Motion Detector with On/Off Switch and Temperature Sensor
User Manual

Model: ZB11C

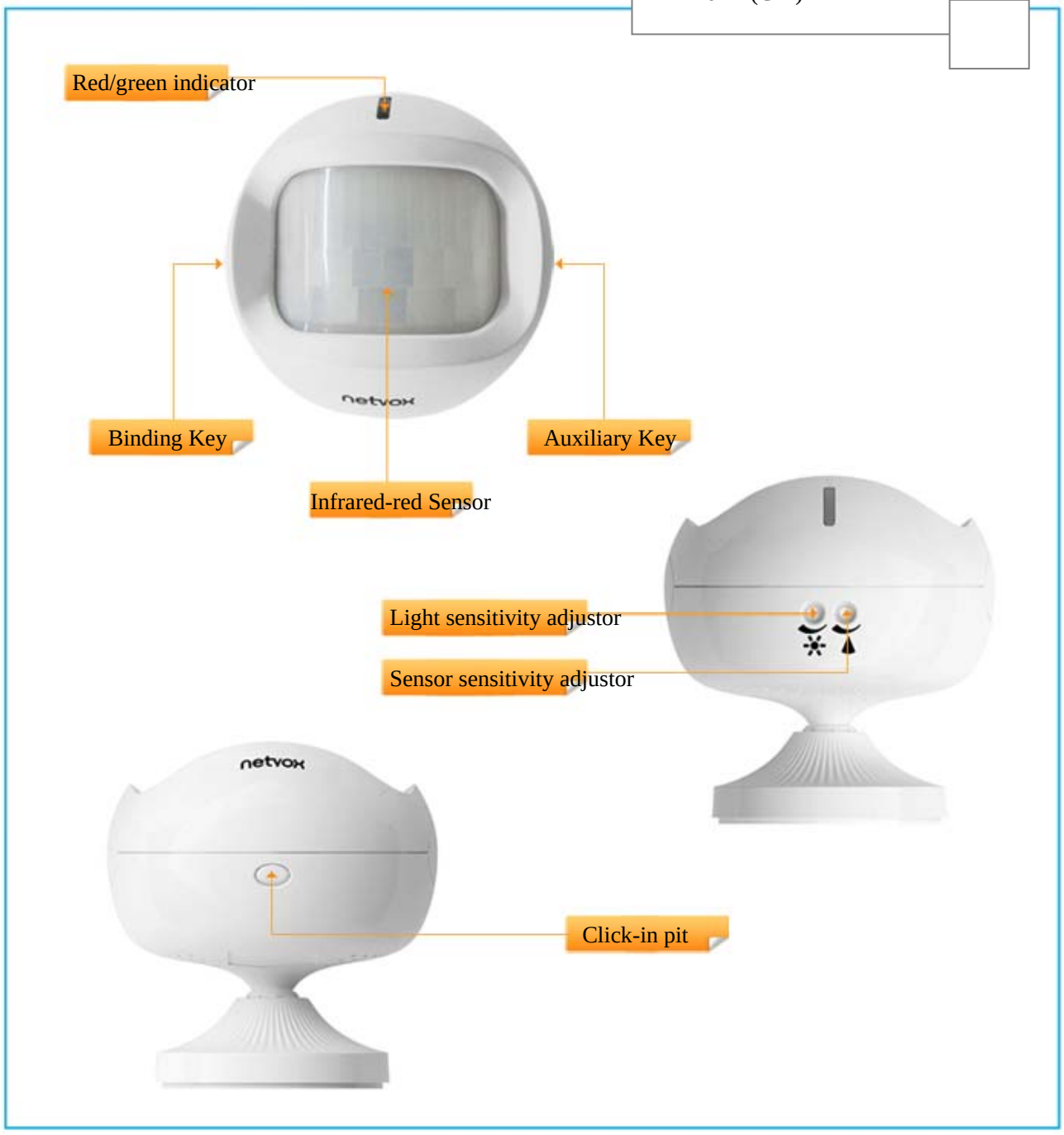
FW: V1.1
HW: V0.2
20130605

Motion Detector

Z-B11C

Related Netvox devices

- ✓ Power outlet -Z80x *series*
- ✓ Security -Z601A, Z210, Z201B (CIE)



Introduction

ZB11C is a motion detector for triggering a remote target device wirelessly. It is a motion detection for intrusion alarm system and can also work as an on/off control lighting switch and a temperature sensor. When the Infrared detects movement, it sends the message to the network for specific task.

In ZigBee network ZB11C device act as an end-device node which does not permit any device to join through it. It enters to ***sleep mode*** when not triggered by movement to save power. When ***triggered by movement*** it sends message and status notification to the network for specific application.

What is ZigBee?

ZigBee is a short range wireless transmission technology which defined for a minimum complexity, low power consumption, low data rate, cost effective wireless solution. ZigBee lies in between wireless markup technology and Bluetooth. ZigBee is based on IEEE802.15.4 standard, the mutual co-ordination between thousands of sensors to exchange data. Sensor to sensor or node-to-node communication is achieved through relays of control data between devices with only a fraction of energy use which denoted for highly transmission efficiency.

Note: Wireless communication, in some real use cases, can be limited by the signal blockage. Please consult your service provider or place of purchase.

Product Specification

- ✓ Fully IEEE 802.15.4 compliant
- ✓ Utilizes 2.4GHz ISM band, up to 16 channels
- ✓ Up to 70 meters non-obstacle wireless distance
- ✓ Simple operation and device configuration
- ✓ Power supply: 2 x ER14505 3.6V AA batteries

Setting up the ZB11C and network

Setting Up Summary
(1) Join it into the existed network.
(2) Featuring the device by pairing between two or more devices or zone registration for security system
(3) How to use it

Step 1. Startup and Network Association

To allow ZB11C to function, it must first join to a ZigBee network. When it is given powered it will automatically start searching for an existed network. So before you give power to ZB11C make sure it is within the wireless coverage distance (~70 meters or less) and make sure ***first*** you have the ***permit-join feature enabled*** either on a coordinator or a router device in the network so that ZB11C will join to the network through it; then give power to ZB11C and it will join into the network by itself.

