CORA

CS1060 Temperature & Humidity Sensor

User Guide

Long-range, low-power temperature and humidity 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

The CS1060 is a long-range, low-power, temperature, and humidity sensor supporting LoRaWAN or Coralink wireless protocols. The sensor has highly accurate thermometer and hygrometer with standard and custom configuration profiles supporting a variety of applications in the home and business. The sensor offers user-definable notifications, periodic sampling, and statistics reporting delivering optimal monitoring and data collection.

Deploy the sensor in any location, where temperature monitoring is required:

♦ Ensure refrigerators and freezers maintain constant temperature;

♦ Monitor the temperature of rooms and animal shelters;

♦ Detect freezing temperatures before water pipes freeze;

♦ Monitor environmental changes in and around the home and business.

What's In the Box

♦ CS1060 Sensor

The sensor is self-contained and is watertight. Once activated, the sensor can be placed in areas where accurate temperature and humidity monitoring is required. See page 9 for details and to learn more about proper placement.
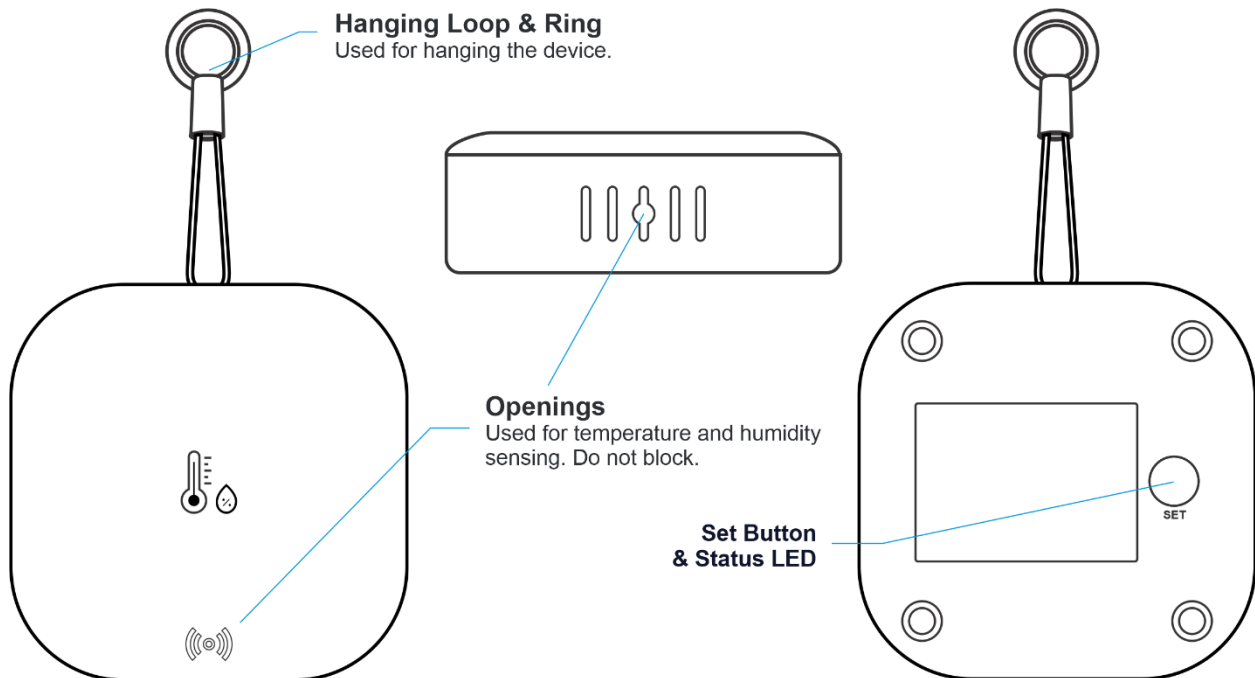

Figure 1 – CS1060 Temperature & Humidity Sensor

Registering the Device

This step requires a third-party mobile application, which can register new devices. Please follow the application instructions for registration. Cora devices are typically registered by scanning the QR code printed on the device housing or attached label.

Attaching to the Network

Once the device is registered, it can be activated by pressing the set button.

