

Motion 2In1 Manual

Version	Written By	Date	Change List
1.0	Yongqi	20170628	Initial
1.1	Yongqi	20170824	Add "Wakeup" and "Product Test Mode" Operation
1.2	Yongqi	20170901	Modify Some Command Classes Version Number
1.3	Yongqi	20180228	Modify the description for SmartStart
1.4	Yongqi	20180809	Modify "Security Keys" Table

This sensor has motion detector and light intensity in one which based on Z-Wave™ Plus technology.

This product 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.

Z-Wave™ Network Inclusion/Exclusion/Reset

There is one button in the back side of the sensor, it can be executed inclusion, exclusion and reset from Z-Wave™ network.

Inclusion ¹	<ol style="list-style-type: none"> 1、 Power up the device. 2、 Set Z-Wave™ Controller into inclusion mode 3、 Press the button 3 times within 1.5s to enter inclusion mode. 4、 The device will be recognized and automatically included into Z-Wave™ Network. 	Led lights will be blinked with 1s interval until inclusion successful.
Exclusion	<ol style="list-style-type: none"> 1、 Power up the device. 2、 Set Z-Wave™ Controller into exclusion mode 3、 Press the button 3 times within 1.5s to enter exclusion mode 	Led lights will be blinked 3 times with 0.5s interval.
Factory Reset ²	<ol style="list-style-type: none"> 1、 Power up the device. 2、 Press and hold the button for 10s until led lights is on, then release the button. 	Reset successfully, led light will be Blinked 5 times.
Wakeup	<ol style="list-style-type: none"> 1、 Press the button briefly. 	Led will blink once.
Product Test Mode	<ol style="list-style-type: none"> 1、 Press and hold the button. 2、 Power on the device, device will enter factory product test mode 	Led will blink with 100ms interval.

Notice 1: When device enters into inclusion mode, the device all functionality will be useless. The inclusion mode will be timeout after 30s, user can press the button 3 times within 1.5s to terminate inclusion mode.

Notice 2: Factory Reset will clear the device all Z-Wave™ Network data (include home id, node id, etc...) saved in memory, and restore all configuration parameters to factory default. Please use this procedure only when the network primary controller is missing or otherwise inoperable.

Association

The device supports 2 association groups, and each group supports max 5 associated nodes.

Group 1 is lifeline group; all nodes which associated in this group will receive the messages sent by device through lifeline.

Group 2 is controlling group, all nodes associated in this group will be controlled through BASIC_SET command by the device when device detects a movement event.

The Command Class supported by each association group is shown in the table below:

Group	Command Class	Event
1 (Lifeline)	COMMAND_CLASS_NOTIFICATION COMMAND_CLASS_SENSOR_BINARY COMMAND_CLASS_SENSOR_MULTILEVEL COMMAND_CLASS_BATTERY COMMAND_CLASS_DEVICE_RESET_LOCALLY	NOTIFICATION_REPORT SENSOR_BINARY_REPORT SENSOR_MULTILEVEL_REPORT BATTERY_REPORT DEVICE_RESET_LOCALLY_NOTIFICATION
2 (Control)	COMMAND_CLASS_BASIC	BASIC_SET

Z-Wave™ Message Report

Once the device detects a movement, it will report the event to the controller and current light intensity value will be followed.

In default, device will use COMMAND_CLASS_NOTIFICATION to represent the motion event. User can also enable COMMAND_CLASS_SENSOR_BINARY report by setting the “Configuration No. 8” to ‘1’.

Motion Report

When device detects a motion event, it will automatically send the notification report to nodes associated in lifeline.

Command Class	COMMAND_CLASS_NOTIFICATION
Command	NOTIFICATION_REPORT
Type	HOME_SECURITY (0x07)
Event	HOME_SECURITY_MOTION_DETECTION_UNKNOWN_LOCATION (0x08) / HOME_SECURITY_NO_EVENT (0x00)
Command Class	COMMAND_CLASS_SENSOR_BINARY
Command	SENSOR_BINARY_REPORT
Type	MOTION (0x0C)
Event	Detected (0xFF) / No-detected (0x00)

Multilevel Sensor Report

The device embeds in a digital light sensor to measure ambient light intensity. The device will report current light intensity to controller if the measured value is sufficient the condition that set by

configuration No. 11.

