User Manual

Wireless Infrared Motion Sensor

Model: Z311S

20150907
FW V2.0 (20150907)
HW V0.1-V1.1

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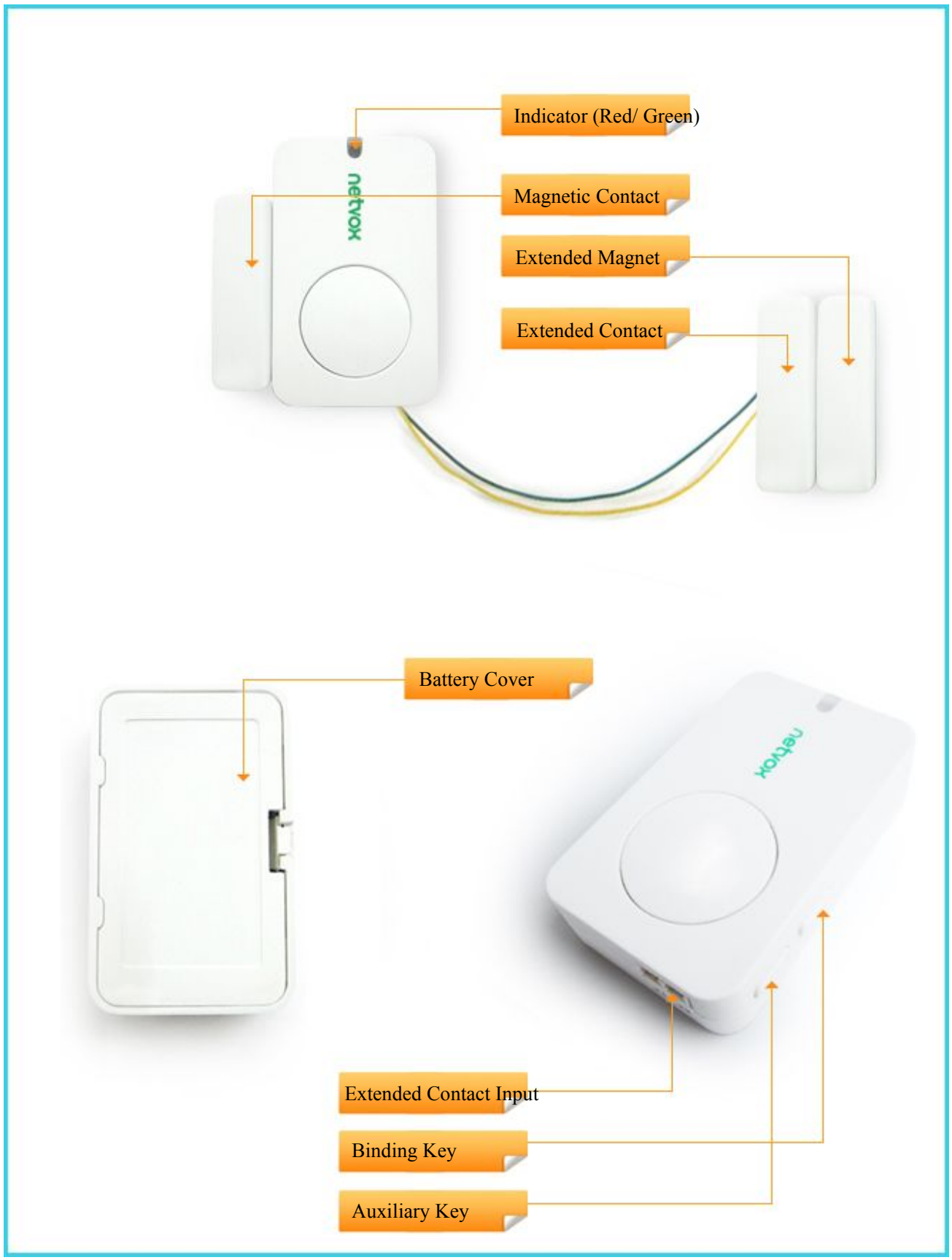
1.Introduction