The device will activate, blinking orange four times and begin issuing join requests. The LED status indicators is shown in the figure below.
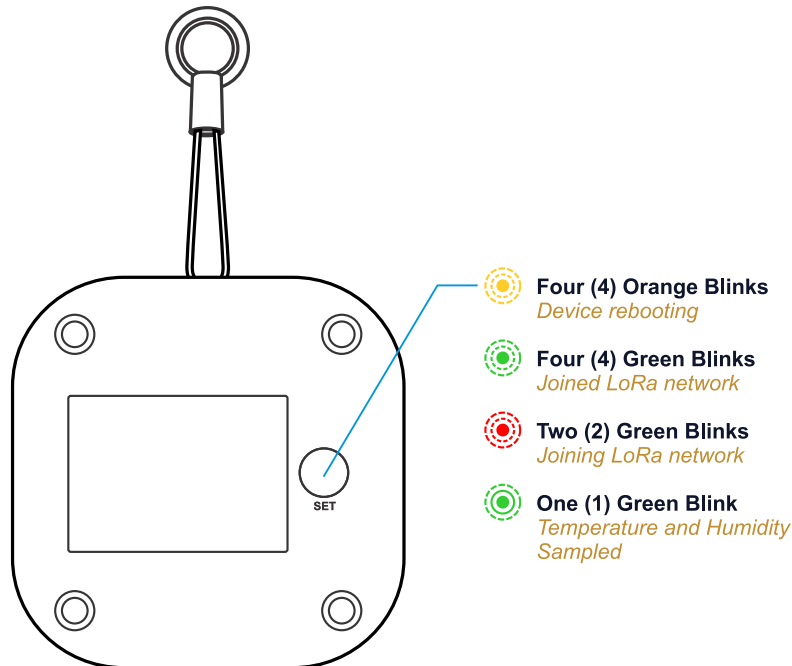
Four (4) Orange Blinks
Device rebooting

Four (4) Green Blinks
Joined LoRa network

Two (2) Green Blinks
Joining LoRa network

One (1) Green Blink
Temperature and Humidity Sampled

SET

Figure 2 – CS1060 LED Status Indicators

Periodically, the CS1060 will blink red twice when joining the network. Assuming the device is properly registered on an available network and in range, it should connect. It will blink green four times indicating it has joined.

Note: If the CS1060 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.*

User Interface

Set Button

The CS1060 user interface consists of the LED status indicators (Figure 2) and the set button located on the underside of the device. Pressing the button once will uplink current temperature and humidity measurements and indicate the current network status discussed previously.
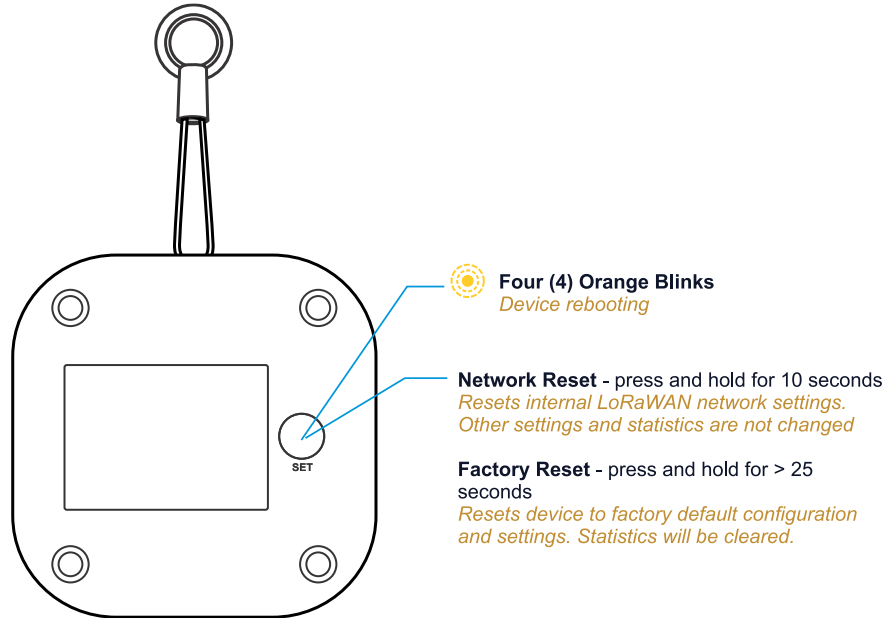

Four (4) Orange Blinks
Device rebooting

Network Reset - press and hold for 10 seconds
Resets internal LoRaWAN network settings. Other settings and statistics are not changed

Factory Reset - press and hold for > 25 seconds
Resets device to factory default configuration and settings. Statistics will be cleared.

