



## **Panic Button - PBTZB-110**

### **Technical manual**

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## 1 Cautionary notes

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## 2 Features

### 2.1 Panic Button - PBTZB-110

The Panic Button is a programmable, Zigbee-based button that can be used for multiple purposes. For example, the Panic Button can be used as a safety button for emergencies, as a door lock button, or as a switch for lights or "all on/off" functionality that enables the user to switch multiple home appliances on or off in the press of a single button. You can program the button to fit the requirements of your solution.

You can program the wireless button as an alarm button for elderly or disabled, enabling them to easily alert friends and family or healthcare professionals, if an emergency occurs.

Being more vulnerable to all kinds of dangers, elderly and disabled can benefit from an easy way to call for help in case of an emergency. With the Panic Button, they can simply press a button to alert others if they need help. The Panic Button can help elderly and disabled gain more independence and security, and it can give friends and relatives peace of mind and reassurance that their loved one is safe.

### 2.2 IAS Zone

The Panic Button is implemented as a IAS Zone ZigBee end point according to ZigBee Home Automation profile „IAS Zone“.

### 2.3 Key features

- Alarm sensor – IAS Zone
- ZigBee OTA cluster for firmware upgrades
- ZigBee 3.0 stack supported
- Water repellent
- RoHS compliant according to the EU Directive 2002/95/EC
- Standard ZigBee Home Automation security and stack settings are used

## 3 Endpoints

The device implements the following standard HA devices on different end points.

### 3.1 ZigBee Device Object (ZDO)

- End point number 0x00
- Application profile Id 0x0000
- Application device Id 0x0000
- Supports all mandatory clusters

### 3.2 IAS Zone

- End point number 0x23
- Application profile Id 0x0104 (Home Automation)
- Application device Id 0x0402

### 3.3 Develco Utility

- Application profile Id 0xCoC9 (Develco Products private profile)
- Application device Id 0x0001
- Manufacturer code for Develco Products is 0x1015
- Private profile for internal Develco Products use only.

#### Reference documents:

053474r18ZB\_CSG-ZigBee-Specification.pdf

075123r03ZB\_AFG-ZigBee\_Cluster\_Library\_Specification.pdf

053520r27ZB\_HA\_PTG-Home-Automation-Profile.pdf

075356r15ZB\_ZSE-ZSE-AMI\_Profile\_Specification.pdf

They can all be downloaded from :

<http://www.zigbee.org/Products/DownloadZigBeeTechnicalDocuments.aspx>

## 4 Supported Clusters

### 4.1 Common clusters for each end point

The ZCL “General Function Domain” clusters in this section are implemented as server clusters. Refer to ZigBee Cluster Library Specification. <http://www.zigbee.org/Specifications.aspx>

#### 4.1.1 Basic – Cluster id 0x0000

Only the first set has mandatory attributes, also the optional attributes that can be relevant to a Develco device are all in set 0x0000.

##### 4.1.1.1 Attribute

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x0	ZCLVersion	UInt8	Type range	M	
0x4	ManufacturerName	String	0-32 byte	O	4.1.1.1.1
0x5	ModelIdentifier	String	0-32 byte	O	4.1.1.1.2
0x6	DateCode	String	0-32 byte	O	
0x7	PowerSource	8 bit enum	Type range	M	

##### 4.1.1.1.1 ManufacturerName

“Develco Products A/S”

##### 4.1.1.1.2 ModelIdentifier

“PBTZB-110”

### 4.1.2 Identify – Cluster id 0x0003

#### 4.1.2.1 Attribute

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x0000	IdentifyTime	UInt16	Type range	M	

#### 4.1.2.2 Commands

The identify cluster has 2 commands as server.

Id#	Name	Payload	Man/Opt	Relevance and ref.
0x00	Identify	UInt16 - Identify Time (seconds)	M	0x00



0x01	Identify Query	none	M	0x01
------	----------------	------	---	------

The identify cluster has 1 command as client.

Id#	Name	Payload	Man/Opt	Relevance and ref.
0x00	Identify Query Response	Uint16 - Identify Time (seconds)	M	0x00

## 4.2 IAS Zone Device – EP 0x23

### 4.2.1 IAS Zone - Cluster id 0x0500

The IAS Zone cluster is described in ZigBee Cluster Library Specification.

