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Femto Lite IoT Gateway

User Manual



Revision History

Revision	Date	Description	Author
.001	July. 09, 2021	First release	Vincent



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Chapter 1 – Introduction

Purpose and Scope

The purpose of this document is to describe the main functions, user manual, supported features, and system architecture of the WLRRTES-106 Femto Lite Indoor Gateway based on the latest LoRaWAN specification.

Product Design

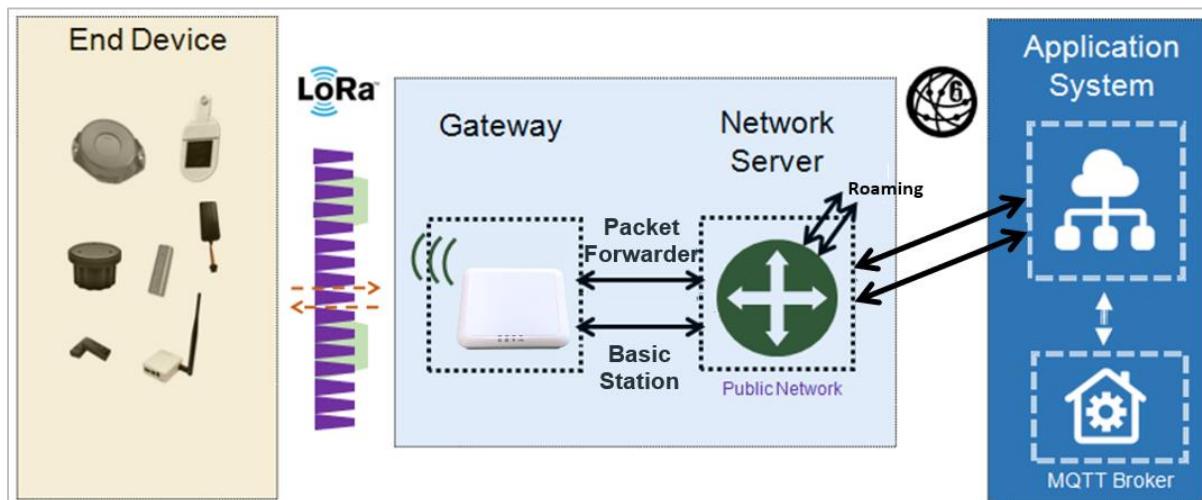
The dimension of WLRRTES-106 Femto Lite IoT Gateway is with the dimension of 116 x 91 x 27 mm, and with one LAN port, one Micro-USB port for 5V DC power input, four LED indicators, and one reset button.



Product Features

- Up to 8 concurrent channels for LoRa transmission
- Built-in 2.4G 802.11b/g/n Wireless LAN
- Various Internet connection: Ethernet, WiFi
- Support LoRaWan 1.0.3 packet forwarder and Basic Station mode (switched through local WEB GUI)
- Ethernet/WiFi Configuration through local Web GUI and APP
- Web UI for LoRa network server configuration
- Support Listen Before Talk for downlink
- Support F/W upgrade through Brownan OTA
- Internal antennas for LoRa and WiFi connection

System Architecture



Definitions, Acronyms and Abbreviations

Item	Description
LPWAN	Low-Power Wide-Area Network
LoRaWAN™	LoRaWAN™ is a Low Power Wide Area Network (LPWAN) specification intended for wireless battery-operated Things in a regional, national or global network.
ABP	Activation by Personalization
OTAA	Over-The-Air Activation
TBD	To Be Defined

Reference

Document	Author
LoRaWAN Specification v1.0.3	LoRa Alliance
RP002-1.0.1 LoRaWAN Regional Parameters	LoRa Alliance
LoRaWAN Backend Interfaces Specification v1.0	LoRa Alliance

Chapter 2 – Hardware Details

LED Indicators

LED sequence: Power(System), WAN, WiFi, LoRa

Four Blue

Solid LED is for static status, blanking means system is upgrading or active devices linked to the corresponding port

	Solid On	Blinking	Off
Power System(Blue)	Power ON	Booting (ignore bootloader)	Power Off
WAN(Blue)	Ethernet Plug and got IP Addr	Connecting	Unplug
Wireless(Blue)	WiFi Station Mode and got IP Addr	Connecting	Wireless Disable
LoRa(Blue)	LoRa is work	Connecting	LoRa is not work

Table 1 LED Behaviors



Figure 1 – IO Ports

I/O Ports

Port	Count	Description

RJ45	1	WAN port of the device
Reset	1	Reset to default (5 seconds to reset settings to factory default)
Micro USB	1	Power input via USB adaptor(5VDC/2A)

