



CS1000 Long Range Door Sensor

User Guide

Long-range, low-power door and window sensor supporting LoRaWAN or Coralink wireless protocols. Ideal for applications in smart-building, home automation, metering, and logistics.



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Contents

Getting Started.....	3
What's In the Box.....	3
Attaching to the Network.....	4
User Interface	5
Reset / Status Button	5
Status Indicators	6
About LoRaWAN	6
Terminology	6
Installation.....	7
Attaching the Door Sensor and Magnet	7
Alarms and Reports	9
Reset Notifications	10
Firmware Version.....	10
Replacing the Batteries	11
Configuration and Integration	13
Specifications.....	14
Ordering Information	15
Communication Options.....	15
Product SKU	15
FCC Statement	17



Getting Started

The CS1000 is a long-range, low-power door and window sensor supporting LoRaWAN or Coralink wireless protocols. The sensor provides configurable real-time alarms or regular reported statistics.

The sensor can be readily attached to doors, windows, or drawers and other equipment. The base unit detects the presence of a strong magnetic field (provided by the included magnet). Small and low profile, the sensor can be used for a wide variety of applications where magnetic triggered events or counting is required.

What's In the Box

The CS1000 door sensor package contains the following:

- ◆ Door Sensor
- ◆ Magnet

The door sensor is comprised of the main unit, the sensor, and a magnet. Each of these units have double sided tape to permanently attach the to smooth surfaces. See *Installation* for additional details and to learn more about attaching the sensors.

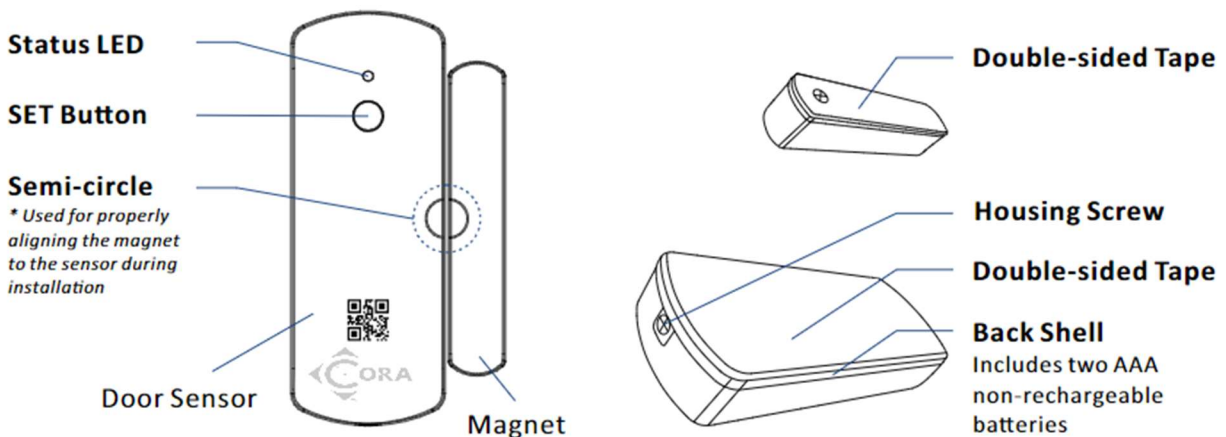


Figure 1 - Door Sensor Components



Attaching to the Network

The device is shipped in a factory hibernate state. Once the sensor is removed from the packaging, it can be activated by pushing the SET button once.

The device will activate, blinking orange four times and begin issuing join requests. The LED status indicators is shown in the figure below.

