BE⌂NEXT-iHome

Quick start: **Tag Reader EU**

Indicator LED

Home & Away

Tag area

Technical specs

Normal operating voltage	2x AA 1,5V batteries
Frequency range	868.42 MHz
Wireless Range	min 150 meters in a mesh network
Protocols supported	ISO15693, ISO18000-3, Tag-it™, RFID
Buzzer-sound	Approx. 60dBa at 10 cm distance

Basic Operations

- The *TagReader* can arm/disarm a security system.
- The *TagReader* can read RFID-tags.
- The *TagReader* has the possibility for the user to manually insert codes.
- The *TagReader's* indicator light will react differently on each action.
- The *TagReader* has a buzzer, which can be used as walk-in/walk-out notification (alarm is being disabled/activated).
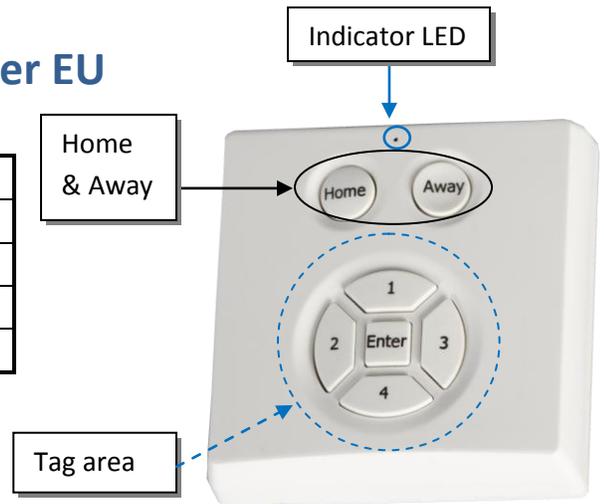
How it operates

After a successful inclusion the *Tag Reader* can be mounted on the wall.

When pressing the Home or Away button you have 1 second to start using the manual code buttons, if you do not press any manual code buttons the tag reader will be starting up and you have 6 seconds to show a RFID-Tag in front of the reader.

With a controller you can request the battery level.

Mounting

1. Before mount, the *Tag Reader should* be included into a Z-Wave network and associated.
2. Use a flat screwdriver at the inlets on the sides to gently unlock the back cover.
3. Use the supplied screws to mount the cover to the wall.
4. Place two AA 1,5V batteries into the device.
5. Mount the *TagReader* onto the back cover.
6. Make sure to close it well on all sides.
7. Mounting is completed when the led blinks for a full second.
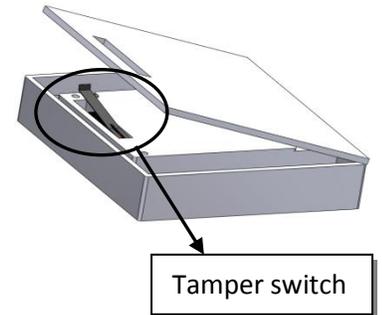
Tamper switch

Include or exclude in Z-Wave network [1]

1. Press and hold the *Tamper switch* for 2 seconds and release to start the inclusion or exclude process.
2. When classic inclusion failed, the product will start Network Wide Inclusion automatically.

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[1] Make sure your Z-Wave controller is in the correct operation mode (include or exclude).

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Technical Manual: **Tag Reader EU**

Caution:
- This device is using a radio signal that passes through walls, windows and doors. The range is strongly influenced by local conditions such as large metal objects, house wiring, concrete, furniture, refrigerators, microwaves and similar items. On average, the indoor range is approximately 30 meters.
- Do not expose this product to excessive heat or moisture.
- Prevent long term exposure to direct sunlight.
- Do not attempt to repair this product. If the product is damaged or if you are in doubt about the proper operation, take the product back to the place of purchase.
- Do not clean the product with any liquid.
- Indoor use only.