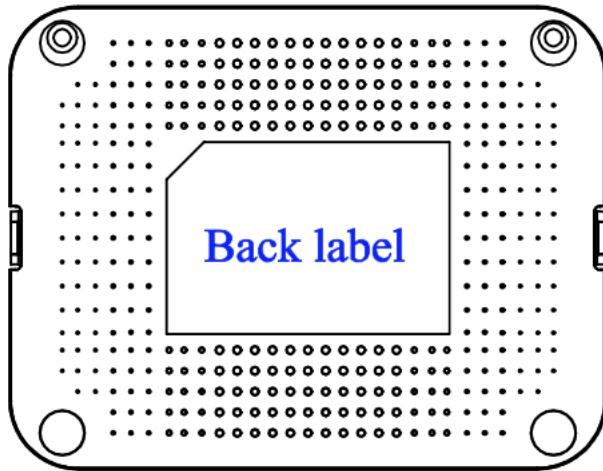


Figure 2 – IO Ports

Back Label

The marking information is located at the bottom of apparatus.

WLRRTES-106



Back label

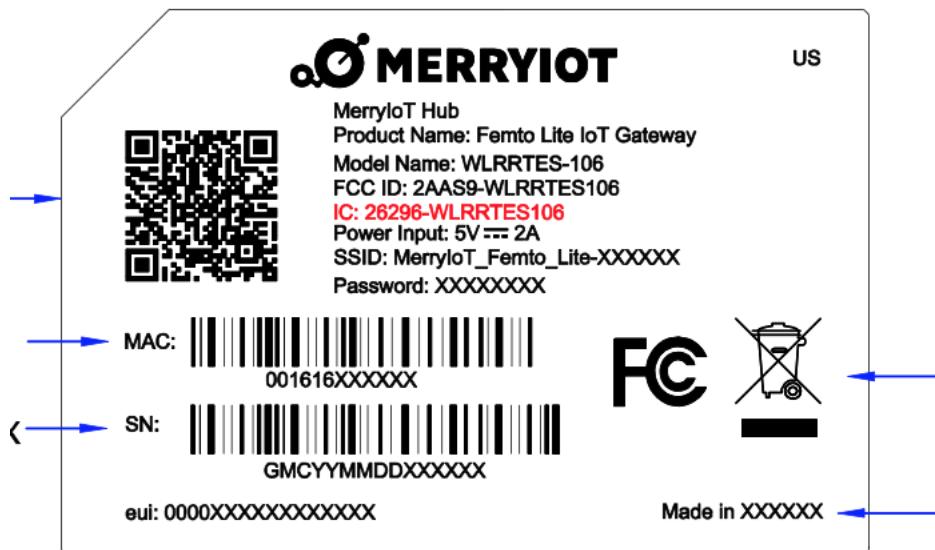


Figure 3 – Back Label

Package Label

N O.	Item	Description
1	Product BOX	Gift Box
2	Labeling	Model/ MAC/ Serial Number/ Type Approval



Package Content

N. o.	Description	Quantity
1	Femto Lite IoT Gateway/MerryIoT Hub	1
2	Power adapter (100-240VAC 50/60Hz to 5VDC/2A)	1
3	Ethernet Cable 1 meter (UTP)	1

Chapter 3 – System Specification

Hardware Specification

N. o.	Item	Description
1	Model Name	WLRRTES-106
2	Frequency Band	US 902~928MHz
3	CPU	Xtensa® single-/dual-core 32-bit LX6 microprocessor(s) up to 240MHz
4	RAM/Flash	64Mb/ 32Mb
5	RF Transceiver	- SX1308 with SX1257 & SX1276
6	Number of Channels	8 concurrent channels
7	WiFi	802.11 b/g/n 1T1R , 2.4GHz
8	WAN Port	One RJ-45 10/100Base-T/TX, Autosensing, Auto-MDIX
9	Transmit RF Power	0.5W (up to 27 dBm)
10	Receive Sensitivity	Down to -142 dBm
11	Modulation	Based on LoRaWAN
12	Security	AES 128
13	USB Port	One Mirco USB for power input
14	Working Temperature	Operating: 0°C ~ 40°C Storage: -20°C ~ 70°C
15	Working Humidity	Operating: 10 ~ 85% (Non-Condensing) Storage: 5 ~ 90% (Non-Condensing)
16	Power Supply	5VDC/2A via Micro-USB port
17	Antenna Type	Built-in Wi-Fi antenna and LoRa antenna
18	Indicators	4 LED indicators
19	Dimensions	L:116 x W:91 x H:27 mm
20	Weight	160 g

LoRa Specification

N. o.	Item	Description
1	Standard	LoRaWAN v1.0.3
2	LoRa Classes	<ul style="list-style-type: none"> - Class A: supported - Class B: to be supported in later release - Class C: supported
3	ADR	Adaptive data rate is supported to control spreading factor of nodes
4	Activation	Both Activation-by-Personalization (ABP) and Over-the-Air-Activation (OTAA) are supported
5	MAC Commands	LoRaWAN v1.0.3