#### 4.2.1.1 Attribute

Id#	Name	Type	Man/Opt	Relevance and ref.
0x0000	Zone State	8-bit Enumeration	M	
0x0001	Zone Type	16-bit Enumeration	M	Hard coded to Personal emergency device
0x0002	Zone Status	Uint16	M	The following bits are supported: Bit1: Alarm 2 Bit3: Battery Bit4: Supervision reports Bit5: Restore reports
0x0010	IAS CIE Address	Valid 64-bit IEEE address	M	
0x0011	ZoneID	Uint8	M	

##### 4.2.1.1.1 Zone State

The device will automatically start to scan the network for an IAS Zone client in a predefined interval. When the client is found it will automatically attempt to enrol. When it has successfully enrolled the Zone Status command is sent to the IAS Zone client.

The attribute value will change from not enrolled (0x00) to Enrolled (0x01).

##### 4.2.1.1.2 IAS CIE Address

Attribute specifies the address that commands generated by the server shall be sent to.

To un-enrol the device the back end system has to write a new address into this attribute. Any value is valid. If the back end system writes an IEEE address then it will try to enrol to this device represented by the IEEE address.

#### 4.2.1.1.3 ZoneID

A unique reference number allocated by the CIE at zone enrolment time.

Used by IAS devices to reference specific zones when communicating with the CIE. The *ZoneID* of each zone stays fixed until that zone is un-enrolled.

#### 4.2.1.2 Commands

The IAS Zone cluster has 2 commands as server.

Id#	Name	Payload			Man/Opt	Relevance and ref.
0x00	Zone Status Change Notification	Uint16 – bit mask			M	
0x01	Zone Enroll Request	Bits	16	16	M	
		Data type	16 bit enum	UINT16		
		Field name	Zone type	Manufacturer code		

Init sequence – when the device has join the network it start to scan for an IAS zone client cluster. If a client is found a Zone enroll request command is send and a Zone Enroll response is expected. If it doesn't receive a response it will wait for 15 minutes and try again.

The following bits are supported in Zone status:

Bit1: Alarm 2

Bit3: Battery

Bit4: Supervision reports

Bit5: Restore reports

Bit0, Alarm

Note: How to clear a alarm in the "Zone status"

The sensor requests ZCL Default Response on the Zone Status Change notification, if any new Alarm bit has been set. Until the IAS CIE has acknowledged the received alarm by sending the mandated Default Response, the Alarm bits are not cleared – even if there is no longer an alarm situation. When the Default Response is received, a new Zone Status Change notification is sent with the Alarm bits cleared, if the alarm situation has disappeared since sending the Zone Status message with alarm set.

Bit3: When the battery is below 2.2 VDC. Battery bit is set high and "Zone Status" is transmitted to the coordinator.

## 4.2.2 Power Configuration - Cluster id 0x0001

The power configuration cluster is described in ZigBee Cluster Library Specification

### 4.2.2.1 Attribute

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x0020	BatteryVoltage	UInt8	0x00 - 0xFF	O	ZCL configure reporting is supported

Note: The attribute "*BatteryVoltage*" is measuring the battery voltage, in units of 100mV.

## 4.2.3 Poll Control - Cluster id 0x0020

The poll control cluster is described in ZigBee Cluster Library Specification

This cluster provides a mechanism for the management of an end device's MAC Data Request rate. For the purposes of this cluster, the term "poll" always refers to the sending of a MAC Data Request from the end device to the end device's parent.

This cluster can be used for instance by a configuration device to make an end device responsive for a certain period of time so that the device can be managed by the controller.

### 4.2.3.1 Attribute

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x0000	Check-inInterval	UInt32	0x00 - 0xFF	M	Default value is 1 hour
0x0001	LongPoll Interval	UInt32		M	Default value is disabled
0x0002	ShortPollInterval	UInt16		M	Default value is 3 seconds
0x0003	FastPollTimeout	UInt16		M	Default value is 5 minutes

Start up, auto scan for client poll control cluster on the coordinator. If it is support on the coordinator an auto bind is created and the smoke sensor will send a check-in command in the interval specified in attribute "Check-inInterval". The coordinator has to reply with a check-in response. The sensor supports the following commands send from the client (Typically the coordinator).

- 0x00 Check-in Response,
- 0x01 Fast Poll Stop,
- 0x02 Set Long Poll Interval,
- 0x03 Set Short Poll Interval,

If it doesn't find a poll client it will search again periodically.

#### 4.2.4 OTA Upgrade – Cluster id 0x0019

The cluster provides a ZigBee standard way to upgrade devices in the network via OTA messages. The devices support the client side of the cluster.

When the devices has joined a network it will automatically auto scan for a OTA upgrade server in the network. If it finds a server an auto bind is created and ones every 24 hour it will automatically send its “current file version” to the OTA upgrade server. It is the server that initiate the firmware upgrade process.

