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# Zigbee Range Extender - REXZB-11x

## Technical manual

Revised 29.08.2025





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## 1 Cautionary notes

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## 2 Features

The Zigbee interface of the Range Extender allows the following information and functionality to be accessed wirelessly:

- Battery voltage measurement (REXZB-111 variant only)
- Mains power loss (REXZB-111 variant only)
- Zigbee network diagnostics (RSSI, Frame Error Rate, other low level data)

### 2.1 Device Responsiveness

As a Zigbee router, the receiver is always on and the device will respond to messages immediately.

### 2.2 Low battery (REXZB-111 variant only)

The battery voltage can be read from the power configuration cluster. The attribute "*BatteryVoltage*" is measuring the battery voltage in units of 100mV. When the device is mains powered, the battery voltage will be maintained above 4 V.

In case of a power loss, the device will report low battery when the battery voltage is below 3.45 V. This is done via the ZoneStatus Bit3 in the ZoneStatusChangeNotification message.

### 2.3 Keep-alive

The device will check for connectivity with the PAN coordinator every 15 minutes. If the coordinator has a time server, the device will send a ReadAttribute request to read the time attribute. If no time cluster is available, the device will send an IEEE address request instead.

### 2.4 Behavior after a power cycle or reset

The behavior of the device after a power on depends on whether it has already been enrolled into a Zigbee network

#### 2.4.1 Not enrolled in a network

When the device has not previously joined a network (or has been reset to factory default), it will start up and search for a network with join permit open. The device will scan each ZigBee channel starting from 11 to 26. The yellow LED will flash once every second until it joins a device. After 15 minutes the device will pause the scan and enter a backoff mode. Another 15 minutes later the scan will recommence. This pattern repeats until the device successfully joins a network.

## 2.4.2 Enrolled in a network

Once the device has joined the network, it will stay there until a factory reset is performed or it receives a Zigbee message instructing it to leave.

The device will explore the network for the following standard Zigbee services:

- OTA server
- Time server
- IAS Zone Client (CIE).

If unsuccessful, the device will search again after a reset or after recovering from a lost network connection.

## 2.5 MMI, EZ-mode and Factory Reset

The MMI button has the following functions:

| Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | User action                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| Display device status with yellow LED:<br><b>1 blink</b> <b>OK</b><br><b>2 blinks</b> <b>Low battery</b><br><b>3 blinks</b> <b>Network trouble</b>                                                                                                                                                                                                                                                                                                                                                                                                                      | Quick push and release                                            |
| EZ-mode initiator.<br>Perform the following actions: <ul style="list-style-type: none"> <li>• Blink LED once every 3 seconds</li> <li>• Broadcast MgtPermitJoinReq to allow new devices to join the network</li> <li>• Broadcast IdentifyQuery and listen for IdentifyQueryResponse messages from potential targets</li> </ul> If a target is identified, the device will perform a discovery for the following client clusters: <ul style="list-style-type: none"> <li>• Power Configuration</li> </ul> If a match is found, a binding is created to the target device | Push and hold button for 5 seconds until yellow LED blinks once   |
| EZ-mode target.<br>Perform the following actions: <ul style="list-style-type: none"> <li>• Blink LED twice every 3 seconds</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                   | Push and hold button for 10 seconds until yellow LED blinks twice |

|                                                                                                                                                                       |                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Broadcast MgtPermitJoinReq to allow new devices to join the network.</li> <li>• Respond to IdentifyQuery messages</li> </ul> |                                                                          |
| Perform factory reset. All persisted data will be erased, and the device will start to search for a network to join                                                   | Push and hold button for 15 seconds until yellow LED blinks continuously |

## 3 Endpoints

The device implements the following Zigbee endpoints:

### 3.1 Range Extender

- End point number 0x25
- Application profile Id 0x0104 (Home Automation)
- Application device Id 0x0008 (Range Extender)

### 3.2 Green Power Proxy

- End point number 0xF2
- Application profile Id 0xA1E0 (Green Power)
- Application device Id 0x0061 (Green Power Proxy)

### 3.3 Onics Utility

- End point number 0x01
- Application profile Id 0xC0C9 (Onics (Formerly Develco Products) manufacturer specific profile)
- Application device Id 0x0001
- Manufacturer code is 0x1015

### 3.4 Manufacturer Name

“frient A/S” or “Develco Products A/S” – depending on the product version.

