Aeon Labs LED Bulb

(Z-Wave LED Bulb)

Change History

Revision	Date	Change Description
1	03/24/2015	Initial draft.
2	06/02/2015	Update
3	06/17/2015	Update

Aeon Labs LED Bulb
Engineering Specifications and Advanced Functions for Developers

Aeon Labs LED Bulb is a switch multilevel device based on Z-wave enhanced 232 slave library of V6.51.06. Its bulb has the Smart RGB LEDs in, which can be used for adding colour to your home, the bulb 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 Bulb 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 Bulb is a security Z-Wave device, so a security enabled controller is needed for take full advantage of all functionally for the LED Bulb. It also supports the Over The Air (OTA) feature for the product's firmware upgrade.

1. Library and Command Classes

1.1 SDK: 6.51.06

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

	Included Non-Secure	Included Secure
Node Info Frame	COMMAND_CLASS_ZWAVEPLUS_INFO V2 COMMAND_CLASS_SWITCH_MULTILEVEL V2 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 COMMAND_CLASS_SECURITY V1 COMMAND_CLASS_MARK V1 COMMAND_CLASS_DEVICE_RESET_LOCALLY V1 COMMAND_CLASS_HAIL V1	COMMAND_CLASS_ZWAVEPLUS_INFO V2 COMMAND_CLASS_VERSION V2 COMMAND_CLASS_MANUFACTURER_SPECIFIC V2 COMMAND_CLASS_SECURITY V1 COMMAND_CLASS_MARK V1 COMMAND_CLASS_DEVICE_RESET_LOCALLY V1 COMMAND_CLASS_HAIL V1
Security Command Supported Report Frame	–	COMMAND_CLASS_SWITCH_MULTILEVEL V2 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 COMMAND_CLASS_DEVICE_RESET_LOCALLY V1 COMMAND_CLASS_HAIL V1

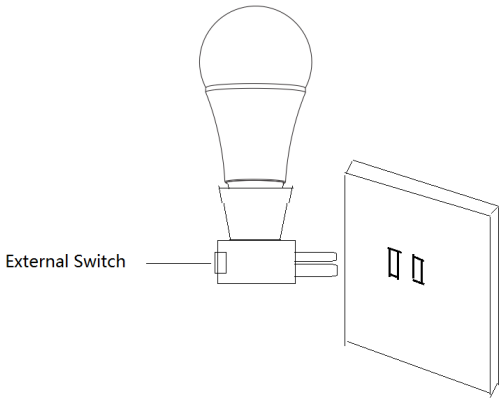
2. Technical Specifications

Model number: ZW098.
Bulb holder type: E26 for USA version, E27 for EU/AU version.
Max operating power: 9W.
Max standby power: 0.7W.
Operating temperature: 0℃ to 40℃.
Relative humidity: 8% to 80%.
Operating distance: Up to 500 feet/150 metres outdoors.

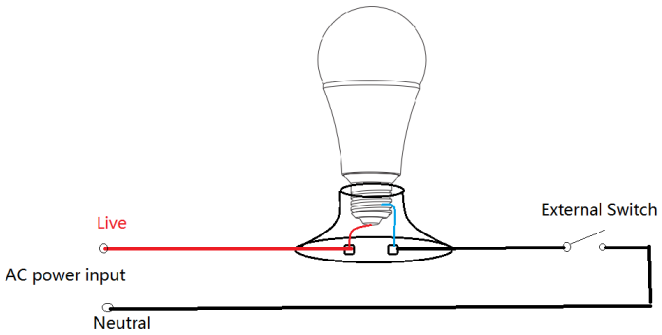
3. Familiarize Yourself with Your LED Bulb

3.1 Interface

4. Inclusion/Exclusion of LED Bulb



Or



Event	Operation Steps
Press the External switch to turn off the Bulb and then turn on it.	**1, Send out node info without Security CC in node info list (Non-security inclusion).** **2, Add the Bulb into z-wave network.** 1. Power on your LED Bulb as above the wire diagrams. 2. Let the primary controller into inclusion mode (If you don't know how to do this, please refer to its manual). 3. Turn off the LED Bulb and then turn on it via pressing the external switch. 4. If the inclusion is failed, please repeat the process from step 2. **Note:** If LED Bulb has been successfully included into your Z-Wave network, its warm white LED will be solid. If the linking was unsuccessful and the LED Bulb continues to be active with a colourful gradient.
Press the External switch to turn off the Bulb and then turn on it, repeat it 3 times within 2 seconds.	**1, Send out node info contains Security CC in node info list (Security inclusion).** **2, Add the Bulb into z-wave network:** 1. Power on your LED Bulb as above the wire diagrams. 2. Let the primary controller into inclusion mode (If you don't know how to do this, please refer to its manual). 3. Turn off the LED Bulb and then turn on it, repeat the operation 3 times within 2 seconds via pressing the external switch.

	.4. If the inclusion is failed, please repeat the process from step 2. **Note:** If LED Bulb has been successfully included into your Z-Wave network, its warm white LED will be solid. If the linking was unsuccessful and the LED Bulb continues to be active with a colourful gradient. **3, Remove LED Bulb from z-wave network:** 1. Power on your LED Bulb as above the wire diagrams. 2. Let the primary controller into exclusion mode (If you don't know how to do this, please refer to its manual). 3. Turn off the LED Bulb and then turn on it, repeat the operation 3 times within 2 seconds via pressing the external switch. 4. If the exclusion is failed, please repeat the process from step 2. **Note:** If LED Bulb has been successfully excluded from your Z-Wave network, its warm white LED will be active with a colourful gradient. If the exclusion was unsuccessful and the LED Bulb continues to be solid.