##### 4.2.4.1 Attributes

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x0000	UpgradeServerID	IEEE Address	-	M	
0x0001	FileOffset	Uint32	Type range	O	
0x0002	CurrentFileVersion	Uint32	Type range	O	
0x0003	CurrentZigBeeStackVersion	Uint16	Type range	O	
0x0004	DownloadedFileVersion	Uint32	Type range	O	
0x0005	DownloadedZigBeeStackVersion	Uint16	Type range	M	
0x0006	ImageUpgradeStatus	8 bit enum	0x00 to 0xFF	O	
0x0007	Manufacturer ID	Uint16	Type range	O	
0x0008	Image Type ID	Uint16	Type range	O	
0x0009	MinimumBlockRequestDelay	Uint16	Type range	O	

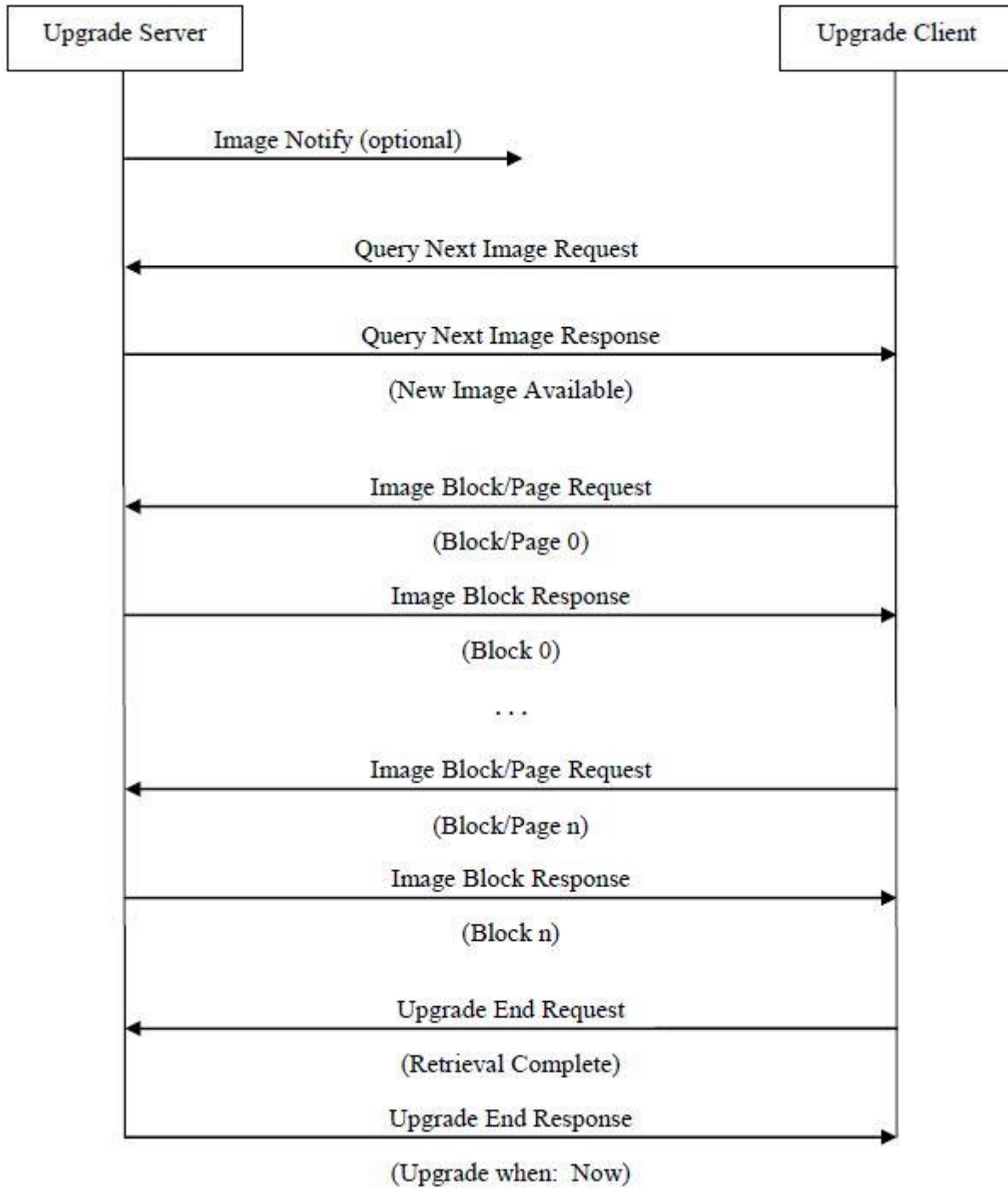
Above attribute description is to be found in section 6.7 “OTA Cluster Attributes” in ZigBee document – “zigbee-ota-upgrade-cluster-specification” provided by the ZigBee alliance.