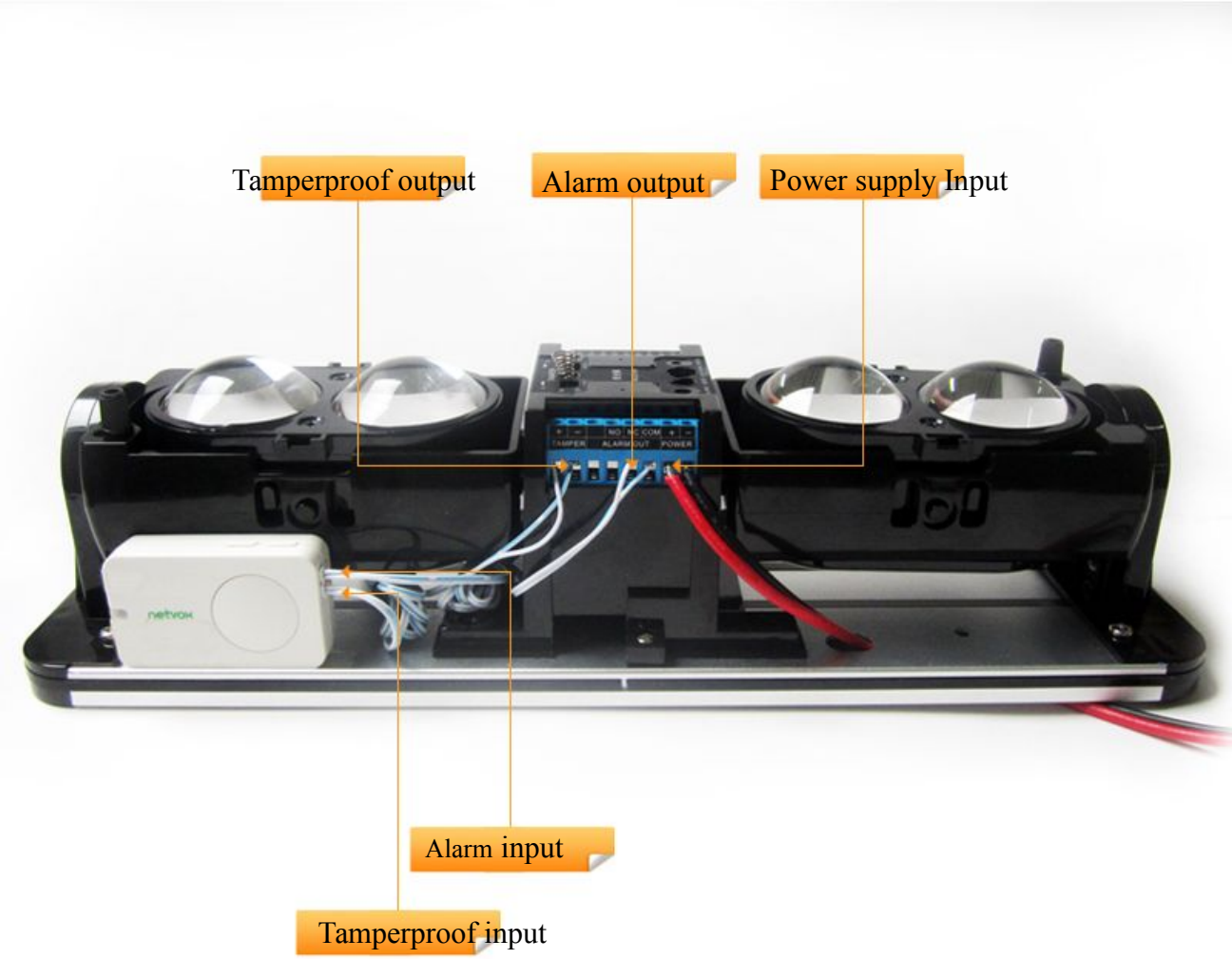
Netvox Z311S, a wireless infrared motion sensor, acts as an End Device in ZigBee network. It does not perform permit-join function as a coordinator or a router for other devices to join the network. Z311S is an active infrared intrusion sensor. While connected to a quad active infrared detector, a moving object can be detected in alarming zone. It is integrated with 2.4G wireless transceiver module allowing wireless monitoring and surveillance functions. Widely used in many areas such as urban security, residential, factories, companies, schools, families, villas, warehouses and so on.

What is ZigBee?

ZigBee is a short range wireless transmission technology based on IEEE802.15.4 standard and supports multiple network topologies such as point-to-point, point-to-multipoint, and mesh networks. It is defined for a general-purpose, cost-effective, low-power-consumption, low-data-rate, and easy-to-install wireless solution for industrial control, embedded sensing, medical data collection, smoke and intruder warning, building automation and home automation, etc.

2.Product Appearance




Tamperproof output
Alarm output
Power supply Input
Alarm input
Tamperproof input

3.Introduction

Z311S is an active infrared intrusion sensor. While connected to a quad active infrared detector, a moving object can be detected in alarming zone. It is integrated with 2.4G wireless transceiver module allowing wireless monitoring and surveillance functions. Widely used in many areas such as urban security, residential, factories, companies, schools, families, villas, warehouses and so on.

4.Specification

Fully IEEE 802.15.4 compliant

- Utilizes 2.4GHz ISM band; up to 16 channels
- Power supply: 2 x 3V CR2450 button cell batteries.
- Operating consumption: ≤ Tx ≤ 43mA; Rx ≤ 28mA
- Standby consumption: ≤ 3.5uA
- Up to 70 meters wireless transmission range in non-obstacle space
- Device type: IAS ZONE
- Protocol based on IEEE802.15.4 / Zigbee ProTM
- Simple operation and device configuration
- Two dry contact inputs
- Easy installation and configuration

5. Zigbee Installation

5.1 Power on

(1) No need power supply, use 2 button batteries.
(2) Open the battery cover with flathead screwdriver or so.
(3) Insert two button batteries.
(4) Close the battery cover and all the indicator light will flash once.

5.2 Turn On/ Turn Off Z311S

Under the circumstances Z311S is first time used or after resetting, when it is powered on and cannot successfully search a network, Z311S will go into turn-off mode. Turn-off mode ensures the minimum power consumption. Under this mode, any other buttons and contacts are not active except the binding key.

When Z311S had previously joined a ZigBee network, Z311S will go to turn-on mode and is ready to work in the network after powering on it.

Users can also manually turn on or turn off Z311S using the following instructions:

(1) Turn it on: Press the *Binding Key* once. The indicator will flash **red once**, and the device is ready to be used.
(2) Turn it off: Press the *Binding Key* once. The indicator will flash **red 10 times** in 5 seconds. Press the *Binding Key* again **within the 10 red flashes** to turn the device off. Otherwise, while the key press is not applied within 5 seconds, the device will be still in turn-on mode.

NOTE: We recommend that users remove the battery to power off Z311S when it is not indented to be used for a long period of time.