LoRa RF Specification

No. .	Item	Capability	Remarks
1	Frequency Range	- EU 862~870 MHz	
2	Channel Band Width	125KHz	
3	Maximum Output Power	Up to 27 dBm	
4	Sensitivity	-142 dBm	BW=125KHz with SF=10

* All the radio performance is validated from 0 to 40 °C

Software Specification

3.1 Configuration/Performance/Capability

Req. #	Features	Description	comment
PR-0001	Network Configuration	WiFi or Ethernet switch Configuration	
PR-0002	Performance	Gateway SHOULD support Class A/C end-device	
PR-0003	WiFi	Femto_Lite-xxxxxx where the last digits are the last 6 digits of the MAC address.	
PR-0004	WiFi Password	WiFi Password:(Printed in the back label) <ul style="list-style-type: none"> - 8 characters - Random English uppercase and lowercase, 2~9 numbers (default Skip: 0,0,1,I,l, o) 	

3.2 Basic Features

Req. #	Features	Description	comment
PR-1001	OTA	Support OTA through Browan OTA Server(option enable/disable)	
PR-1002	Upgrade FW	Support upgrade FW feature through Local WEB	
PR-1003	WiFi Config	Support WiFi configuration through local Web GUI <ul style="list-style-type: none"> - Scan SSID - Switch to Station mode and connect to the selected SSID 	
PR-1004	Reset Button	5 sec press: Factory reset (wipe out WiFi credentials, Ethernet and LNS credentials)	
PR-1005	LED	1. Refer to Table 1 LED Behavior.	
PR-1006	Ethernet Config	Support DHCP/Static IP Setting	
PR-1007	Single WAN	Support Single WAN setting through Local WEB	

3.3 LoRaWAN features

Req. #	Features	Description	comment
PR-2001	Basic Station	Compatible with Standard LoRa Basic Station <ul style="list-style-type: none"> - Semtech CUPS/LNS 	
PR-2002	Packet Forwarder	Compatible with Semtech LoRa Packet Forwarder	
PR-2003	Packet Forwarder Setting	Import json file for configuration	
PR-2004	Basic Station Setting	<ul style="list-style-type: none"> • Option 1: CUPS access is DISABLED and only LNS configuration is allowed. Configuration and FOTA happen via AWS IoT and gateway has just the LNS configuration • Option 2: CUPS access is ALLOWED and LNS configuration is known via CUPS. But it requires a public key and LNS configuration update in CUPS to point to the desired LNS. <ul style="list-style-type: none"> ○ LNS URI + Port Number ○ Public Key for the gateway which has been registered with CUPS ○ Customer will then need to add MAC, Private key and claim code onto their CUPS 	

PR-2005	Default Mode	Basic Station Mode	
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Regulatory Specification

No.	Item	Standard
1	FCC	TBD
2	Telec	TBD
3	CE	EN 300 328 V2.2.2(included EN 62311/EN 50665/EN 50385) EN 300 220-2 V3.1.1 EN 301 489-1 V2.2.3 EN 301 489-3 V2.1.1 EN 301 489-17 V3.2.4 EN 55032 / EN 55024 EN 62368-1 LVD
4	RCM	TBD

Reliability Specification

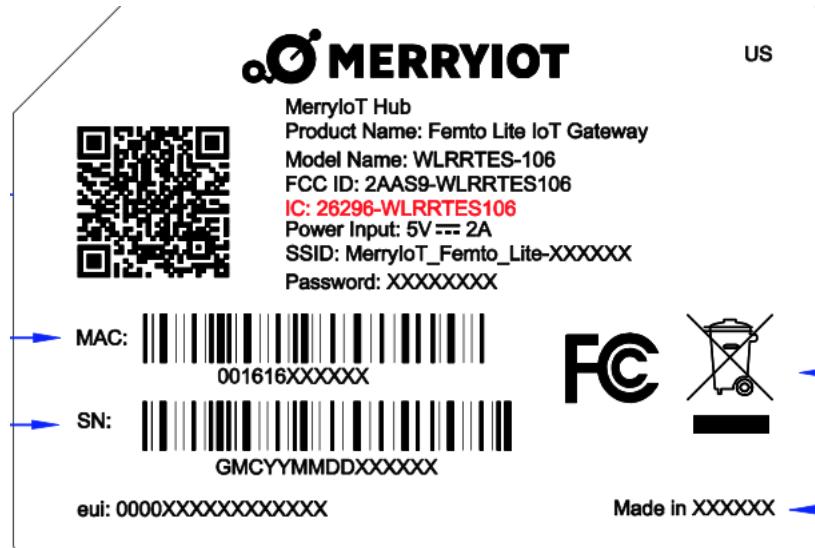
No.	Item	Specification
1	MTBF	300,000 @ 40 °C

Chapter 4 – User Manual

4.1 Connect Femto Lite

You can connect to the gateway via WiFi interface which the SSID and password printed on the back label by default.