##### 4.2.4.2 Commands

The OTA Client cluster can send the following commands

Id#	Name	Man/Opt	Relevance and ref.
0x01	Query Next Image request	M	6.10.1 OTA Cluster Command Identifiers
0x03	Image Block Request	M	6.10.1 OTA Cluster Command Identifiers
0x06	Upgrade End Request	M	6.10.1 OTA Cluster Command Identifiers

4.2.4.3 OTA Upgrade Messages Diagram



## 4.2.5 Time – Cluster id 0x000A

The Time cluster is a general cluster for time it is based on a UTC time in seconds since 0 hrs 0 mins 0 sec on 1st January 2000. Refer to [\[Z2\]](#) for ZigBee specification of the time cluster.

The device will use this clusters as a client – provided that a suitable Time Server is available on the network (most likely on the Gateway).

### 4.2.5.1 Attribute

Id#	Name	type	Range	Man/Opt	Relevance and ref.
0x0000	Time	UTCTime (Uint32)	Type range	M	The module will periodically update its clock by synchronizing through this cluster
0x0001	TimeStatus	8 bit bitmap	00000xxx	M	

## 5 MMI user guide

The MMI menu allows the user to perform various operations on the device. Its use is explained in section 5.2 Push Button Menu

### 5.1 Accessing and re-enabling MMI menu

The MMI menu is accessible while the device is initially scanning for a network. When the device joins a network, the MMI menu is accessible for an additional 60 seconds. After this point, the MMI menu is inaccessible. To re-enable the MMI menu, use one of the two methods below.

**WARNING:** Using method 1 will temporarily put the device into alarm state until the MMI menu becomes active. If this is of concern, method 2 can be used instead.

Method 1:

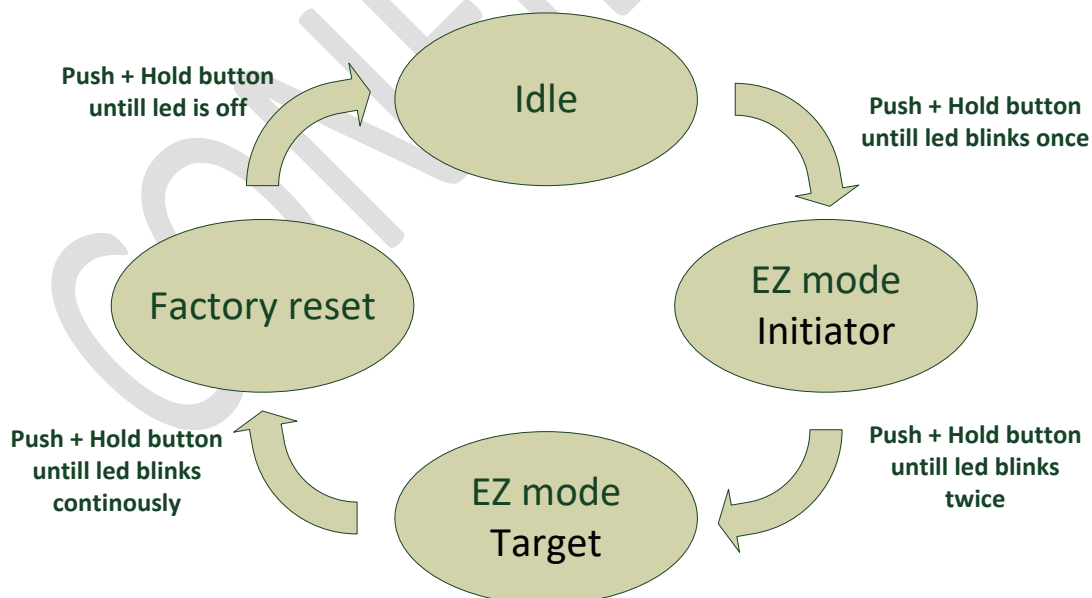
- Press and hold the button for 10 seconds. When the LED flashes green, release the button immediately

Method 2:

- Remove the battery, wait 10 seconds and re-insert it into the device

### 5.2 Push Button Menu

When MMI menu is active the user can push the button and select the different menus described below. Pushing the button for longer (push, hold for a few seconds, and release) allows the user to set the device into a desired mode. A mode change happens at 5 second interval. Below, these modes are illustrated in a state chart.