Figure 3 – Performing Network or Factory Reset

Holding the button will perform a network or factory reset:

♦ **Network Reset** – Press and hold the SET button for 10 seconds, but less than 25, then release. The device will reset all LoRaWAN Settings, which does not affect device operation or configuration. Following reboot, a reset event uplink (confirmed) will be sent upon rejoining the LoRaWAN network.

♦ **Factory Reset** – Press and hold the SET 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
Continuous Red/Green Blink	Select Configuration Mode

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

Selecting Operating Configuration

The CS1060 can be configured through a series of button presses to operate in one of the available default settings. Select one of the following settings based on the application requirements.

Default Configuration	Description	Button Presses
Continuous Sampling (DEFAULT)	Continuous periodic reporting of temperature and humidity every 15 minutes. Battery health check sent once per day. This configuration is good to monitor changes in temperature and humidity over long periods of time, creating a stable sample set. This configuration is typically used for monitoring outdoor weather conditions. The device ships with this configuration as the default. Generates 96 uplinks per day (2,920 per month; about 35,040 per year). Battery life is typically 2+ years.	1
Rapid Change Detection	Monitors changes in temperature using 1 minute sampling. Notifies when temperature or humidity exceeds thresholds and reports readings hourly. Battery health check sent once per day. Sends notifications whenever conditions exceed the following: • Any relative temperature change of 0.9°F (0.5°C) on average (5 minutes running average);	2

	• Any relative humidity change of 10% on average (5 minutes running average); • Any changes of temperature exceeding 3.6°F (2°C) per minute. This configuration is useful for monitoring temperature changes in refrigerators and freezers, where rapid changes in temperature can indicate a door was left open. Also detects long-term changes to indicate potential equipment failure. Battery life is typically 2+ years.	
Extreme Long Life	Monitors changes in temperature using 10-minute sampling interval. Notifies when temperature or humidity exceeds thresholds and reports readings twice daily. Battery health check sent once per day. Sends notifications whenever conditions exceed the following: • Any relative temperature change of 0.9°F (0.5°C) on average (50-minute rolling average) • Any relative humidity change of 10% on average (50-minute running average) This configuration is useful for long term monitoring temperature changes with equipment indicating potential equipment failure. Battery life is typically 5+ years.	3

To change the Sensor configuration:

1. Press the button slowly three (3) times (about 2 – 3 presses per second max) to enter the configuration selection mode. The device will alternate green/red blink pattern continuously once entered.

2. Then press the button slowly the corresponding number of times (e.g., 1,2, or 3) to select the desired configuration.

3. If pressed more than four (4) times, the selection will be cleared and a new selection specified. If no selection is made in 30 seconds, the device will exit configuration mode without changes.

4. Once the choice of configuration is made, the device will stop the blink pattern, wait 30 seconds for no further input, apply the configuration change, and perform a network reset.

5. After reset, the Sensor will be in the new operating mode.

The device configuration can also be changed using one or more of the configuration downlink messages. Custom configurations are possible as well. Consult your application provider for support.

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 CS1060 Sensor, wireless connectivity to an internet connected LoRaWAN gateway is required.

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

Terminology

♦ Message sent from the Sensor to the network are referred to as "uplink messages" or "uplinks".

♦ Messages sent to the 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 CS1060 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.

Device Placement

The CS1060 can be hung or placed on a shelf.

♦ **Wall-mounting:** using the mounting ring, hang the sensor on the wall, using a nail, screw, or other secure object.

♦ **Surface-, Shelf-, or countertop-mounting:** place the sensor on a stable surface so that it will not fall off or be knocked down.

Notes for Proper Use

6. The sensor must <u>NOT</u> be submerged.

7. For accurate readings, do not obstruct the opening on the sensor.

8. Do not place the sensor on or near sources of extreme heat or cold.

9. While this device is designed for outdoor use, refer to the environment operating range information on page 14. Use of this device for applications outside of the environmental operating range is likely to damage the sensor, which is NOT covered by the warranty.