Technical details

Normal operating voltage	2x AA 1.5V batteries From 2.3Vdc to 4.0Vdc do not use rechargeable batteries
Frequency range	868.42 MHz
Wireless Range	Approx. 100 meters in line of sight. Min 150 meters with good mesh network (max 4 hops).
Battery Lifetime	Normal usage will give an approx 5 years lifetime. Notice: long and big networks will increase the battery lifetime.
Protocols supported	ISO15693, ISO18000-3, Tag-it™, RFID
Buzzer-sound	Approx. 60dB at 10 cm distance
Storage temperature	-5°C to +65°C
Storage humidity	10% to 70%
Operating temperature	10°C to 40°C
Operating humidity	30% to 80%

Product dimensions (Length x Width x Height)

Tag Reader = 62 x 62 x 20 mm

Indication mode

The indicator light gives various statuses of the device as follows:

1. Ready for learn mode: indicator light blinks every second.
2. Learn in progress (add):   indicator light 2 times every second.
3. Learn in progress (remove):   indicator light 3 times every 1.5 second.
4. Learn mode success: indicator light is on for one second.
5. Tamper released   indicator light blinks 6 times rapidly.
6. Mounting successful   indicator light is on for 1 second.
7. RF message send failed   indicator light blinks 6 times rapidly

Control

The *TagReader* operates as an access control device, using the combination of the USER_CODE command class and the ALARM_V2 command class.

UserCodes are to be stored in the *TagReader*, using the USER_CODE_SET command.
When the UserCodes are stored in the *TagReader*, the ALARM_REPORT_V2 will have the corresponding USER_ID with the used USER_CODE.

There are two types of Access Control with UserCodes:
1. Manually by using the buttons on the *TagReader*
2. Using the RFID reader and Tags

The difference in using one of the above mentioned methods is:
1. When pressing Home/Away, the manual codes (1-4) can be pressed <u>within</u> 1 second.
   After entering the code the user must press ENTER and the USER_CODE_REPORT or ALARM_REPORT_V2 will be sent.
2. When the user waits 1 second after pressing Home/Away, the RFID reader is started and a Tag can be presented at the *TagReader*.
   After successful read, the USER_CODE_REPORT or ALARM_REPORT_V2 will be sent.

Because the RFID code are not readable on the Tags, the *TagReader* has some special procedures.
Some examples are given at the **Typical operation diagrams** chapter in the **Technical Manual**.

There are some situations:
1. **In case an unknown Manual Code entered or unknown Tag presented.**
   In this case, the *TagReader* will send an unsolicited USER_CODE_REPORT with **UserID 0** and **UserID Status 0**.
   A controller will receive this report and can initiate a USER_CODE_SET to the *TagReader*.
2. **In case a known Manual Code or Tag is presented.**
   This means, this code was previously SET using the USER_CODE_SET command.
   Then the *TagReader* will respond with a ALARM_REPORT_V2 with **Type 6** and **Event 0x05 or 0x06**.
   When the user presses **Home**, event **0x06** (Keypad Unlock) will be used.
   When the user presses **Away**, event **0x05** (Keypad Lock) will be used.

Supporting Command Classes

     Basic type: BASIC_TYPE_ROUTING_SLAVE
     Generic type: GENERIC_TYPE_ENTRY_CONTROL
     Specific type: SPECIFIC_TYPE_NOT_USED
     Listening: FALSE, Z-Wave Lib: 4.54

     class: 0x85 COMMAND_CLASS_ASSOCIATION
     class: 0x80 COMMAND_CLASS_BATTERY
     class: 0x84 COMMAND_CLASS_WAKE_UP
     class: 0x86 COMMAND_CLASS_VERSION
     class: 0x72 COMMAND_CLASS_MANUFACTURER_SPECIFIC_V2
     class: 0x71 COMMAND_CLASS_ALARM_V2
     class: 0x70 COMMAND_CLASS_CONFIGURATION

class: 0x25 COMMAND_CLASS_SWITCH_BINARY
class: 0x63 COMMAND_CLASS_USER_CODE

Not listening Routing SLAVE
This Z-Wave product will be used as routing slave. Slave nodes are nodes in a Z-Wave network that receive commands and perform actions based on the command. This device will always be in sleep mode because it works on batteries. In sleep mode the device is not active listening, the device will wake up according to the wakeup command class.

