# PRODUCT DATASHEET

| Company Name | |
|---|---|
| **MODEL** | **ST-GM7400N** |
| **CUSTOMER APPROVAL** | |

☐ **CUSTOMER REMARK :**

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# S-TAG Datasheet

## S-Label (Electronic Label System)

## REV 1.0

Solu-M

2016-04-19

## Summary

This datasheet presents the general performance and specifications of S-Tag for S-Label ESL (Electronic Shelf Label) system, which is based on IEEE 802.15.4.

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# Document History

| Rev. | Date | Revision history | Page |
|------|------|------------------|------|
| 1.0 | 19 Apr 2016 | Initial release | - |
| | | | |
| | | | |
| | | | |

# 1 General Description

 This S-Tag product is a part of Solu-M S-Label (Electronic Shelf Label) system as well as S-Label Gateway (S-Gate), Remote controller (S-RC). S-Label system make up a system that electronically displays price and other product information on S-Tags, which has been traditionally printed or written on paper in places like retail markets.
 S-Tag receives product price/information updates from S-Gate and updates or changes its display of price and other information.

 S-Tag is the product based on IEEE standard 802.15.4 for low power wireless communication applications. S-Tag consists of RF transceiver, RF circuitry and 8051-compatible MCU offering IEEE 802.15.4 based network protocol and MAC protocol and other peripheral devices.
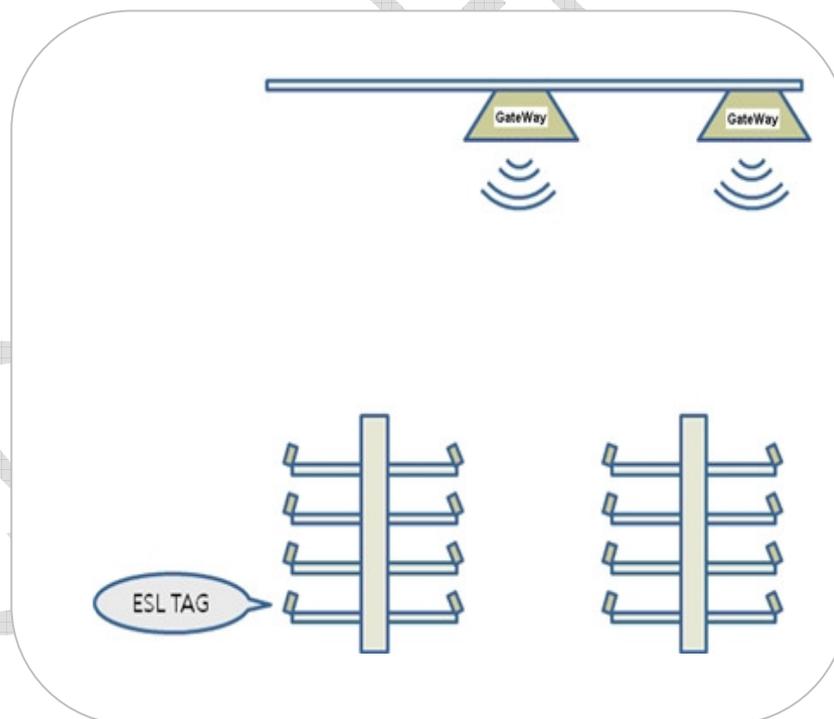
**Figure 1. S-Label System**

## 1.1 Features

- Display : E-Paper Display (EPD) (active type) (163.2 X 97.92 mm)
- Communication : Wireless communication based on IEEE 802.15.4
- Operating on 2.4GHz Unlicensed ISM band for ZigBee
- Low Power Consumption
- External Wakeup : RF Wakeup (using ISM Band(2.4GHz))
- Outline Dimension : 181 mm X 123 mm X 15.5 mm
- Case Color : White
- Working condition: Indoor where wireless communication is available.