Event Notifications and Reports

The CS1060 Sensor has six (6) configurable event triggers that can be used to monitor the changing temperature and humidity conditions. When event thresholds are exceeded, the Sensor uplinks a notification indicating the event and current temperature conditions. Using the configuration messages for the device, the Sensor can report the following information:

♦ **Event Notifications** – Triggered notifications based on evaluating sampled temperature and humidity data.

♦ **Periodic Reports** – Report samples of temperature and humidity data. Can configure intervals from one minute to 44 days.

♦ **Periodic Statistics** – Report temperature and humidity statistics at regular intervals from one minute to 44 days.

Statistics reports provide:

♦ Average values

♦ Maximum/ Minimum values

♦ Variances

♦ Count of samples

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

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

Reset Notifications

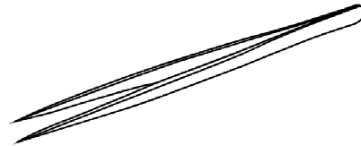FACTORY RESET uplink messages will be sent after rebooting.

Firmware Version

The firmware information can be retrieved via sending a downlink command.

Replacing the Batteries

A small Philips screwdriver and tweezers are needed to replace the batteries.


Small Philips
Screwdriver

Tweezers

- TO MAINTAIN THE WATERTIGHT DESIGN OF THE TEMPERATURE AND HUMIDITY SENSOR, USE EXTREME CARE AND FOLLOW THE BATTERY REPLACEMENT INSTRUCTIONS CLOSELY.

- DO NOT MIX OLD AND NEW BATTERIES

- MAKE SURE THE BOTTOM SHELL AND SEALED RUBBER PADS ARE TIGHTLY SECURED. OTHERWISE, THE ENTRY OF WATER INTO THE SENSOR MAY CAUSE SEVERE DAMAGE.

- BE SURE TO REPLACE BATTERIES WITH TWO LITHIUM NON-RECHARGEABLE AAA BATTERIES. ALKALINE BATTERIES DO NOT PERFORM AS WELL IN EXTREME TEMPERATURE CONDITIONS.
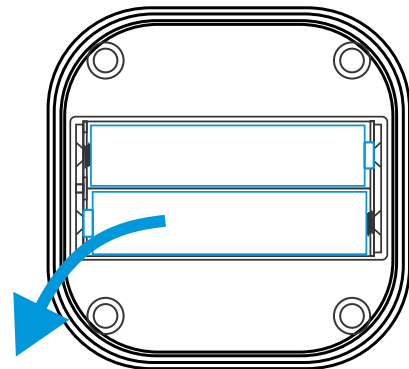
Procedure

10. Use Tweezers to take out the four sealed rubber pads at the base of the device.
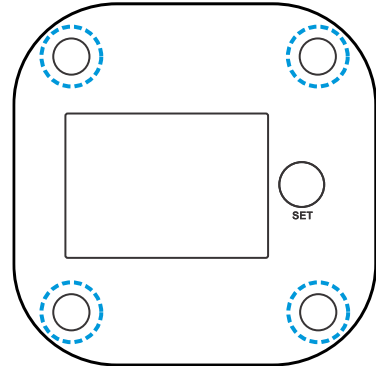
11. Use a screwdriver to unscrew the screws at the base of the device and remove the base.
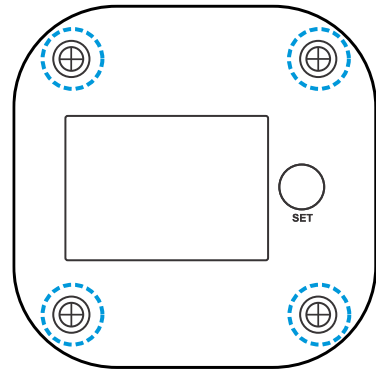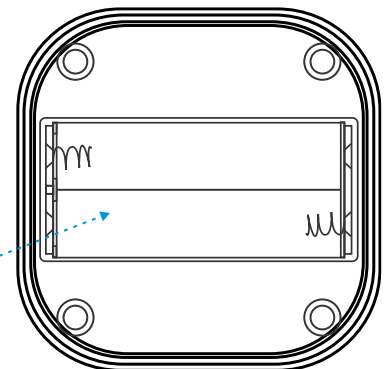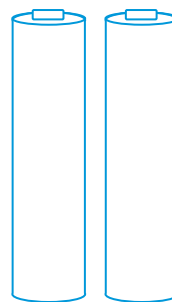
12. Remove existing batteries and recycle.