**On how to enable permit-join please refer to the router or coordinator device user manual*

Operation:

Step 1: enable permit-join function (valid for 60 seconds)on either a coordinator or a router device.

Step 2: give power to ZB11C device so it can start search for a network to join.

Step 3: at this time if a network is found it will join automatically. The network indicator on the ZB11C will flash 5 times in green if successful otherwise the indicator stays dark.

Repeat the process if join attempt failed. ZB11C is an end-device which goes to sleep. To wake up the device for another join attempt, please reload the battery. Make sure that the permit-join of a router or coordinator is again enabled.

For advance user: The device supports network commissioning joining method.

Notes:

a. By default the ZigBee network does not allow any devices to join, this is done this way to prevent any potential unauthorized device join attempt. Make sure ZB11C is within the coverage area. You must first enable permit join feature on a router or a coordinator already in the network so that the new device like ZB11C is permitted to join when the channel is automatically searched.
b. On how to enable permit-join feature please refer to the coordinator or the router user manual.

Most read Warning: Possible battery drainage

When the device was once joined to a network and by any chance the network is no longer present or it is out of network - it will wake up every 15 minutes to find the network it joined before. It never goes to deep sleep but continues to find its network every 15 minutes. This scenario can consume up to 50 times power more than normal operation. To avoid this unwanted power consumption, you need to manually switch off the sensors when network is off.

Feature Description

Before we move on to the next step there are several things to know. This will help you in the next step as to which sub-steps you will need and why you need them.

As mentioned earlier in the manual, ZB11C comes with 3 functions, such as Zone, On/Off and temperature reading.

Zone, for example, will feature the device to work as a zone sensor for the security system to notify the security system or called CIE security system device -Control & Indication Equipment in the network to trigger a siren or a silent alarm. **This device will require security zone registration (enrollment).**

On/Off, for example, will feature the device to work as a motion-triggered light or power switch. In many cases it is used for door or stairway lighting application. **This device will require device pairing.**

Temperature reading, for example, will feature the device to work as a temperature reporting device. It reports the temperature reading to a paired display device. **This device will require device pairing or device matching.**

Step 2. Featuring the device by pairing

Automatic zone registration

ZB11C contains zone feature to work with the security system in the network. After it has joined to the network, the device needs to register itself to the security system called CIE (Control and Indicating Equipment). The registration is an automatic process followed by network join. All you need is to observe whether it has successfully registered.

Observing registration to the CIE:

(1) If CIE device does not exist in the network the LED indicator **flashes twice in green**.

(2) If CIE device is found and successfully enrolled, it flashes **6 times otherwise flashes 4 times meaning enrollment failed. Trigger the device by motion will force it to re-enroll. The siren will only sound when it has truly enrolled.** Refer to View enrolled zone device table section at the end of this manual.

Note

It is a good practice that there should have only one CIE device in a given network at the time when ZB11C is joining into the network. If you happen to have two or more CIE devices present in the network, ZB11C will somehow confused as which to enroll. This may or may not cause enrollment rejection. If this happens right after ZB11C joined to the network, please power off those CIE devices and leave only one in the network, then power ZB11C on again to allow it to register to the intended CIE. Or for some reason you should leave the CIE on which you do not wish to enroll ZB11C into, simply enroll it to this one first and then apply CIE reassignment. Refer to Assigning ZB11C to a preferred CIE system section.

Device pairing (Binding)

Operation:

Step 1: Operate binding on the power outlet device (refer to its own user manual).

Step 2: **Within 5 seconds** short press on the binding key (once for motion detector binding, twice for lighting control binding, 3 times for temperature report binding) If pairing successful the green LED indicator **flashes 5 times** otherwise flashes 10 times quickly.

Unbinding operation: *Unbinding procedure is exactly the same as binding operation. The device will reverse paired.*

How to use ZB11C in the network

Security System

At the time that the device sends alert message to the registered CIE device in the network while the security system is at ***armed status***, the siren device in the network will receive a warning message to trigger.

ZB11C takes one minute to warm up right after it joined to the network. The device will be inactive during the warm up period and will not respond to motion.

There is another condition which ZB11C will be inactive in motion detection reporting. This is done to prevent too sensitive to motion.

The device will report when motion is detected then it will appear to be inactive for a period of 84 seconds. Any motion detected by the IR will not be reported. After the inactive period elapsed the ZB11C will be then back to its motion detection reporting. If no more movement is dectected for a period of 120 seconds, the device will send a message to deactivate the alarm.

Light control

According to the surrounding light intensity from the internal light sensor, when the movement is detected the device sends ON command to the paired power outlet or power switch devices. The 120 seconds countdown timer will start followed by a turn ON command sent.

The light sensor sensitivity (threshold) can be adjusted to fit your need. From the light sensitivity adjustor turn clock-wise for lower sensitivity and anti-clockwise for higher sensitivity. For example, if you would like the light to be turned ON at the lowest surrounding light intensity when motion is detected, then turn the adjustor anticlock-wise.

The light control will stay functional regardless whether the security system is in armed/disarmed mode or whether the ZB11C is registered to the security system or not.

To avoid frequent or unstable light switching, ZB11C stays inactive to movement for ***a period*** **of** ***84 seconds*** by factory default. Any movement detected within this period the countdown timer will not be reported. If no movement were detected and the 120s period were elapsed, ZB11C will switch off the paired power outlets.

Temperature reporting

Again as mention earlier, the sensor sends the current temperature data to the coordinator of the network once every 3 minutes by default if not pairing settings were done. The device sends captured temperature data to paired machine which installed ZiG-BUTLER or any other ZigBee enabled in-home display device. For more details about temperature reporting configuration, please refer to *temperature reporting* on chatper ZiG-BUTLER of this manual.

Device Tampering

ZB11C comes with tampering alarm. Any attempt of unauthorized tampering such as removing the device cover, the device sends alarm messages to the security system (CIE device) to set off the siren in the network.

