

Outdoor Motion Sensor Engineering Specifications



The Motion Sensor 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 Motion Sensor is a security Z-Wave device (S2), so a security enabled controller is needed for take full advantage of all functionality for the Motion Sensor.

Features :

- The Motion Sensor is powered by DC 12-24V or by two CR123A batteries with 2 year's battery life.
- The Motion Sensor Support low battery alarm function.
- The Motion Sensor Support Smart Start.
- New 800 chip for battery performance than ever.
- Support new features for Z-Wave Long Range, including 4x wireless range, 10x node scalability for larger network.
- Supporting firmware OTA.
- Installation and Use : Indoor/Outdoor (IP66)

1. Technical Specifications

Communication Protocol	Z-Wave (800 series, ZG23A020)
Z-Wave Radio Frequency	908.42MHz (US) with LR (also 868.42MHz, EU ver without LR)
Z-Wave LR Radio Frequency	912.00 MHz (default channel) 920.00 MHz (back up channel)
Wireless Range	More than 100m outdoors About 40m indoors (depending on building materials)

Power Source	3V, CR123A*2 or DC 12-24V
Working current	~10mA
Standby current	~60μA
Temperature Sensor	-10°C to 50°C / 14°F to 122°F with accuracy of $\pm 2^{\circ}\text{C}$
PIR motion detection range	Min 10 meters
Light Sensor	0 LUX to 30000 LUX with $\pm 20\%$ accuracy
Battery Life	2 years
Operating Temperature	-10°C - 40°C / 32 - 104°F
Operating Humidity	8%- 100% non-condensing (100% during rain reports up to 100% !)

2. Functions

Functions	Descriptions
Inclusion	When the product is outside of network, and a controller is at adding devices Mode, and the product is at learning mode (sending Node info), the product will be added in the controller network and enter sleep after 30 seconds.
Exclusion	When the product is inside the network, if the controller is adding the device, and the product enters into learning mode (sending Node Info), then the product will be removed in the controller network.
Wake Up	Only available when is powered by battery, invalid when powered by USB. 1. The product will enter the sleep mode in the free time. 2. Short press the button once, the product will send 'Wake up notification CC' 3. When receive "Wake up no more information CC", the product will enter the sleep mode.
Setting for the Sleep and Wake cycle.	Only available when is powered by battery, invalid when powered by USB. 1. Send "Wake up interval set CC" to the product to configure the sleep and wake cycle of the product. 2. The minimum unit of sleep arousal is 3600 seconds. 3. The default value is: 14400 seconds (4 hours)
Report PIR motion	1. PIR opening, closing and sensitivity configuration (configuration parameter 1). 2. When PIR is triggered, the product will send Basic Set (0xff) to the nodes that associated with group 2 (configuration parameter 3 and 4). 3. The PIR is triggered for 30 seconds (configuration parameter 2 configurable time) without triggering, and the product will send Basic set (0x00) to the node that associated with group 2.
Report battery power	Only available when is powered by battery, invalid when powered by DC. 1. The current battery charge will be automatically reported after the power back on. 2. The current battery power will be reported in 10 seconds after the success inclusion of the product.

	3. Report the battery power regularly, and can be configured through configuration parameter 8
Report the temperature	1. The current temperature will be reported in 10 seconds after successful inclusion. 2. Timely report temperature (See param 9, 12, 17) Note: 1) The temperature accuracy is one decimal. 2) all default values for temperature and measuring scale, programming scale, etc are in Fahrenheit and NOT Celsius
Report the brightness	1. The current brightness will be reported in 10 seconds after the product is successfully included. 2. Regular report brightness (See param 10, 13, 18)
Automatic report when the sensor exceeds the set threshold.	When the product is powered by battery, the sensor will start when the product wakes up. When the change value of the sensor (battery, temperature and brightness) exceeds the set change threshold, the product will automatically report the corresponding value.(can set the configuration param 11, 12, 13)
Report Tamper	When the tamper is triggered, a report will be sent to the controller, the Notification Report Event= Tampering product covering removed (03); After 2.5 seconds, a cleaning event report will be sent.
SmartStart	Support SmartStart inclusion
OTA	Firmware can be upgraded through the z-wave network
Factory data reset	Restore all configuration to default values and exclude the device to the network.

