



# Aeotec LED Strip

(Z-Wave LED Strip)



### Change History

Revision	Date	Change Description
1	04/19/2016	Initial draft.
2	04/25/2016	Update
3	05/06/2016	Update
4	05/20/2016	Update
5	07/10/2016	Update
6	08/24/2016	Update
7	08/31/2016	Update
8	09/21/2016	Update

## Aeotec LED Strip

### Engineering Specifications and Advanced Functions for Developers

Aeotec LED Strip is a switch multilevel device based on Z-wave enhanced 232 slave library of V6.51.08.

Its Strip has the Smart RGB LEDs in, which can be used for adding colour to your home, the LED Strip has 5 main colour channels available for you to adjust: Red, Green, Blue, Warm white and Cold white. You can configure its indication colour according to your favour.

LED Strip can be included and operated in any Z-Wave network with other Z-Wave certified devices from other manufacturers and/or other applications. All non-battery operated nodes within the network will act as repeaters regardless of vendor to increase reliability of the network.

The LED Strip is a security Z-Wave plus device, so a security enabled controller is needed for take full advantage of all functionality for the LED Strip. It also supports the Over The Air (OTA) feature for the product's firmware upgrade.

## 1. Library and Command Classes

### 1.1 SDK: 6.51.08

### 1.2 Library

- Basic Device Class: BASIC\_TYPE\_ROUTING\_SLAVE
- Generic Device class: GENERIC\_TYPE\_SWITCH\_MULTILEVEL
- Specific Device Class: SPECIFIC\_TYPE\_POWER\_SWITCH\_MULTILEVEL

### 1.3 Commands Class

Node Info	Included Non-Secure	Included Secure
<b>Frame</b>	CCCOOOMMMMMMAAANNND DD__CCCLLLAAASSSSSS__ZWWAVEPLUS_INFO V2 BASIC V1 SSSIIITTTCCCHH__MULTILEVEL V2 CCCOOOMMMMMMAAANNND DD__CCCLLLAAASSSSSS__ ALL V1 SSSCCCEEEENNTTTRRRAAANNF V1 C IVATION V1 CONFIGURATION V1 AAASSSSSOOCCCLAAATTTTIOCONNN_GRP_INF V1 V2 MANUFACTURER_SPECIFIC V2 VERSION V2 CCCOOOMMMMMMAAANNND DD__CCCLLLAAASSSSSS__FIRMWARE_UPDATE_MD V2 POWERLEVEL V1 SECURITY V1 CCCOOOMMMMMMAAANNND DD__CCCLLLAAASSSSSS__DEVICE_RESET_LOCALLY V1 MARK V1	CCCOOOMMMMMMAAANNND DD__CCCLLLAAASSSSSS__ZWWAVEPLUS_INFO V2 VERSION V2 MANUFACTURER_SPECIFIC V2 CCCOOOMMMMMMAAANNND DD__CCCLLLAAASSSSSS__SECURITY V1 DEVICE_RESET_LOCALLY V1 MARK V1

<b>Security Command Supported Report Frame</b>	<ul style="list-style-type: none"> <li>COMMAND_CLASS_SWITCH_MULTILEVEL V2</li> </ul>	COMMAND_CLASS_BASIC V1 COMMAND_CLASS_SWITCH_COLOR V1 COMMAND_CLASS_SWITCH_ALL V1 COMMAND_CLASS_SCENE_ACTUATOR_CONF V1 COMMAND_CLASS_SCENE_ACTIVATION V1 COMMAND_CLASS_CONFIGURATION V1 COMMAND_CLASS_ASSOCIATION_GRP_INFO V1 COMMAND_CLASS_ASSOCIATION V2 COMMAND_CLASS_MANUFACTURER_SPECIFIC V2 COMMAND_CLASS_VERSION V2 COMMAND_CLASS_FIRMWARE_UPDATE_MD V2 COMMAND_CLASS_POWERLEVEL V1
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## 2. Technical Specifications

Model number: ZW121.