Include Initiator
The include initiator is used when Primary and Inclusion Controllers include nodes into the network. When both the include initiator have been activated simultaneously the new node will be included to the network (if the node was not included previously).

Exclude Initiator
The exclude initiator is used by Primary and Inclusion Controllers to exclude nodes from the network. When the exclude initiator and a slave initiator are activated simultaneously, it will result in the slave being excluded from the network (and reset to Node ID zero). Even if the slave was not part of the network it will still be reset by this action.

Z-Wave compatibility
Because this is a Z-Wave device, it means it can co-operate with other Z-Wave devices of other manufacturers. It can co-exist in a Z-Wave network existing with product from other manufacturers.

Hops & Retries
The Z-Wave range has a range of up to 30 meters in line of sight. This signal is not limited to the 30 meter range due to routing the Z-Wave message to other nodes in the network. This way the range of the Z-Wave network can be expanded to 150 meters indoors (limit of 4 hops).

class: 0x63 COMMAND_CLASS_USER_CODE
The purpose of the User Code Command Class is to configure the *TagReader* to accept certain RFID Tags or codes. This is typically done by some kind of static controller or gateway (for instance the BeNeXt myGate). After sending a User Code Set, including a unique User Identifier (UID), the in-use state (0x01) and the Tag code or keypad sequence using ASCII codes, the *TagReader* will accept the codes and notify any other device using the Alarm Command Class.
This other device can be configured using the Association Command Class and is typically the same controller or gateway.
When a tag or code is not known to the *TagReader*, it will send an unsolicited report to the devices in its association group with the UID 0x00. The value in this message can be used to configure new tags.

Note: Code length must be 4 to 10 ASCII digits.

class: 0x86 COMMAND_CLASS_VERSION
This Command Class is used to obtain information about the *TagReader*. The Z-Wave library type, the Z-Wave protocol version and the application version will be reported.

class: 0x72 COMMAND_CLASS_MANUFACTURER_SPECIFIC_V2
This will report information about the manufacturer. This product will contain the manufacturer ID of *BeNeXt*.

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Manufacturer ID of *BeNeXt* is 138, the ID of this product is 7.

This command class can also be used to request the serialnumber of the device.

class 0x20 COMMAND_CLASS_BASIC

The basic command class only has a supporting role and is mapped to the Switch Binary Command Class.

class 0x25 COMMAND_CLASS_SWITCH_BINARY

The Switch Binary Command Class is used to enable or disable the notification sound. This sound is typically used to notify a user when the alarm system is being activated. See also the 'Sound Notification' section.

class: 0x80 COMMAND_CLASS_BATTERY

This class is used to request and report battery levels for a given device.

When battery level is lower then 20% the Tag Reader will send a battery warning (value 255) after every wake up notification. A battery get will report the actual value even if below 20 %

An unsolicited (without receiving a BATTERY_GET) BATTERY_REPORT is sent when the DoorSensor has measured that the battery level has dropped.

Note that the following points apply for the unsolicited BATTERY_REPORT

- When new batteries applied a report is sent with the current value.
- The report will always be lower then the previous sent value.
- The battery level in the report is maximum 2% lower then the previous sent value.

class: 0x85 COMMAND_CLASS_ASSOCIATION

The Association Command Class is used to associate the *TagReader* to other devices. When a tag or code is read, the *TagReader* will send a notification to the Z-Wave devices in its association group. It will also report the state of the tamper alarm to the devices in this association group.

Number of groupings: 1
Maximum supported nodes per group: 5

class: 0x84 COMMAND_CLASS_WAKE_UP

The Wake Up Command Class is used at battery-operated devices. This class allows the *Tag Reader* to wake up occasionally to notify others devices, that the *TagReader* is ready to receive commands. After receiving the commands the *TagReader* will go into sleep mode again. The wake up interval can be set using the WAKE_UP_INTERVAL_SET command.