## 4 EP 0x25 – Range Extender Clusters

### 4.1 Basic Server – Cluster id 0x0000

#### 4.1.1 Attributes

| Id#    | Name                       | Data Type    | Spec                  | Comment                                                                                                          |
|--------|----------------------------|--------------|-----------------------|------------------------------------------------------------------------------------------------------------------|
| 0x0000 | ZCLVersion                 | UInt8        | Standard              |                                                                                                                  |
| 0x0004 | ManufacturerName           | Char String  | Standard              |                                                                                                                  |
| 0x0005 | ModelIdentifier            | Char String  | Standard              |                                                                                                                  |
| 0x0006 | DateCode                   | Char String  | Standard              |                                                                                                                  |
| 0x0007 | PowerSource                | Enum8        | Standard              |                                                                                                                  |
| 0xFFFD | ClusterRevision            | UInt16       | Standard              |                                                                                                                  |
| 0x8000 | PrimarySwVersion           | Octet String | MFG specific (0x1015) | Represents the 3 version numbers x.x.x. E.g. values 0x020301 is version 2.3.1                                    |
| 0x8010 | PrimaryBootloaderSwVersion | Octet String | MFG specific (0x1015) | Same format as above                                                                                             |
| 0x8020 | PrimaryHwVersion           | Octet String | MFG specific (0x1015) | Same format as above                                                                                             |
| 0x8050 | PrimarySwVersion3rdParty   | Octet String | MFG specific (0x1015) | Same format as above                                                                                             |
| 0x8100 | LedControl                 | Bitmap8      | MFG specific (0x1015) | Bitmask to control the LED behavior<br>BIT0: Indicate faults<br>BIT1: Indicate mains power status with green LED |
| 0x8101 | TxPower                    | Enum8        | MFG specific (0x1015) | Determines the output power for CE or FCC compliance.<br>0: CE                                                   |

|  |  |  |  |        |
|--|--|--|--|--------|
|  |  |  |  | 1: FCC |
|--|--|--|--|--------|

## 4.2 Identify Server/Client – Cluster id 0x0003

### 4.2.1.1 Attributes

| Id#     | Name            | Type   | Spec     |
|---------|-----------------|--------|----------|
| 0x0000  | IdentifyTime    | UInt16 | Standard |
| 0xFFFFD | ClusterRevision | UInt16 | Standard |

### 4.2.1.2 Server Commands Received

| Id#  | Name           | Spec     |
|------|----------------|----------|
| 0x00 | Identify       | Standard |
| 0x01 | Identify Query | Standard |

### 4.2.1.3 Server Commands Generated

| Id#  | Name                    | Spec     |
|------|-------------------------|----------|
| 0x00 | Identify Query Response | Standard |

### 4.2.1.4 Client Commands Received

| Id#  | Name                    | Spec     |
|------|-------------------------|----------|
| 0x00 | Identify Query Response | Standard |

### 4.2.1.5 Client Commands Generated

| Id#  | Name           | Spec     |
|------|----------------|----------|
| 0x00 | Identify       | Standard |
| 0x01 | Identify Query | Standard |

## 4.3 Power Configuration Server - Cluster id 0x0001

This cluster is only enabled on REXZB-111 variant.

### 4.3.1 Attributes

| Id#    | Name                | Type     | Spec     |
|--------|---------------------|----------|----------|
| 0x0020 | BatteryVoltage      | UInt8    | Standard |
| 0x0031 | BatterySize         | Enum8    | Standard |
| 0x0033 | BatteryQuantity     | UInt8    | Standard |
| 0x0034 | BatteryRatedVoltage | UInt8    | Standard |
| 0x003E | BatteryAlarmState   | Bitmap32 | Standard |
| 0xFFFD | ClusterRevision     | UInt16   | Standard |

## 4.4 IAS Zone Server - Cluster id 0x0500

This cluster is only enabled on REXZB-111 variant.

When the device has joined a network it starts to scan for an IAS Zone client cluster. If a client is found a Zone enroll request command is sent and a Zone Enroll response is expected. If the device doesn't receive a response, it will try again periodically.

