User Manual

Airpoint LoRa Gateway

User Manual

(AirLOG S900G)

FCC Compliance 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.

CAUTION : Any Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment. 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.

A minimum separation distance of 20 cm must be maintained between the antenna and the person for this appliance to satisfy the RF exposure requirements.

Guideline & Warranty

The manufacturer is not responsible for loss caused by unauthorized modification of this product or interference with other devices. Such unauthorized modifications will void the user's authority as well as the warranty of the product.

Certification Information

Applicant	Airpoint.Co.LTD
Equipment Name	Lora Gateway (US902MHz)
Model Name	AirLOG S900G
FCC ID	WYFAPGL19NA01
Contains FCC ID	N7NHL8548
Manufacturer / Country	Airpoint.Co.LTD / Korea

1 Introduction

The AIrpoint® Wireless Gateway for LoRaWAN supports the LoRa™ physical layer technology and complies with the LoRaWAN specification defined by the LoRa Alliance™ to provide LPWA (Low Power Wide Area) wireless connectivity for low data rate, battery-powered devices and sensors. Through the unlicensed sub-GHz radio, a wide variety of Internet of Things (IoT) endpoints that require low power operation or long-range transmission distances can now be connected and located more economically than ever before. Example use cases include asset tracking, water and gas metering, environmental monitoring, waste management, smart street lighting, smart agriculture, parking sensors, asset trackers, environmental sensors, smoke detectors and many others.

LoRa

LoRa is a disruptive RF physical layer modulation technology that offers long-distance wireless connectivity, excellent power efficiency, very high receiver sensitivity, robust spectrum spreading, and securely encrypted transmissions. It operates on unlicensed Industrial, Scientific, and Medical (ISM) frequency for 902 - 928 MHz spectrum and spectrum subsets can be utilized in the Americas and in Asia-Pacific countries.

LoRaWAN

LoRaWAN is a MAC (Media Access Control) protocol specification defined by the LoRa Alliance that complements the LoRa physical layer. It is supported by an established ecosystem of LoRaWAN compliant devices that are available from multiple vendors, and which can be certified for interoperability by the LoRa Alliance.

The end-to-end LoRaWAN network architecture consists of four elements (Figure 1):

- Device: Endpoints such as water and gas meters, parking sensors, asset trackers, environmental sensors, or smoke detectors.
- Gateway: The wireless infrastructure required to provide radio coverage and packet forwarding for the devices, as well as IP backhaul to the network server.
- Network server: The centralized radio controller, which performs radio management, the provisioning and authentication of devices, and the delivery of the data to one or multiple application servers through a set of Application Programming Interfaces (APIs).

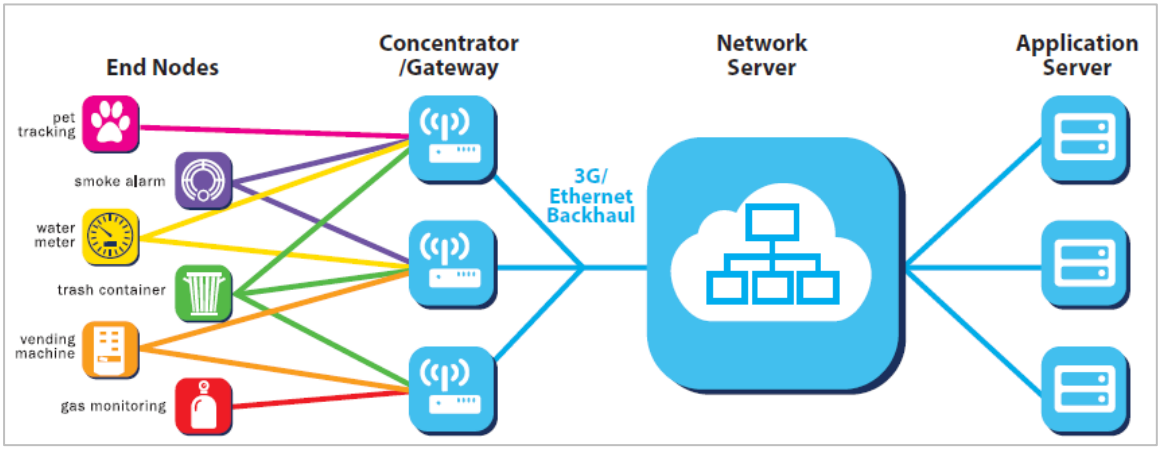

Figure 1. LoRaWAN Network Architecture

2 Hardware Overview

2.1 Mechanical

The AirLOG S900-G is composed of:

- The enclosure itself including
  - The casing
  - LAN Port : For connecting RJ45 POE
  - MS connector : For connecting RS422 (For Debugging)
  - N-Type Connector(F) : : For connecting LoRa antenna
  - N(F) to N(F) Type Adapter : For connecting enclosure and antenna
  - SMA connector(F) : For connecting 3G antenna

Mounting

Three different installation configurations are possible with the provided mounting kit:

- Pole mounting by U-bolt
- Wall mounting
- Metallic strapping mounting (tube, pipe, flue...)

2.2 Hardware

2.2.1 System

CPU

Cortex-A8 core processor ~ 1200 MIPS

Real time clock saved by battery

Hardware watchdog

Optimized power consumption management

Volatile memory

SDRAM (512 MB)

Non- volatile memory

eMMC (4GB),

2.2.2 User Interfaces

Internal LEDs

Operational status : power, software activity

RF Status : Rx & Tx

Internal push buttons

Manual station power on/off

Factory Reset.