5.3 Join the ZigBee Network

After Z311S is powered on, it will search for an existing ZigBee network and send a request to join the network automatically. While Z311S is under the coverage from a coordinator or a router whose **permit-join feature is enabled**, Z311S will be permitted to join the network. Typically, the default permit-join period of time is 60 seconds. Please refer to the following steps to complete the join:

(1) Restore Z311S back to the default factory setting (please refer to Chapter 7. Restore To Factory Setting).
(2) Enable the permit-join function (valid for 60 seconds) of a coordinator or a router (please refer to the user manual of the coordinator or the router to enable the permit-join feature).

(3) Turn on Z311S. It will start to search and join the network.

The indicator will flash **green 5 times** after it is joined successfully. Otherwise, the indicator will not flash. Z311S will stop searching and go to turn-off mode when it doesn't find a network to join in 3mins. Press the *Binding Key* again to turn it on for searching and joining the network.

NOTE: After joining a network, Z311S would try to enroll in the ZigBee security system. Please make sure Z311S and CIE (Control and Indicating Equipment) device have enough power.

5.4 Enroll in the ZigBee Security System

Z311S is a Zone device in the ZigBee security system. Right after Z311S join the ZigBee network, it will automatically find out a CIE (Control and Indicating Equipment) device (i.e. Netvox Z201B) and send a registration request to the CIE device to enroll in the security system. The enrollment has these 3 situations:

A. There is no CIE device or no compatible CIE device in the network → the indicator flashes **red twice**.
B. There is a compatible CIE device in the network, but it is failed to enroll → the indicator flashes **red 4 times**. Users can press the *Auxiliary Key* to initiate the registration.
C. The enrollment is completed → the indicator flashes **red 6 times**.

NOTE:
(1) Users had better NOT enroll multiple Zone devices at the same time to prevent registration failure.
(2) For Z311S which is already registered, users are not able to join any other CIE in the network. Instead, users need to consign a CIE through Zig-butler. Please refer to 6. --(4) Set up CIE zone and heartbeat interval --(5) Consign CIE for Z311S

5.5 Trigger and clear

(1) Z311S Zone Type: Motion_Sensor (ID: 0x000D)
(2) The value of Alarm 1 is 1 (on) when the four beam infrared senses or detectors motion.
(3) The value of Alarm1 is 0 (off) when the four beam infrared sensor is clear.
(4) The alarm and clear situation of four beam infrared detector:
(a) Only when the detector receives all four reflecting beams from reflection, the alarm is clear.
(b) Once the detector does not receive all four beams, Z311S will send signal to registered CIE. CIE will send out alarm sound or lighting alert for warning.

NOTE:
While testing Z311S, it is not suggested to trigger the device rapidly that the signal will block up the network. We suggest the time interval at least **two seconds** between every trigger.

(5) The tamperproof function : when the tamperproof is clear, tamper value is 0. When the case is open by outsider, Z311S will send warning to CIE to indicating the intrusion. CIE will send out alarm sound or lighting alert for warning.
(6) When Z311S has enrolled to the security system, it will send the contact status to the command center

(clusterID ID: 0x0500) after triggering. The Warning Device will send out alarm sound or lighting alert for warning.

(7) When Z311S hasn't enrolled to the security system, it will try enroll in a security system after triggering. After the enrollment, Z311S will send the contact status to the command center.

ZoneStatusChange commands:

Command：0x00。Command format：

Bits:8	8	8	var	
Frame control	Transaction Sequence number	Command identifer	Frame payload	
			16-Bit Enumeration	8-Bit Enumeration
0x09		0x00	ZoneStatus	ExtendedStatus

（Clusterid：0x 0500）

Values of the ZoneStauts payload

ZoneStatus Attribute Bit Number	Meaning	Values
0	Alarm1	1 – opened or alarmed 0 – closed or not alarmed
1	Alarm2	1 – opened or alarmed 0 – closed or not alarmed
2	Tamper	1 – Tampered 0 – Not tampered
3	Battery	1 – Low battery 0 – Battery OK
4	Supervision reports	1 – Reports 0 – Does not report
5	Restore reports	1 – Reports restore 0 – Does not report restore
6	Trouble	1 – Trouble/Failure 0 – OK
7	AC (mains)	1 – AC/Mains fault 0 – AC/Mains OK
8-15	Reserved	

Values of the ExtendedStatus payload

ExtendedStatus Attribute Bit Number	Meaning	Values
0-6	ZoneID	
7	**ZoneStatusChange Or Heartbeat**	**1 – HeartBeat** **0 – ZoneStatusChange**

5.6 Active status

When users would like to setup or acquire data from the device which is in sleeping mode, we have to active the device as the following steps:

(1) Press and hold both the *Auxiliary Key* and the *Binding Key*.
(2) After the indicator flashes **red twice**, release both buttons.
(3) The indicator will flash **green 5 times** while broadcasting the IP address and the IEEE address.

Z311S would be in active status for 2 minutes for communication.

5.7 Restore to factory setting

While Z311S is unable to communicate with its enrolled CIE device or users would like Z311S to join a new network, a factory reset is required. To restore it to factory setting, please follow the steps:

(1) Press and hold both the *Auxiliary Key* and the *Binding Key*.
(2) The indicator will flash **red twice.** Keep pressing and holding the both buttons.
(3) Until the indicator starts flashing **red** again, release both buttons.
(4) After 10 **red** flashes, it will go into turn-off mode.

After the factory restore, please refer to Chapter 5.1. Turn On/ Turn Off Z311S to setup it.

5.8 Low voltage check and warning function

Low-power report: The working voltage for Z311S is 2.1~3.6V. When the operating voltage is lower than 2.1V, Z311S will send a low-power report to the CIE device.

The related data:

- Power configuration cluster (ID:0x0001)
- Battery voltage attribute (ID:0x0020)

5.9 Heart beat function

In a security system, it is important that Zone devices report the conditions to the central security unit (the CIE device). To meet this need, Netvox came up with a technique called "**HeartBeat**".