3. Software specifications

3.1 Button and LED indicator functions.

Trigger mode	Network state	LED	Function description
Start	In the network	Power on: light on for 3 seconds, then off	--
	Outside the network	Power on: flashing slowly 3 times	Enter "SmartStart" function; The indicator will be off after the success of inclusion
Short press 1 time	In the network	The LED will flash quickly during Wake up . And LED will be off after receive 'Wake up no more information CC' Or after 10S time out.	Wake up device
Triple click	Outside the network	LED keep quick flashing and enter learning mode; 1) it will flash slowly 2 times when 60s timeout Or inclusion failed; 2) When inclusion successes, the LED will be solid on for	Enter "learn" function. Sending node info. The LED indicator will be solid on for 2S and then off after the inclusion.

		2S then off.	
	In the network	LED keep quick flashing and enter learning mode; 1) it will flash slowly 2 times when 60s timeout Or exclusion failed; 2) When exclusion successes, the LED will be solid on for 2S then off.	Enter “learn” function. Sending node info. The LED indicator will be solid on for 2S and then off after the exclusion.
Long press	In the network & Outside the network	1~5S, flashing quickly	long press the button till the LED flashing quickly , it will send “wake up notification” And then LED indicator will be off after receive” wake up no more information”
		>=5S , solid on	Restore to factory Settings, sending “Device Reset locally” to notify the controller.
Receive command	In the network	Flash 1 time	--
sleep	In the network	Be off	--

3.2 Definition of button and indicator light

3.2.1 Button definition.

Definition of actions	Action time interval (seconds)
Short press	< 1s
Long press	>=1s

3.2.2 Indicator light definition.

Flashing way	definition
Slow flash	Blink every 2S.
Quick flash	Blink every 0.5 seconds.

4. Z-Wave command

SDK:7.19.3

4.1 Z-Wave Plus device type

Device Type	Basic device feature	Specific device feature	Role Type
Sensor - Notification	GENERIC_TYPE_SENS OR_NOTIFICATION	SPECIFIC_TYPE_NOTI FICATION_SENSOR	Reporting Sleeping Slave (RSS)

i. Command list

Command	Version	Security type
COMMAND_CLASS_ZWAVEPLUS_INFO_V2	2	None
COMMAND_CLASS_TRANSPORT_SERVICE_V2	2	None
COMMAND_CLASS_SECURITY_0_V1	1	None
COMMAND_CLASS_SECURITY_2_V1	1	None
COMMAND_CLASS_SUPERVISION_V1	1	None
COMMAND_CLASS_APPLICATION_STATUS_V1	1	None
COMMAND_CLASS_NOTIFICATION_V8	8	S0/S2 Authenticated/Unauthenticated
COMMAND_CLASS_BATTERY_V1	1	S0/S2 Authenticated/Unauthenticated
COMMAND_CLASS_WAKE_UP_V2	2	S0/S2 Authenticated/Unauthenticated
COMMAND_CLASS_CONFIGURATION_V4	4	S0/S2 Authenticated/Unauthenticated
COMMAND_CLASS_ASSOCIATION_V2	2	S0/S2 Authenticated/Unauthenticated
COMMAND_CLASS_ASSOCIATION_GRP_INFO_V3	3	S0/S2 Authenticated/Unauthenticated
COMMAND_CLASS_VERSION_V3	3	S0/S2 Authenticated/Unauthenticated
COMMAND_CLASS_MANUFACTURER_SPECIFIC_V2	2	S0/S2 Authenticated/Unauthenticated
COMMAND_CLASS_DEVICE_RESET_LOCALLY_V1	1	S0/S2 Authenticated/Unauthenticated
COMMAND_CLASS_POWERLEVEL_V1	1	S0/S2 Authenticated/Unauthenticated
COMMAND_CLASS_FIRMWARE_UPDATE_MD_V5	5	S0/S2 Authenticated/Unauthenticated
COMMAND_CLASS_MULTI_CHANNEL_ASSOCIATION_V3	3	S0/S2 Authenticated/Unauthenticated
COMMAND_CLASS_INDICATOR_V3	3	S0/S2 Authenticated/Unauthenticated
COMMAND_CLASS_MULTILEVEL_SENSOR_V11	11	S2 Authenticated/Unauthenticated

4.2 Command description

Z-Wave Plus Info Report Command

Parameter	Value
Z-Wave Plus Version	2
Role Type	6 (ROLE_TYPE_SLAVE_SLEEPING_REPORTING)
Node Type	0 (ZWAVEPLUS_INFO_REPORT_NODE_TYPE_ZWAVEPLUS_NODE)
Installer Icon Type	0x0C00 (ICON_TYPE_GENERIC_SENSOR_NOTIFICATION)
User Icon Type	0x0C00 (ICON_TYPE_GENERIC_SENSOR_NOTIFICATION)

Association command

Support two groups of associated nodes, each with a maximum of five node Numbers.