The default value is 0x1C20 = 7200 sec = 2 hour
The default node is 0xFF = 255 (broadcast)

It is possible to send a **wake up notification** on user interaction. Besides sending a Wake Up Notification automatically every 2 hours (or any other time that is configured using the Wake Up Interval Set command), the *TagReader* also sends a Wake Up Notification when:

- The tamper alarm state changes (*TagReader* is mounted or removed from the wall)
- A tag read
- A code is entered using the keypad

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When the wake up time is set to 0 a **wake up notification** is never send periodically, only on user interaction.

class: 0x70 COMMAND_CLASS_CONFIGURATION_V1

Configure parameters:

1. **Set to default**
    Description: Set all configuration values to default values (factory settings).
                                    Read more in chapter Configuration Reset.
    Size: 1 byte*
    Param1:   if 0xFF then set to default
    Param2,3,4:   not used

2. **Feedback time**
    Description: To configure the time the beep is automatically turned off in seconds.
    Default: 0x0F
    Param1:   0x00 means disabled, 0xFF is endless.
    Param2, 3, 4:   not used
    Size: 1 byte*

3. **Feedback timeout**
    Description: To configure the timeout to wait for a
                                    WAKEUP_NO_MORE_INFORMATION before the error beep is
                                    automatically sound.
                                    The error beeps are fixed 8 beeps shortly after each other.
    Default: 0x00
    Param1:   0x00 means disabled
    Param2,3,4:   not used
    Size: 1 byte*

4. **Feedback beeps per second**
    Description: To configure the number of beeps per second.
                                    Every beep is fixed about 10ms.
    Default: 0x02
    Param1:   nr of beeps per second
    Param2,3,4:   not used
    Size: 1 byte*

5. **The mode**
    Description: To configure the operating mode.
    Default: 0x01

    Size: 1 byte*
    Param1:   Mode 1: Normal operating mode.
                                    Mode 3: Z-Wave chip is always on to request e.g. version or
                                    manufacturer id.
                                    If any mode other then 3, that value will be reported after a get but
                                    will be handled in SW as mode 1.
    Param2, 3, 4:   not used.

6. **RFID circuit startup time**

Description:	The time (*10 ms) that the RFID circuit is started after home or away is pressed.
Default:	0x64 (100 * 10 ms = 1 s)
Size:	1 byte*
Param1:	The time * 10 milliseconds, minimum 0 seconds, maximum 2,55 seconds
Param2, 3, 4:	not used.

* if a size is other then given size the frame is ignored totally so configuration values are **not** changed

class: 0x71 COMMAND_CLASS_ALARM_V2

In the *TagReader*, this Command Class has two purposes:

1. Identify the state of the tamper alarm. The device will send an unsolicited report to the devices in its association group if tempering is detected. The state of the tamper alarm can also be requested by any other device.

2. Report tags or codes that are entered. The *TagReader* will send an unsolicited report to the devices in its association group with the UID that belongs to the code or tag and whether the alarm system should be armed (Away) or disarmed (Home).

Every other alarm type that is requested will be ignored by application.

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Configuration Reset

The Tag Reader Supports a configuration reset function. Configuration reset means
- All configuration values are defaulted.
- Wake up interval is defaulted.

This function can be activated by sending a configuration set frame:

CONFIGURATION_SET
Parameter: 0x01
Size: 0x01 (can't be different from 1)
Value: 0xFF (can be any value except for 0x55)

When the value of configuration value is requested 2 possible values can be returned

CONFIGURATION_REPORT
Parameter: 0x01
Value 0x55:   Configuration settings of the device are altered.
                    The device will report this even if the configuration parameters are changed
                    back to the default value.
Value 0xAA: Configuration of the device is untouched.
                    Note that this value will not change to 0x55 upon modifying the wake up interval
                    and that re-setting the value to 0xAA will always reset the wake up interval.

Always awake mode

The always awake mode is used to request different values from the device e.g. version and manufacturer specific.

Note: in always awake mode the batteries will be drain very fast, we do not recommend to use this mode for a longer period. Always awake mode should only be used in order to configure the device.