Overcoming a sleeping device

The ZB11C is featured to be an end device and is designed to enter temporal sleep after idle to save battery power. Sometimes during system setup you would want to retrieve information (i.e. IEEE address, short address) from the device so you need to press keys to allow the device to enter wake mode to stay connected.

Operation: Press auxiliary key once, the green indicator will give **5 short flashes**. The device will be active and will broadcast its short address and its device physical IEEE address.

Low Battery Notification

When ZB11C uses battery to power, the device will not work if the battery is bellow **3.3Vdc.**

The green indicator will flash once and the device will broadcast low battery message to the network notifying the user for battery replacement.

Restore to factory setting

ZB11C is capable of storing and saving includes network routing information. If you wish to remove ZB11C from an exited network, you would need to clear the saved routing and

other information to join to a new network by simply reset the device to restore to the factory setting.

Operation:

Hold press the auxiliary key for 10 seconds until the gren indicator flashes quickly which indicating factory restored setting has achieved. And then the device will be turned off automatically.

Affirming detection zone

During motion sensor installation, you would want to be sure how far and wide does ZB11C actually detect especially for security system installation.

Operation: To force the device to run in the zone detection mode, hold press the auxiliary key for 3s , release when indicator flashes once in green. Zone detection mode will stay active for 10 minutes.

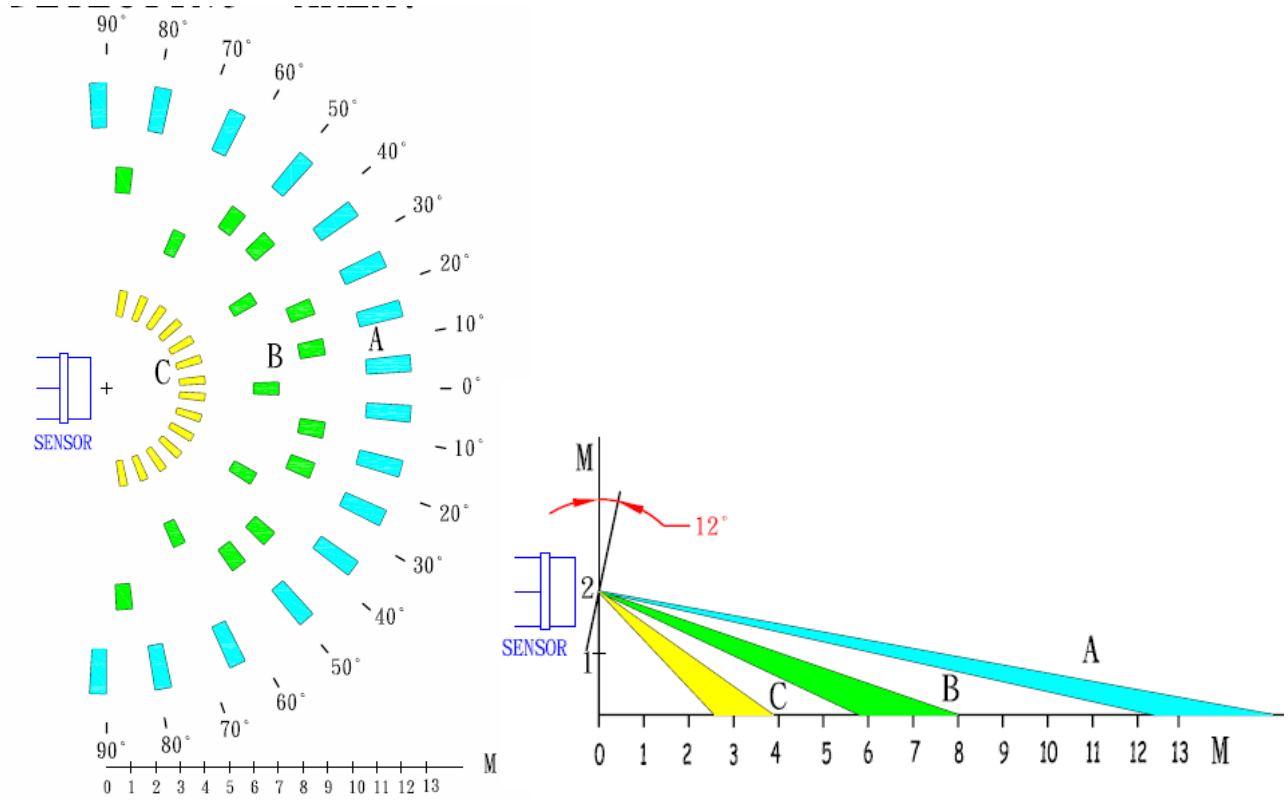
Indication:

When motion detected, red indicator will light up if surrounding conditon of light switching is met, otherwise red indicator will flash several times.

No LED indication indicates no motion is been detected.

To exit from zone detection mode before 10 minutes elapse, short press auxiliary key once.

IR Coverage Range



Coverage A, B and C

The coverage area A has the farthest distance of 11 meters with view angle of 30 degrees.
The coverage area B has the mid-range distance of 8 meters with view angle of 60 degrees.
The coverage area C has the shortest distance of 5 meters with view angle of 120 degrees.

[Next Page: Device Attributes Description for developers only]

Clusters of Home Automation for ZB11C

Home Automation device feature is defined by the endpoint which contains functional clusters. The tables bellow lists clusters for the endpoint of ZB11C.

