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Indoor Femto Gateway

WLRGFM – 100

Product Description

Revision History

Revision	Date	Description
0.1	Sep. 25, 2017	Temporary release
0.2	Oct. 12, 2018	Remove 3G/4G Dongle
001	Mar. 19, 2020	(1) Browan first released (BQW_01_0003.001) (2) Add certificates details (3) Trademark changed to 2020 BROWAN COMMUNICATIONS INC. (4) Modified contents of “System Architecture” (5) Modified contents of “Product Features” (6) Modified contents of “LED Indicators” (7) Modified contents of “Software Specification” (8) Modified contents of “Hardware Specification”
002	Apr. 22, 2020	Modified contents of “Product Features”
003	May. 7, 2020	(1) Modified contents of “Hardware Specification” (2) Modified contents of “LoRa RF Specification”
004	May. 18, 2020	Modified contents of “LoRa RF Specification”
005	Aug. 6, 2020	Modified Company Address. 2020 Copy Right.
006	Oct. 22, 2020	Modified contents of “Product Features”
007	Mar. 3, 2021	Separated the OPDK/Generic firmware features

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Trademark

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Contents

Chapter 1 – Introduction

Purpose and Scope

The purpose of this document is to describe the main functions, supported features, and system architecture of the WLRGFM-100 Browan Indoor Femto Gateway based on the latest LoRaWAN specification.

Product Design

The dimension of Browan Indoor Femto Gateway WLRGFM-100 is with the dimension of 116 x 91 x 27 mm, and with one external LoRa antenna, one WAN port, and one USB 2.0 connector.

Product Features

- In compliance with the latest LoRaWAN specification v1.0.3 and Regional Parameters v1.0.3
- Wide frequency range from 470MHz to 928MHz in different SKU
- Up to 8 concurrent channels for LoRa transmission
- Supports packet forward mode to work with 3rd party network server that uses UDP protocol, such as TTN, ChirpStack.
- Packet forward mode and Basic Station mode to work with 3rd party network server
- Two classes of LoRa end-device are supported- Class A and Class C
- Active scan for channel availability with RSSI levels
- Supports Listen-Before-Talk (LBT) for downlink
- Built-in 2.4GHz 802.11b/g/n Wireless LAN, like AP or repeater mode
- Firmware can be upgraded via OTA or USB port
- Various Internet connections: Ethernet, WiFi
- Non-Line-of-Sight (NLOS) coverage
- Self-installation and easy deployment
- Superior receiving sensitivity

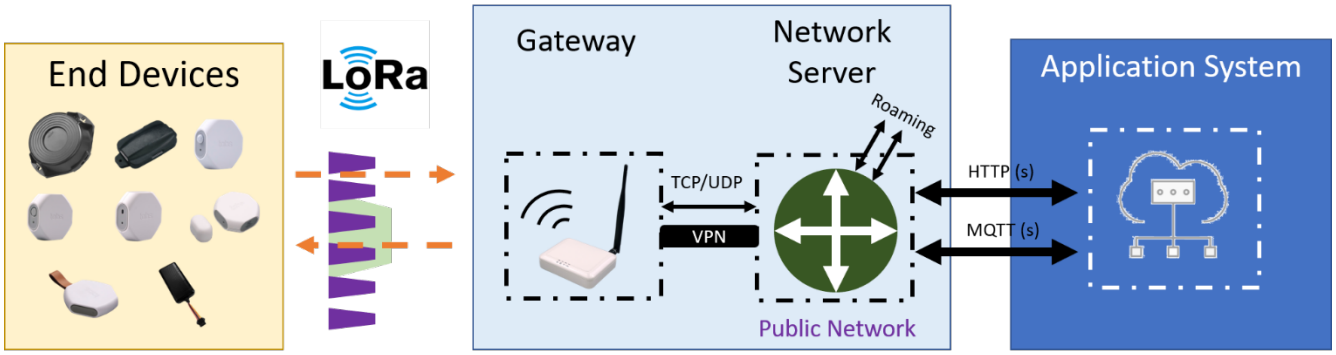
Optional Features

- Works with Browan embedded network server (LoRaWAN Standalone Mode) by default, customer can specify the MQTT broker's address and it will direct data to your specified MQTT broker.
- Embedded network server.
- Two activation methods- ABP and OTAA

*Note: Please feel free to contact us for more details about these optional features at www.browan.com or email us directly: sales@browan.com.

System Architecture

The WLRGFM-100 Browan Indoor Femto Gateway can be provisioned to support different LoRa system as follows:
Packet Forwarder mode and Basic Station mode, that can work with a specific network server.