Command Class	COMMAND_CLASS_SENSOR_MULTILEVEL
Command	SENSOR_MULTILEVEL_REPORT
Type	Luminance
Scale	Lux

Command Class Configuration

The device supports the controller to configure parameters of the device through Configuration Command Class, and the device has 14 parameters available for users to set according to their different needs:

1) Motion Sensitivity

This parameter is configured the sensitivity that motion detect. This value is larger, the sensitivity is lower, and the distance for motion detecting is closer.

Parameter Number	Size (Byte)	Available Settings	Default value
1	1	0 ~ 99	3

2) Motion Window Time

This parameter is configured the specified time window (4s..16s) in which the amount of pulses will trigger a motion event.

Window Time = [Value] * 4s + 4s.

Parameter Number	Size (Byte)	Available Settings	Default value
2	1	0 ~ 3	2

3) Pulse Count

This parameter is configured amount of pulses during the specified time window which trigger a motion event.

Amount of pluses = [Value] + 1.

Parameter Number	Size (Byte)	Available Settings	Default value
3	1	0 ~ 3	1

4) Motion Blind Time

This parameter is configured the no motion detected time after a motion event detects. The device will wait for setting times to ready to next detect.

Blink Time = ([Value] + 1) * 0.5s.

Parameter Number	Size (Byte)	Available Settings	Default value
4	1	0 ~ 15	15

5) Motion Enable

This parameter is configured the motion detected if enable or not. If '1', Motion detected function is enable. Otherwise is disabled.

Parameter Number	Size (Byte)	Available Settings	Default value
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5	1	0, 1	1
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6) Motion Clear Time

This parameter is configured the time to clear motion event after a motion event detected. Time to motion clear, the device will send a clear event report to controller. Unit: Second.

Parameter Number	Size (Byte)	Available Settings	Default value
6	2	10 ~ 3600	30

7) Led Indicate Enable

This parameter is configured the Led light on disable or enable. '1' – Enable Led Blink when device detects a motion event. '0' – Disable led blink. This configuration is not affect inclusion, exclusion and reset.

Parameter Number	Size (Byte)	Available Settings	Default value
7	1	0, 1	1

8) Binary Sensor Report Enable

'1' – Enable sensor binary report when device detects a motion event.

'0' – Disable sensor binary report when device detects a motion event.

Parameter Number	Size (Byte)	Available Settings	Default value
8	1	0, 1	0

9) Basic Set Level

This parameter is configured the value that BASIC_SET for nodes that associated in Group 2.

'100' – BASIC_SET = 0xFF (ON).

'0' – BASIC_SET = 0x00 (OFF).

Parameter Number	Size (Byte)	Available Settings	Default value
9	1	0 - 100	100

10) Light Sensor Measuring Interval

This parameter is configured the time interval for light sensor measure the ambient light intensity. This value is larger, the battery life is longer. And the light intensity changed is not obvious.

Parameter Number	Size (Byte)	Available Settings	Default value
10	2	30 - 3600	180

11) Light Intensity Differential Report

This parameter is configured the value that differential between current measured and previous report value. If the differential value larger than the settings, device will report this measured light intensity to controller.

Parameter Number	Size (Byte)	Available Settings	Default value
11	1	1 - 127	50

12) Light Intensity Threshold

This parameter is configured the light intensity for light controller. If the light intensity

current measured is less than the settings, device will considered to be dark at current time. If configuration 13 is set '1' and a motion event is detected, the device will send a BASIC_SET to the nodes that associated in group 2.

