**BENEXT**

# Quick start: Remote Display EU

## Technical specifications

| Normal operating voltage | 2x AAA 1,5V batteries |
|---|---|
| Frequency range | 868.42 MHz |
| Wireless range | Up to 30 meters in line of sight |

Group 1

Group 2

Scroll button

On

Off

iHome.eu

## Basic operations

- The *Remote Display* can be updated remotely with new configuration.
- The *Remote Display* can report all statuses of other listening Z-Wave devices in the network.
- The *Remote Display* can control other Z-Wave devices in the network.

## How it operates

You can easily turn on and off your lightning. You can also controlling directly your Z-Wave devices separately or in a group. Complete monitoring and controlling of your house.
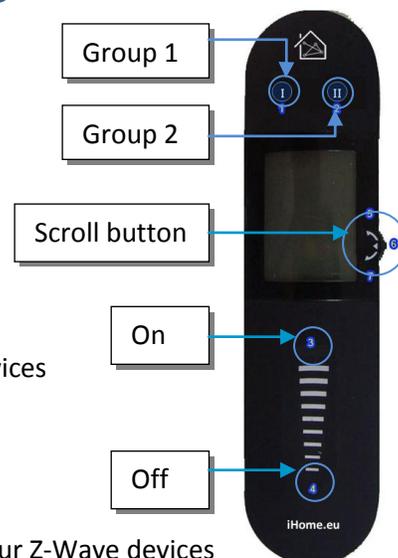
## Mounting

1. Install the batteries by sliding the back cover downwards to reveal the battery socket.
2. Place two AAA 1,5V batteries into the device, and slide the cover of the *Remote Display* back on the device.

## Include or exclude in Z-Wave network [1]

1. Navigate through the *Remote Display's* menu, go to '**System**', select '**RemDispl**' and then scroll to '**Install**' to include the *Remote Display* into your Z-Wave network.
2. When classic inclusion failed, the product will start Network Wide Inclusion automatically.

## Further setting up

See our detailed instruction file called: "setting up Remote Display"

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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: **Remote Display 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 AAA 1,5V batteries<br>From 2,3Vdc to 4,0Vdc<br>Do not use rechargeable batteries |
| Frequency range | 868.42 MHz |
| Wireless range | Approximately 100 meters in line of sight<br>Min. 150 meters with a good mesh network (max 4 hops) |
| Storage temperature | -5°C to +65°C |
| Storage humidity | 10% to 70% |
| Operating temperature | 0°C to 50°C |
| Operating humidity | 30% to 80% |

## Product dimensions (length x width x height)

Remote Display = 170 x 45 x 22 mm

## Supporting command classes:

Basic type: BASIC_TYPE_ROUTING_SLAVE (enhanced)
Generic type: GENERIC_TYPE_DISPLAY
Specific type: SPECIFIC_TYPE_NOT_USED
Listening: FALSE
Z-Wave Lib : 4.54

Class: 0x20 COMMAND_CLASS_BASIC
Class: 0x80 COMMAND_CLASS_BATTERY
Class: 0x85 COMMAND_CLASS_ASSOCIATION
Class: 0x84 COMMAND_CLASS_WAKE_UP
Class: 0x86 COMMAND_CLASS_VERSION
Class: 0x72 COMMAND_CLASS_MANUFACTURER_SPECIFIC_V2
Class: 0x70 COMMAND_CLASS_CONFIGURATION_V2

## Controlled command classes
Class: 0x20 COMMAND_CLASS_BASIC
Class: 0x81 COMMAND_CLASS_CLOCK
Class: 0x70 COMMAND_CLASS_CONFIGURATION_V2

**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 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 : 0x20 COMMAND_CLASS_BASIC**
The Basic command class is mapped to battery command class, so if Remote Display receives a BASIC_GET command it will reply with a BATTERY_REPORT.

COMMAND_CLASS_BASIC is also controlled.

- When a GENERIC_TYPE_SWITCH_BINARY in menu control is switched on/off
  BASIC_SET 255/0
- When a GENERIC_TYPE_SWITCH_MULTILEVEL in menu control is set to a multilevel
  BASIC_SET 0-99

**Class : 0x80 COMMAND_CLASS_BATTERY**
This class is used to request and report battery levels for a given device. The Remote Display reports the battery value in percentage.

