Aeotec LED Bulb

(Z-Wave LED –RGBW Bulb)

RGBW Bulb Engineering Specifications

Aeotec RGBW Bulb is a switch multilevel device based on Z-wave enhanced 232 slave libraryof V6.51.09.

RGBW Bulb has 5 main color channels available for you to adjust: Warm white , Cold white,Red,Green and Blue. You can configure its color according to your favour.RGBW Bulb can be included and operated in any Z-Wave network with other Z-Wave certifieddevices 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 RGBW Bulb is a security(s0) Z-Wave Plus device, so a security enabled Z-Wave 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.

Features:
- High performance RF design, visual communication distance up to 40m.
- Follow standard Z-Wave plus protocol.
- Select and Configure favorite color output.
- Supporting repeater role.
- Supporting firmware OTA.

1. **Hardware specifications**

Wireless Protocol	Z-Wave
Radio Frequency	908.42MHz(US) 868.42MHz(EU) 921.42MHz(AU)
Communication Distance	40m(LOS)
Modulation Mode	FSK(BFSK/GFSK)
Power(W)	9W
Voltage(V)	110~240V
CCT(K)	2700~6500K
CRI	80
Beam Angle	240
Dimensions(mm)	126*60/118*60

2. SECURITY AND NON-SECURITY FEATURES OF LED BULB

1. The function of the LED Bulb as a security and non-security device is identical.

	Included Non-Secure Network	Included Secure Network
Node Info Frame	COMMAND_CLASS_SWITCH_MULTILEVEL_V2 COMMAND_CLASS_SWITCH_COLOR_V1 COMMAND_CLASS_SWITCH_ALL V1 COMMAND_CLASS_CONFIGURATION_V1 COMMAND_CLASS_ASSOCIATION_V2 COMMAND_CLASS_ASSOCIATION_GRP_INFO_V1 COMMAND_CLASS_VERSION_V2 COMMAND_CLASS_MANUFACTURER_SPECIFIC_V2 COMMAND_CLASS_DEVICE_RESET_LOCALLY_V1 COMMAND_CLASS_POWERLEVEL_V1 COMMAND_CLASS_FIRMWARE_UPDATE_MD_V2 COMMAND_CLASS_ZWAVEPLUS_INFO_V2 COMMAND_CLASS_SECURITY0_V1	COMMAND_CLASS_ZWAVEPLUS_INFO_V2 COMMAND_CLASS_SECURITY0_V1
Security Command Supported Report Frame		COMMAND_CLASS_SWITCH_MULTILEVEL_V2 COMMAND_CLASS_SWITCH_COLOR_V1 COMMAND_CLASS_SWITCH_ALL V1 COMMAND_CLASS_CONFIGURATION_V1 COMMAND_CLASS_ASSOCIATION_V2 COMMAND_CLASS_ASSOCIATION_GRP_INFO_V1 COMMAND_CLASS_VERSION_V2 COMMAND_CLASS_MANUFACTURER_SPECIFIC_V2 COMMAND_CLASS_DEVICE_RESET_LOCALLY_V1 COMMAND_CLASS_POWERLEVEL_V1 COMMAND_CLASS_FIRMWARE_UPDATE_MD_V2

3. All functions of each trigger

RGBW Bulb not in the Z-Wave network:

Trigger	Description
press once	**Add for inclusion** 1. Ensure the led bulb has been excluded outside the network. 2. Triggered by OFF ->ON (between 0.5-2 seconds each time) 3. LED solid yellow Color (0xFFFF00) during the pairing(Timeout is 10 seconds). ● Failure: Blinks between 100% White and Red 0x0000FF color for 3 seconds (at a rate of 200ms per flash), Once 3 seconds have passed, the LED should return to a Warm White LED at 100% ● Success: Blinks between 100% White and Green 0x00FF00 color for 3 seconds (at a rate of 200ms per flash). Once 3 seconds have passed, the LED should return to a Warm White LED at 100%.
press twice	1. Ensure the led bulb has been excluded outside the network. external switch OFF -> ON -> OFF -> ON within (between 0.5-2 seconds each time). 2. Bulb color cycle: red-> orange-> yellow-> green-> blue -> Indigo-> purple.