Power supply: 24V/3A DC Adapter.

Max operating power: 72W.

Max standby power: 1.2W.

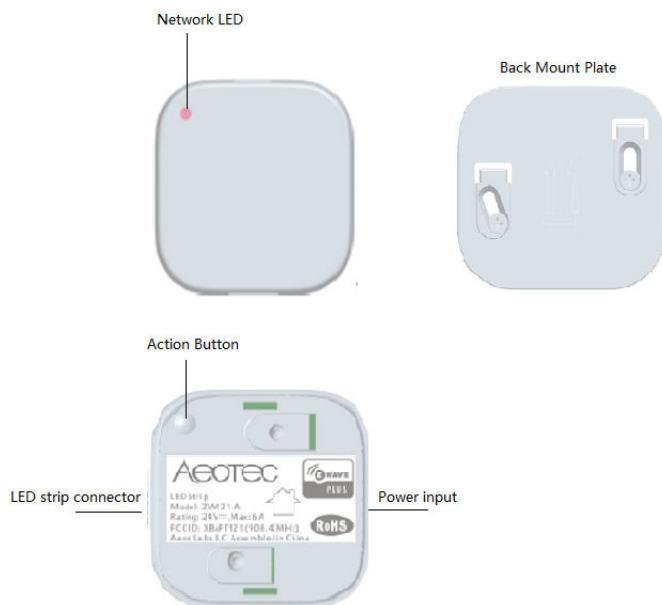
Operating temperature: 0°C to 40°C.

Relative humidity: 8% to 80%.

Operating distance: Up to 492 feet/150 metres outdoors.

## 3. Familiarize Yourself with Your LED Strip

### 3.1 Interface



#### 4. Inclusion/Exclusion of LED Strip

Button Action	Description
Click one time	<p><b>Add the LED Strip into the Z-Wave network:</b></p> <ol style="list-style-type: none"> <li>1. Power on your LED Strip, the Network LED will be colorful gradient status.</li> <li>2. Let your Z-Wave controller into add/inclusion mode.</li> <li>3. Implement the Button Action, the LED Strip will send out a Node info without Security CC in command class list (<i>Non-security inclusion</i>).</li> <li>4. If the inclusion is successful, its Network LED will be solid when you press the Action Button again, Otherwise, please repeat the steps above.</li> </ol> <p><b>Remove LED Strip from a Z-Wave network:</b></p> <ol style="list-style-type: none"> <li>1. Power on your LED Strip, the Network LED will be solid.</li> <li>2. Let the primary controller into remove mode (If you don't know how to do this, refer to its manual).</li> <li>3. Press the Action Button on the LED Strip.</li> </ol> <p>If the remove is success, the Network LED will be colorful gradient status. If Network LED still follows the load status, please repeat the process from the steps above.</p>
Quick press 2 times	<p><b>Add the LED Strip into the Z-Wave network:</b></p> <ol style="list-style-type: none"> <li>1. Power on your LED Strip, the Network LED will be colorful gradient status.</li> <li>2. Let your Z-Wave controller into add/inclusion mode.</li> <li>3. Implement the Button Action, the LED Strip will send out a Node info that contains Security CC in the command class list (<i>Security inclusion</i>).</li> <li>4. If the inclusion is successful, its Network LED will be solid when you press the Action Button again. Otherwise, please repeat the process above.</li> </ol> <p><b>Remove LED Strip from Z-Wave network:</b></p> <ol style="list-style-type: none"> <li>1. Power on your LED Strip.</li> <li>2. Let the primary controller into exclusion mode (If you don't know how to do this, please refer to its manual).</li> <li>3. Press the Action Button on the LED Strip..</li> <li>4. If the exclusion is failed, please repeat the process from step 2.</li> </ol> <p>If LED Strip has been successfully removed from your Z-Wave network, the Network LED will be colorful gradient status. If Network LED still follows the load status, please repeat the process from the steps above.</p>
Press and hold for 20 seconds	<p>Reset the LED Strip to factory default:</p> <p>Note:</p> <ol style="list-style-type: none"> <li>1, This procedure should only be used when the primary controller is inoperable.</li> <li>2, Reset LED Strip to factory default settings, it will:               <ol style="list-style-type: none"> <li>a ), let the LED Strip to be excluded in Z-Wave network;</li> </ol> </li> </ol>

	b), delete the Association settings; c), restore the Configuration settings to the default.
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## 5. Special Rule of Each Command