## 1.2 Typical Applications

- Retail industry with electronic displays, platforms, solutions and services.
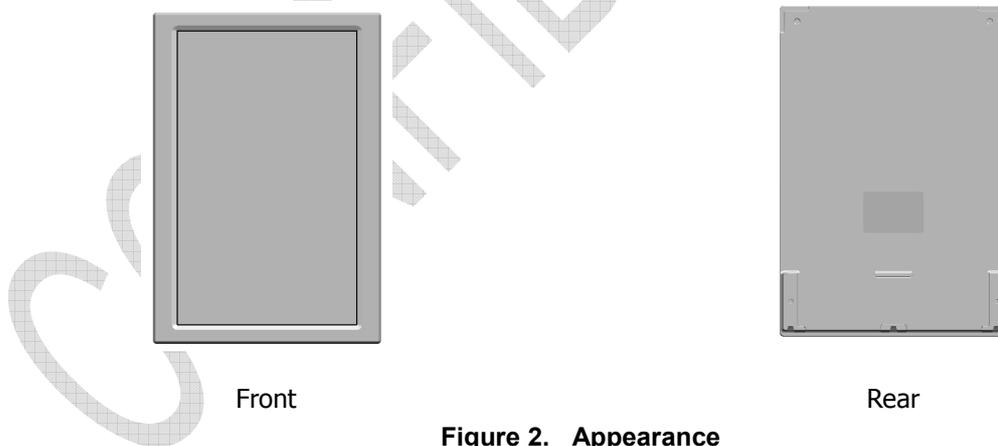- Intelligently communicating, managing, and optimizing price and product information.

Front                                    Rear

**Figure 2.   Appearance**

**Preliminary**

# 2 Specification

## 2.1 Product Specification

| Item | Description |
|---|---|
| Size | 181 mm X 123 mm X 15.5 mm |
| Battery | CR2450 Lithium Battery (3V)<br>2.5 ~ 3.3Vdc(condition : In active status) |
| Display | Electrical paper display ( active type ) (163.2 X 97.92 mm) |
| Housing Color | White |
| Information display | Price, Unit, Symbol etc. |
| Communication | Wireless communication based on IEEE 802.15.4 |
| Communication Distance | Radius 20m (Line of Sight) |
| Operation Temp. | 0 ~ 40 ℃ (@35~70% RH) |
| Storage Temp. | -20 ~ 60 ℃ |
| Etc. | No additional anti-theft locking structure : Rail Mounted only |

## 2.2 Radio (RF)[1] Specification

| Item | Parameter | SPEC | | | Unit | Condition |
|---|---|---|---|---|---|---|
| | | Min | Typ | Max | | |
| TX | Transmit Power | -4 | 2 | 6 | dBm | |
| | Error Vector Magnitude | | 10 | 30 | % | When measured for 100 chips |
| | Tx Current | | | 70 | mA | Total current at max Tx Power |
| RX | Receiver Sensitivity | -90 | - | - | dBm | PER < 1% |

[1] Test Channel : 2480MHz

## 2.3 NFC Specification

| Items | Parameter | spec. | | | Units | Condition |
|---|---|---|---|---|---|---|
| | | Min | Typ | Max | | |
| NFC | Read/Write Distance | - | 40 | - | mm | PCB status |
| NFC | Read/Write Distance | - | 30 | - | mm | Final Assy status |