13. Install two new lithium AAA non-rechargeable batteries.

    Do not mix old and new batteries,

2 x AAA

Configuration and Integration

The CS1060 supports the following settings and features, which are configured via downlink messages.

Configuration	Description	Units	Default
Heartbeat / Battery Interval	Specifies the heartbeat message uplink interval	minutes	1440 (24 hours)
Statistics Interval	How often the statistics are uplinked.	Minutes	0: disabled
Clear Statistics	Downlink this message to clear the stored statistics	N/A	N/A
Reset Configuration	Select one the available default configurations. See page 6.	N/A	Continuous Sampling
Custom Notification Triggers	Define up to six (6) triggers to tailor the temperature / humidity monitoring and notification reporting	N/A	*See Default Configurations*
LED Mode	• LED OFF (Stealth Mode) • LED ON (Telemetry Only) • LED ON (Sensor and Telemetry)	N/A	LED ON (Sensor and Telemetry)
Notification Confirm / Unconfirmed Setting	If set to true, notifications are confirmed uplink messages. Set to false to uplink without confirmation.	N/A	CONFIRMED MESSAGES
Notification Enable	Enable or Disable notifications. If disabled, the sensor 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 Cora CS1060 Sensor - Codepoint Technologies.

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
- Dimensions [L x W x D]: 2.44 x 2.44 x 0.87 inches (62 x 62 x 22 mm)
- Multi-color status LED (underside)
- Set button (underside)
- Power: two (2) lithium, non-rechargeable AAA batteries (3V DC)
- **Environmental:**

    Operating Temperature Range: -22°F – 158°F (-30°C – 70°C)

    Operating Humidity Range: < 95% non-condensing

    Temperature Value Resolution: 0.1 °F/°C

    Humidity Value Resolution: 0.1%
- For Indoor and Outdoor Use
- IP Rating: IP67
- Typical Temperature Accuracy:

Degrees Fahrenheit (°F)		Celsius (°C)	
Range	Uncertainty	Range	Uncertainty
-40 – 14	±1.44	-40 – -10	±0.8
14 – 41	±0.72	-10 – -5	±0.4
41 – 140	±0.36	5 – 60	±0.2
140 – 176	±0.72	60 – 80	±0.4

- Maximum Temperature Accuracy:

Degrees Fahrenheit (°F)		Celsius (°C)	
Range	Uncertainty	Range	Uncertainty
-40 – 4	±2.7	-40 – -20	±1.5
4 – 32	±1.8	-20 – 0	±1
32 – 41	±0.9	0 – 5	±0.5
41 – 140	±0.72	5 – 60	±0.4
140 – 176	±1.35	60 – 80	±0.75

- Typical Humidity Accuracy (@ 77°F / 25°C):

% Humidity	
Range	Uncertainty
0 – 20	±3.5
20 – 80	±2
80 – 100	±3.5
41 – 140	±0.72

♦ Maximum Humidity Accuracy (@ 77°F / 25°C)

% Humidity	
Range	**Uncertainty**
0 – 20	±3.5
20 – 80	±2
80 – 100	±3.5
41 – 140	±0.72

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, Chirp stack, 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 details the SKU fields and character length.

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

The fields are defined as follows.

Field name	Character Length	Description
ID	6	Device six (6) character identification code, Available options: CS1060 – Revision A Cora Sensor
Version	2	Device 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 (Link ware) network configuration Other profiles are available upon request.

Packaging	2	Packaging configuration. This code determines 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.

Example SKUs:

♦ **CS1060-UL-US9HT-00** – Temperature & Humidity sensor for U.S. region, untethered, supporting Helium and TTN sub-band 2.

♦ **CS1060-UL-EU8ST-01** – Temperature & Humidity sensor for Europe region, untethered, standard configuration, packaged for solution provider distribution.

> **CS1060-CL-US9HT-00** – Temperature & Humidity sensor 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."