### 5.1 Basic Command Class

Basic Set = 255 maps to Multilevel Switch Set = 255

Basic Set = 0 maps to Multilevel Switch Set = 0

Basic Set = 1 - 99 maps to Multilevel Switch Set = 1 - 99

Basic Get/Report maps to Multilevel Switch Get/Report

### 5.2 Z-Wave Plus Info Report

Parameter	Value
Z-Wave Plus Version	1
Role Type	5 (ZWAVEPLUS_INFO_REPORT_ROLE_TYPE_SLAVE_ALWAYS_ON)
Node Type	0 (ZWAVEPLUS_INFO_REPORT_NODE_TYPE_ZWAVEPLUS_NODE)
Installer Icon Type	0x0600 (ICON_TYPE_GENERIC_LIGHT_DIMMER_SWITCH)
User Icon Type	0x0600 (ICON_TYPE_GENERIC_LIGHT_DIMMER_SWITCH)

### 5.3 Manufacturer Specific Report

Parameter	Value (hex)
Manufacturer ID 1	0x00
Manufacturer ID 2	0x86
Product Type ID 1	EU=0x00, US=0x01, AU=0x02, JP=0x0A
Product Type ID 2	0x03
Product ID 1	0x00
Product ID 2	0x79

### 5.4 Association Command Class

The LED Strip supports 2 association groups and can add max 5 nodes for each group.

Association Group	Nodes	Send Mode	Send commands
Group 1	0	N/A	N/A
	[1,5]	Single Cast	When the state of LED Strip (turn on/off the LED Strip) is changed: 1, Set Configuration parameter 80 to 0: Reserved (Default). 2, Set Configuration parameter 80 to 1: Send Hail CC. 3, Set Configuration parameter 80 to 2: Send the Basic Report.

Group 2	0	N/A	N/A
	[1,5]	Single Cast	Forward the Basic Set, Switch Binary Set, Switch Multilevel Start Level Change, Switch Multilevel Stop Level Change, Switch Multilevel Set, Scene Activation Set to associated nodes in Group 2 when the LED Strip receives the Basic Set, Switch Binary Set, Switch Multilevel Start Level Change, Switch Multilevel Stop Level Change, Switch Multilevel Set, Scene Activation Set commands from the main controller.

## 5.5 Association Group Info Command Class

### 5.5.1 Association Group Info Report Command Class

Profile: General: NA (Profile MSB=0, Profile LSB=1)

### 5.5.2 Association Group Name Report Command Class

Group 1: Lifeline

Group 2: Retransmit

## 5.6 Scene Actuator Conf Command Class

The LED Strip supports max 255 Scene IDs.

The Scene Actuator Conf Set command is effective, when only Level $\geq$ 0 and Level $<$ 0x64 or Level=0xff, otherwise, it will be ignored.

The Scene Actuator Configuration Get Command is used to request the settings for a given scene, if scene ID is not setting, it will be ignored. If Scene ID =0, then the LED Strip will report currently the activated scene settings. If the currently activated scene settings do not exist, the LED Strip will reports Level = currently load status and Dimming Duration=0

## 5.7 Scene Activation Set Command Class

The Scene Activation Set Command is effective, when only Level $\geq$ 0 and Level $<$ 0x64 or Level=0xff, otherwise, it will be ignored. If the requested Scene ID is not configured, it will be ignored too.