## 2.4 Mechanical Drawing
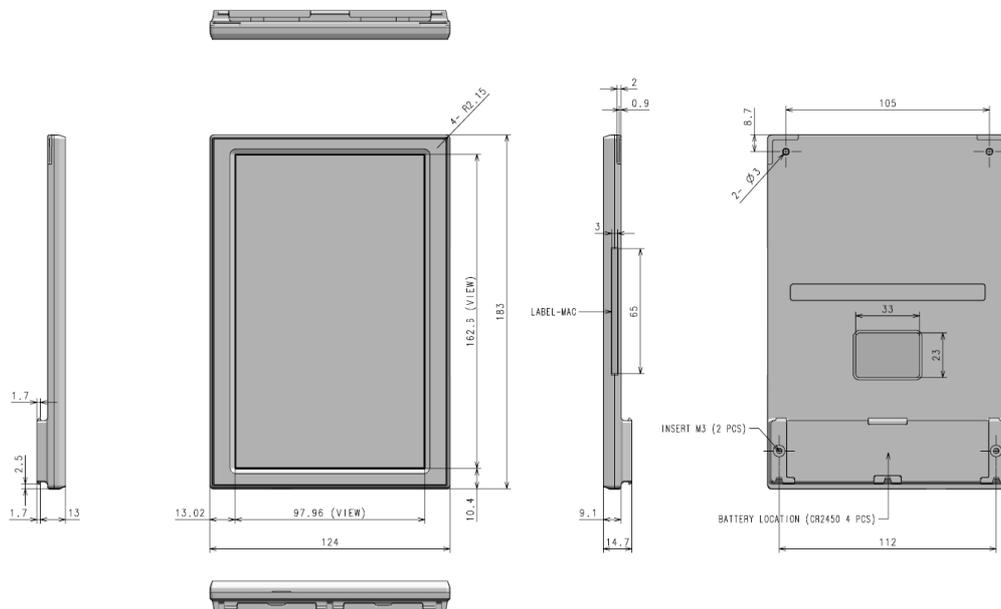


**Figure 3.  Mechanical Dimension**

## 2.5 Labels

### 2.5.1 Code Information

**Serial 1, 2 Code Value**

| 15 | Y | 5 | S | A | A | 2JW |
|----|----|----|----|----|----|----|
| ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ |

① Year : Last two digits of manufacturing year.

　　　(00 ~ 99, Example : 2015 is '15')

② Month : Manufacturing month

　　　(1 ~ 9, X(10), Y(11), Z(12))

③ Date : Manufacturing date

　　　(1 ~ 9, A(10) ~ V(31))

④ Vendor : Manufacturing vendor

　　　(D : Dongguan Solu-M, S : SEMTHAI, T : TSEM, etc)

⑤ Line number : Manufacturing Line number

　　　('A', 'B', 'C', etc)

⑥ Revision : Product revision number

　　　(A : First, B : Second, C : Third, etc.)

⑦ ZigBee IC Lot Number : Last 3 characters of Lot Number

　　　(Example : YME06862JW is '2JW')

① 년 / CODE

| 년 | CODE |
|----|----|
| 2009 | 09 |
| 2010 | 10 |
| 2011 | 11 |
| 2012 | 12 |
| 2013 | 13 |
| 2014 | 14 |
| 2015 | 15 |
| 2016 | 16 |
| 2017 | 17 |
| 2018 | 18 |
| 2019 | 19 |
| 2020 | 20 |
| 2021 | 21 |
| 2022 | 22 |

② 월 / CODE

| 월 | CODE |
|----|----|
| 1 | 1 |
| 2 | 2 |
| 3 | 3 |
| 4 | 4 |
| 5 | 5 |
| 6 | 6 |
| 7 | 7 |
| 8 | 8 |
| 9 | 9 |
| 10 | X |
| 11 | Y |
| 12 | Z |

③ 일 / CODE

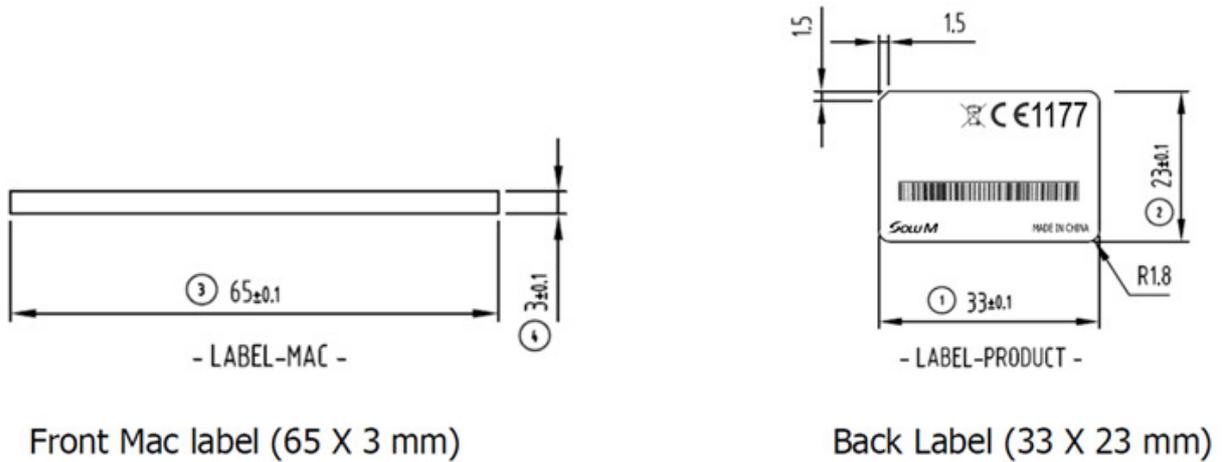| 일 | CODE |
|----|----|
| 1 | 1 |
| 2 | 2 |
| 3 | 3 |
| 4 | 4 |
| 5 | 5 |
| 6 | 6 |
| 7 | 7 |
| 8 | 8 |
| 9 | 9 |
| 10 | A |
| 11 | B |
| 12 | C |
| 13 | D |
| 14 | E |
| 15 | F |
| 16 | G |
| 17 | H |
| 18 | I |
| 19 | J |
| 20 | K |
| 21 | L |
| 22 | M |
| 23 | N |
| 24 | O |
| 25 | P |
| 26 | Q |
| 27 | R |
| 28 | S |
| 29 | T |
| 30 | U |
| 31 | V |