2.2.3 Communications

LoRa

Modulation Technique : Digital Modulation

Incorporated to LoRa™ bidirectional communication technology

Sensitivity : -141 dBm @ SF12

Tx conducted power : 0 ~ 27 dBm

49 LoRa Demodulators over 9 channels

More than 10 km in sub-urban situation

WWAN

HSDPA/UMTS/GPRS/GSM/WCDMA

IMEI Inside

Ethernet

PoE (Power Over Ethernet) IEEE 802.3af alternative B 10/100 base T compliant

2.2.4 Sensors

Temperature/Humidity sensor

2.2.5 Power

PoE: 48V class 0

2.2.6 Mechanical

Dimension : 230 X 190 X 40 mm

Weight : 1.8 kg (including mounting kit)

2.2.7 Environmental

Full Operation Range : : -30 ~ +75 ℃

Ingress Protection : IP67

2.2.8 Antenna

Default antenna delivered with station is a 5.8dBi gain omnidirectional antenna.

3 Regional Parameters for US 902-928MHz ISM Band

3.1 Channel Frequency

The US ISM Band SHALL be divided into the following channel plans.

- Upstream – 64 channels numbered 0 to 63 utilizing LoRa 125 kHz BW varying from DR0 to DR3, using coding rate 4/5, starting at 902.3 MHz and incrementing linearly by 200 kHz to 914.9 MHz
- Upstream – 8 channels numbered 64 to 71 utilizing LoRa 500 kHz BW at DR4 starting at 903.0 MHz and incrementing linearly by 1.6 MHz to 914.2 MHz
- Downstream – 8 channels numbered 0 to 7 utilizing LoRa 500 kHz BW at DR8 to DR13 starting at 923.3 MHz and incrementing linearly by 600 kHz to 927.5 MHz

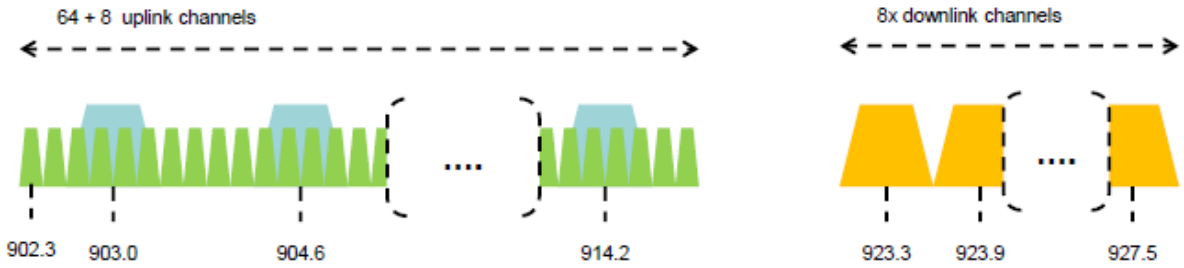

Figure 2. US902-928MHz Channel Frequency

Category	Channel	BW (kHz)	DR	Frequency (MHz)	Spacing
Upstream	0 ~ 63	125	0 ~ 5	915.2 ~ 927.8	200 kHz
	64 ~ 71	500	6	915.9 ~ 927.1	1.6 MHz
Downstream	0 ~ 7	500	8 ~ 13	923.3 ~ 927.5	600 kHz

3.2 Data Rate and End-point Output Power encoding

The following encoding is used for Data Rate (**DR**) and End-point EIRP (**TXPower**) in the US902-928 band:

Data Rate	Configuration (LoRa)	Indicative physical bit rate [bit/sec]
0	SF10 / 125 kHz	980
1	SF9 / 125 kHz	1760
2	SF8 / 125 kHz	3125
3	SF7 / 125 kHz	5470

4	SF8 / 500 kHz	12500
5:7	RFU	
8	SF12 / 500 kHz	980
9	SF11 / 500 kHz	1760
10	SF10 / 500 kHz	3900
11	SF9 / 500 kHz	7000
12	SF8 / 500 kHz	12500
13	SF7 / 500 kHz	21900
14	RFU	
15	Defined in LoRaWAN	

Note: DR4 is purposely identical to DR12, DR8..13 MUST be 496 implemented in end-devices and are reserved for future applications

4 LoRa Modem & RF specifications for US902-928MHz ISM Band

4.1 Main Characteristics

RF modem implements LoRa™ demodulators over 9 channels.

- 8 x 125 kHz Channels
- 1 x 500 kHz Channel

4.2 TX Performances

Transmit power is adjustable from 0dBm to 27 dBm.

TX band is 923 ~ 927 MHz.

Allowed Bandwidths for transmission is 500 kHz.

4.3 RX Performances

SF	BW (kHz)	Coding Rate	Data Rate (bps)	Sensitivity (dBm)
7	125	5/4	5469	-128
12	125	5/4	293	-141
7	500	5/4	21875	-122
12	500	5/4	1172	-134

5 Contact Information

Company Name : Airpoint Co. LTD.

Web : http://www.airpoint.co.kr

Sales : toona21@airpoint.co.kr, +82-42-484-5460

R&D : smartkim@airpoint.co.kr

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