**Note:** the battery value as seen on the battery logo on display isn't the same value the value reported by a battery report command. E.g. the battery report says 82% but the battery logo on display still shows 100%.

An unsolicited (without receiving a BATTERY_GET) BATTERY_REPORT is sent when the Remote Display 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 than the previous sent value
- The battery level in the report is maximum 2% lower than the previous sent value

**Class : 0x85 COMMAND_CLASS_ASSOCIATION**
The Remote Display has 38 association groups.

Group 1
Any nodes in associated into this group receive a CONFIGURATION_SET frame when the 'group' buttons (1/2) are pressed or when any item in the submenu 'scene' is selected.

Maximum supported nodes per group: 1

Group 2
Not used.

Group 3 until group 34
These are the groups which are connected to the menu entry control. Every group is one entry in the control menu. You can switch on and off a node in case it is a switch binary device and set a multilevel value if it is a dimmer device.

The Remote Display only supports switch binary and switch multilevel devices so you need to configure generic type of a product. See command class configuration parameter offset 4 how to do this. The default is GENERIC_TYPE_SWITCH_BINARY.

Maximum supported nodes per group: 1

It is possible to configure your own names. The default names are:
- for group 3 it is Switch1
- for group 4 it is Switch2
- for group 5 it is Switch3
- …
- for group 34 it is Switch32

Group 35

This group can be connected to a device that supports a CLOCK_REPORT when associated the time is requested when the Remote Display starts he request the time and shows this on the display.

Maximum supported nodes: 1

Group 36

This group is used to setup a configuration between the Remote Display and a node. The Remote Display sends a CONFIGURATION_SET to the node in this group when the configuration menu is configured.

Maximum supported nodes: 1

Group 37

Not used.

Group 38

You can send a BASIC_SET frame to the node in this group. To do this you have to press and hold one of the group buttons (1/2) for three seconds. This is meant to associate with a panic device like an Alarm Sound.

Maximum supported nodes: 1

*Note: For groups 1 – 38, if you want to change the node in one of these groups you must sent an ASSOCIATION_REMOVE command first before sending an ASSOCIATION_SET command. It is not possible to overwrite a node in an association group that only support 1 node.*

**Class: 0x84 COMMAND_CLASS_WAKE_UP**

The Wake Up command class is used at battery-operated devices. This class allows the Remote Display to wake up occasionally to notify others devices, that the *Remote Display* is ready to receive commands. After receiving the commands, the *Remote Display* 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. This happens every time the Remote Display is turned on.

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

**Class: 0x86 COMMAND_CLASS_VERSION**

This Command Class is used to obtain information about the *Remote Display*. 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*. Manufacturer ID of *BeNext* is 138, the ID of this product is 2.

Because the version 2 is supported this command class can also be used to request the serial number of the device.

**Class : 0x70 COMMAND_CLASS_CONFIGURATION_V2**
- The Remote Display has 4180 configuration parameters.
- All parameters have size 1, if any other size then whole frame is ignored.
- You can use CONFIGURATION_SET_V1 to configure single parameters.
- You can use CONFIGURATION_BULK_SET_V2 to configure multiple parameters.

Parameter 1: Set to default
Number of parameters: 1

When value is not 0x55 or not 0xAA set all configuration parameters to default

Parameter 2: Time OFF
Number of parameters: 1

This parameter is used to the time (s) the Remote Display is awake when on, every time a button is pressed the time OFF is reset.

The maximum time OFF value is 60 seconds. Every value higher than that will corrected to 60 seconds but is still reported as the value that was configured. E.g. if 100 seconds as value is configured then the time OFF value is 60 seconds but the CONFIGURATION_REPORT value is 100.

The minimum value is six seconds. Every value lower than six will be corrected to six seconds, but reported as the value that was set.

Parameter 3: Awake mode
Number of parameters: 1

This parameter is used to set the Remote Display in always awake mode.
If value is 3 the display is not going to sleep mode.
If value is not 3 then display is going into sleep mode (when time OFF ends).