### 2.5.2 Mac Label Drawings



Figure 2.  Mac Labels

Product information is indicated in a printed sticker label. The information consists of MODEL (model name), MFD (manufacturing date), S/N (serial number), MAC (MAC address), certification mark, and Manufacture.

1) FCC ID : E2X-ST-GM7400N

2) Model Name : ST-GM7400N

3) MFD : (Month).(Date).(Year)    ex) APR.19.2016

4) S/N : Daily Production quantity (5 digits) & Serial Number Information (hexadecimal 10 digits)

5) MAC : barcode & barcode number(hexadecimal 16 digits)

- 6 digits (1st ~ 6th) : XXXXXX (Company code)

- 6 digits (7th ~ 12th) : XXXXXX (Increasing number : 000000 ~ FFFFFF)

- 4 digits (13th ~ 16th) : 705X

# 3  Operation Test

- Equipment : Gateway(S-Gate), R/C, Jig for power supply
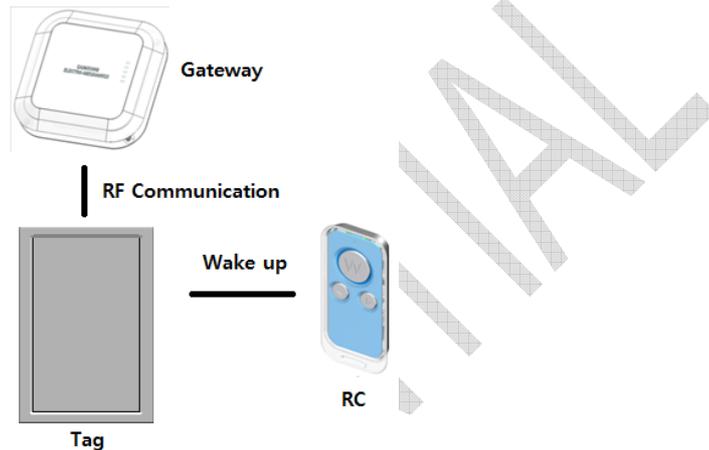- Target DUT : EPD TAG



**Figure 3.  Operation Test**

- **Test Scenario**
  ① Install Tag on Jig
  ② Ready to Gateway(S-Gate) and R/C
  ③ Tag start to communicate with Gateway
  ④ Tag display the image received from Gateway and enter to sleep mode.
     (Display pattern : MAC → SCAN Icon → White)
  ⑤ wake up Tag with R/C
  ⑥ Check Tag (Display pattern : SCAN Icon → White)
  ⑦ Get off Tag from Jig.

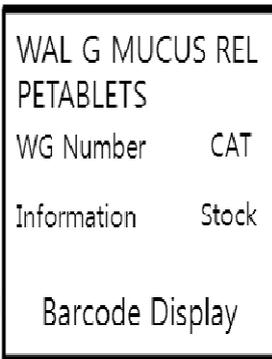- **Criterion** (Below both two conditions should be all satisfied)
  ① Good : You can see a White display.
  ② Compare MAC address with that of label attached to Side or Back plane.
  \* gateway lost / not found : You can see a diamond(◆) in the upper right corner.
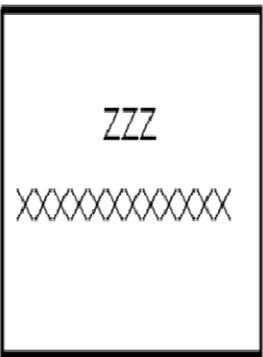
# 4 ESL Operation by display