EP:0x01

Server side	**Client side**
Mandatory	
Basic(0x0000)	
Identify(0x0003)	
Ias Zone（0x0500）	
Commissioning(0x0015)	
Identify(0x0003)	

EP:0x02

Server side	**Client side**
Mandatory	
Basic(0x0000)	On/Off Switch(0x0006)
Power configuration(0x0001)	
Identify(0x0003)	

EP:0x03

Server side	**Client side**
Mandatory	
Basic(0x0000)	
Power configuration(0x0001)	
Identify(0x0003)	
Temperature Measurement(0x0402)	

Attributes of the Basic cluster 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		O
0x0002	*StackVersion*	Unsigned 8-bit integer	0x00 – 0xff	Read only		O
0x0003	*HWVersion*	Unsigned 8-bit integer	0x00 – 0xff	Read only		O
0x0004	*ManufacturerName*	Character string	0 – 32 bytes	Read only	netvox	O
0x0005	*ModelIdentifier*	Character string	0 – 32 bytes	Read only		O
0x0006	*DateCode*	Character string	0 – 16 bytes	Read only		O
0x0007	*PowerSource*	8-bit Enumeration	0x00 – 0xff	Read only		M
0x0010	*LocationDescription*	Character string	0 – 16 bytes	Read/write		O
0x0012	*DeviceEnabled*	Boolean	0x00 – 0x01	Read/write	0x01	M

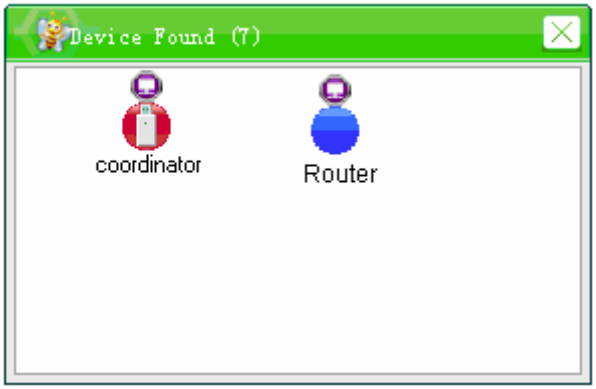
ZiG-BUTLER

During device installation, you will go though permit join and device pairing. Most of the time you need to physically access to a device that is out of your reach. It becomes handy when you can program through software on a PC wirelessly. Our ZiG-BUTLER allows you to do that. Of course, any other 3rd party ZigBee enabled software is also applicable.

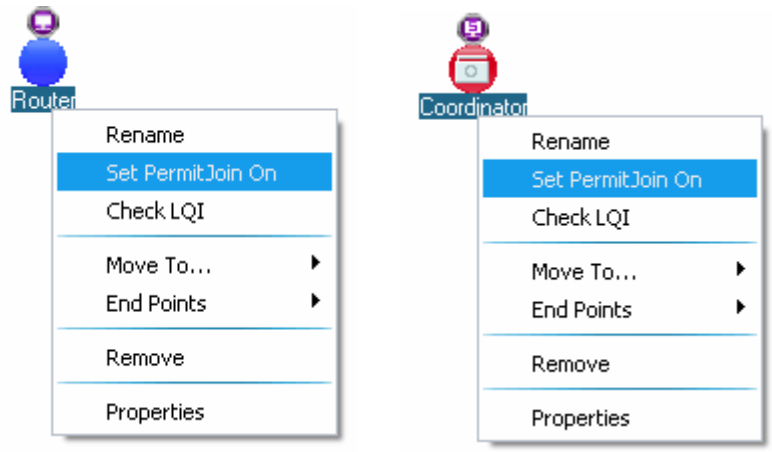
ZiG-BUTLER software is to be installed on a PC or a server. The system needs a Z103 USB dongle or a ZigBee to PC hardware interface such as a Z202 gateway to communicate with ZigBee network.

Join ZB11C into the network

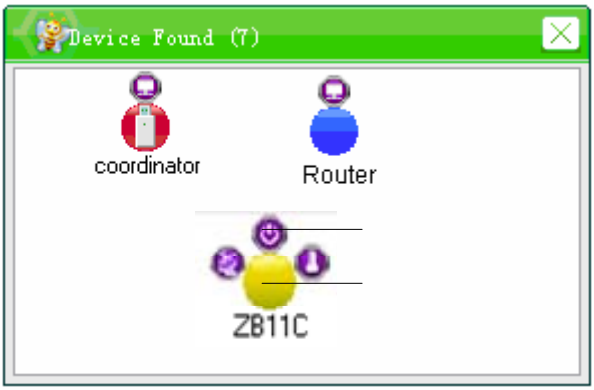
If your ZiG-BUTLER sees a coordinator or a router device, you should be able to see the icon similar to the one bellow:



-point your mouse to either the coordinator or router device icon and right click. From the menu select ***Set PermitJoin On***.



When ZB11C has successfully joined, you should see the ZB11C device icon appeared in ZiG-BUTLER.



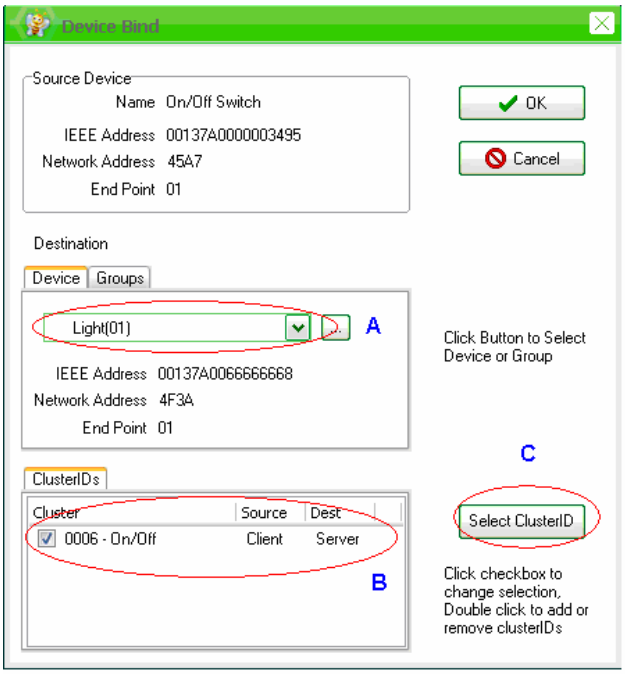
Device Pairing Configuring

You are able to program and pair two devices through ZiG-BUTLER.