Parameter Number	Size (Byte)	Available Settings	Default value
12	1	1 - 127	50

13) Light Intensity Associated Enable

'1' – Enable current light intensity to associate the motion event, if there has a motion event detected and the current light intensity is less than the settings in configuration 12, the device will send a BASIC_SET to nodes associated in group2. And if the current light intensity is larger than the settings in configuration 12, the device will not send BASIC_SET to nodes associated in group2.

Parameter Number	Size (Byte)	Available Settings	Default value
13	1	0, 1	0

14) Motion Event Report Once Enable

'1' – The motion detected event will be sent to controller only once until device report motion cleared event.

'0' – The motion detected event will be sent to controller when device detects a movement event.

Parameter Number	Size (Byte)	Available Settings	Default value
14	1	0, 1	0

99 15) Light Intensity Offset Calibration

This parameter defines the calibrated scale for ambient light intensity. Because the method and position that the sensor mounted and the cover of sensor will bring measurement error, user can get more real light intensity by this parameter setting. User should run the steps as blows for calibrating

- 1) Set this parameter value to default(Assumes the sensor has been added in a Z-Wave Network).
- 2) Place a digital luxmeter close to sensor and keep the same direction, monitor the light intensity value (Vm) which report to controller and record it. The same time user should record the value (Vs) of luxmeter.
- 3) The scale calibration formula: $k = V_m / V_s$.
- 4) The value of k is then multiplied by 1000 and rounded to the nearest whole number.
- 5) Set the value getting in 5) to this parameter, calibrate finished.

For example, $V_m = 300$, $V_s = 2000$, then

$$k = 300 / 2600 = 0.11538$$

$$k = 0.11538 * 1000 = 115.38 \approx 115$$

The parameter should be set to 115.

Parameter Number	Size (Byte)	Available Settings	Default value
99	2	1 - 65536	1000

Wakeup Command Class

The device stays in sleep status for the majority of time in order to conserve battery life.

The minimum wakeup interval is 1800s (30 minutes)

The maximum wakeup interval is 64800s (18 Hours)

Allowable min step among each wakeup interval is 60 seconds, such as 1860s, 1920s, 1980s...

Note: The default value is 8 hours with factory default. This value is greater, the battery life is longer.

Battery Command Class

The users can also enquire the battery status of the device by sending BATTERY_GET command.

Once the device receives the command, it will return BATTERY_REPORT command.

The device will send BATTERY_LEVEL = 0xFF command to the Z-Wave™ Controller to inform that the device is in dead battery status, otherwise BATTERY_LEVEL value range is 0% to 100%.

Command Class Basic

The COMMAND_CLASS_BASIC is realized to control the devices associated in group 2 in this motion detector.

When device detects a motion event occurred, it will send a "BASIC_SET = [Value]" command to control the devices in group 2.

And it will send a "BASIC_SET = 0x00" command to control the devices in group 2 after the motion event is cleared.

The [Value] is set by **configuration No.9**.

SmartStart

This device supports SmartStart function. QR code printed by laser can be found on surface of product and the outside of packing box. And the full DSK code is printed can be found on the packing box.

The device will enter SmartStart if the device is not included in network after power up. And if device is not included successfully during 10 second, it will enter sleep mode. And then

2nd SmartStart time delay approximately 16s

3rd SmartStart time delay approximately 32s

4th SmartStart time delay approximately 64s

5th SmartStart time delay approximately 128s

6th SmartStart time delay approximately 256s

7th SmartStart time delay approximately 512s

Afterwards, the Smartstart mode will be auto running with 512 second interval until device is included successfully or battery run down.

Led Action Indicator

LED Color	Led Display Status	Description
Red	Blink 5 Times(1s Interval)	Power on and Not Add in Z-Wave Network
	Blink 5 Times(300ms Interval)	Power on and Already Add in a Z-Wave Network
	Blink 3 Times(500ms Interval)	1, Press button tripled, device sends Node Info. 2, Press button tripled, device enters into exclusion mode.
	1, Blink with 1s interval and then 2, blink 15 times with 2s interval	Press button tripled, device enters into inclusion mode. Device assigned a node id and wait for configuration completed.
	Light On 150ms	Press the button briefly, device send a wakeup information to controller
		Detect a movement.
	Light On 500ms	Hold pressed the button and factory reset.