RGBW Bulb in the Z-Wave network:

Trigger	Description
press once	1. When the color cycle arrives at the color you'd like to select, toggle (off -> on) in quick succession via external switch. 2. The visible color will be set as your bulb's default or color cc set.
press twice	1. Ensure the led bulb has been included the network. external switch OFF -> ON -> OFF -> ON within (between 0.5-2 seconds each time). 2. Bulb color cycle: red-> orange-> yellow-> green-> blue -> Indigo-> purple.
press three times	**Remove for exclusion** 1. Assuming led bulb was added to controller. 2. Triggered by OFF -> ON -> OFF -> ON -> OFF -> ON (between 0.5-2 seconds each time). 3. LED Solid Purple/Violet Color (0xEE82EE) during the unpairing process. (Timeout is 10 seconds). ● Failure: Blinks between 100% White and Red 0x0000FF color for 3 seconds (at a rate of 200ms per flash), Once 3 seconds have passed, the LED

	should return to the last color (**memory status(color cc set)**) of LED Bulb. ● Success: Blinks between 100% White and Blue 0x0000FF color for 3 seconds (at a rate of 200ms per flash). Once 3 seconds have passed, the LED should return to a Warm White LED at 100%.
press six times	**Reset the Device.** 1. Assuming led bulb was added to controller and was power on. 2. RGBW bulb re-power 6 times (between 0.5-2 seconds each time). **Note:** ON -> OFF -> ON -> OFF -> ON -> OFF -> ON -> OFF -> ON -> OFF -> ON -> OFF -> ON 3. If the 6th power on, the led bulb change to Yellow color(into pairing process), which means that the reset factory settings are successf.

4. Special Rule of Each Command

4.1 Basic Command Class
Basic CC is map to Multilevel CC.

4.2 Manufacturer Specific Report Commands

Parameter	Value(hex)
Manufacturer ID 1	0x03
Manufacturer ID 2	0x71
Product Type ID 1	EU=0x00 US=0x01
Product Type ID 2	0x03
Product ID 1	0x00
Product ID 2	0x02

4.3 Version Report Commands

Parameter	Value
Z-Wave Library Type	0x03
Z-Wave Protocol Version	0x04
Z-Wave Protocol Sub Version	0x26
Firmware 0 Version	0x02
Firmware 0 Sub Version	0x00
Hardware Version	0x01
Number of firmware targets	0x00

Association Command Class

Association Group	MAX Nodes	Send Mode	Send Commands
Group 1	0X01	Single Cast	Set Configuration parameter 0x50 0: nothing.

| | | | 1: Send the Basic Report. |
| | | | 2. Send the Device Reset Locally CC |

4.4 Switch Color Set Command Class

Priority	Capability ID	Color
1(Highest)	0	Warm White
2	1	Cold White
3	2	Red
4	3	Green
5(Lowest)	4	Blue

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 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.

4.5 Configuration Set Command Class

Parameter Number	Description Size	Default Value	Size
0x01	User custom mode for LED animations. 0 = Disable custom mode. 1= Blink Colors in order mode. 2=Randomized blink color mode	0	1
0x02	Enable/Disable Strobe over Custom Color. 0 = Disable. 1 = Enable. Others = Ignore.	0	1
0x03	Set the rate of change to next color in Custom Mode. Value1 ~ Value4: Value Range = 5 - 8640000 (50 - 86400000ms)	0x00000032	4
0x04	Set color that LED Bulb blinks in (Blink Mode) Value range =0x01-0xFF	0x01	1
0x10	Ramp rate when dimming using Multilevel Switch V1 CC in 100ms Value range = 0x00 -0x64	0x14	1
0x50	Enable to send notifications to associated devices (Group 1) when the state of LED Bulb is changed. 0 = Nothing. 1= Basic CC report.	1	1

0x51	The user can configure the parameter to adjust the color component Warm White. Value range =Warm White(0x0A8C(2700k) ~ 0x1387 (4999k))	0x0A8C	2
0x52	The user can configure the parameter to adjust the color component Cold White. Value rang = Cold White (0x1388 (5000k) ~ 0x1964 (6500k))	0x1964	2

Parameter 1 (8 bits)- User custom mode for LED animations

custom mode	Description
0	Disable custom mode
1	Blink Colors in orderMode
2	Randomized blink color mode

Note:

0 = disable custom mode

(1)Alternatively, sending Basic, Binary Switch, Multilevel, and Color SET will automatically disable custom mode and set Parameter 1 [1 byte] = 0.

(2)Toggling OFF -> ON will cancel custom mode set on LED Bulb and change the LED Bulb back to default White Color at 100%.