Right after Z311S enrolls to a security system, it sends a HeartBeat signal to the CIE device. Afterward, it will send HeartBeat data every hour by default settings.

5.10 Consign CIE

No mater if current Z311S has been registered on a CIE or not, other devices can send command in air--- by setting a given product IEEE address in **IAS_CIE_Address attribute.** In order to restart the matching and registration

process to register Z311S on consigned CIE.

(1) If Z311S has already registered on a CIE, and consigned CIE happens to be the CIE, then after the re-registration is successful, the **red led flashes 6 times** ; if the consigned CIE is different from original CIE, when registration is successful, Z311S will send “UnEnroll” command to CIE and will remove own information from it, and the red light blinks 6 **times** indicating success.
(2) If Z311S is not yet registered on a CIE, refer to point 4. for registration process to condign the CIE.

5.11 Sleeping Mode

Z311S is designed to go into sleeping mode for power-saving in some situations:

A. When it doesn’t find a network to join → Z311S will go to sleeping mode.
B. While the device is in the network → the sleeping period is 5 minutes; it will wake up every 5 minutes to keep online.
C. Once Z311S was joined to a network and by any chance the network is no longer existed or the device is out of the network → Z311S will wake up every 15 minutes to find the network it joined before. It never keeps in sleeping mode and continues to find its network every 15 minutes. This condition would consume up to 30 times power spending compared to normal-operating status. To prevent this unwanted power consumption, we recommend that users manually power off the device.

6. Home Automation Clusters for Z311S

A cluster is a set of related attributes and commands which are grouped together to provide a specific function. A simple example of a cluster would be the On/Off cluster which defines how an on/off switch behaves. This table lists the clusters which are supported by Z311S.

1.End Point(s)：0x01:

2.Device ID：IAS Zone（0x0402）

3.EndPoint Cluster ID

Cluster ID for Z311S	
Server side	**Client side**
EP 0x01 (Device ID: IAS Zone(0x0402))	
Basic(0x0000)	*None*
Power configuration(0x0001)	
Identify(0x0003)	
commissioning(0x0015)	
IAS zone (0x0500)	
Poll Control（0x0020）	
Diagnostics（0x0B05）	

This lists the attributes of the basic information.

Identifier	Name	Type	Range	Access	Default	Mandatory / Optional
0x0000	*ZCLVersion*	Unsigned 8-bit integer	0x00 – 0xff	Read only	0x03	M
0x0001	*ApplicationVersion*	Unsigned 8-bit integer	0x00 – 0xff	Read only	0x0A	O
0x0002	*StackVersion*	Unsigned 8-bit integer	0x00 – 0xff	Read only	0x35	O
0x0003	*HWVersion*	Unsigned 8-bit integer	0x00 – 0xff	Read only	0x0B	O
0x0004	*ManufacturerName*	Character string	0 – 32 bytes	Read only	netvox	O
0x0005	*ModelIdentifier*	Character string	0 – 32 bytes	Read only	Z311SE3ED	O

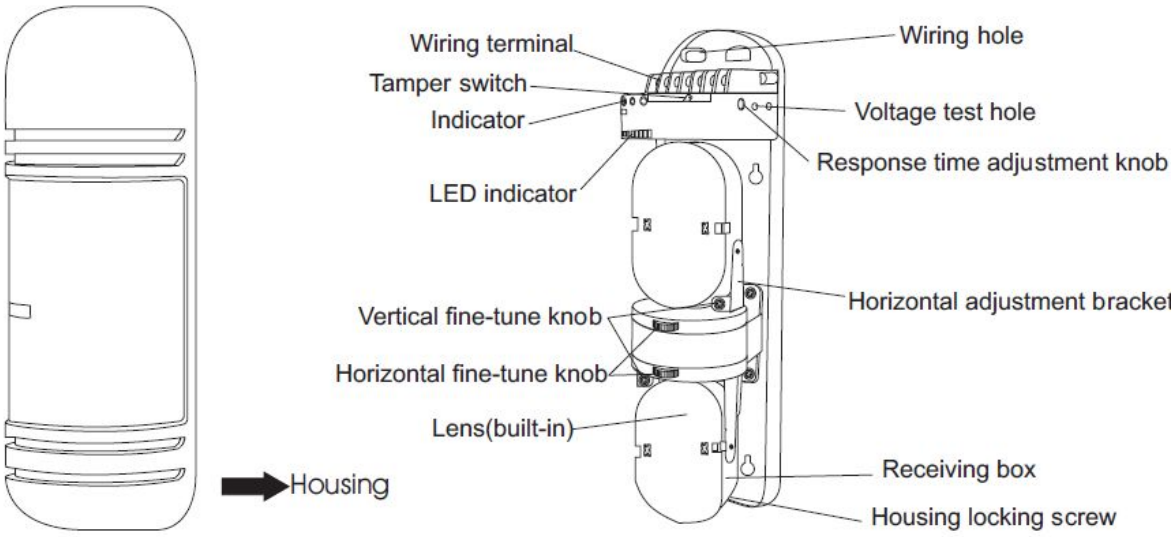
0x0006	*DateCode*	Character string	0 – 16 bytes	Read only	20150722	O
0x0007	*PowerSource*	8-bit Enumeration	0x00 – 0xff	Read only	0x03	M
0x0010	*LocationDescription*	Character string	0 – 16 bytes	Read/write	--	O
0x0012	*DeviceEnabled*	Boolean	0x00 – 0x01	Read/write	0x01	M