Note: it is not possible to use the buttons of the *TagReader* while it is operating in always awake mode.

The always awake mode can be activated by:

CONFIGURATION_SET
Parameter: 0x05
Size: 0x01 (can't be different from 1)
Value: 0x03 (mode 3)

The LED of the device will toggle on and off every second to notify you that it is functioning in always awake mode.

The always awake mode can be deactivated by:

CONFIGURATION_SET
Parameter: 0x05
Size: 0x01 (can't be different from 1)
Value: Any value except 3

A second option to deactivate mode 3 is
1. Remove batteries.
2. Wait ca 10 seconds.
3. Replace batteries

Sound notification

The *TagReader* is capable of playing a notification sound. This feature is typically used to notify a user that an alarm system is being activated. Since the *TagReader* is a non-listening device, the feature can not be controlled at all times. It requires the *TagReader* to wake up and send a Wake Up Notification.

After sending a notification that a tag/code is read (either an unknown or already configured code), the *TagReader* will send a Wake Up Notification.

The notification sound can be turned on/off upon receiving any Wake Up Notification. See the section about the Wake Up Command Class for information on when a Wake Up Notification is send.

Notification sound and acknowledgement
The *TagReader* supports 3 types of notification sound configurations:

1. Notification sound disabled (configuration parameter 2 set to zero)
2. Notification sound enabled (*default*, configuration parameter 2 set to auto-stop time).
3. Notification sound and acknowledgement enabled (configuration parameter 3 set to acknowledgement timeout).

In the first mode, any Basic or Switch Binary commands that are received are ignored.

The second mode, the default, can be used to inform a user that the alarm system is armed or disarmed. To use this, you can send a Basic or Switch Binary set on (0xFF) after receiving an Alarm Report and the Wake Up Notification following it.

The last mode can be used in situations where, for example, users can only disarm the alarm system at certain times. In this case, the user can be notified whether or not its code or tag is accepted.
By configuring configuration parameter 3, you can set an acknowledge timeout. Whenever a Lock/Unlock Alarm Report containing an UID is send by the *TagReader*, the acknowledgement timeout timer is started.