## 5.8 Switch Color Set Command Class

Priority	Capability ID	Color
1 (Highest)	0	Warm white
	1	Cold white
2 (lowest)	2、3、4	R、G、B

**Note:** White color LED and RGB LED will not light up at the same time, so the software makes the following processing. When you want to activate the current RGB color, the color value of higher priority should be set to 0.

For example: The Warm/ Cold white is the highest priority, when it is configured to 0, the RGB color configuration values can be activated. Otherwise, the LED Strip is always be activated by Warm/ Cold white.

### 5.9 Configuration Set Command Class

7	6	5	4	3	2	1	0
Command Class = COMMAND_CLASS_CONFIGURATION							
Command = CONFIGURATION_SET							
Parameter Number							
Default	Reserved					Size	
Configuration Value 1(MSB)							
Configuration Value 2							
.....							
Configuration Value n(LSB)							

#### Parameter Number Definitions (8 bit):

Parameter Number Hex / Decimal	Description	Default Value	Size
0x14 (20)	The LED Strip's state after re-power on it. 0 = The last state before re-power on. 1 = Always On. 2 = Always Off.	0	1
0x20 (32)	Enable/disable to send out a report when the color is changed. 0 = Disable. 1 = Hail CC. Others = ignore.	0	1
0x21 (33)	Get the LED Strip's color value. Value 1 = Reserved. Value 2 = Red color value. Value 3 = Green color value. Value 4 = Blue color value.	-	4



0x22 (34)	Enable/disable to turn on the last brightness level of the LED Strip when using the Color Switch Set CC to change its color. 0 = Disable. 1 = Enable. Others = Ignore.	0	1
0x23 (35)	Configure the display mode of Cold/Warm white. 0 = Arbitrary combination of Cold/Warm white. 1 = Complementary combination of Cold/Warm white. Others = Ignore.	0	1
0x24(36)	Reboot/save/exit Colorful mode. 0 = Un-reboot Colorful mode. 1 = Reboot Colorful mode. 2 = Exit Colorful mode. 3 = Save the current Colorful mode value and then to be exited.	-	1
0x25(37)	Colorful mode configuration. (See the below table)	0x09630000	4
0x26 (38)	Change speed: Value 1: The speed from OFF to ON. Value 2: The speed from ON to OFF. Value 3: Pause time of ON. Value 4: Pause time of OFF.	0x03000300	4
0x27 (39)	Color index configuration when the LED Strip is in Multi color mode. (See the below table)	0x30000000	4
0x28 (40)	Colorful mode configuration. 1 = Rainbow mode. 2 = Mutil color mode. 3 = Fade out and fade in (Red). 4 = Fade out and fade in (Green). 5 = Fade out and fade in (Blue). <i>Note: this parameter is a Set-only parameter.</i>	0	1
0x50 (80)	Enable to send notifications to associated devices (Group 1) when the state of LED Strip is changed. 0 = Nothing. 1 = Hail CC. 2 = Basic CC report. 3 = Hail CC when pressing the Action Button to change its state.	3	1

0x70 (112)	Dimmer mode: 0 = Parabolic curve. 1 = Index curve. 2 = (Parabolic + Index)/2. 3 = Linear.	2	1
0xFC (252)	Enable/disable Lock Configuration (0 =disable, 1 = enable). Value=0, the setting of configuration parameters is allowed. Value=1, all configuration parameters cannot be set (Locked).	0	1
0xFF (255)	1, Value = 0x55555555, Default = 1, Size = 4 Reset to factory default settings and removed from the z-wave network	N/A	4
	2, Value = 0, Default = 1, Size = 1 Reset all configuration parameters to factory default settings	N/A	1

Parameter 37 [4 byte] will set the LED Strip into different modes:

	7	6	5	4	3	2	1	0
Value 1 (MSB)	Color Transition Style		Color Change Speed Option			Color Display Cycle		
Value 2	Brightness							
Value 3	Cycle Count							
Value 4 (LSB)	Time Base of Color Change Speed			Color Change Speed Level				