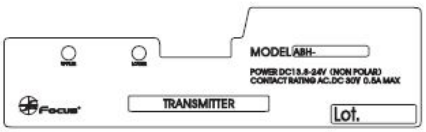
7. Installation guid of quad active infrared detector

Model:

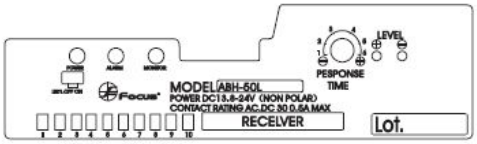
ABH-50L	**(Outdoor 50m, Indoor 150m)**
ABH-100L	**(Outdoor 100m, Indoor 300m)**
ABH-150L	**(Outdoor 150m, Indoor 450m)**
ABH-200L	**(Outdoor 200m, Indoor 600m)**
ABH-250L	**(Outdoor 250m, Indoor 750m)**

Ⅰ. Part Name



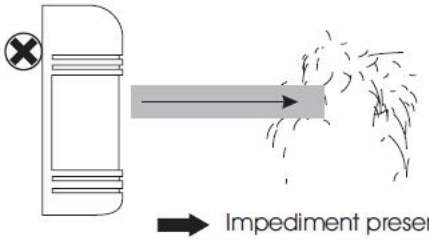


●UPPER indicator turns on when upper beam transmits.
●LOWER indicator turns on when lower beam transmits.

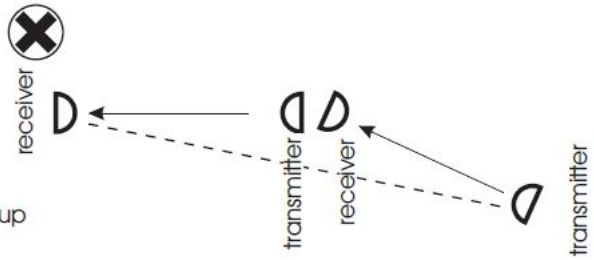


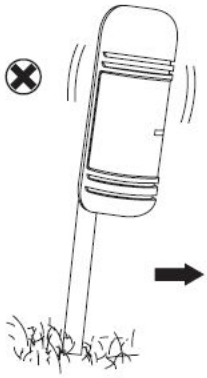
●POWER: The indicator turns on when power is connected.
●ALARM: The indicator turns on when alarm presents.
●MONITOR: (adjustment indicator) The green indicator turns on when the beam aligns with the receiver. If fails to align, the red indicator will on.

II. Precautions for setting



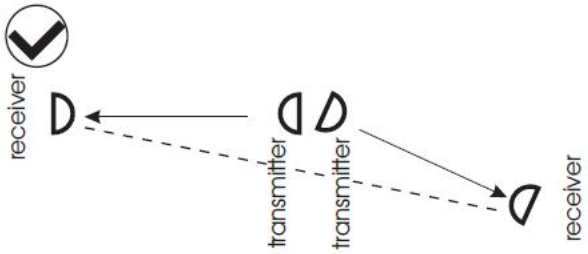
Impediment presents during setup

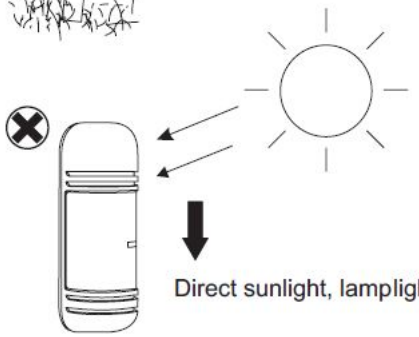




The base is unstable

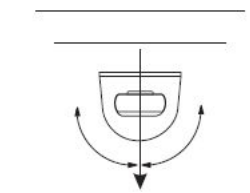
Multi sensors may be used for long-distance guarding. Please install according to the below diagram to avoid interference between beams.



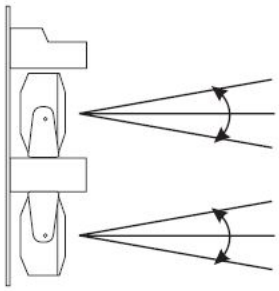


Direct sunlight, lamplight etc.

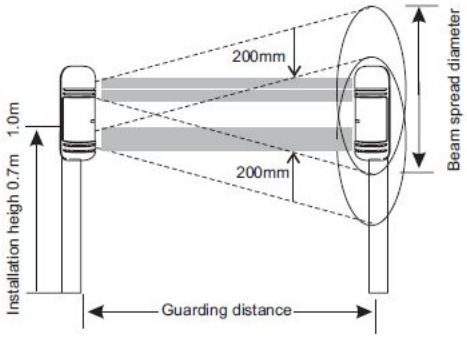
●Adjustable angle: horizontal ± 90°
vertical ± 10°



Horizontal 180 (90)



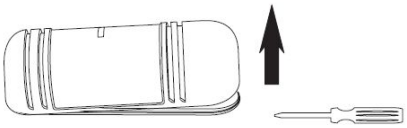
Vertical 10



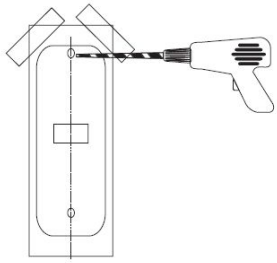
Style	Guarding distance	Beam spread diameter
ABH-50L	50m	0.8m
ABH-100L	100m	1.6m
ABH-150L	150m	2.4m
ABH-200L	200m	3.2m
ABH-250L	250m	4.0m

III Setting procedure

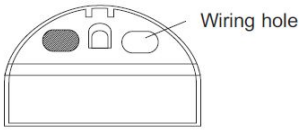
1.Remove the cover



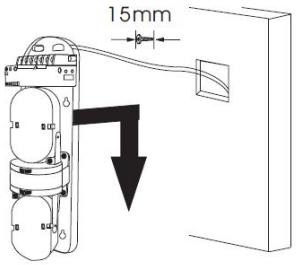
2.Attach the paper stencil onto the location where the equipment is to be mounted, and drill the holes in the positions on its mark.