1 = Blink Colors in order that has been set

Blinks instantly to the next color.Does not turn off, instantly turns to the next color.

● Parameter (#3) - Set the X ms rate of change to next color in Custom Mode.

Ex1: If Parameter 3 = 0x08 for example, instantly change to the next color in 80ms.

● Parameter (#4) - colors can be set

Cycles through the colors in this order based on what is set (White -> Red -> Orange -> Yellow -> Green -> Blue -> Indigo ->Violet/purple)

EX1: If all colors are set , it will instantly change through the colors in order (White -> Red -> Orange -> Yellow -> Green -> Blue -> Indigo ->Violet/purple -> White)

EX2: Blue and Yellow are set. It will cycle between Blue and Yellow.

EX3: If blue is set only, it will remain on blue solid color.

● Parameter (#2) - Strobing of blinking

This should only happen if Parameter 2 = 1, When changing to another color, it must turn OFF, then switch to the next color.OFF transition will take half the time of LED Bulb being ON based on the speed.

EX1: if time to next color is 500ms, color that is on will stay on for 250ms, then 250ms off, then 250ms for the next color and so on.

EX2: If it was a blue color, LED must turn OFF, then turn on another color or the same color if only blue is set.

EX3: If all colors are set to report, it will blink through the colors in order (White -> OFF -> Red -> OFF   -> Orange -> OFF   -> Yellow -> OFF   -> Green -> OFF   -> Blue -> OFF   -> Indigo -> OFF ->Violet/purple -> OFF   -> White)

2 = Randomized blink color mode

Blinks instantly to the next color.Does not turn off, instantly change to the next color.

- Parameter (#3) - Set the X ms rate of change to next color in Custom Mode.

EX1: If Parameter 3 = 8 for example, instantly change to the next color in 80ms.

- Parameter (#2) - Strobing of animation

This should only happen if Parameter 2 = 1,When changing to another color, it must turn OFF, then switch to the next color.OFF transition will take half the time of LED Bulb being ON based on the speed.

EX1: If time to next color is 500ms, color that is on will stay on for 250ms, then 250ms off, then 250ms for the next color and so on.

EX2: If it was a blue color, LED must turn OFF, then turn on another color or the same color if only blue is set.

Parameter 2(8 bits) - Enable/Disable Strobe over Custom Color

Strobe Blink	Description
0	Disable Strobe over Custom Color
0x01	Enable Strobe over Custom Color

Note: If enabled, this will change the reaction of LED Bulb 7 Parameter #1 when changing to the next color.

Parameter 3 [4 byte] - Set the rate of change to next color in Custom Mode.

rate of change	Description
0x05~0x0083D600	Set the rate of change to next color(50 - 86400000ms(one day))

Note: Set in multiples of 10ms

EX1: setting of 0x14 would set 200ms for each transition.

Parameter 4 (8 bits) - Set color that LED Bulb blinks in (Blink Mode)

Color Bit Set	Description
0x01~0xFF	Setting out the output color by the bit selection

Note: 0x01 = White, 0x02 = Red (0xFF0000), 0x04 = Orange (0xFFA500), 0x08 = Yellow (0xFFFF00), 0x10 = Green (0x00FF00), 0x20 = Blue (0x0000FF), 0x40= Indigo (0x4B0082),0x80= Violet/Purple (0x800080)

EX1: If customer set a value of 0x06 (0000 0110) (0x02+0x04), LED Bulb will blink between (Red -> Orange) in a cycle.

EX2: If customer set a value of 0xFF (11111111), LED bulb will blink (White -> Red -> Orange -> Yellow -> Green -> Blue ->Indigo -> Violet/purple)

Parameter 10 (8 bits)- Ramp rate when dimming using Multilevel Switch V1 CC in seconds (0 = instant change, while 10 setting allows 10 seconds to ramp from 0 to 100%).

Dimming time	Description
0~0x64	Multilevel Switch V1 CC would take(0~10s)econds to dim from 0 to 100% and vise versa
>0x64	Ignore

Note:

If set to 50, it would take 5.0 seconds to dim from 0 to 100% and vise versa.

If set to 100, it would take 10.0 seconds to dim from 0 to 100% and vise versa.

If set to 0, it would instantly set any dim level the customer sets it to.

If set to 7, it would take 0.7 seconds to dim from 0 to 100% and vise versa.