After this there are two possibilities:
1. The *TagReader* does not receive anything (or receives a Wake Up No More Information upon its Wake Up Notification). It starts the error sound to notify the user of the unaccepted code.
2. The *TagReader* receives either a Basic (or Switch Binary) on (to start the normal notification sound) or off (to silently acknowledge the code). The acknowledgement timer is stopped.
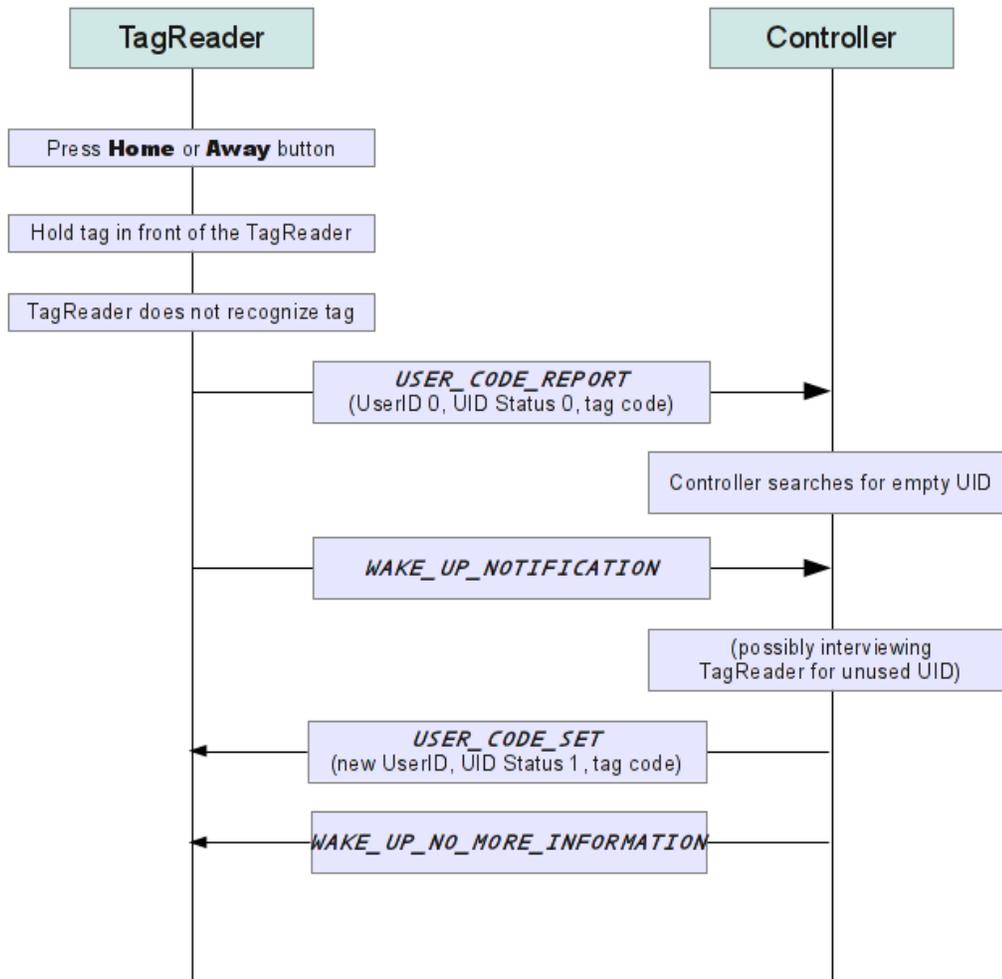
Note that it is actually possible to disable notification sound, but enable acknowledgement. In this case a silent acknowledgement can be both a Basic/Switch Binary on (0xFF) or off (0x00).
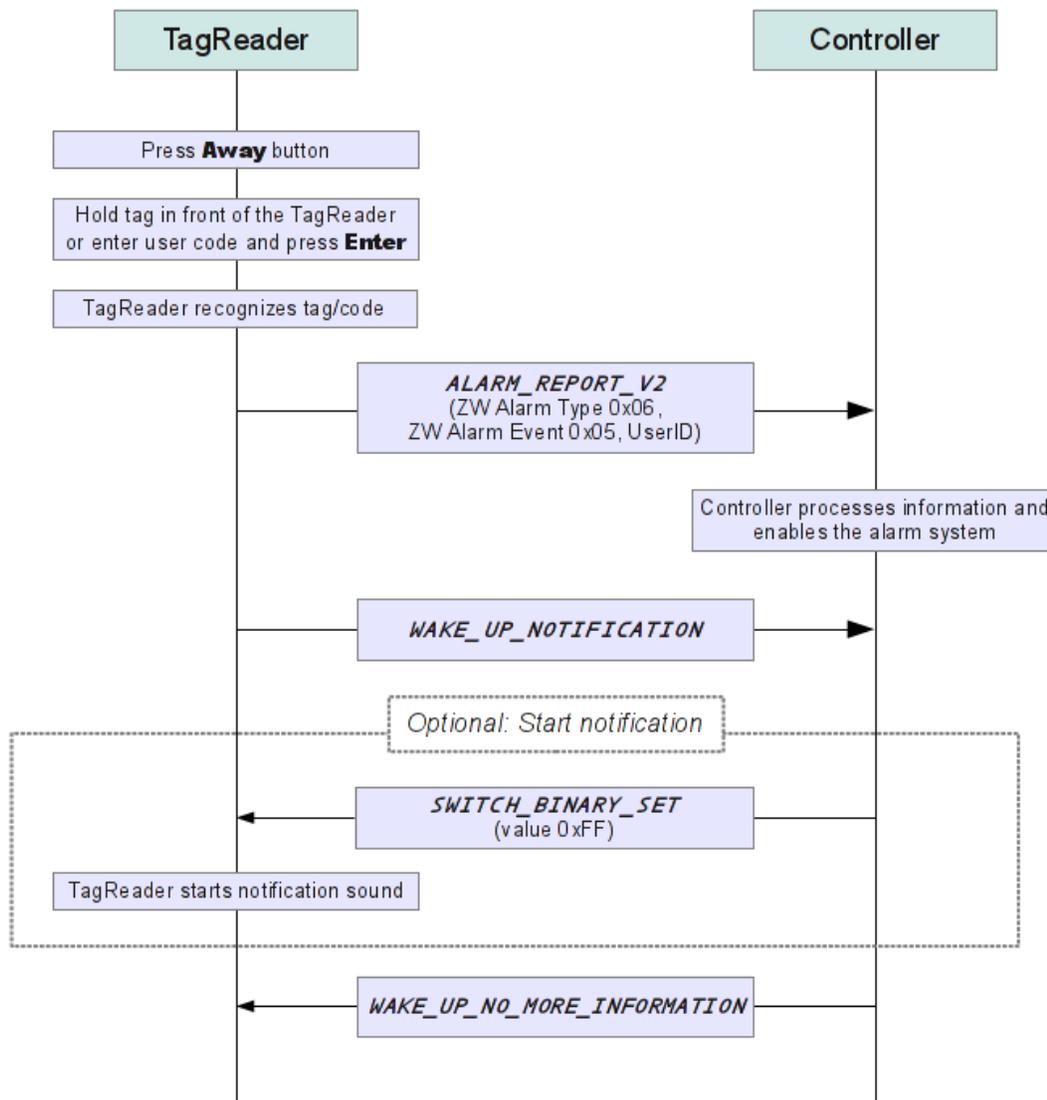
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Typical operation diagrams