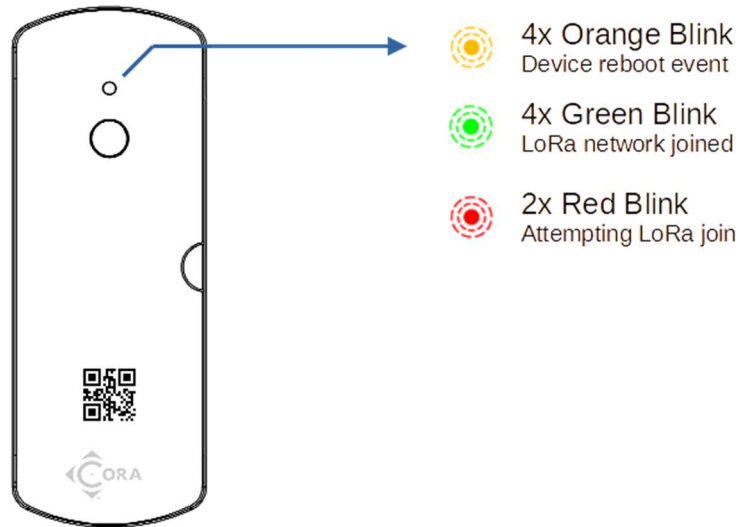


Figure 2 – CS1000 LED Status Indicators

Periodically, the device will blink red twice while attempting to join. Assuming the device is properly registered on an available network and in range, it should connect. It will blink green four times to indicate it has joined.

Once joined, the device can be tested by moving the magnet away and near the main unit sensor. By default, the device will generate open and closed alarms to notify the application that the events have occurred. If the magnet remains away too long from the main sensor unit, time alarms may also be issued.

Note: If the device has not joined within a few minutes, the LED will stop blinking, though it will continue try to join: ten times in the first hour, then longer intervals over the first week until finally attempting once every 12 hours. This is done to conserve battery power when the network is not available for long periods of time. You may reset the join schedule by performing a Network Reset on the device, see *User Interface*.

To learn more about the capabilities of the CS1000, see *Configuration and Integration*.



User Interface

Reset / Status Button

The CS1000 user interface is comprised of the LED status indicators (Figure) and the button shown below. Pressing the button quickly, will indicate the current network status discussed previously.

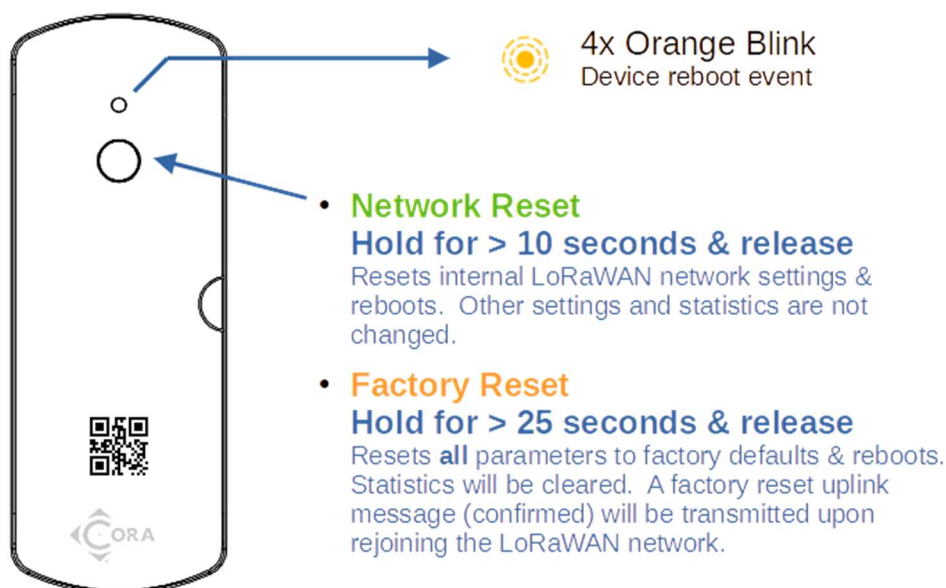


Figure 3 – Performing Network or Factory Reset on the Door Sensor

Holding the button will perform a network or factory reset:

- ◆ **Network Reset** – Press and hold the key button for 10 seconds, but less than 25, then release. The device will reset all LoRaWAN Settings which do not affect device operation and reboot. Following reboot, a reset event uplink (confirmed) will be sent upon rejoining the LoRaWAN network.
- ◆ **Factory Reset** – Press and hold the key button for > 25 seconds, then release. The device will reset all parameters to factory defaults. Following reboot, a Factory Reset event uplink (confirmed) will be sent upon rejoining the LoRaWAN network.



Status Indicators

A single button press will indicate the network status. The following table summarizes all the LED indicators.