Security Network

The device supports the security function with S2 encrypted communication. The device will auto switch to the security mode when the device included with a security controller. In the security mode, the follow commands must use security and security_2 command class wrapped to communicate, otherwise the device will not response any commands.

Security Keys

This device supports security levels are listed in below table:

Security Levels	Support (Yes/No)
SECURITY_KEY_S0	No
SECURITY_KEY_S2_UNAUTHENTICATED	Yes
SECURITY_KEY_S2_AUTHENTICATED	No
SECURITY_KEY_S2_ACCESS	No

All Supports Command Class

This device supports All Z-Wave Command Classes in NIF List as follows:

- * COMMAND_CLASS_ZWAVEPLUS_INFO (V2)
- * COMMAND_CLASS_SECURITY_2 (V1)
- * COMMAND_CLASS_TRANSPORT_SERVICE (V2)
- * COMMAND_CLASS_VERSION (V2)
- * COMMAND_CLASS_POWERLEVEL (V1)
- * COMMAND_CLASS_ASSOCIATION (V2)
- * COMMAND_CLASS_MULTI_CHANNEL_ASSOCIATION (V3)
- * COMMAND_CLASS_ASSOCIATION_GRP_INFO (V1)
- * COMMAND_CLASS_MANUFACTURER_SPECIFIC (V2)
- * COMMAND_CLASS_DEVICE_RESET_LOCALLY (V1)
- * COMMAND_CLASS_BATTERY (V1)
- * COMMAND_CLASS_WAKEUP (V2)
- * COMMAND_CLASS_NOTIFICATION (V8)
- * COMMAND_CLASS_SENSOR_BINARY (V2)
- * COMMAND_CLASS_SENSOR_MULTILEVEL (V7)
- * COMMAND_CLASS_CONFIGURATION (V1)
- * COMMAND_CLASS_SUPERVISION (V1)

All Security Command Class in Security Network

The Z-Wave Command Classes are secured in security network as follows:

- * COMMAND_CLASS_VERSION (V2)
- * COMMAND_CLASS_POWERLEVEL (V1)
- * COMMAND_CLASS_ASSOCIATION (V2)
- * COMMAND_CLASS_MULTI_CHANNEL_ASSOCIATION (V3)
- * COMMAND_CLASS_ASSOCIATION_GRP_INFO (V1)
- * COMMAND_CLASS_MANUFACTURER_SPECIFIC (V2)
- * COMMAND_CLASS_DEVICE_RESET_LOCALLY (V1)
- * COMMAND_CLASS_BATTERY (V1)
- * COMMAND_CLASS_WAKEUP (V2)
- * COMMAND_CLASS_NOTIFICATION (V8)
- * COMMAND_CLASS_SENSOR_BINARY (V2)
- * COMMAND_CLASS_SENSOR_MULTILEVEL (V7)
- * COMMAND_CLASS_CONFIGURATION (V1)

Non-Secure Command Class in Secure Network

Unsecure Command Class which included in a secure Z-Wave Network is listed in unsecure node information.

- * COMMAND_CLASS_ZWAVEPLUS_INFO (V2)
- * COMMAND_CLASS_SECURITY_2 (V1)
- * COMMAND_CLASS_TRANSPORT_SERVICE (V2)
- * COMMAND_CLASS_SUPERVISION (V1)

Specifications

Power Supply	CR123A × 1
Standby Current	25uA
Work Current(RF Tx)	Up to 36mA
Operational Temperature	0 - 70°C
Communication frequency	868.40MHz, 869.85MHz (EU) 908.40MHz, 916.00MHz(US)
Range	Up to 45m indoors (depending on the building structure), and 80m for outdoor open fields. Up to 60m outdoors.