Part A *-For power switch pairing (for temperature, go to Part B)*

Move your mouse to the On/Off Switch circle on top of ZB11C where the arrow is pointing. Then right click your mouse should display menu and select **Bind**.

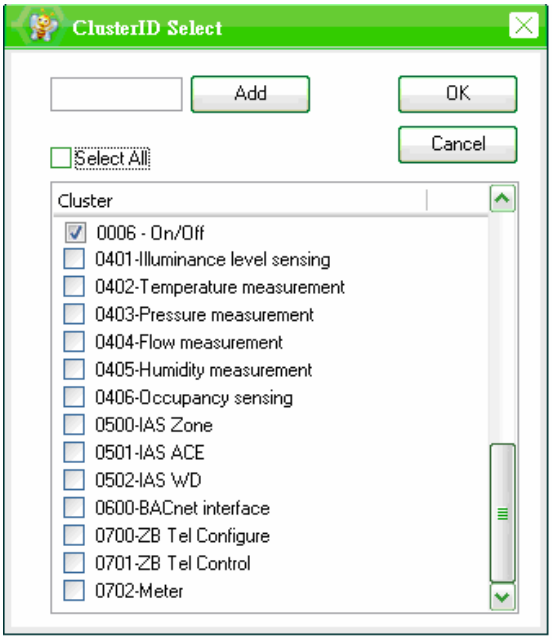
Device binding configuration box will appear similar to the one bellow



Under the Device tab (label A) select the device to be paired (normally a lighting device or a power outlet device). Under Cluster column (label B) look for ***0006-On/Off***. Make sure the empty box next to must be ticked.

If you do not see ***0006-On/Off***, you can obtain it from a pool of *Cluster ID* by a mouse click on ***Select ClusterID*** button (label C).

Cluster ID configuration box will appear similar to the one bellow



-check the box next to ***0006-On/Off*** and click ***OK*** to confirm the setting and the system will paired the device.

-Click ***OK (of the previous figure)*** and the system will pair the interface. Before you click on ***OK*** make sure you wakeup the ZB11C device so that the setting can be written into it.

> **ZigBee knowledge:* ZigBee device has specific feature which is given by their cluster type such as *0006-On/Off*.

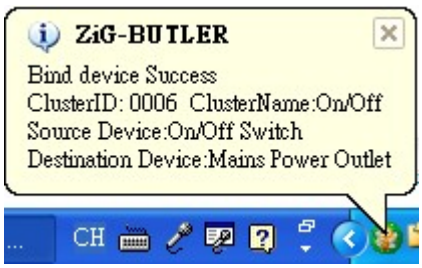


Figure 2: Binding successful

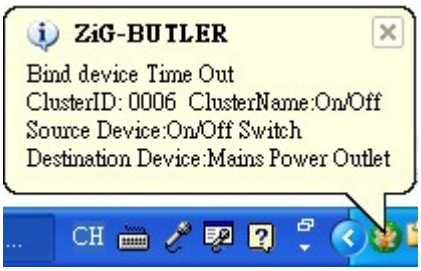
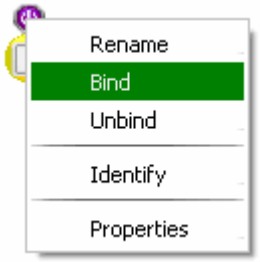


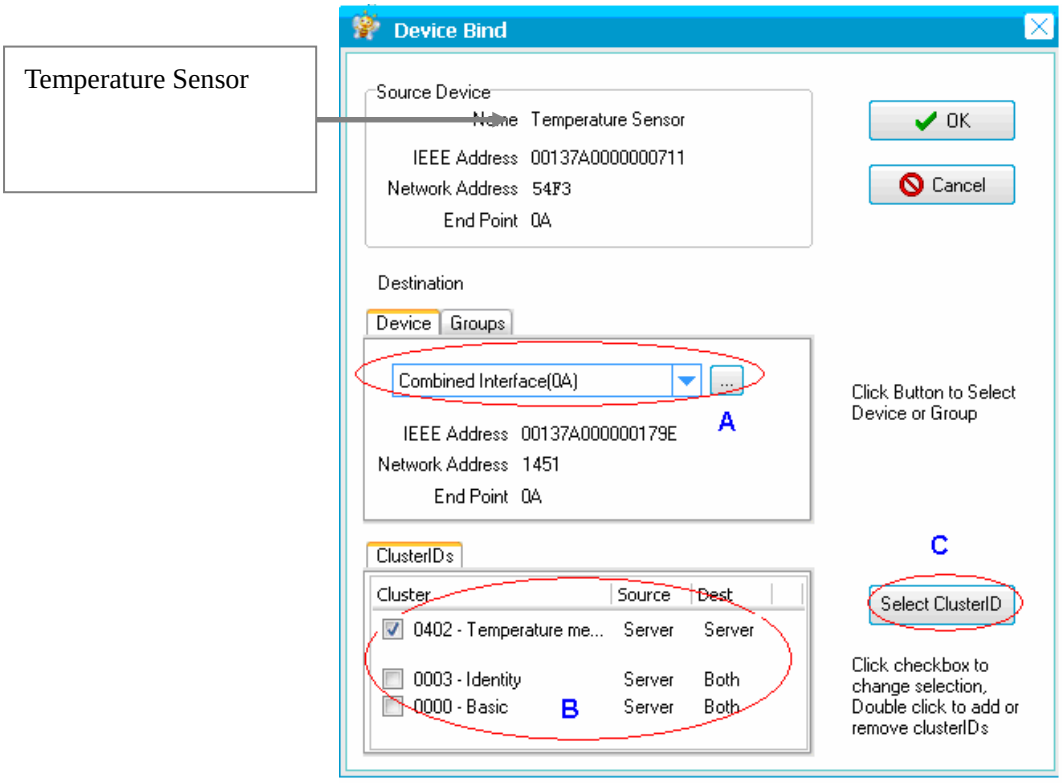
Figure 3: Binding unsuccessful

Part B *-For temperature reporting (for power switch, go to Part A)*

Move your mouse to the temperature sensor circle on top of ZB11C where the arrow is pointing. Then right click your mouse should display menu and select **Bind**.