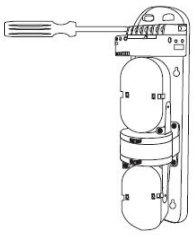
3.Put the cable through the hole for wiring.

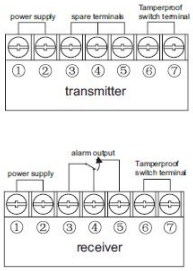


4.Fix the main body onto the wall



5.Connect the cable to the wire terminal.

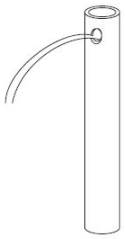




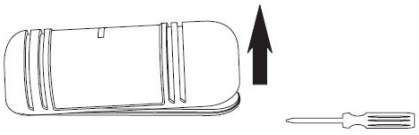
6.Put on the cover after adjusting the response time of the beam.

● Installation of fixed bracket

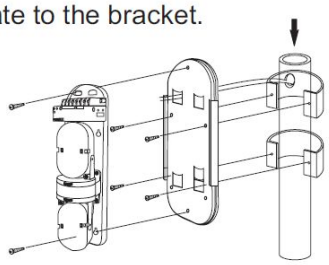
1.Drill a hole on the bracket and extend out the cable from it.



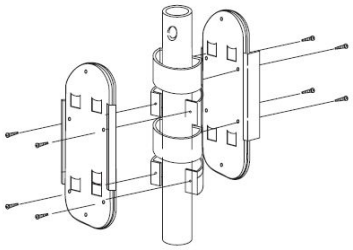
2.Remove the cover.



3.Fasten the base-plate to the bracket.



(Back-to-back installation guiding diagram)



Wiring distance between transmitter and receiver

wire size \ voltage / distance	DC13.8V	DC24V
0.5mm²(0.8)	300m	300m
0.75mm²(1.0)	400m	800m
1.25mm²(1.2)	700m	1400m
2.0mm²(1.6)	1000m	2000m

netvox™

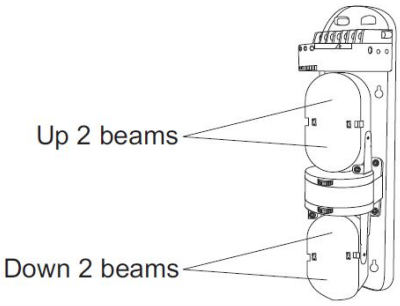
IV Beam alignment

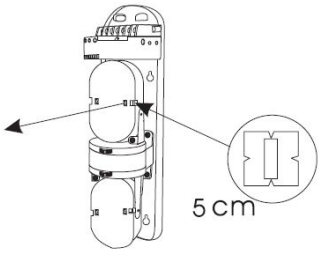
Visual test method

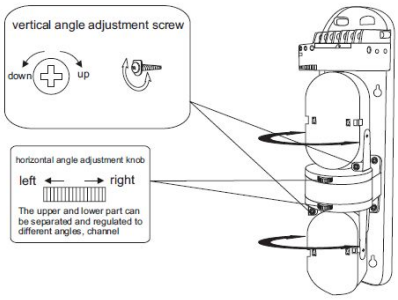
1.Remove the cover and connect power.

2.Observe the collimation effect at a distance of 5cm from the viewfinder. Adjust the upper / lower angle regulation screw and horizontal adjustment wheel in order that the image of opposite detector falls into the central part of the viewing hole.

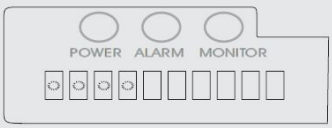
3.Adjust the vertical adjustment screw and the horizontal angle adjusting wheel, the signal strength indicator will light up step by step, adjust until level 5 or higher indicator lights up. If not, adjust it repeatedly.



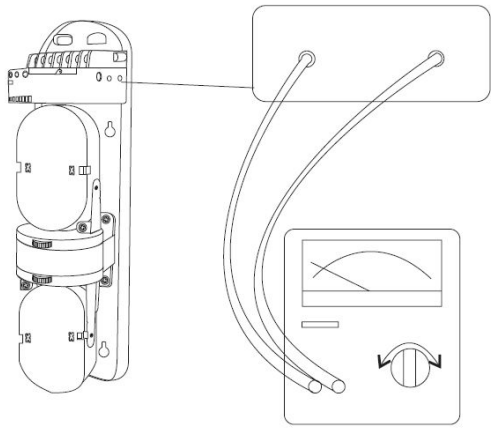




Note



In the diagram, after adjustment of the beam, the level 5 of the reception / transmission LED shall light up. Otherwise, adjust again. It is strongly recommended that it should be adjusted to the point until level 7 or higher lights up.



Multimeter selects DC 10V

Voltage test method

1.Cover the receiver with a light filter. Insert the test pen into the test hole (please note the +,- polarity)
2.The adjustment method is the same as visual test method. But the voltage shown by the multimeter must satisfy the value as under form. Otherwise, repeat the steps above to meet the standard.