Once enrolled, the device will send ZoneStatusNotificationChange commands at an interval specified by the ZoneStatusInterval attribute (The default is 5 minutes).

The following events will trigger a ZoneStatusNotificationChange to be sent to the CIE immediately:

- Battery is low
- Battery or charger is defective
- Mains power is lost

### 4.4.1 Behavior on zone events

When the device registers an event that shall be reported to the CIE, it will set the corresponding bits in the ZoneStatus attribute and command fields. If the device is enrolled as a zone with a CIE it will immediately send a ZoneStatusNotificationChange command with the DisableDefaultResponse flag set to FALSE in the frame control field. The CIE must acknowledge the message by responding with a DefaultResponse. If the device doesn't receive a DefaultResponse, it will retransmit the command at a quick interval at first and fall back to the regular interval after some time.

If the physical state of the device changes before the previous message was acknowledged (e.g. mains power has returned), the event is buffered and will only be reflected in ZoneStatus when the

previous status has been acknowledged. This ensures that the CIE always has the latest status while not missing important events.

## 4.4.2 Attributes

| Id#    | Name               | Type         | Spec                  | Comment                                                                                                                                                        |
|--------|--------------------|--------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0x0000 | ZoneState          | Enum8        | Standard              |                                                                                                                                                                |
| 0x0001 | ZoneType           | Enum16       | Standard              | Hard coded to Fire Sensor Device (0x0028)                                                                                                                      |
| 0x0002 | ZoneStatus         | Bitmap16     | Standard              | The following bits are supported:<br>Bit3: Low Battery<br>Bit4: Supervision reports<br>Bit5: Restore reports<br>Bit7: Mains power lost<br>Bit9: Battery defect |
| 0x0010 | IAS CIE Address    | IEEE address | Standard              |                                                                                                                                                                |
| 0x0011 | ZoneID             | UInt8        | Standard              |                                                                                                                                                                |
| 0x8000 | ZoneStatusInterval | UInt16       | MFG Specific (0x1015) | Controls the periodic interval between ZoneStatusNotificationChange commands                                                                                   |

## 4.4.3 Commands received

| Id#  | Name                 | Spec     |
|------|----------------------|----------|
| 0x00 | Zone Enroll Response | Standard |

## 4.4.4 Commands generated

| Id#  | Name                            | Spec     |
|------|---------------------------------|----------|
| 0x00 | Zone Status Change Notification | Standard |
| 0x01 | Zone Enroll Request             | Standard |

## 4.5 OTA Upgrade Client – Cluster id 0x0019

After joining a network or after a reset, the device will check for a firmware update using the QueryNextImage command. OTA firmware files are encrypted and only official images from Onics (Formerly Develco Products) will be accepted by the device.

The device will send QueryNextImage every 6 hours.

### 4.5.1 Attributes

| Id#    | Name                     | Type         | Spec     |
|--------|--------------------------|--------------|----------|
| 0x0000 | UpgradeServerID          | IEEE Address | Standard |
| 0x0001 | FileOffset               | UInt32       | Standard |
| 0x0002 | CurrentFileVersion       | UInt32       | Standard |
| 0x0004 | DownloadedFileVersion    | UInt32       | Standard |
| 0x0006 | ImageUpgradeStatus       | Enum8        | Standard |
| 0x0007 | Manufacturer ID          | UInt16       | Standard |
| 0x0008 | Image Type ID            | UInt16       | Standard |
| 0x0009 | MinimumBlockRequestDelay | UInt16       | Standard |
| 0xFFFD | ClusterRevision          | UInt16       | Standard |

### 4.5.2 Commands received

| Id#  | Name                   | Spec     |
|------|------------------------|----------|
| 0x00 | ImageNotify            | Standard |
| 0x02 | QueryNextImageResponse | Standard |
| 0x05 | ImageBlockResponse     | Standard |
| 0x07 | UpgradeEndResponse     | Standard |

### 4.5.3 Commands generated

| Id#  | Name                     | Spec     |
|------|--------------------------|----------|
| 0x01 | Query Next Image request | Standard |
| 0x03 | Image Block Request      | Standard |
| 0x06 | Upgrade End Request      | Standard |

## 4.6 Time Client – Cluster id 0x000A

This cluster is used for internal time keeping and for the keep-alive mechanism.