Group ID	Support Node	Support commands
Group 1(Lifeline)	0x05	1. Notification Report. The Notification Report command is used when a supported notification event is triggered 2. Sensor Multilevel Report. The device periodically reports the Sensor Multilevel Report of temperature and brightness to associated group 1. You can configure it by parameter 9, 12, 17 and parameter 10, 13, 18 3. Battery Report. A Battery Report is sent when the device is powered on, successfully networked or periodically. 4. Device Reset Locally Notification. It sends a Device Reset Locally Notification when you hold down the button for longer than 5s and release it 5.Indicator Report.
Group 2(On/Off control)	0x05	1. Basic Set The Basic Set is sent when the PIR is triggered or untriggered, which can be configured with parameters 3 and 4

4.3 Manufacturer Specific Report

Parameter	Value (HEX)
Manufacturer ID 1	0x02
Manufacturer ID 2	0x7A
Product Type ID 1	0x00
Product Type ID 2	0x04
Product ID 1	0x00
Product ID 2	0x06

4.4 Version Report

Parameter	Value (HEX)
Z-Wave Protocol Library Type	0x03
Z-Wave Protocol Version	0x07
Z-Wave Protocol Sub Version	0x13
Firmware 0 Version	Firmware 0 version
Firmware 0 Sub Version	Firmware 0 Sub Version
Hardware Version	0x01
Number of Firmware Targets	0x00

4.5 Notification command

Notification type	Notification Event	Description
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Home Security (0x07)	(0x00) State idle	Notification value for the state variable going to idle.
	(0x08) Motion detection	When motion triggered.
	(0x03) Tampering, product moved	When vibrating.
Power Management (0x08)	(0x02) AC mains disconnected	When AC cable disconnected and insert battery again.
	(0x03) AC mains re-connected	When insert the AC cable. Note: When powered by AC, the device will work as a repeater.
	(0x0A) Replace battery soon	When battery level below the param7 value
	(0x0B) Replace battery now	When battery level below 1%.

When PIR is triggered, send Motion Detection Unknown Location (08);

When PIR detection is cleared, send Previous Events cleared (00), Parameter 1 is Motion Detection Unknown Location (08);

When Tamper/motion is detected, send Tampering Product covering removed (03);

The report that Event is cleared will be sent after 2.5s, Previous Events cleared (00), and Parameter 1 is Tampering Product covering removed (03);

Notification is a switch for Notification Status, only when it is 0xFF, there is Notification Report, when it is 0, there will be no Notification Report.

4.6 Sensor MultiLevel Command

Sensor Type	function
0x01	temperature value, Scale=1: Fahrenheit (default), Scale=0: degree centigrade When the temperature sensor is abnormal, report value is 0x8000。 Range -10~50 degree centigrade
0x03	Lux value, range from 0~30000 lux

4.7 Wake Up Command

(1) When the device is included, short press Z-Wave button one time, after release, it will send Wake Up Notification

(2) Use command "wake up interval set" to configure the interval time of wake up. If the configured time is less than 3600 seconds, the device will not automatically wake up. The minimum unit configured by the user is 3600 seconds.

(3) Wake Up Interval Capabilities Report CC

Minimum Wake Up Interval Seconds = 3600s

Maximum Wake Up Interval Seconds = 3600x24, equal to 24h

Default Wake Up Interval Seconds = 14400 seconds (4 hours)

Wake Up Interval Step Seconds = 3600 S

4.8 Battery command

- (1) Send "battery get" command to the device, Report the current battery power when it wakes up. It report 100% power level when the power is up to 3V. 0% when the power is 2.2V. The power will be divided in to 100 levels. Each level is correspondent to $2.2V(0\%)-3V(100\%)/100$
- (2) When the device is low voltage, (Par 7 can Configure the threshold, The default value is less than 10%) , Report to the group 1 associated node "Battery report 0xff". The device will not work when power is less than 2.2V. Low power means the battery is less than 2.28V.