It will be updated before 2<sup>nd</sup> release. Below is just a sample.

| Display | State | User Action |
|---------|-------|-------------|
| ZZZ<br><br>XXXXXXXXXXXX | STATE: 1<br><br>Initial display when shipped from the manufacturer (Tag version, MAC address). | None |
| ZZZ<br><br>XXXXXXXXXXXX | STATE: 1<br><br>No change. | To assign a tag using a PDA |
| ZZZ<br><br>XXXXXXXXXXXX | STATE 1 → 2<br><br>Searching for GWs (Tag version, MAC address and triangle). | A tag woken up by an RC |

| | | |
|---|---|---|
| WAL G MUCUS REL PETABLETS<br>**BUY 2 FOR**<br>19.99<br>OR $15 EA<br>60CT    Model# | STATE 2 → 4<br><br>A tag is connected to a GW and received price<br>(Price) | None |
| ZZZ<br>XXXXXXXXXXXX ◆ | STATE 2 → 3<br><br>A tag failed to locate a GW (Tag version, MAC address). | |
| WAL G MUCUS REL PETABLETS<br>WG Number    CAT<br>Information    Stock<br>Barcode Display | STATE 4 → 5<br><br>When a tag is connected to a GW, and woken up by an RC, Next page display predefined.<br><br>Display is end, tag wait 10 second wakeup signal by RC. When signal is detected in this time, immediately return first Page and Send Price Request to GW. No signal in this time, after 10 second return first Page and Same Operation. | Woken up by an RC |

| | | |
|---|---|---|
| WAL G MUCUS REL PETABLETS **BUY 2 FOR** 19.99 OR $15 EA 60CT Model# | STATE 4 → 6<br><br>Connection to a GW is lost (price and Rectangle on upper right corner) | None |
| WAL G MUCUS REL PETABLETS **BUY 2 FOR** 19.99 OR $15 EA 60CT Model# | STATE 6 → 6<br><br>When connection is lost and woken up by an RC<br><br>(blinks with the price and Rectangle)<br><br>Starts to search GWs. | Woken up by an RC |
| ZZZ XXXXXXXXXXX | STATE 4 → 1<br><br>Initial display<br><br>(Tag version, MAC address) | To clear an assigned tag using a PDA |

**SOLU M**
*Preliminary*

# 5 Package



Packing Pattern(Non Scale)

LABEL-BAG

TAG (WORLD)
PART NAME : XXXXXXXXXXXXX
PART NO   : XXX-XXXXX

LOT NO    : XXXXXX

Q'TY      : XXX PCS

LABEL-OUTBOX(L)

TAG (WORLD)
PART NAME : XXXXXXXXXXXXX
PART NO   : XXX-XXXXX

LOT NO    : XXXXXX

Q'TY      : XXX PCS

LABEL-OUTBOX(R)