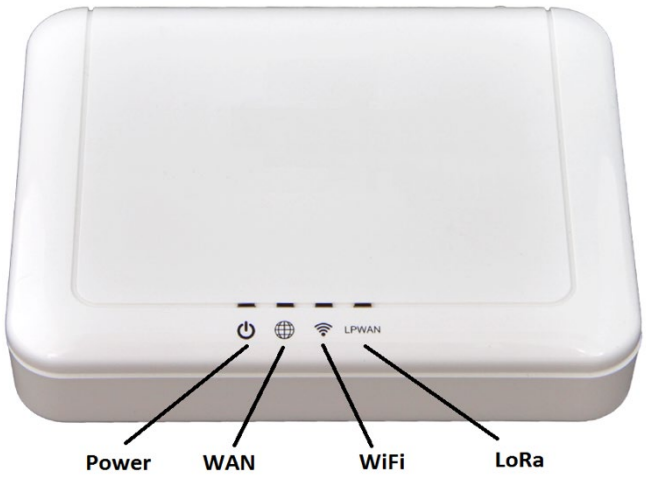
Definitions, Acronyms, and Abbreviations

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
LoRaWAN Regional Parameters v1.0.3	LoRa Alliance
LoRaWAN Backend Interfaces Specification v1.0	LoRa Alliance

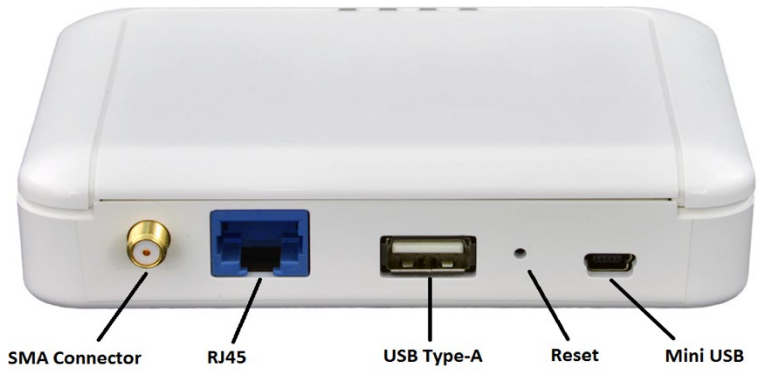
Chapter 2 – Product Details



LED Indicators

LED	Color	Status	Description
Power	Green	Off	Power off
		On	Power on
		Blinking	Booting
	Orange	Off	N/A
		On	System Error (no provision)
		Blinking	System is upgrading
WAN	Green	Off	Failed to obtain the IP address
		On	- Ethernet cable attached, and IP address obtained - WiFi repeater mode enabled and IP address obtained
		Blinking	N/A
	Orange	Off	N/A
		On	N/A
		Blinking	N/A
WiFi	Green	Off	WiFi radio-disabled
		On	WiFi radio-enabled
		Blinking	N/A
	Orange	Off	N/A

LED	Color	Status	Description
		On	N/A
		Blinking	N/A
LoRa	Green	Off	LoRa network server disconnected or inactivated
		On	LoRa network server connected or activated
		Blinking	N/A
	Orange	Off	N/A
		On	N/A
		Blinking	N/A



I/O Ports

Port	Count	Description
SMA connector	1	External LoRa antenna
RJ45	1	WAN port of the device
USB Type-A	1	For firmware upgrade
Reset	1	Reset to default (5 seconds to reset settings to factory default)
Mini USB	1	Connected with USB power adapter

Package Label

No.	Item	Description
1	Product BOX	Brown Box
2	Labeling	Model/ MAC/ Serial Number/ Type Approval

Package Content

No.	Description	Quantity
1	The product	1
2	Power adapter (USB Charger 100-240VAC 50/60Hz to 5VDC/2A)	1
3	USB cable 1.5 meters for charging purpose	1
4	Ethernet Cable 1 meter (UTP)	1
5	Dipole Antenna (0dBi) for LoRa	1

Chapter 3 – System Specification

Hardware Specification

No.	Item	Description
1	Model Name	WLRGFM-100
2	Frequency Band	The following configuration is supported by different SKU: - EU 862~870 MHz - US 902~928 MHz - IN 865~867 MHz - AS 920~928 MHz - CN 470~510 MHz
3	CPU	Network SOC with 580MHz MIPS CPU Core
4	RAM/Flash	2Gbit/ 4Gbit
5	RF Transceiver	- SX1301 with SX1257 & SX1276 (channel scanning) - SX1301 with SX1255 & SX1276 (channel scanning) for CN-470 SKU
6	Number of Channels	8 concurrent channels
7	WiFi	802.11 b/g/n 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 USB 2.0 port for firmware upgrade
14	Working Temperature	Operating: -10℃ ~ 55℃ Storage: -10℃ ~ 60℃
15	Working Humidity	Operating: 10 ~ 85% (Non-Condensing) Storage: 5 ~ 90% (Non-Condensing)
16	Power Supply	5VDC/2A via mini-USB port
17	Antenna Type	Built-in Wi-Fi antenna and one (1) external SMA LoRa antenna
18	Indicators	4 LED indicators
19	Dimensions	L:116 x W:91 x H:27 mm
20	Weight	160 g