Parameter 4 - 291: Product names and types
Size: 288

 These parameters are used to change the names and types of the product, if a product is added by an association or manually (system → products → add → control) then it will appear on the 'Control' menu with its default name.

Control can have maximum 32 products so the parameters are split up into 32 x 9. The maximum number of characters a product can have is 8. The ninth byte per product is the type.
Because Remote Display only supports switch and dimmer devices the type must be GENERIC_TYPE_SWITCH_BINARY (0x10) or GENERIC_TYPE_SWITCH_MULTILEVEL (0x11). If any other type is configured the product is not shown in the control menu.

So to determine the parameter for the name of a product: param = 4 + ((Product - 3) * 9)
So to determine the parameter for the type of a product: param = 4 + ((Product - 3) * 9) + 4

The 'Product' is the number of the association group the products are in.

**Note:** Names and types are not defaulted when removed thus once a name/type is configured you should manually default this when removing the group.

Parameter 292 – 357: Not used

Parameter 358, 359: Configuration entries
Size: 2

These parameters are used to set the number of configuration entries. The first six bits of the integer are ignored. The other 10 bits of the integer represent each one config entry. So there can be up to maximal 10 configuration entries. If at least one configuration entry is configured the 'Config' will appear on the top level menus.

Parameter 360: Configuration parameters
Size: 1

The configuration parameter of the configuration_set when an entry is the config menu is sent.

Parameter 361 - 440: Configuration names
Size: 80

These parameters are used to change the name of the configuration entries.
There can be up to 10 info entries configured and every configuration entry can have maximal 8 characters.
So to determine the parameter offset of an info entry: param = 361 + ((Entry -1)*8)

Parameter 441 - 450: Configuration values
Size: 10

Ten values that correspond with ten configuration entries where value 0 is entry 1, value 1 is entry 2 etc.

Parameter 451 - 460: Configuration logo options
Size: 10

Ten values that correspond with ten configuration entries where value 0 is entry 1, value 1 is entry 2 etc.

A logo option value is build up with bits where:
0000 **0000** = the number (0-9) (can only used with logo 1 or logo 2)
000**0** 0000 = reserved
**000**0 0000 = the number of the logo (1, 2, 3 or 4)

Parameter 461 – 464: Scene entries
Size: 4

These parameters are used to set the number of scene entries, the first 12 bits of the long are ignored. The other 20 bits of the integer represent each one scene entry. So there can be up to maximal 20 configuration entries.

Parameter 465: Scene configuration parameter
Size: 1

The configuration parameter of the configuration_set when an entry is the scene menu is sent.

Parameter 466- 625: Scene names
Size: 160

These parameters are used to change the name of the scene entries.
There can be up to 20 scene entries configured and every scene entry can have a maximum of 8 characters.
So to determine the parameter offset of an info entry: param = 466 + ((Entry -1)*8)

Parameter 626 - 645: Scene values
Size: 20

Twenty values that correspond with twenty scene entries where value 0 is entry 1, value 1 is entry 2 etc.

Parameter 646: Scene group 1 button value
Size: 1

The value that is sent with the configuration_set frame when 'group' button 1 is triggered.

Parameter 646: Scene group 2 button value
Size: 1

The value that is sent with the configuration_set frame when 'group' button 2 is triggered.

The following parameters (648 - 1103) are texts on the Remote Display and therefore can be used to e.g. translate the Remote Display to another language.

Parameter 648 - 679
Number of parameters: 32

These are the names for the top level names:
Default:
- Lifestyl
- Scene
- Control
- System

Parameter 680 - 695
Number of parameters: 16

These are the names for the system menu:
Default:
- RemDispl
- Products

Parameter 696 - 727
Number of parameters: 32

These are the names for the MyDisplay entry in the system menu.
Default:
- Light
- Time OFF
- Install
- Uninstal

Parameter 728 - 743
Number of parameters: 16

These are the names for the products entry in the system menu.
Default:
- Add
- Remove

Parameter 744 - 767
Number of parameters: 24

These are the names for the Add/Remove entry Products -> system menu.
Default:
- Control
- Group 1
- Group 2

Parameter 768 - 791
Number of parameters: 24

These are the names that are showing the status messages when requesting a value from a product.
Default:
- On
- Off
- Fail