4.9 Parameter List

Par	Bytes	Default value	Descriptions
1	1	6	PIR Sensitivity configuration 0 — turn off PIR notification 1~8 — turn on PIR notification , Corresponding to PIR sensitivity, there are 8 levels, 1 indicates the lowest sensitivity and 8 indicates the highest sensitivity.
2	2	30	(1) Wait time for clearing the PIR triggered (default 30 seconds) If there is no trigger during this time, it will send Notification (Notification Type is Home Security, Event is 0, Parameter 1 is Motion Detection Unknown Location) to its associated node. (2) effective value: 10~3600 s
3	1	7	When the PIR is triggered, the way of sending Basic Set command: 0 — no send 1 — When PIR is triggered, send Basic Set 0xFF; When PIR is cleared, send Basic Set 0x00. 2 — When PIR is triggered, send Basic Set 0x00; When PIR is cleared, send Basic Set 0xFF. 3 — When PIR is triggered, send Basic Set 0xFF, When PIR is cleared, no send. 4 — When PIR is triggered, send Basic Set 0x00, When PIR is cleared, no send 5 — When PIR is triggered, no send; When PIR is cleared, send Basic Set(0x00) 6 — When PIR is triggered, no send; When PIR is cleared, send Basic Set(0xFF) 7 — When PIR is triggered , Send Basic Set (value could be set by Par 4); When PIR is cleared, Send Basic Set (value could be set by Par 4);

4	2	65280	The value of the Basic Set is sent when PIR is triggered. The high byte is the value when PIR is triggered, and the low byte is the value when PIR is cleared. e.g: 0x0A00 means: When PIR is triggered , Send Basic Set(0A), When PIR is cleared , send Basic Set(00)
5	1	1	The default unit for temperature report 0- degrees Celsius 1- Fahrenheit
6	1	1	When motion is detected, the indicator light on or off. 0 – turn off 1 – turn on
7	1	10	Low battery alarm value, Unit is percent, when battery power is less than this value, Battery Report 0xff (Up to 1 report per day) effective value: 10~50
8	2	4	Battery power checking interval. Checking battery power time interval , value 0-744 hours. While set to 0 DISABLE battery power check. Send report ONLY if changed by threshold set in par 11 – comparing to recent report.
9	2	30	Interval time of checking the temperature threshold value (Unit: S) Effective value: 0~600s 0: disable to check threshold value (sensor disable and not visible at hub) 1~ 600 - checking interval in s
10	2	10	Interval time of checking the Light threshold value (Unit: S) Effective value: 0~600s 0 : disable to check threshold value ((sensor disable and not visible at hub) 1~ 600 - checking interval in s
11	1	2	Threshold value to enable battery power report when the battery's changed value exceeds the value. effective value: 0~50%; 0: this threshold value doesn't work; (if powered with external power supply no reports, neither battery level not visible on hub) 1~50 means 1%~50% ...

12	1	1	Temperature sensor value change threshold Unit F as default, threshold value=Value. Effective value:1F~144F (see par 9) 0 – disable . (no send reports based on threshold, only on time set with par 17)
13	2	50(lux)	Light sensor value change threshold Effective value: 0~30000lux; (see par 10) 0 – disable . (no send reports based on threshold, only on time set with par 18)
14	1	100	Can add or minus this setting value to calibrate temperature when checked. Effective value: 0~200; 0-99 deducted value with decimal scale 101-200 added value with decimal scale 100 disable ex. 56 means Deduct 4.4 degree from measured value,121 means add 2.1 degree
15	1	100	Can add or minus this setting value to calibrate Lux value when checked. Effective value: 0~200; 0-99 deducted value 101-200 added value 100 disable ex. 75 means Deduct 25Lux from measured value,147 means add 47Lux
16	2	0	Dusk to Dawn function: Set Lux threshold value to enable/disable motion reports). Default: 0 (send motion report once motion triggered) Effective value: 0~30000lux; PIR can be reported only when the ambient brightness is lower than the set value
17	2	0	Automatic report interval time for TEMP sensor 0 –NO reporting, all reports based on threshold 1-43200 time in seconds to send report to the hub regardless of threshold (range : 0-43200)

18	2	0	Automatic report interval time for light sensor 0 –NO reporting, all reports based on threshold 1-43200 time in seconds to send report to the hub regardless of threshold
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5. FCC Warning

FCC Warning Statement

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

RF Exposure Statement

To maintain compliance with FCC's RF Exposure guidelines, This equipment should be installed and operated with minimum distance of 20cm the radiator your body. This device and its antenna(s) must not be co-located or operation in conjunction with any other antenna or transmitter.