### 4.6.1 Attributes

| Id#     | Name            | type   | Spec     |
|---------|-----------------|--------|----------|
| 0xFFFFD | ClusterRevision | Uint16 | Standard |

## 4.7 Diagnostics Server – Cluster id 0x0b05

### 4.7.1 Attributes

| Id#    | Name               | Type   | Spec     |
|--------|--------------------|--------|----------|
| 0x0000 | NumberOfResets     | Uint16 | Standard |
| 0x0100 | MacRxBcast         | Uint32 | Standard |
| 0x0101 | MacTxBcast         | Uint32 | Standard |
| 0x0102 | MacRxUcast         | Uint32 | Standard |
| 0x0103 | MacTxUcast         | Uint32 | Standard |
| 0x0104 | MacTxUcastRetry    | Uint16 | Standard |
| 0x0105 | MacTxUcastFail     | Uint16 | Standard |
| 0x0106 | APSRxBcast         | Uint16 | Standard |
| 0x0107 | APSTxBcast         | Uint16 | Standard |
| 0x0108 | APSRxUcast         | Uint16 | Standard |
| 0x0109 | APSTxUcastSuccess  | Uint16 | Standard |
| 0x010A | APSTxUcastRetry    | Uint16 | Standard |
| 0x010B | APSTxUcastFail     | Uint16 | Standard |
| 0x010C | RouteDiscInitiated | Uint16 | Standard |
| 0x010D | NeighborAdded      | Uint16 | Standard |
| 0x010E | NeighborRemoved    | Uint16 | Standard |
| 0x010F | NeighborStale      | Uint16 | Standard |

|        |                                   |        |          |
|--------|-----------------------------------|--------|----------|
| 0x0110 | JoinIndication                    | UInt16 | Standard |
| 0x0111 | ChildMoved                        | UInt16 | Standard |
| 0x0112 | NWKFCFailure                      | UInt16 | Standard |
| 0x0113 | APSFCEFailure                     | UInt16 | Standard |
| 0x0114 | APSUnauthorizedKey                | UInt16 | Standard |
| 0x0115 | NWKDecryptFailures                | UInt16 | Standard |
| 0x0116 | APSDDecryptFailures               | UInt16 | Standard |
| 0x0117 | PacketBufferAllocateFailures      | UInt16 | Standard |
| 0x0118 | RelayedUcast                      | UInt16 | Standard |
| 0x0119 | PhytoMACQueueLimitReached         | UInt16 | Standard |
| 0x011A | PacketValidatedDropcount          | UInt16 | Standard |
| 0x011B | AverageMACRetryPerAPSMMessageSent | UInt16 | Standard |
| 0x011C | LastMessageLQI                    | UInt8  | Standard |
| 0x011D | LastMessageRSSI                   | Int8   | Standard |
| 0xFFFD | ClusterRevision                   | UInt16 | Standard |

## 5 EP 0xF2 – Green Power Proxy Clusters

### 5.1 Green Power Client - Cluster id 0x0021

#### 5.1.1 Attributes

| Id#     | Name                    | Type                 | Spec     |
|---------|-------------------------|----------------------|----------|
| 0x0010  | gppMaxProxyTableEntries | UInt8                | Standard |
| 0x0011  | ProxyTable              | Long Octet String    | Standard |
| 0x0016  | gppFunctionality        | Bitmap24             | Standard |
| 0x0017  | gppActiveFunctionality  | Bitmap24             | Standard |
| 0x0022  | cl_gpLinkKey            | 128-bit security key | Standard |
| 0xFFFFD | ClusterRevision         | UInt16               | Standard |

## 6 EP 0x01 – Onics Utility Clusters

### 6.1 Network Diagnostics Server - Cluster id 0x0005

| Id#    | Name               | Type         | Spec         | Description                                          |
|--------|--------------------|--------------|--------------|------------------------------------------------------|
| 0x0000 | NetworkLinkAddress | IEEE Address | MFG specific | The IEEE address of the network parent of the device |
| 0x0001 | NetworkLinkRSSI    | UInt8        | MFG specific | The RSSI of packets received from the parent device  |
| 0x0003 | NetworkLinkFER     | UInt8        | MFG specific | The frame error rate (FER) of outgoing packets       |

## 7 Contact Information

**Technical support:** Please contact Onics for support.

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