### Colour Display Cycle (4 bits)

The Color Display Cycle field can have the following values corresponding to 4 different modes:

Color Display Cycle	Description
0	Inactive (keep the current configuration values)
1	Rainbow Mode(red, orange, yellow, green, cyan, blue, violet, pinkish)
2	Multi Color Mode(colors cycle between selected colours)
3	Random Mode

4	Single Color Mode
5 to 15	Reserved

**Single colour mode:** The LED Strip will be solid/ blinking with one color in this mode.

**Rainbow mode:** The LED Strip has 8 colors to display and will change through a range of colors (Red→ Orange→ Yellow→ Green→ Cyan→ Blue→ Violet→ pinkish).

**Multi-colour mode:** The LED Strip can change between multiple colors according to the color index which is configurable through configuration parameter 39, see the configuration table of parameter 39 below.

**Random mode:** The Bulb's color will be displayed randomly.

### Color Transition Style (2 bits)

The following values correspond to 3 different transition styles between colors:

Dim Style	Description
0	Smooth Color Transition.
1	Fade Out Fade In Transition.

### Brightness (8 bits)

Level	Description
1 to 99	1 = Min level. 99 = Max level.
0 or 255	Inactive (keep the current configuration values)

### Cycle Count (8 bits)

The Cycle Count is used to define the number of repetitions/cycles displayed by your LED Strip in Color Display Cycle before stopping.

Cycle Count	Description
0	Unlimited
1 to 254	Total number of repetitions/cycles before stopping.
255	Inactive (keep the current configuration values).

Note: The process of the first color change to the last color is regarded as a cycle.

For example:

When the LED Strip is in Rainbow mode, the color change from red to pink (Red→ Orange→ Yellow→ Green→ Cyan→ Blue→ Purple→ Pink), going through the colors is regarded as 1 cycle.

### Time Base of Colour Change Speed (3 bits)

This function would be used when the Color Transition Style is set to Fade out/in.

Time Base	Description
0	Time base is 1s.
1	Time base is 10ms.
2	Time base is 100ms.

### Colour Change Speed Level (5 bits)

This function would be used when the Color Transition Style is set to Fade out/in.

Level	Description
0	Constant speed
1~30	Accelerate/decelerate speed from the level 1 to 30.
31	Inactive (keep the current configuration values)

Parameter 39 [4 byte] can be used to set the 8 color index when the Bulb is in Multi color mode.

	7	6	5	4	3	2	1	0
Value1 (MSB)	Index 1				Index 2			
Value2	Index 3				Index 4			
Value3	Index 5				Index 6			
Value4 (LSB)	Index 7				Index 8			

Color component id:

ID	1	2	3	4	5	6	7	8
Color	Red	Orange	Yellow	Green	Cyan	Blue	Violet	Pinkish

The color will be changed form index 1 to index 8 circularly when your LED Strip is in Multi color mode.

For example:

If you set the parameter 39 to 305135616 (0x12300000 in hexadecimal, which means the Index 1=1(Red), the Index 2=2(Orange) and the Index 3=3(Yellow)), the color will be changed from Blue to Violet and then Violet to Pinkish (Red → Orange → Yellow).

When your Strip is in Single Colour Mode and the Fade Out Fade In transition style, the parameter 39 would be used to set the RGB value.

	7	6	5	4	3	2	1	0
<b>Value1 (MSB)</b>	Red value							
<b>Value2</b>	Green value							
<b>Value3</b>	Blue value							
<b>Value4 (LSB)</b>	Reserved							

When your Strip is in Random Mode, the parameter 39 would be used to set the random seed, then your bulb will automatically generate random colours to be displayed according to the random seed you set.

	7	6	5	4	3	2	1	0
<b>Value1 (MSB)</b>	Random seed value							
<b>Value2</b>								
<b>Value3</b>								
<b>Value4 (LSB)</b>								