Figure 4 – Back Label



The rule of gateway SSID is Femto_Lite-xxxxxx where the last digits are the last 6 digits of the MAC address

The PC will fetch IP address of range 192.168.4.x except 192.168.4.1 assigned by the AP.

4.2 Femto Lite Setting

Open the web browser(ex:Chrome) after connect to the gateway via IP address “192.168.4.1”

Now you can configure the gateway through the WEB UI.

STEP 1 : SET WAN

The gateway support either “Ethernet” or “Wi-Fi” connection as the internet backhaul.

STEP 3. SET WAN

- Ethernet
- Wi-Fi



Figure 5 – WAN connection

STEP 1.1 Ethernet Setting

Configure the IP address of WAN.[Static IP/DHCP client]

STEP 3. SET WAN	
<input checked="" type="radio"/> Ethernet <input type="radio"/> Wi-Fi	
ETHERNET STATUS	
Protocol: Static IP IP Address: 192.168.55.20 Subnet Mask: 255.255.255.0 Default Gateway: 192.168.55.1 DNS 1: 8.8.8.8 DNS 2: -	
ETHERNET SETTING	
(Please connect ethernet cable before setting.)	
<input checked="" type="radio"/> Static IP <input type="radio"/> DHCP	
IP Address: 192.168.11.111	
Subnet Mask: 255.255.255.0	
Default Gateway: 192.168.11.244	
DNS 1: 8.8.8.8	
DNS 2 (Option): 168.95.1.1	

Figure 6 – WAN connection

ETHERNET STATUS – The information of IP address/Subnet Mask/Gateway/DNS.

ETHERNET SETTING - Configure the IP address of WAN.[Static IP/DHCP client]

Static IP – Setup the IP address/Subnet Mask/Default Gateway/DNS of the static IP.



Contact to the network administrator for the static IP address information.

DHCP – The IP address/Subnet Mask/Default Gateway/DNS will be assigned by the DHCP server.

ETHERNET SETTING

(Please connect ethernet cable before setting.)

- Static IP
- DHCP

Figure 7 – DHCP client

STEP 1.2 Wi-Fi

Select “Wi-Fi” to be the internet backhaul connection.



The gateway WiFi interface is the Access Point by default which SSID is “Femto_Lite-XXXXXX” printed on the back label. Administrator can only access to the WEB UI through the Access Point mode to configure the gateway. The gateway will be the WiFi client and won’t access to the WEB UI after enable WiFi interface as the internet backhaul connection.



STEP 3. SET WAN

- Ethernet
- Wi-Fi

MANUAL CONNECT

ADD (HIDDEN) SSID

OR CHOOSE A NETWORK...

garyhome	
SSAK3	
ALHN-8B78	
HITRON-C150	
Eric	
dlink-E4DC	
YT-VLC-2G	

Figure 8 – Wi-Fi connection

MANUAL CONNECT – Specify the remote AP SSID and enter the password if necessary.

Click “Join” to accept or “Cancel” to abort.

MANUAL CONNECTION	
LoRa gateway	
•••••••••	
<input type="button" value="Cancel"/>	<input type="button" value="Join"/>

Figure 9 – Wi-Fi manual connection

The gateway will scan the neighbor access point automatically. Just click the SSID for the WiFi connection.



OR CHOOSE A NETWORK...

garyhome		
SSAK3		
ALHN-8B78		
HITRON-C150		
Eric		
dlink-E4DC		
YT-VLC-2G		

Figure 10 – Wi-Fi manual connection

Enter WiFi password if it is necessary for the connection.

PASSWORD FOR ALHN-8B78

Password

Cancel Join

Figure 11 – Wi-Fi password

Click “Join” to accept or “Cancel” to abort.



Federal Communication Commission Interference 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 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.

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

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.

IMPORTANT NOTE:

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Country Code selection feature to be disabled for products marketed to the US/CANADA

Operation of this device is restricted to indoor use only



Industry Canada statement:

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- (1) This device may not cause interference
- (2) This device must accept any interference, including interference that may cause undesired operation of the device

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- (1) L'appareil ne doit pas produire de brouillage;
- (2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Radiation Exposure Statement:

This equipment complies with Canada radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Déclaration d'exposition aux radiations:
Cet équipement est conforme Canada limites d'exposition aux radiations dans un environnement non contrôlé. Cet équipement doit être installé et utilisé à distance minimum de 20cm entre le radiateur et votre corps.