The following diagrams show the user action that is required and the messages which are being sent from/to the *TagReader* for several basic operations, including optional functionality as the sound notification and UID acknowledgement.

Configure a new tag
(for configuring new codes, you can skip directly to the WAKE_UP_NOTIFICATION).

```
          TagReader                                    Controller

  ┌──────────────────────────┐
  │ Press Home or Away button │
  └──────────────────────────┘

  ┌──────────────────────────────────┐
  │ Hold tag in front of the TagReader │
  └──────────────────────────────────┘

  ┌──────────────────────────────────┐
  │ TagReader does not recognize tag  │
  └──────────────────────────────────┘

          ┌──────────────────────────────────┐
          │        USER_CODE_REPORT          │────────────▶
          │ (UserID 0, UID Status 0, tag code)│
          └──────────────────────────────────┘

                              ┌──────────────────────────────────┐
                              │ Controller searches for empty UID │
                              └──────────────────────────────────┘

          ┌──────────────────────────────────┐
          │      WAKE_UP_NOTIFICATION         │────────────▶
          └──────────────────────────────────┘

                              ┌──────────────────────────────────┐
                              │     (possibly interviewing        │
                              │  TagReader for unused UID)         │
                              └──────────────────────────────────┘

  ◀───────┌──────────────────────────────────┐
          │         USER_CODE_SET             │
          │ (new UserID, UID Status 1, tag code)│
          └──────────────────────────────────┘

  ◀───────┌──────────────────────────────────┐
          │   WAKE_UP_NO_MORE_INFORMATION     │
          └──────────────────────────────────┘
```

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Arm the alarm system

TagReader	Controller

Press **Away** button

Hold tag in front of the TagReader
or enter user code and press **Enter**

TagReader recognizes tag/code

ALARM_REPORT_V2
(ZW Alarm Type 0x06,
ZW Alarm Event 0x05, UserID)

Controller processes information and
enables the alarm system

WAKE_UP_NOTIFICATION

Optional: Start notification

SWITCH_BINARY_SET
(value 0xFF)

TagReader starts notification sound

WAKE_UP_NO_MORE_INFORMATION

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Disarm the alarm system

TagReader — Controller

Press **Home** button

Hold tag in front of the TagReader
or enter user code and press **Enter**

TagReader recognizes tag/code

ALARM_REPORT_V2
(ZW Alarm Type 0x06,
ZW Alarm Event 0x06, UserID)

Controller processes information and
disables the alarm system

WAKE_UP_NOTIFICATION

Optional: Acknowledge

SWITCH_BINARY_SET
(value 0x00)

WAKE_UP_NO_MORE_INFORMATION

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Example more explained

NOTE: If you readout the **Tag** for the first time you will receive a "UserCodeReport" (note the report is not ASCII but raw hex data).