5. Special Rule of Each Command

5.1 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)

5.2 Manufacturer Specific Report

Parameter	Value (hex)
Manufacturer ID 1	0x01
Manufacturer ID 2	0x6A
Product Type ID 1	EU=0x00, US=0x01, AU=0x02
Product Type ID 2	0x03
Product ID 1	0x00
Product ID 2	0x62 /0x6b (CUBE version)

5.3 Association Command Class

The LED Bulb supports 2 association groups and Max 5 nodes for each group.

Association Group	Nodes	Send Mode	Send commands
Group 1	0	N/A	N/A
	1 [2,5]	Single Cast	When the state of LED Bulb (turn on/off the bulb) 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 Bulb 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 main controller.

5.4 Association Group Info Command Class

5.4.1 Association Group Info Report Command Class

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

5.4.2 Association Group Name Report Command Class

Group 1：Lifeline
Group 2：Retransmit

5.5 Scene Actuator Conf Command Class

The LED Bulb supports max 255 Scene IDs.

The Scene Actuator Conf Set command is effective, when only Level>=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 Bulb will report currently the activated scene settings. If the currently activated scene settings do not exist, the LED Bulb will reports Level = currently load status and Dimming Duration=0

5.6 Scene Activation Set Command Class

The Scene Activation Set Command is effective, when only Level>=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.

5.7 Color Control State Set Command Class

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

Note: White 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 white is the highest priority, when it is configured to 0, the Cold white or RGB color configuration values can be activated. Otherwise, the bulb is always be activated by warm white.

5.8 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
0x20 (32)	Enable/disable to send out a report when the color is changed. 0=disable. 1=Hail CC. Others=ignore.	0	1
0x22 (34)	Enable/disable the function of using External Switch to turn on/off the bulb. 0=disable. 1=enable. Others=ignore.	0	1
0x23 (35)	Enable/disable the function of using External Switch to changes the bulb's color. 0=disable. 1=enable. Others=ignore.	1	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)	0x00000F00	4
0x26 (38)	Color index configuration when the bulb is in Multi color mode. (See the below table)	0x87654321	4
0x50 (80)	Enable to send notifications to associated devices (Group 1) when the state of LED Bulb is changed (0=nothing, 1=hail CC, 2=basic CC report).	1 (US version) 2(other version)	1
0xC8 (200)	Partner ID (0= Aeon Labs Standard Product).	0	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 setting and removed from the z-wave network	N/A	4
	2, Value=0、Default=1、Size=1 Reset to factory default setting	N/A	1

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

	7	6	5	4	3	2	1	0
Value 1 (MSB)	Colour Transition Style		Reserved		Colour Display Cycle			
Value 2	Cycle Count							
Value 3	Colour Change Speed							
Value 4 (LSB)	Colour Residence Time							

Colour Display Cycle (4 bits)

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

Colour Display Cycle	Description
0	Single colour mode
1	Rainbow Mode(red, orange, yellow, green, cyan, blue, violet, pinkish)
2	Multi Colour Mode(colours cycle between selected colours)
3	Random Mode
15	Inactive (keep the current configuration values)
4 to 14	Reserved

Single colour mode: The Bulb is solid with one colour in this mode. If you want to change its current colour, you need to turn the Bulb off and on 2 times via wall switch within 1 second, the Bulb will enter into colour change status. During this time, turning the wall switch off when your desired colour appears, will be used as the colour of the bulb when it is on.

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

Multi-colour mode: The Bulb can change between multiple colours according to the colour index which is configurable through configuration parameter 38, see the configuration table of parameter 38 below.

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

Colour Transition Style (2 bits)

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

Dim Style	Description
0	Smooth Colour Transition.
1	Fast/Direct Colour Transition.
2	Fade Out Fade In Transition.
3	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 Bulb in Colour 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 colour change to the last colouris a cycle.

For example:

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

Colour Change Speed (8 bits)

This field specifies the transition speed when one colour changes to another.

Speed Level	Description
0 to 254	0 is the slowest and 254 is the fastest.
255	Inactive (keep the current configuration values).

Colour Residence Time (8 bits)

This field specifies the length of time each individual colour is displayed before a transition.

Residence time	Description
0 to 254	Corresponds from 0 to 25.4 seconds.
255	Inactive (keep the current configuration values).

The tables above show a decimal representation of the settings that can be set on parameter 37.

For example:

1. If you want your Bulb in Rainbow mode, parameter 37 should be set to16777216 (0x01000000 in hexadecimal).
2. If you want your Bulb to be in Single colour mode, set the parameter 37 to 0.
3. If you want your Bulb to use No Dimming Style and Rainbow mode, you can set the parameter 37 to 1090519040 (0x41000000 in hexadecimal).

Parameter 38 [4 byte] can be used to set the 8 colour index when the Bulb is in Multi colour mode.

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

Colour component Id:

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

The colour will be changed form index 1 to index 8 circularly when your bulb is in Multi colour mode.

For example:
If you set the parameter 38 to 801(0x00000321 in hexadecimal, which means the Index 1=1(red), the Index 2=2(Orange) and the Index 3=3(Yellow)), the colour will change from Red to Orange and then Orange to Yellow (Red→Orange→Yellow→Red).