LED	Status
Fast Red Blink Two (2) Times	Not Joined
Fast Green Blink Four (4) Times	Joined
Slow Red Blink Two (2) Times	Joining Network
Slow Green Blink Four (4) Times	Joined Network

Network status blink occurs up to 50 times. Single button press will resume status blink for another 50 cycles.

About LoRaWAN

LoRaWAN is a low-power, secure, wide area (LPWAN) networking protocol designed to wirelessly connect devices to the internet in regional, national, or global networks. To use the CS1000 Door Sensor, wireless connectivity to an internet connected LoRaWAN gateway is required.

For more information about LoRa and LoRaWAN visit the LoRa Alliance webpage: <https://loro-alliance.org/>.

Terminology

- ◆ Message sent from the Door Sensor to the network are referred to as “uplink messages” or “uplinks”.
- ◆ Messages sent to the Door Sensor from the network are referred to as “downlink messages” or “downlinks”.
- ◆ Both uplink and downlink messages may be of either “confirmed” or “unconfirmed” type. Confirmed messages are guaranteed to be delivered but will consume extra wireless bandwidth and battery life. These mechanisms are analogous to TCP (confirmed) vs UDP (unconfirmed) protocols used for IP networks.
- ◆ Before a device, such as the CS1000 Door Sensor can transmit messages using LoRaWAN it must go through a “join” process. The Join process involves key-exchange with the cloud-hosted network provider (The Things Network, Helium, etc.) and is defined in the LoRaWAN protocol standard. If connectivity is lost due to RF interference, power loss or other temporary internet outages, the device will need to rejoin the network prior to being able to transmit messages. This process happens automatically but is managed in a battery-efficient manner and may take significant time.



Installation

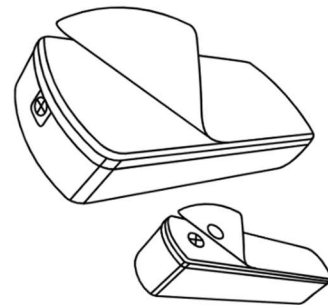
1. The sensor and magnet are very difficult to relocate after being affixed to the mounting surface. Test the sensor and magnet location before affixing the device to the surface. Use masking or painter's tape to secure the sensor and magnet to the surface (align the semi-circle on magnet with the semi-circle on sensor). Once the sensor and magnet temporarily are mounted, test it to ensure that generates open and closed alarms .
2. Be sure the installation gap between the sensor and magnet is within 0.4 inch and the semi-circle on the magnet is aligned with the semi-circle on the sensor body when closed.
3. Avoid exposing the sensor to strong impacts of vibration. The sensor body should be mounted on the fixed part (frame) of a door or window, while the magnet should be mounted to the movable part of the door or window.
4. The sensor operates with a magnetic reed-type switch. Take care to install away from other strong magnetic fields or spurious alarms could occur.