With this Usercode you can configure an empty User_ID inside the TagReader with that TAG-code.
The same way you can configure a Manual user code (like home + 1,2,3,4 + enter), you will send a User_Code_Set to the User_ID

Let me make an example.
You have a TAG (=from a customer called Paul) with hex raw value 0x8F086C2C500001000000 (according the usercode report) you will send this code back to the TagReader that you want to make a New user with User_ID= 1.
The next time that Paul will show the tag in front of the reader it will not send this user_code_report anymore because it recognize that this is a valid User with User_ID=1. Now the TagReader will send an Alarm_Report_v2 with the User_ID=1 (to tell the controller that Paul entered his tag and pressed on button home (unlock) or pressed on away(lock).).
See the flowchart diagrams above.

This same trick will happen when you configure a manual user code inside the TagReader like (1,2,3,4 + enter) for this example you have configured this usercode_set 0x31323334000000000000 (ascii value 1,2,3,4 always fill it up with zeros to let it work) to a new user which will be User_ID=2
The next time you will enter home + 1234+enter the TagReader will report an AlarmReportV2 with Unlock alarm by user_id=2.
The controller will have to handle this alarm message and disable the alarm or active a special scene.

A short description of the alarmclass v2.:
class: 0x71 COMMAND_CLASS_ALARM_V2
In the TagReader, this Command Class has two purposes:
Identify the state of the tamper alarm. The device will send an unsolicited report to the devices in its association group if tempering is detected. The state of the tamper alarm can also be requested by any other device.
Report tags or codes that are entered. The TagReader will send an unsolicited report to the devices in its association group with the UID that belongs to the code or tag and whether the alarm system should be armed (Away) or disarmed (Home).
Every other alarm type that is requested will be ignored by application.

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Troubleshooting

Frequently Asked Questions

Q: Why doesn't the *TagReader* read tags?
A: **1**. The device is not (correctly) included in a Z-Wave network. Include the device and try it again.
2. Are you using the right tags? The supported protocols are ISO15693, ISO18000-3, Tag-it™.
3. The batteries are so empty that the device cannot startup; it is advised to replace your batteries.
4. The tamper switch is not fully or properly pressed. You should hear a clicking sound when the Tamper switch is pressed in completely.

Q: The buttons don't work, even when the batteries are in.
A: **1**. The tamper switch is not fully or properly pressed. You should hear a clicking sound when the tamper switch is pressed in completely.
2. The batteries could be empty. Please put new batteries in and try it again.

Q: I can't have the *TagReader* included into my Z-Wave network, what am I doing wrong?
A: **1**. Is the controller ready to include any device into the Z-Wave network? If the controller is not in Include or exclude mode, the *TagReader* will not be included or excluded.
2. The *TagReader* is already included in a Z-Wave network. Exclude the *TagReader* and Try to include it again.

Q: I have configured a value but when I request it, it is not changed?
A: It is mandatory that the correct size is used while configure a parameter; go to the documentation about the configuration command class to check if the right size is used during configuration. If the wrong size is used the frame is ignored totally.

Q: I have configured a new value and when I request it the correct value is returned but the behavior is still the same?
A: Some configuration parameters have limits of what they can do, go to the documentation about configuration to check if the value of the configured parameter is out off limit.

Q: When I mount the Tag Reader it performs its standard mounting routine but after 8 seconds the indicator light doesn't go on for 1 second but blinks 6 times.
A: blinking 6 times can mean:
1. Tag Reader is not included
2. Tag Reader is not associated
3. Tag Reader can't reached his destination
If all three options are corrected, the *TagReader* is will operate correctly and can be mounted again.