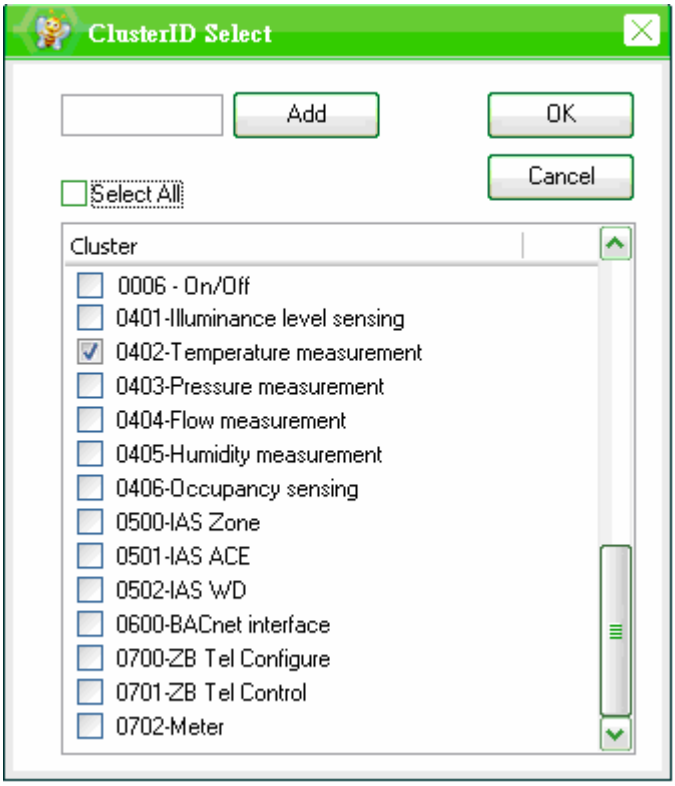
Device binding configuration box will appear similar to the one bellow



Under the Device tab (label A) select the device to be paired (normally an interface device). Under Cluster column (label B) look for temperature measurement. Make sure the empty box next to must be ticked.

If you do not see ***0402-Temperature measurement***, you may obtain it from a pool of *Cluster ID* by a mouse click on ***Select ClusterID*** button (label C).

Cluster ID configuration box will appear similar to the one bellow



-check the box next to ***0402-Temperature measurement*** and click ***OK*** to confirm the setting.

-Click ***OK (of the previous figure)*** and the system will pair the interface. Before you click on ***OK*** make sure you wakeup the ZB11C device so that the setting can be written into it.

> **ZigBee knowledge:* ZigBee device has specific feature which is given by their cluster type such as *0402-Temperature measurement*.

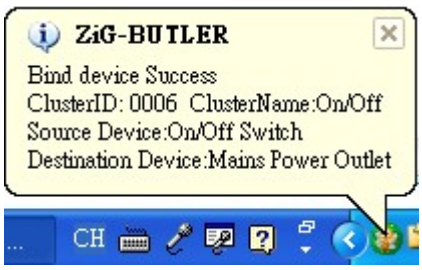


Figure 2: Binding successful

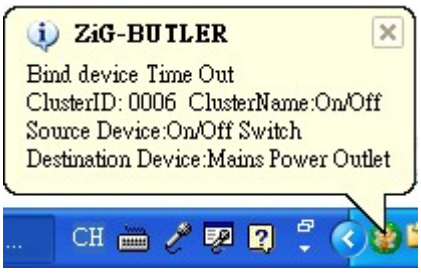


Figure 3: Binding unsuccessful

Having done that, now configure the reporting time interval

Now move your mouse to the circle on top of ZB11C icon. Then right click your mouse should display menu and select **Property.**

Go to **Report Config** tab, similar to the figure bellow.