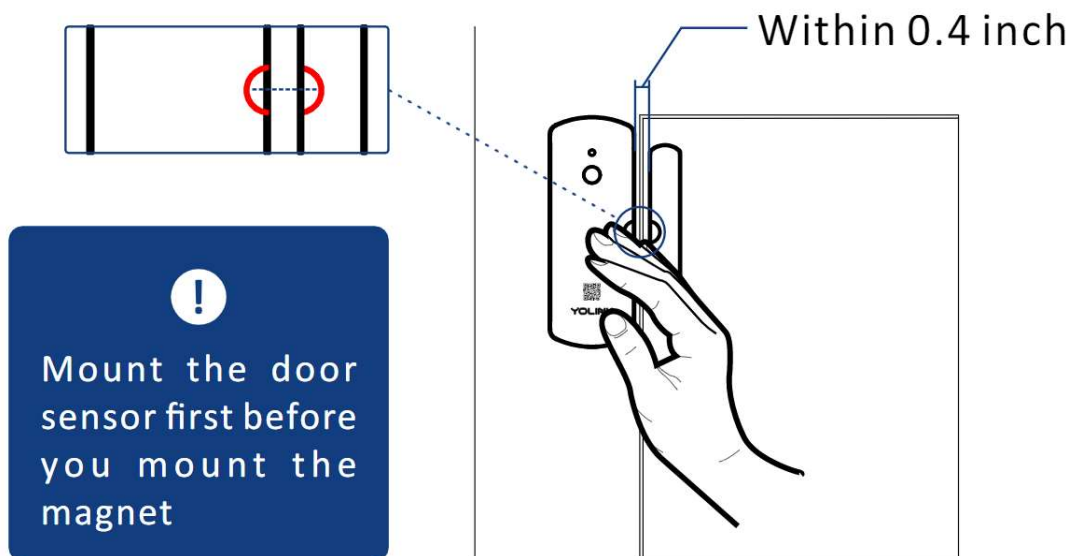
Attaching the Door Sensor and Magnet

1. Clean the Installation Area:

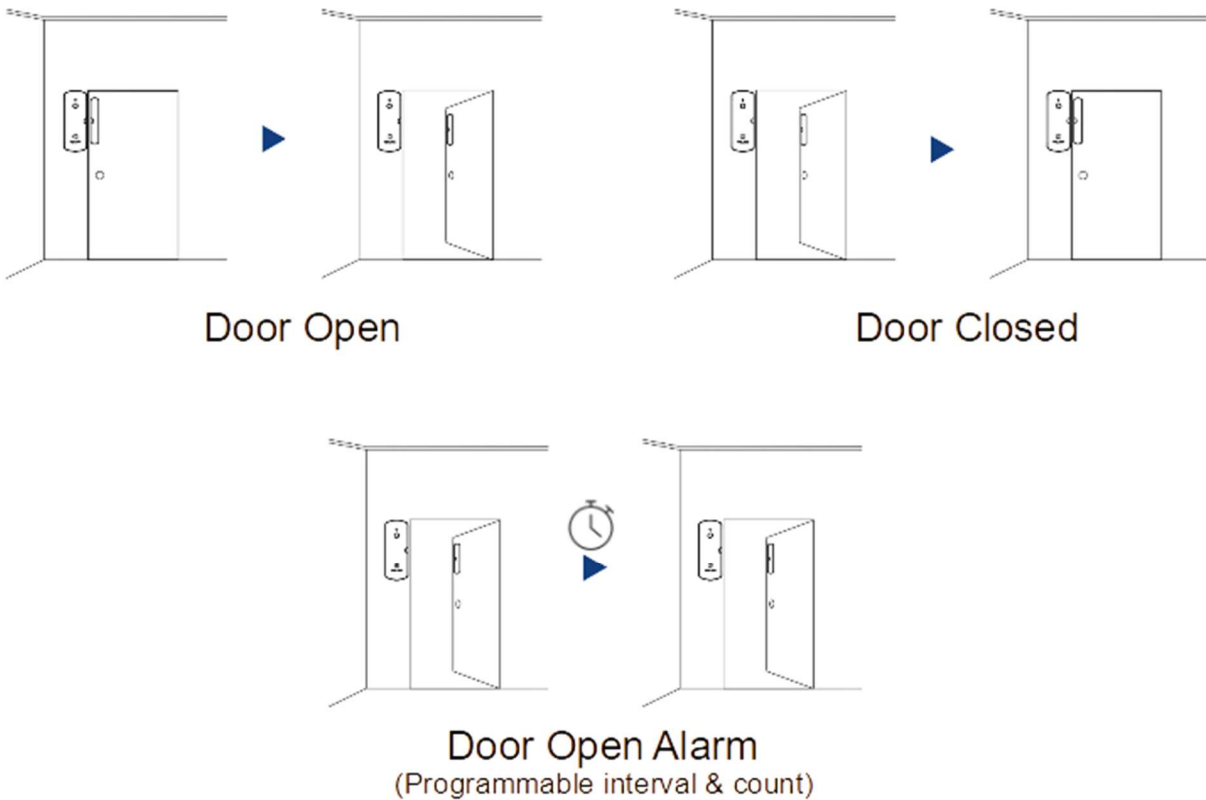


2. Remove the protective layer from the rear of sensor and place it in the desired position (fixed part of door or window) and press firmly for at least 5 seconds.
3. Remove protective layer from rear of magnet and align the magnet semi-circle with the body semicircle, press firmly for at least 5 seconds.