Parameter 792 - 807
Number of parameters: 16

This is the status text when a request is started
Default:
- Request
- Started

Parameter 808 - 823
Number of parameters: 16

This is the text when inclusion is failed.
Default:
- mDisplay
- Failed

Parameter 824 - 839
Number of parameters: 16

This is the text when inclusion is successful.
Default:
- mDisplay
- Added

Parameter 840 - 855
Number of parameters: 16

This is the text when exclusion is successful.
Default:
- mDisplay
- Removed

Parameter 856 - 863
Number of parameters: 8

This is the text when either light or time OFF is selected.
Default:
- Level:

Parameter 864 - 871
Number of parameters: 8

This is the text when a product is added/removed to a group.
Default:
- Product:

Parameter 872 - 879
Number of parameters: 8

This is the text when a product is added.
Default:
- added:

Parameter 880 - 887
Number of parameters: 8

This is the text when a product is removed.
Default:
- removed:

Parameter 888 - 903
Number of parameters: 16

This is the text when there can't be any products added to control or a group.
Default:
- Memory
- all-out

Parameter 904 - 919
Number of parameters: 16

This is the text when you try to remove a product manually but is associated.
Default:
- Product NOT
- present

Parameter 920 - 922
Number of parameters: 16

This is the text when you try to add a product manually but is not supported.
Default:
- Product NOT
- accepted

Parameter 936 - 951
Number of parameters: 16

This is the text when you try to request information but there is no info available.
Default:
- Info NOT
- present

Parameter 952 - 967
Number of parameters: 16

This is the text when your battery is empty.
Default:
- Battery
- Empty

Parameter 968 - 975
Number of parameters: 8

This is the text when the Remote Display is in always awake mode.
Default:
- Awake

Parameter 976 - 991
Number of parameters: 16

This is the text shown during NWI.
Default:
- Check
- Gateway

Parameter 992 - 1007
Number of parameters: 16

This is the text shown when forced shutdown.
Default:
- Shutting
- down

Parameter 1008 - 1023
Number of parameters: 16

This is the text shown when Remote Display needs a restart.
Default:
- Please
- Restart

Parameter 1024 - 1031
Number of parameters: 8

This text is used for the group buttons.
Default:
- Products

Parameter 1032 - 1039
Number of parameters: 8

This text is used when one of the group buttons is pressed and hold for 3 seconds.
Default:
- Panic

Parameter 1040 – 1071
Number of parameters: 32

This text is used when one of the group buttons is pressed and released within 3 seconds.
Default:
- 1
- 2
- Hotkey
- Pressed

Parameter 1072 - 1079
Number of parameters: 8

This text is used when any configuration_set or association_set frame is received.
Default:
- Updating

Parameter 1080 - 1103
Number of parameters: 24

This text is used panic is sent
Default:
- !!!!!!!!
- PANIC
- Send

Parameter 1104 - 1871: Font 1
Number of parameters: 768

These parameters are used to configure the first font, this font is used for the:
- Top level menu names

The font is standard Ascii where parameter 853 is " " (space) and parameter 1619 ~ , 1620 DEL.

Parameter 1872 - 2639: Font 2
Number of parameters: 768

These parameters are used to configure the second font, this font is used for the:
- Non highlighted submenu names

The font is standard Ascii where parameter 1621 is " " (space) and parameter 2387 ~ , 2388 DEL.

Parameter 2640 - 3407: Font 3
Number of parameters: 768

These parameters are used to configure the third font, this font is used for the:
- Highlighted submenu names

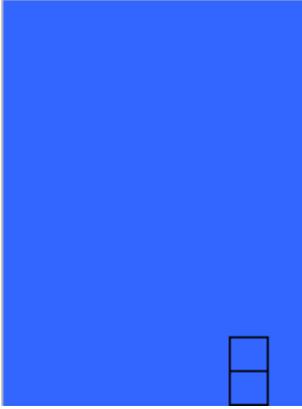The font is standard Ascii where parameter 2389 is " " (space) and parameter 3155 ~ , 3156 DEL.

Parameter 3408 - 3423: RF sends logo
Number of parameters: 16

These parameters are used to configure the RF send logo, this logo is shown when:
- Any form of Z-Wave transmission

The RF send logo is shown on the following area on the display.