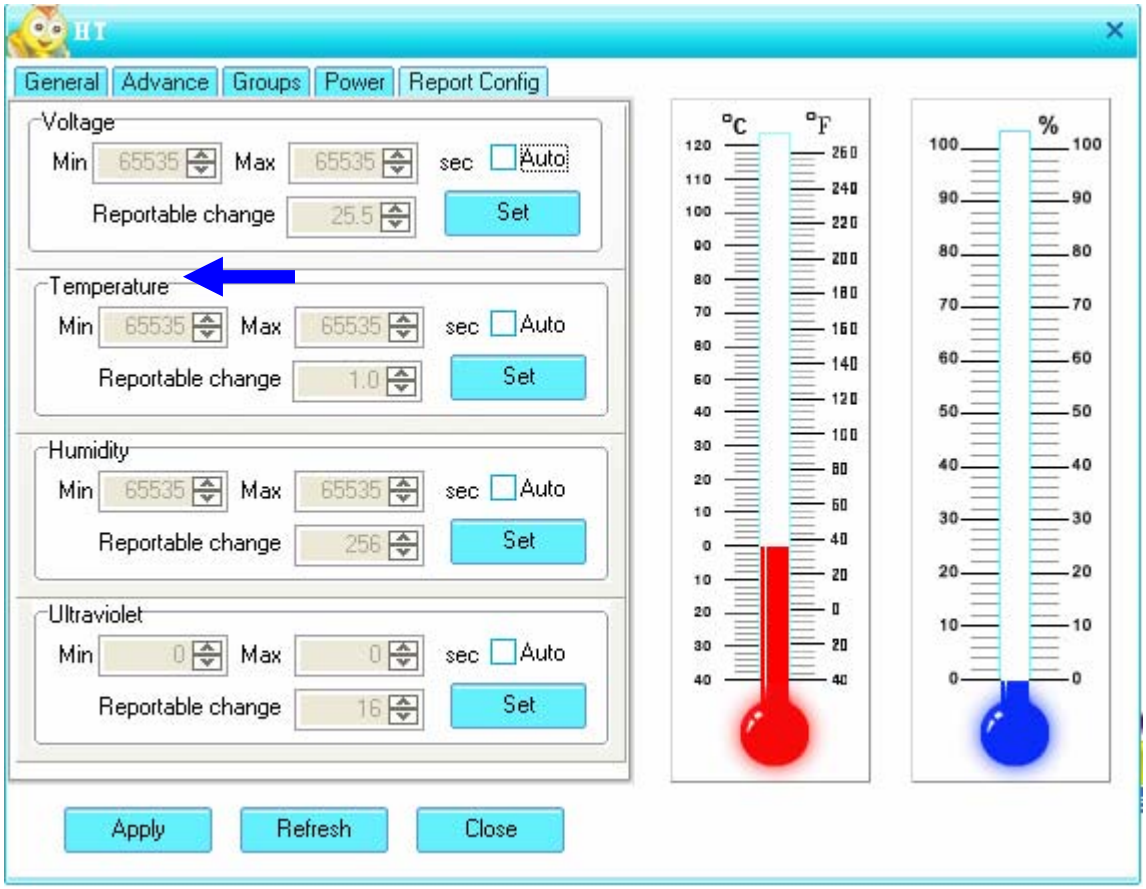


Figure: temperature reporting interval configuration

Minimum reporting time interval (Min) –this is the minimum temperature sampling time interval, in seconds, between issuing temperature reports. If this value is set to 0, then there is no minimum limit.

Maximum reporting time interval (Max) –this is the fixed time sampling interval, in seconds, between issuing temperature reports. If this value is set to 0, then the device shall not report the temperature.

Reportable change – this is the minimum temperature change that will result in a report being issued. If the change in temperature *is greater than* the set **Reportable Change** temperature value, the device issues report the detected temperature at the **Min** -minimum reporting time. If the change *is less than*, the reportable change will not report until the time reaches to the **Max** -maximum reporting time.

Explain: The reportable change (in unit ^{o}C) is the actual difference in temperature between the current and the previously reported. It tells the system that if the temperature difference is said to be **greater than** the previously reported temperature

then the sensor device is forced to report it at specified **minimum** time. If the difference is **less than** then the sensor device will wait until the time reaches to the specified **maximum** time.

The minimum time interval is just how fast the device responds to temperature.

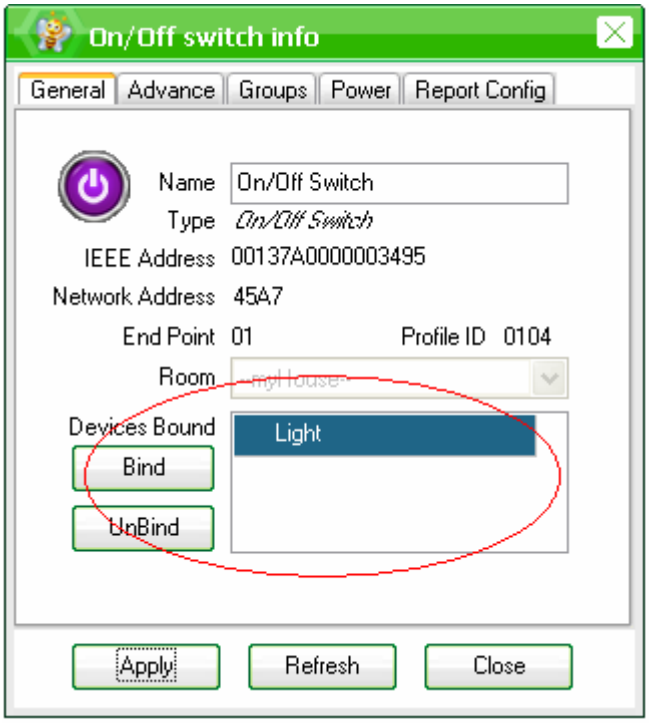
ZB11C doesn't support UV and humidity feature.

Make sure to check **Auto** to enable the feature configured or to uncheck it to disable. Then click ***Set*** to send the configured information to the ZB11C device. Please refer to Notice bellow.

Notice: Recall that the ZB11C is an end-device which goes to sleep between the reporting time intervals. The only way to write the configured information to the device is when ZB01 is awake. *(To wake up the device please refer to the Over coming sleeping device section of this user manual)*. During wake-up time, click on ***Set*** or ***Refresh*** or ***Apply*** as required.

View Paired Devices

Move your mouse to the circle on top of ZB11C icon, then right click your mouse should display menu and select **Properties**.
A device information dialog screen appears, similar to the one bellow.



In this figure for example, the paired light device is listed in the Devices Bound list.
If you have doubt that the list is incorrect, please wake up the ZB11C device again, and then click on ***Refresh*** button. This should update the pairing information. Otherwise make sure that ZB11C is controlling the paired device.

Advance Setting

Move your mouse to the circle on top of ZB11C.
Then right click your mouse should display menu and select **Advance**.

IR disabling duration

User is able to configure motion sensing disabling period following the previous motion detection. Default time is 120 seconds. Refer to figure bellow.