Alarms and Reports



The CS1000 Door Sensor has three standard alarm messages enabled by default:

- ◆ **Door Open Alarm** – Sensor changed from closed state to open state.
- ◆ **Door Closed Alarm** – Sensor changed from open state to closed state.
- ◆ **Door Open Alarm Timeout** – Door has not closed within the specified time period. This alarm is optional and must have the interval and count configured prior to use.

Additionally, statistics can be enabled providing regular reports of sensor event activity:

- ◆ Door Open Counter
- ◆ Door Closed Counter
- ◆ Lifetime Door Closed Time
- ◆ Lifetime Door Open Time
- ◆ Min/Max Door Closed Duration
- ◆ Min/Max Door Open Duration



Statistics are stored in non-volatile memory and will persist through a battery change or dead battery. Both the statistic reporting and alarms can be configured remotely by sending downlink messages.

The sensor has a periodic Heartbeat / Battery-status message that must be sent to maintain LoRaWAN network connectivity and provide battery status information. The default period for this message is 60 minutes and may be configured between two (2) minutes minimum and 48 hours maximum

Reset Notifications

After any type of device reboot a Reset Event uplink message (confirmed) will be sent.

Firmware Version

The firmware information can be retrieved via sending a downlink command. See *Configuration and Integration* for details.



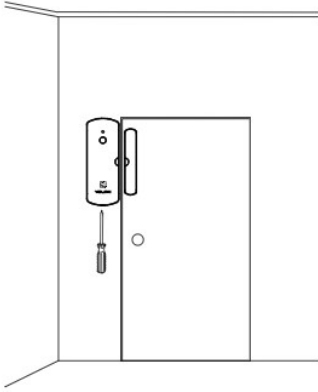
Replacing the Batteries

1. Remove the housing screw using a small Phillips screwdriver.

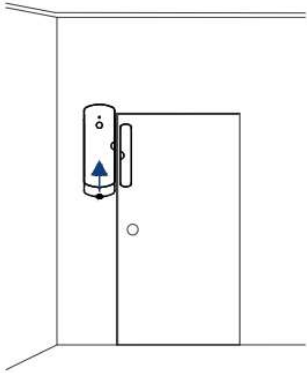
Tools Required:



Small Philips Screwdriver



2. Push the sensor body upwards and gently remove the sensor by pulling outwards.



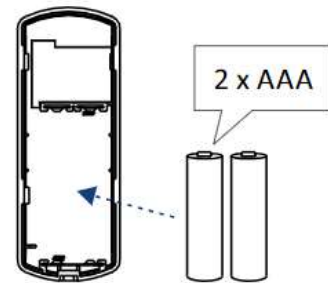
3. Remove old batteries and dispose of in accordance with your local regulations.



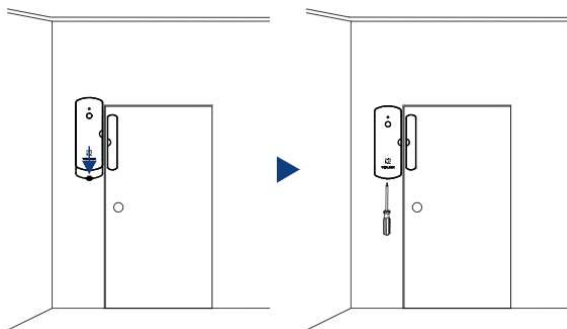
4. Install two new AAA batteries.

Note: Do not mix old and new batteries!

5. Reassemble the sensor and tighten the screw.



6. Verify the sensor is functioning. The sensor will rejoin the network prior to communicating.



Configuration and Integration

Door Sensor supports the following settings and features, which are configured via downlink messages.

Configuration	Description	Units	Default
Door Open Alarm Interval	Controls how often the Door Open Alarm is sent	minutes	0: disabled
Door Open Alarm Count	Controls the maximum amount of Door Open alarm messages sent after the state occurs	count	0: disabled
Heartbeat / Battery Interval	Controls how often the heartbeat message is uplinked	minutes	180
Statistics Interval	Controls how often the statistics are uplinked. Setting this value will cause 1 statistics uplink immediately.	minutes	0: disabled
Clear Statistics	Downlink this message to clear the stored statistics	N/A	N/A
LED Mode	- LED OFF (Stealth Mode) - LED ON (Telemetry Only) - LED ON (Sensor and Telemetry)	N/A	LED ON (Sensor and Telemetry)
Door Alarm Confirm / Unconfirmed Setting	Set Alarm Uplink Messages to LoRaWAN confirmed or LoRaWAN unconfirmed mode.	N/A	CONFIRMED MESSAGES
Alarm Enable	Enable or Disable Door Open / Close alarms. If disabled, effectively allows the sensor to operate as a counter / statistic only device.	N/A	enabled
Firmware Version	Downlink this message to retrieve the firmware information	N/A	N/A

For information on decoding and encoding the sensor messages please visit the product page at <https://www.codepoint.xyz/devices-cora-doorsensor.html>.



