 | F17 | Indoor standby units freezing abnormality | 3 times happen within 40 minutes | Wrong wiring and connecting pipe, expansion valve leakage, indoor heat exchanger sensor open circuit | • Check indoor/outdoor connection wire and pipe<br>• Indoor heat exchanger sensor lead wire and connector<br>• Expansion valve lead wire and connector. |
| 12432 | F90 | Power factor correction (PFC) circuit protection | 4 times happen within 10 minutes | Power factor correction circuit abnormal | • Outdoor PCB faulty |
| 12433 | F91 | Refrigeration cycle abnormality | 2 times happen within 20 minutes | Refrigeration cycle abnormal | • Insufficient refrigerant or valve close |
| 12435 | F93 | Compressor abnormal revolution | 4 times happen within 20 minutes | Compressor abnormal revolution | • Power transistor module faulty or compressor lock |
| 12436 | F94 | Compressor discharge pressure overshoot protection | 4 times happen within 30 minutes | Compressor discharge pressure overshoot | • Check refrigeration system |
| 12437 | F95 | Outdoor cooling high pressure protection | 4 times happen within 20 minutes | Cooling high pressure protection | • Check refrigeration system<br>• Outdoor air circuit |
| 12438 | F96 | Power transistor module overheating protection | 4 times happen within 30 minutes | Power transistor module overheat | • PCB faulty<br>• Outdoor air circuit (fan motor) |
| 12439 | F97 | Compressor overheating protection | 3 times happen within 30 minutes | Compressor overheat | • Insufficient refrigerant |
| 12440 | F98 | Total running current protection | 3 times happen within 20 minutes | Total current protection | • Check refrigeration system<br>• Power source or compressor lock |
| 12441 | F99 | Outdoor direct current (DC) peak detection | Continuous happen for 7 times | Power transistor module current protection | • Power transistor module faulty or compressor lock |

**Table 13.1** Error codes

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

# 14. EnOcean Interoperability

In this section there is a list of the allowed transmission and reception EEPs and its description:

| EEP Tx | EEP [1] description |
|---|---|
| [05-02-01] | Light and Blind Control – Application Style 1 |
| [07-02-05] | Temperature Sensor. Range 0°C to +40°C |
| [07-10-01] | Temperature Sensor; Set Point, Fan Speed and Occupancy Control |
| [07-10-03] | Temperature Sensor; Set Point Control |
| [07-20-10] | HVAC Components. Generic HVAC interface. Functions: Mode, vane position, fan speed, sensors and on/off |
| [07-20-11] | HVAC Components. Generic HVAC interface. Functions: Error control: AC Error code, Error states and disablements |

**Table 14.1** IntesisBox® supported transmission (Tx) EEPs

| Profile Index Rx (S2) | Supported EEP |
|---|---|
| 0 | [05-02-xx] [05-03-xx] [06-00-01] [07-10-01] [07-10-02] [07-10-05] |
| 1 | [05-02-xx] [05-03-xx] |
| 2 | [05-02-xx] [05-03-xx] [07-10-01] [07-10-02] [07-10-04] [07-10-07] [07-10-08] [07-10-09] |
| 3 | [05-02-xx] [05-03-xx] |
| 4 | [05-02-xx] [05-03-xx] [07-10-01] [07-10-02] [07-10-03] [07-10-04] [07-10-05] [07-10-06] [07-10-0A] [07-10-10] [07-10-11] [07-10-12] |
| 5 | [07-02-05] [07-02-06] [07-10-01] [07-10-02] [07-10-03] [07-10-04] [07-10-05] [07-10-06] [07-10-07] [07-10-08] [07-10-09] [07-10-0A] [07-10-0B] [07-10-0C] [07-10-0D] [07-10-10] [07-10-11] [07-10-12] [07-10-13] [07-10-14] |
| 6 | [05-02-xx] [05-03-xx] [06-00-01] [07-30-02] |
| 7 | [05-04-01] |
| 8 | [07-07-01] [07-08-01] [07-08-02] |
| 9 | [05-02-xx] [05-03-xx] |
| A | [05-02-xx] [05-03-xx] |
| B | [07-02-05] [07-02-06] [07-10-01] [07-10-02] [07-10-03] [07-10-04] [07-10-05] [07-10-06] [07-10-07] [07-10-08] [07-10-09] [07-10-0A] [07-10-0B] [07-10-0C] [07-10-0D] [07-10-10] [07-10-11] [07-10-12] [07-10-13] [07-10-14] |
| E | [07-20-10] [07-10-03] [07-20-11] [2] |
| F | [07-20-10] [07-10-03] [07-20-11] [2] |