LoRa Specification

No.	Item	Description
1	Standard	LoRaWAN v1.0.3
2	LoRa Classes	- Class A: supported - Class B: to be supported in a later release - Class C: supported
3	ADR	The adaptive data rate is supported to control the 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 - US 902~928 MHz - IN 865~867 MHz - AS 920~928 MHz - CN 470~510 MHz	Separated SKU
2	Channel Band Width	125/250/500 kHz	8 uplinks + 1 downlink
3	Maximum Output Power	27 dBm	
4	Sensitivity	-142 dBm	BW=125KHz with SF=10

* All the radio performance is validated from 0 to 40 ℃

Software Specification

No.	Item	Description
1	Internet Connectivity	- thru WAN port with fixed IP/ DHCP client/ PPPoE - thru WiFi repeater mode
2	WiFi Configuration	SSID/ Encryption/ Channels
3	Network Configuration	- DHCP server for IP leasing - Diagnostics with Ping, TraceRoute, and NSlookup
4	System Status	- Overview with the system, software version, memory usage, and wireless configuration - System Log shows system console information - Kernel Log shows kernel information - Processes shows running process information - Real-time graphs show system load, inbound/outbound traffic, and IP connections
5	LoRa Information	- Current LoRa channel configuration and Gateway ID - Supported spreading factors - Provision code - External network server configuration and logs - Channel scan
6	Channel Scan	The gateway can scan all supported channels based on ISM band regulation
7	Time Sync	- Support Network Time Protocol (NTP) - Sync up with the browser's time
8	Firmware Upgrade	1. Over-the-air (OTA) upgrade 2. Thru USB port
9	Remote Management	- Managed and configured by Browan Network Management System (DCMS) at LoRaWAN Standalone mode - Auto-provisioning with the public and private data model - Keepalive with CPU load, memory usage, and in/out traffic
10	LoRa Uplink Message Format (LoRaWAN mode with external MQTT broker)	Uplink Message (to the network server) includes: 1. Channel info 2. Spreading factor 3. Received time 4. Gateway IP 5. Gateway ID 6. Received RSSI 7. Received SNR 8. Device address of end-node 9. Uplink data 10. Frame count 11. F-port

No.	Item	Description
11	LoRa Downlink Message Format (LoRaWAN mode with external MQTT broker)	Downlink Message (from the network server) includes: 1. Device address of end-node 2. Downlink data 3. Gateway ID 4. Any string ID (for tracking purpose) 5. Un-confirmed or confirmed data

Software Specification (Optional)

No.	Item	Description
1	LoRaWAN Configuration (LoRaWAN mode with embedded network server)	- Current OTAA end-node list - Detailed end-node logs at Gateway - ABP table for managing end-node device with ABP mode (user-defined DevAddr/ NwkSKey/ AppSKey) - OTAA table for managing end-node with OTAA mode (user-defined AppEUI/ DevEUI/ AppKey/ DevAddr Start Counts/ Aging Out time)
2	Provisioning	Auto/manual provisioning with area code/customer code for configuring regional frequency bands and switch over between LoRaWAN Standalone mode or packet forward mode

*Note: Please feel free to contact us for more details about these optional features at www.browan.com or email us directly: sales@browan.com.

Regulatory Specification

No.	Item	Standard
1	FCC	ID: MXF-WLRGFM100
2	Telec	No.: 201-170417 / 01
3	CE	EN 62311:2008 EN 50385:2017 EN 55032:2015/AC:2016, Class B EN 61000-3-2:2014, Class A EN 61000-3-3:2013 EN 55024:2010/A1:2015 IEC 61000-4-2:2008 ED 2.0 IEC 61000-4-3:2010 ED 3.2 IEC 61000-4-4:2012 ED 3.0 IEC 61000-4-5:2014 ED 3.0 IEC 61000-4-6:2013 ED 4.0 IEC 61000-4-8:2009 ED 2.0 IEC 61000-4-11:2004 ED 2.0 EN 300 220-2 V3.1.1 (2017-02) EN 300 220-1 V3.1.1 (2017-02) EN 300 328 V2.1.1 (2016-11) EN 301 489-1 V2.2.0 (2017-03) EN 301 489-3 V2.1.1 (2017-03) EN 301 489-17 V3.2.0 (2017-03) EN 60950-1:2006+A11:2009+A1:2010+A12:2011+A2:2013
4	Anatel	No.: 04133-19-12264

Reliability Specification

No.	Item	Specification
1	MTBF	300,000 @ 40 ℃