Specifications

- ◆ LoRaWAN v1.03 Class A, Coralink™ Class A device
- ◆ U.S. 923 MHz, E.U. 868 MHz, China 470 MHz, and other frequencies available
- ◆ Color: White
- ◆ Sensor Magnetic Trigger Distance: 0.3 – 1.0 inches (8 – 25 mm)
- ◆ **Dimensions:**
 - Door Sensor [L x W x D]: 3.27 x 1.22 x 0.59 inches (83.06 x 30.99 x 14.99 mm)
 - Magnet [L x W x D]: 2.48 x 0.44 x 0.47 inches (62.99 x 11.18 x 11.94 mm)
- ◆ Multi-color status LED (front)
- ◆ Set button (front)
- ◆ Power: 2 AAA batteries (3V DC)
- ◆ **Environmental:**
 - Operating Temperature Range: 32°F – 122°F (0°C – 50°C)
 - Operating Humidity Range: < 95% non-condensing
- ◆ Intended for indoor use only



Ordering Information

Communication Options

Prior to ordering, determine the communication requirements:

- ◆ **Application Protocol:** Untethered XMF or CP-Flex OCM
- ◆ **Network Protocol:** LoRaWAN or Coralink
- ◆ **Operating Region and Frequency:** US915, EU868, CN470 (others available upon request)
- ◆ **Network Provider:** TTN, Helium, Chirpstack, etc.

Product SKU

When placing an order use the following SKU structure to determine, the specific version, profile, hardware revision, and packaging needed for the application.

The specification below identifies the SKU field and character length.

[id: 6]-[version:2]-[Profile:5]-[Packaging:2]

The fields are defined as follows.

Field name	Character Length	Description
ID	6	Component four (6) character identification code, Available options: CS1000 – Revision A Cora Door Sensor
Version	2	Component version specification identifying one or key variations that differentiate this version of the component relative to others. Available options: UL – Untethered XMF Application / LoRaWAN protocols CL – Cora OCM / LoRaWAN protocols CC – Cora OCM / Coralink protocols
Profile	5	Profile code specifies a configuration that may be unique for an implementation. Available options: US9HT – U.S. 915 MHz Region supporting Helium, TTN sub-band 2. EU8ST – Europe 868 MHz region standard configuration CN4EZ – China 470 MHz region Easylinkin (Linkware) network configuration Other profiles are available upon request.



Packaging	2	Packaging configuration. This code identifies the packaging format for the device. Available standard options: 00 – Standard reseller packaging. Device identification details included. 01 – Solution provider / reseller packaging. Only manufacturing ID provided. Provider receives CSV file with all identifiers to load into their database. 0X – Custom packaging option. Contact Codepoint for further information.
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Example SKUs:

- ◆ **CS1000-UL-US9HT-00** – Door sensor for U.S. region, untethered, supporting Helium and TTN sub-band 2.
 - ◆ **CS1000-UL-EU8ST-01** – Door sensor for Europe region, untethered, standard configuration, packaged for solution provider distribution.
- CS1000-CL-US9HT-00** – Door sensors configured for Cora OCM and CP-Flex cloud stack integration, Supports OCM V2 protocol specifications.



FCC Statement

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
- ◆ Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- ◆ Increase the separation between the equipment and receiver
- ◆ 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
 2. This device must accept any interference received, including interference that may cause undesired operation.

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

Note: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

FCC RF radiation exposure statement

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This device and its antenna must not be co-located or operating in conjunction with any other antenna or transmitter. "To comply with FCC RF exposure compliance requirements, this grant is applicable to only Mobile Configurations. The antennas used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter."