**Table 14.2** IntesisBox® supported reception (Rx) EEPs

[1] EnOcean Equipment Profiles (EEP) V2.0 and v2.1

[2] HVAC Components (FUNC = 20) Generic HVAC interface (TYPE = 10 and 11) explained in section 12 and in EnOcean Equipment Profiles (EEP) v2.1

| EEP Rx | EEP description |
|---|---|
| [05-02-xx] | Rocker Switch, 2 Rocker |
| [05-03-xx] | Rocker Switch, 4 Rocker |
| [05-04-01] | Key Card Activated Switch |
| [06-00-01] | Single Input Contact |
| [07-02-05] | Temperature Sensor. Range 0°C to +40°C |
| [07-02-06] | Temperature Sensor. Range +10°C to +50°C |
| [07-07-01] | Occupancy Sensor |
| [07-08-01] | Light, Temperature & Occupancy Sensor |
| [07-08-02] | Light, Temperature & Occupancy Sensor |
| [07-10-01] | Temperature Sensor; Set Point, Fan Speed and Occupancy Control |
| [07-10-02] | Temperature Sensor; Set Point, Fan Speed and Day/Night Control |
| [07-10-03] | Temperature Sensor; Set Point Control |
| [07-10-04] | Temperature Sensor; Set Point and Fan Speed Control |
| [07-10-05] | Temperature Sensor; Set Point and Occupancy Control |
| [07-10-06] | Temperature Sensor; Set Point and Day/Night Control |
| [07-10-07] | Temperature Sensor; Fan Speed Control |
| [07-10-08] | Temperature Sensor; Fan Speed and Occupancy Control |
| [07-10-09] | Temperature Sensor; Fan Speed and Day/Night Control |
| [07-10-0A] | Temperature Sensor, Set Point Adjust and Single Input Contact |
| [07-10-0B] | Temperature Sensor and Single Input Contact |
| [07-10-0C] | Temperature Sensor and Occupancy Control |
| [07-10-0D] | Temperature Sensor and Day/Night Control |
| [07-10-10] | Temperature and Humidity Sensor; Set Point and Occupancy Control |
| [07-10-11] | Temperature and Humidity Sensor; Set Point and Day/Night Control |
| [07-10-12] | Temperature and Humidity Sensor; Set Point Control |
| [07-10-13] | Temperature and Humidity Sensor; Occupancy Control |
| [07-10-14] | Temperature and Humidity Sensor; Day/Night Control |
| [07-20-10] | HVAC Components. Generic HVAC interface. Functions: Mode, vane position, fan speed, sensors and on/off |
| [07-20-11] | HVAC Components. Generic HVAC interface. Functions: Error control: AC Error code, Error states and disablements |
| [07-30-02] | Digital Input. Single Input Contact |

**Table 14.3** Description of reception (Rx) EEPs

# 15. Regulations and standards

CE conformity:

R&TTE EU-directive on Radio and Telecommunications Terminal Equipment

The general registration for the radio operation is valid for all EU countries as well as for Switzerland.

Standards:

UNE-EN 50491-3:2010
UNE-EN 60950-1:2007
UNE-EN 61000-6-2:2006
UNE-EN 61000-6-3:2007

FCC ID: SZV-STM300C
IC: 5731A-STM300C

The enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (i.) this device may not cause harmful interference and (ii.) this device must accept any interference received, including interference that may cause undesired operation.

Warning: Changes or modifications made to this equipment not expressly approved by Intesis Software may void the FCC authorization to operate this equipment.



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