Every bit in a byte forms a pixel on the display. The first 8 bytes are the top square and the second 8 bytes the bottom square.

Parameter 3424 - 3471: Battery logo's
Number of parameters: 48

48 parameters are divided in three sets 16 bytes.

Parameter 1 – 16 is shown when:
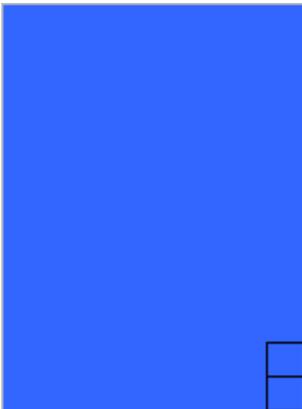- Battery value is higher the 60% (so likely it is a battery full logo)

Parameter 17– 32 is shown when:
- Battery value is higher the 30% and lower than 60% (so likely it is a battery half full logo)

Parameter 33– 48 is shown when:
- Battery value is lower than 30% (so likely it is a battery empty logo)

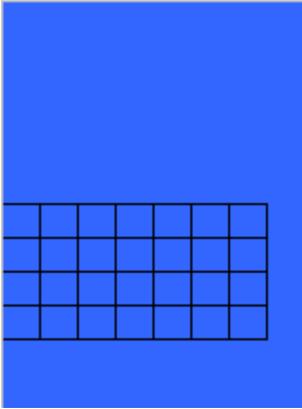The logo is shown on the following area on the display.



Parameter 3472 - 3695: Configuration logo 1
Number of parameters: 224

These parameters are used to configure the RF send logo, this logo is shown when:
- When selected in the configuration menu

The logo is shown on the following area on the display.

Every bit in a byte forms a pixel on the display and every square has 8 bytes.

The first 7 x 8 bytes are the first line
The second 7 x 8 bytes are the second line
The third 7 x 8 bytes are the third line
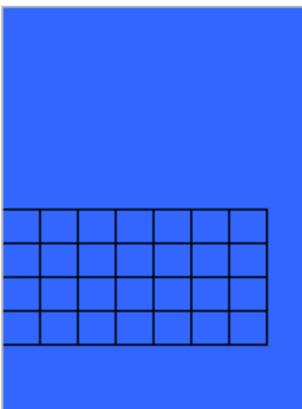The fourth 7 x 8 bytes are the fourth line

Parameter 3696 - 3919: Configuration logo 2
Number of parameters: 224

These parameters are used to configure the RF send logo, this logo is show when:
-    When selected in the configuration menu

The logo is shown on the following area on the display.



Every bit in a byte forms a pixel on the display and every square has 8 bytes.

The first 7 x 8 bytes are the first line
The second 7 x 8 bytes are the second line
The third 7 x 8 bytes are the third line
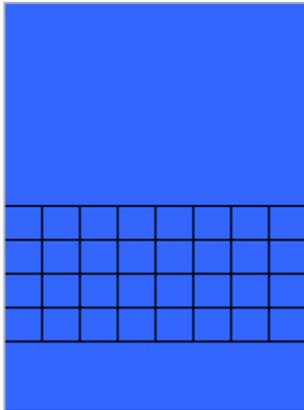The fourth 7 x 8 bytes are the fourth line

<u>Parameter 3920 - 4175: Configuration logo 3</u>
Number of parameters: 256

These parameters are used to configure the RF send logo, this logo is show when:
- When selected in the configuration menu

The logo is shown on the following area on the display.

Every bit in a byte forms a pixel on the display and every square has 8 bytes.

The first 8 x 8 bytes are the first line
The second 8 x 8 bytes are the second line
The third 8 x 8 bytes are the third line
The fourth 8 x 8 bytes are the fourth line

<u>Parameter 4176 - 4431: Configuration logo 4</u>
Number of parameters: 256

These parameters are used to configure the RF send logo, this logo is show when:
- When selected in the configuration menu

The logo is shown on the following area on the display.

Every bit in a byte forms a pixel on the display and every square has 8 bytes.