TAG SIZE : H X W X D

COUNTRY : XXXXXX

ESEL VERSION : X.X

FIRMWARE VERSION : X.X
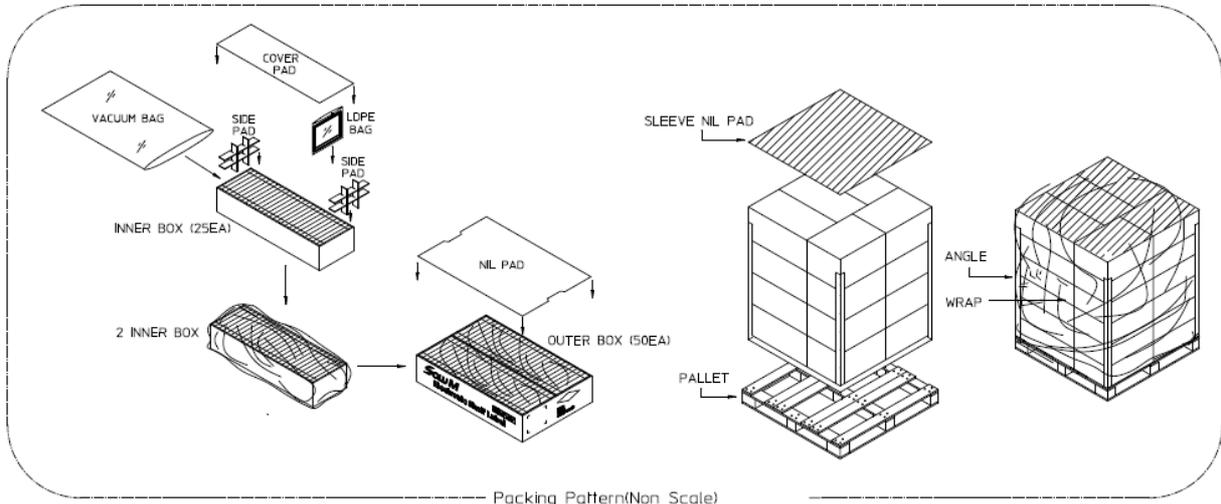
# 6 Cautions for Treatment

Provisions should be made to protect against any damage to the product caused by improper handling.

It is highly recommended that the product should be installed within 3 months from the date of arrival in the logistics hub. Recommended storage condition is in -20 ~ 60 Celsius degree, 35-70% RH environment.

This RF device operates on the 2.4GHz frequency band and can produce radio interference. The device, therefore, may not be used for applications where safety of human lives is concerned.

## 6.1 Usage Environment

Take extra cautions when using this RF device in the vicinity of other electronic devices and appliances. Most electronic devices and appliances use electromagnetic waves. Electromagnetic waves emitted by this RF device can affect other electronic devices and appliances.

If using the device in an explosion hazard area, follow all safety regulations, instructions, and signals.

## 6.2 Storage and Use

• Moisture and liquids can damage internal parts and circuit boards if allowed to enter into the device itself.

• Do not place or store the product on a sloped surface. The product may slide and fall off the surface and damaged.

• Use the product in temperatures ranging from 0℃ to +40℃. Parts and circuits may be damaged if used or stored under temperature extremes.

• The display panel needs extra care when handling.
  - Do not apply any impacts on outside since e-Paper display is fragile.
  - Continuous exposure to excessive moisture (over 70% RH) or UV makes display lifetime shortened.
  - Ghosting image may be appeared in temperature conditions of less than 15 Celsius degree.

• Avoid areas with strong magnetism or subject to magnetism. Contact between the device and a magnetic object can lead to malfunctions.

• Do not place the product near heat-producing kitchen appliances like a stove or a microwave or in the vicinity of highly pressurized containers.

- External impact to the product, such as from being dropped, can damage the product or battery casing can be separated.

- Twisting and bending the product can damage the exterior casing and the internal components.

- If this product operates abnormally in eliminating battery vinyl or replacing battery, you should discharge it by contacting battery terminal (+) and (-).

- This product uses 2.4GHz frequency band for wireless communication network. Radio communications can be limited or affected by other applications which share same frequency band, such as Wi-Fi, Bluetooth, ZigBee, etc.

- Frequent communications, updates and screen renewals may reduce battery life time.

## 6.3 Battery Replacement

### 6.3.1 Audience

Authorized persons with the following knowledge are allowed to replace the battery.

- Battery

- Electronic assemblies like circuit board

- Compliance of the instruction

※ Note : If not authorized person, it will not give any warranty.

### 6.3.2 Instructions

- Risk of explosion through incorrect battery replacement.

- Keep attention that your hands are dry before you start with replacement.

- When replace the battery, please contact right person and get a instructions.

※ Note : Battery rarely has a little stain or leak.

### 6.3.3 Steps

1. Open the battery cover.
2. Take out the batteries.
3. Put in the new batteries.
4. Check the batteries direction.
5. Put the battery cover.

**WARNING** : This equipment may generate or use radio frequency energy. Changes or modifications to this equipment may cause harmful interference unless the modifications are expressly approved in the instruction manual. The user could lose the authority to operate this equipment if an unauthorized change or modification is made.

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.

**NOTE** : 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

This device complies with FCC radiation exposure limits for an uncontrolled

  environment. Avoid operating this device at a distance less than 20cm from the user