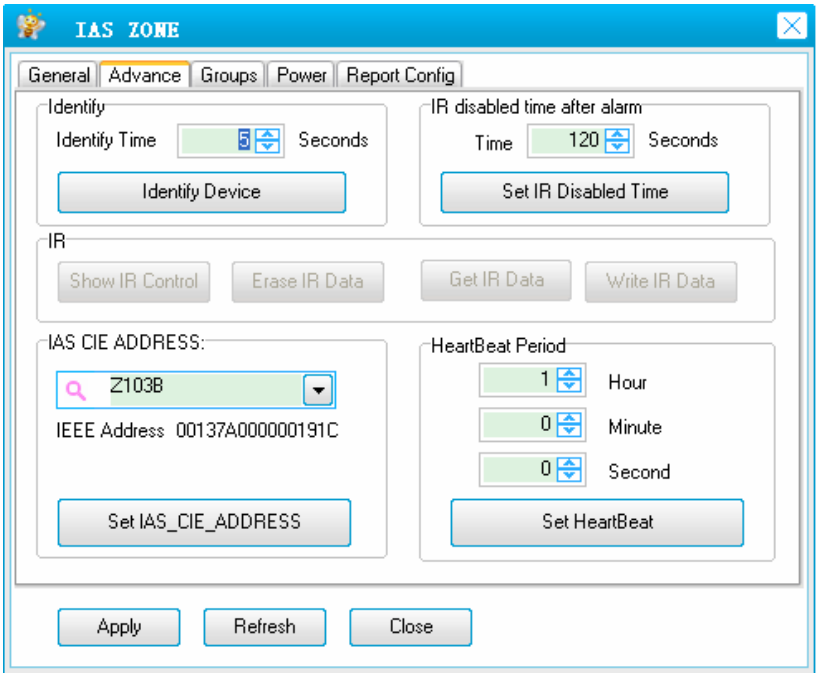
-Click **Set IR Disabled Time** button. Before you click on it make sure you wakeup the ZB11C device so that the setting can be written into the device. This is also true for the following two settings.

Assigning a CIE device

User is able to reassign the zone device to another CIE device in the network.
-Select a CIE device from the dropdown menu then click on **Set IAS_CIE_ADDRESS** button. When successfully registered to the new CIE, the LED on ZB11C will flash 6 times.

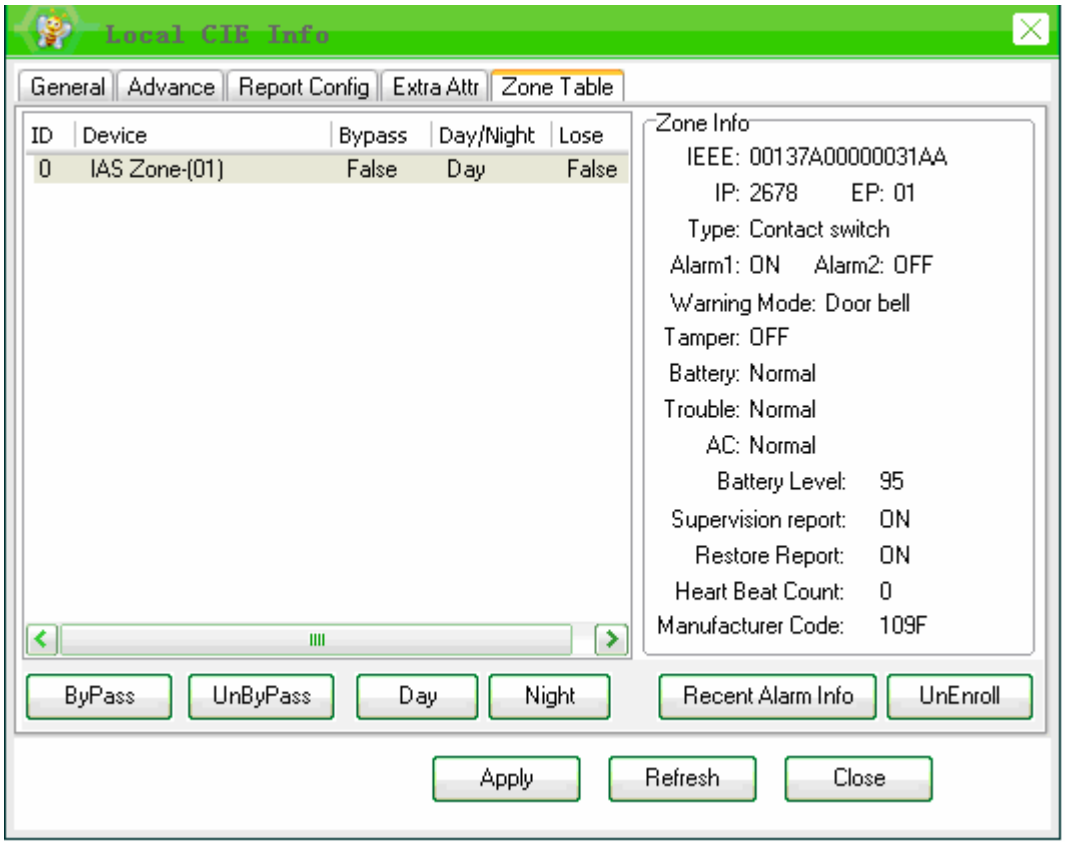
Zone Device Alive Indication

ZB11C periodically sends heartbeats to the network to notify the network that it is still working and alive. This is particular important feature as part of security system. Most users would want to make sure that security device are up and working. After 3 missing heartbeats, ZiG-BUTLER would notify the user. The user may diagnose of its power or device tampering.
-enter the time interval. In the example, 1 hour means the device only sent one heartbeat per hour.



View enrolled zone device table

All the enrolled zones are listed in the zone table as shown in the figure bellow. The table shows the IAS Zone-(01) has enrolled.



Important Maintenance Instructions

As the device is not water proof it is recommended to keep the device in a dry place. Liquid and heavy moisture contains minerals that may oxidize the electronic circuitry. In case of liquid spill, please leave the device to completely dry before storing or using.

- Do not use or store the device in a dusty area. Dust may cause electronic parts to destroy.
- Do not use or store the device in an over heated place. Store in a hotter temperature than the suggested maximum temperature may shorten the life span of the device; and may damage the battery and causing the housing to deform.
- Do not use or store the device in a very cold place than the suggested minimum temperature. The water can be condensed inside the device when moving to an area that is higher in temperature. This can severely damage the PCB board and circuitry. This may shorten the life span of the device; damage the battery and cause the housing to deform.
- Do not throw or strongly vibrate the device. This may damage connectivity of the electronic parts and other sensitive components on the PCB board.
- Do not use any strong chemical or washing to cleanse the device.
- Do not use any coloring materials on any removable parts which my cause poor connections and may keep the device from function properly.

All the above applies to the purchased products, battery and other packaged items. If any unusable or damaged items are found please return the product to your nearest authorized repairing center.

FCC Statement:

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.

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.

Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.