MODEL	VOLTAGE
ABH50L/100L	DC1.4～1.5V
AHB150L/200L	DC1.4～1.5V
ABH250L	DC1.2～1.3V

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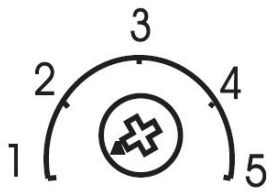
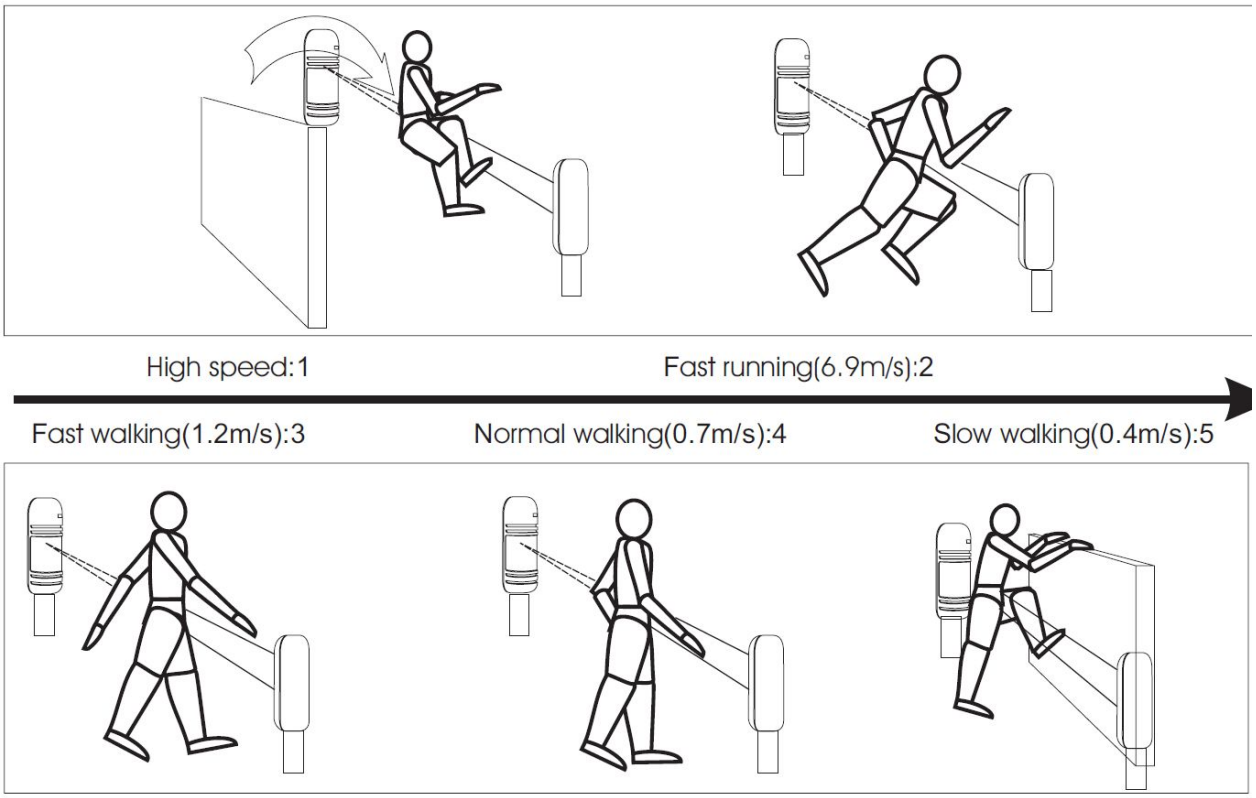
V Beam response time adjustment



Please see the diagram to adjust the response time of the receiver. Usually, the time set shall be less than the time when the intruder crosses the guarding area.



VI.Physical test

Walking test is required after the setting, physical test in accordance to below diagram.

	State	Signal
Transmitter	Transmitting	The 2 indicators of green LED light up
Receiver	Guarding	GOOD LEVEL indicators light up
	In alarm	The red ALARM indicator light up

VII. Trouble checking

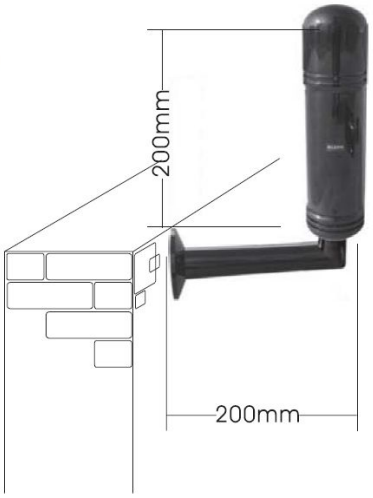
Fault	Cause	Solution
The LED of the transmitter doesn't light up	Power failure (open circuit, short-circuit, etc.)	Check the power wiring
The LED of the receiver doesn't light up	Power failure (open circuit, short-circuit, etc.)	Check the power wiring
The LED of the receiver doesn't light up when the light is blocked	1.By reflecting, or light from other sources enter the receiver 2.Both beams are not blocked at the same time 3.Response time is set too short	1.Remove the reflecting object or change the direction of beam 2. Block both beams at the same time 3.Prolong the response time
The receiver alarm indicator ON after the beam is blocked, but there is NO alarm signal output	1.Broken circuit or short-circuit of the wiring 2.Poor contact	1.Check the wiring and contact 2.Connect the cable
The alarm indicator of the receiver is constantly ON.	1.The beam doesn't match closely 2.There is obstacle presents between the transmitter and the receiver 3.The cover is polluted.	1.Re-adjust the beam 2.Remove the obstacle 3.Clear the cover
Intermittent alarm signal output	1.Improper wiring 2.The supply voltage does not reach 13V or higher 3.The potential obstacle appears to block the beams due to the effect of wind and rain 4.The installation base unstable 5.The beam coincidence accuracy is inadequate 6.Beams blocked by other moving objects 7.Response time too short 8.Level 5 LED does not light up before the cover is put on	1.Check the wiring 2.Check the supply power 3.Remove the obstacle or change the location 4.Select a site with a stable base 5.Re-adjust the optical axis 6.Adjust the shade time or change the install location 7.Re-adjust the response time 8.Re-adjust the optical axis, and make the signal reception reaches its top.