The first 8 x 8 bytes are the first line
The second 8 x 8 bytes are the second line
The third 8 x 8 bytes are the third line
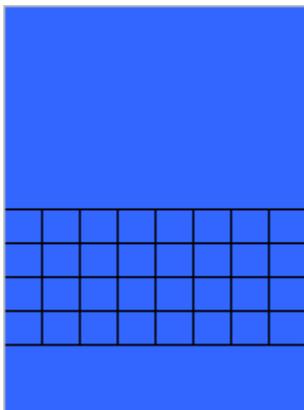The fourth 8 x 8 bytes are the fourth line

**Class : 0x70 COMMAND_CLASS_CLOCK**
This command class is controlled, when associated to other Z-Wave device that supports the
COMMAND_CLASS_CLOCK then the time is shown on the display.

## Configuration reset

The Remote Display supports a configuration reset function. Configuration reset means:
- All configuration values are defaulted
- Wake up interval is defaulted

**Note**: All configurations will also be defaulted after exclusion the device.

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 or 0xAA)

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

CONFIGURATION_REPORT
Parameter:      0x01
Value 0x55:     Device doesn't have all his default configuration settings anymore.
                Even when a configuration parameter is changed back to the default value
Value 0xAA:     Devices still has all his factory settings.
                This are only configuration parameters, wake up interval can be changed.

## Always awake mode

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

The always awake mode can be activated by:

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

The always awake mode can be deactivated by:

CONFIGURATION_BULK_SET
Parameter:          0x03
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

**Note:** in always awake mode the batteries will be drain very fast, we do not recommend to use this mode.

## Manual reset (restart Remote Display).

It is possible to manually reset the Remote Display. You can do this by pressing and holding the enter button (scroll button) for (at least) 5 seconds. Remote Display is now restarted.

## Battery empty protection

The Remote Display has built-in software protection to extend the battery lifetime. This security means that when the batteries are almost empty (the battery empty logo is shown) the (blue) backlight is not switched on anymore. This way the battery lifetime is extended for a significant time.

The backlight is reset when other batteries are placed. These 'new' batteries must be higher than 60% to reset the backlight. You can see if the batteries are higher than 60% when the 'battery full' logo is shown in the right-bottom corner of the screen.

## Error screens

```
Control
PS1    Fail
```
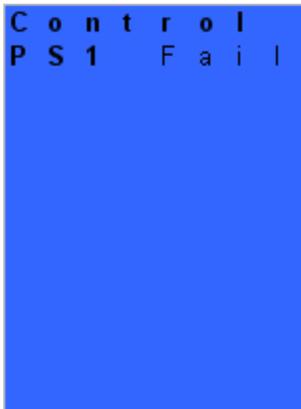
Possible error 1:
The product that you request the status from can't be reached.

Possible solution:
- Check if the product you want to request the status from is main powered

Possible error 2:
The product that you request the status from doesn't report to your request correct.

Possible solution:
- Check if it is a switch binary or switch multilevel device

```
System

mDisplay
Failed
```

Error:
Inclusion from Remote Display into Z-Wave network is failed.

Possible solution:
- Check if your Gateway/controller is in add node mode.
- Check if the Remote Display is in range from your inclusion controller/Gateway.

```
S  y  s  t  e  m




M  e  m  o  r  y
A  l  l  -  o  u  t
```

Error:
You are trying to add a product to a group or to control but there is no more space for new products.

Possible solution:
- Remove a product from a group or control and try to add the new product again.

```
S  y  s  t  e  m




P  r  o  d      N  O  T
p  r  e  s  e  n  t
```

Error:
You are trying to remove a product but the product was never added.

```
S  y  s  t  e  m




I  n  f  o      N  O  T
p  r  e  s  e  n  t
```

Possible error 1: the info the product is requested from doesn't support info reports.

Possible solution:
> - Associate Remote Display to a product that supports info reports (COMMAND_CLASS_SCREEN_MD, SCREEN_MD_REPORT)

Possible error 2: the info the product is requested from can't be reached.

Possible solution:
> - Check if the product that sends the info reports is mains powered
> - Check if Remote Display is in range from the device that reports the info

```
System



Battery
empty
```

Error: the batteries are empty.

Possible solution:
> - Replace the batteries
> - See chapter 'Battery empty protection' for more information