When cycling through the menu modes, the state is indicated by a number of 100ms blinks on the LED. The device is supporting the ZigBee standardized EZ- mode Commissioning.

### 5.2.1 EZ mode - Initiator

If the device is not on the network EZ-Mode Network Steering is invoked when the user enters this menu. The LED blinks once every 1 sec until the device has joined the network. If the device was already on the network it will broadcast the PermitJoin messages. It is the trust center policy that decides if the device is allowed to join the network.

When the device has joined the network EZ-Mode Finding and Binding is invoked and the device starts to blink every 3 sec until a cluster match is found. When a match is found or the cluster examine is finished the blinking stops and the device sends a message to the target device to stop the identify time.

The following clusters are supported in EZ-mode finding and binding:

- Power configuration cluster

The EZ-mode time is hard coded to 3 minutes. This is the Minimum and recommended PermitJoin time broadcast for EZ-Mode Network Steering and minimum IdentifyTime set for EZ-Mode Finding and Binding. If the user enters the menu again another 3 minutes is started.

### 5.2.2 EZ mode - Target

If the device is not on the network EZ-Mode Network Steering is invoked when the user enters this menu. The LED blinks twice every 1 sec until the device has joined the network. If the device was already on the network it will broadcast the PermitJoin messages. It is the trust center policy that decides if the device is allowed to join the network.

When the device has joined the network identify mode is invoked and the device starts to blink twice every 3 sec until identify mode is stopped or after the EZ-mode time has expired. If the user enters the menu again another 3 minutes is started.

### 5.2.3 Factory reset

To allow a device to join a network, one either has to power up a device that has not previously joined a network or push the button until the Reset To Factory default mode is indicated – and subsequently release the button. This will cause the device to reset to its factory default state and scan for a suitable coordinator.

## 5.3 Action on Power On

As a general rule, all end devices and routers that have not previously joined a network (or have been reset to factory default) will start up and search for a network with join permit open. In this mode, the Yellow LED will flash while searching for a network to join

Once the device has joined the network, it will start scanning for an OTA server, Time server, Poll control client and an IAS Zone client.



If a device has joined a network and is powered down, it will attempt to rejoin this network upon power up. For the first 30 seconds hereafter, the device will be available for communication. This time can be expanded using the poll control cluster functionality.

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## 6 General network behaviour

### 6.1 Installation

When the device is virgin and powered for the first time it will start looking for a ZigBee PAN Coordinator or router to join. The device will scan each ZigBee channel starting from 11 to 24. The LED will flash once every second until it joins a device.

#Scan mode - 1	#factory storage mode - 2
Scan all 16 ZigBee channel until join network or 3 minutes	MCU is in sleep mode (Radio off)  Press button to reactivate scan mode

Scan mode 1 will only be activated when the user presses the panic button. If the device doesn't join a ZigBee network it will go back to factory storage mode. Press panic button again to reactivate scan mode

If the user invokes EZ-mode it will start scanning the next 3 minutes

In section 5 "MMI" it is explained how to put the device into a join or leave network mode.

Network settings are stored in NV-memory and after a power cycle the device re-join the same network.

If the device has to join a new PAN coordinator the MMI menu supports a "**Reset To Factory Fresh Settings**" mode. This will erase all current network information.

### 6.2 Low battery

The current battery voltage can be read from the power configuration cluster described in section 4.3.1. The attribute "*BatteryVoltage*" is measuring the battery voltage, in units of 100mV.

Low batt LED indication – RED LED will blink twice every 60 second

## 7 Specifications

<b>General</b>	
Dimensions (L x B x H)	40 x 48,5 x 9 mm
Colour	White – Optional Orange marking on the button
Battery	Battery: CR2450 (Coin Cell)
Battery life	Up to 10 year
<b>Radio</b>	
	Sensitivity: -100 dBm
	Output power: +10 dBm (EU)
<b>Environment</b>	
	IP class: IP67
	Operation temperature 0 to +50°C
<b>Function</b>	
Button	Panic alarm
<b>Communication</b>	
Wireless protocol	ZigBee Home Automation compliant
	ZigBee end-device
<b>Certifications</b>	
	RoHS compliant according to the EU Directive 2002/95/EC

## 8 Contact Information

**Technical support:** Please contact Develco Products for support.  
[products@develcoproducts.com](mailto:products@develcoproducts.com)

**Sales:** Please contact Develco Products for information on prices, availability, and lead time.  
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