VIII. Technical parameters:

Model		ABH-50L	ABH-100L	ABH-150L	ABH-200L	ABH-250L
Alert distance	Outdoor	50m	100m	150m	200m	250m
	Indoor	150m	300m	450m	600m	750m
No. of beams		4 beams				
Detection mode		4 beams blocked simultaneous				
Optical source		Infrared digital pulse beam				
Response speed		35 700msec adjustable				
Alarm output		Relay contact output: NO. NC contact rating: AC/DC30V 0.5AMax				
Power supply		DC13.8 24V AC11 18V P 15W				
Power consumption		95mA	100mA	100mA	100mA	105mA
Operation temperature & humidity		-25 -55 5%-95%RH(relative humidity)				
Dimensions		Refer to its diagram				
Tamper output		Contact output: NC contact rating DC24V 0.5Amax				
Optical axis adjustment(H)		180 (90)				
Optical axis adjustment(V)		20 (10)				
Viewfinder		Window style				
Protection against dew, frost		Calefaction housing (optional)				
Material		PC resin				
Net weight		2000g(receiver +transmitter)				
Gross		2500g				

IX. Recommended installation guide & physical appearance and dimension

Recommended installation



T-shaped bracket
T-100
100 120mm

T-200
200 120mm

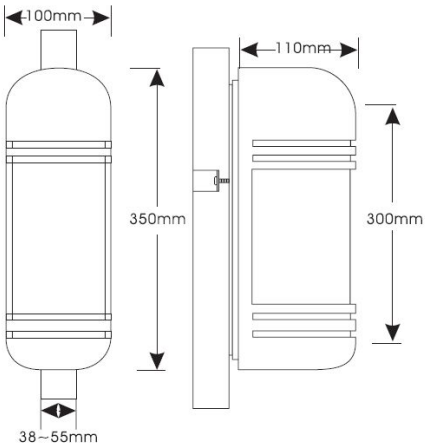
Installation bracket

I-shaped bracket
I-100
100mm

I-200
200mm

L-shaped bracket
80 75mm

Dimensions



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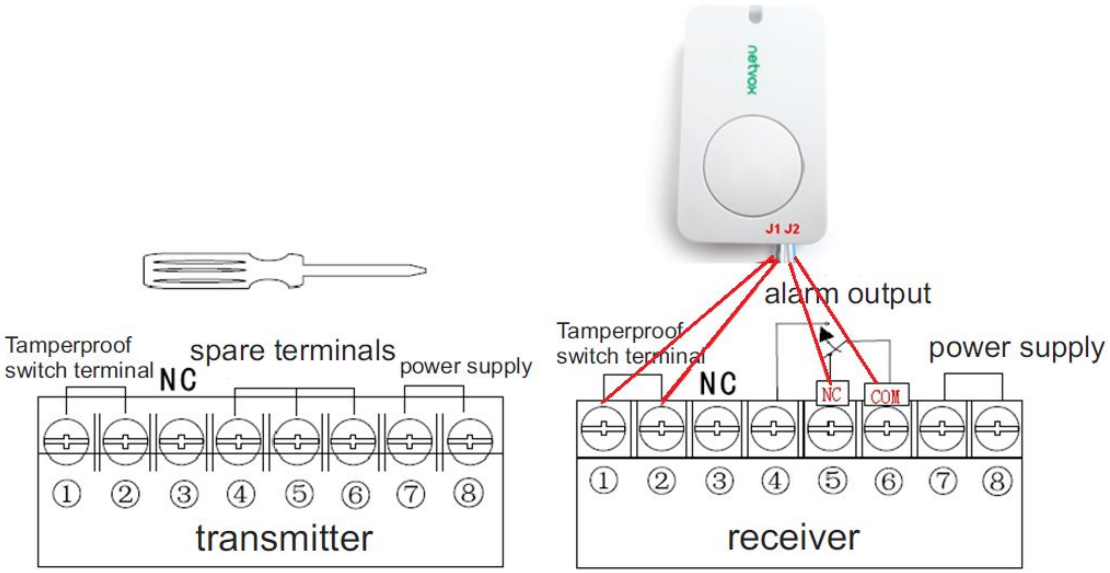
Quad active infrared detector connected to Zigbee device:



NOTE: Open the battery cover with flathead screwdriver or so.

8. Important Maintenance Instructions

- Please keep the device in a dry place. Precipitation, humidity, and all types of liquids or moisture can contain minerals that corrode electronic circuits. In cases of accidental liquid spills to a device, please leave the device dry properly before storing or using.
- Do not use or store the device in dusty or dirty areas.
- Do not use or store the device in extremely hot temperatures. High temperatures may damage the device or battery.
- Do not use or store the device in extremely cold temperatures. When the device warms to its normal temperature, moisture can form inside the device and damage the device or battery.
- Do not drop, knock, or shake the device. Rough handling would break it.
- Do not use strong chemicals or washing to clean the device.
- Do not paint the device. Paint would cause improper operation.

Handle your device, battery, and accessories with care. The suggestions above help you keep your device operational. For damaged device, please contact the authorized service center in your area.