EWRF Technology
US915 LoRaWAN RF Module

EWRF Technology US915 LoRaWAN RF Module User Manual

Contents

EWRF Technology

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Product Information

Specifications

- **Model:** EWRF1022MLA LoRaWAN+wM-bus
- **Version:** V1.0.1
- **Manufacturer:** EWRF Technology, Co., LTD
- **Date:** 2022.01.11
- **Frequency Range:** 902-928 MHz
- **Protocols:** LoRaWAN 1.0.3 Class A/C, Wireless M-bus T1/C1
- **Interface:** UART
- **Data Encryption:** AES 128
- **Compliance:** CE RED/FCC 15.247

Product Usage Instructions

The EWRF1022MLA module integrates the LoRaWAN protocol stack (LoRaWAN Specification 1.0.3 Class A/C) and the wM-bus T1/C1 mode. It provides convenient and fast LoRaWAN network access and one-way data communication in wM-bus T1/C1 mode using a UART interface.

- Ultra Low-power SoC chip ASR6601 embedded with one Sub 1G transceiver and one ARM STAR-MC1 MCU
- Supports 902-928 MHz channels
- Easy to use UART interface for communication and configuration
- AT command support for communication and configuration

- Data encryption using AES 128
- Compliance with CE RED/FCC 15.247 requirements

Scope

- This manual applies to firmware version LoRaWAN 1.0.3_wMbus 1.0.2-20220101 and later.

FAQ

- **Q:** What are the supported protocols of the EWRF1022MLA module?
- **A:** The module supports LoRaWAN 1.0.3 Class A/C and Wireless M-bus T1/C1 protocols.
- **Q:** How can I communicate with the module?
- **A:** You can communicate with the module using the UART interface and AT commands for configuration and data exchange.
- **Q:** What is the data encryption method used by the module?
- **A:** The module uses AES 128 for data encryption.

Document History

Date	Version	Description/Changes
2022.01.11	V1.0	Initial version
2023.4.12	V1.0.1	C1 of wM-busmodeadded Specification of module added Typical application circuit added Fix some errors

Introduction

EWRF1022MLA module integrates the LoRaWANprotocol stack (LoRaWAN Specification 1.0.3 Class A/C) and the wM-bus T1/C1 mode. The module uses the UART interface to exchange messages with the user's equipment, providing convenient and fast LoRaWAN network access, and one-way data communication in wM-bus T1/C1 mode.

Feature

- Ultra Low-power SoCchipASR6601 embeddedwithoneSub 1Gtransceiver and one ARM STAR-MC1 MCU, supporting 902-928 MHz channels
- Embedded LoRaWAN (1.0.3) Class A/C and Wireless M-bus T1/C1 protocols
- Easy to use UART interface for communication and configuration
- AT command for communication and configuration
- Data encryption AES 128
- Conforms with CE RED/FCC 15.247 requirements

Scope
This manual applies to firmware version: LoRaWAN1.0.3_wMbus1.0.2-20220101 and later.

Working Mechanism

Modes
The module has two working modes: transparent transmission and command.

1. The command mode uses AT commands to configure parameters, read status send data, etc.. In the command mode, when sending a parameter configuration or a status reading command, the user needs to wait for the module to return “OK” or “ERROR” before proceeding with the next command, otherwise the command may be invalid. When switching from transparent transmission mode to the command mode, the instruction (0x00 0x00 0x00) needs to be input and does not include the terminator “\r\n”.
2. The transparent transmission mode is used to send and receive application data. In this mode, there are two kinds of communication, namely the LoRaWAN communication and the wM-bus communication. The LoRaWAN communication requires the module to join the network before it can access the LoRaWAN data services. The two communications can be switched from the AT command mode by inputting the “AT+SWTMD”.

Power-on/Resetinitialization
When the module is powered on/reset (hardware or software reset), it will be initialized. At this time, the module is in command mode, and the module can be operated through AT commands.

Parameters stored in non-volatile memory
If the user wants to store the parameters after power-off, the “AT+SAVE commands need to be executed to set the LoRaWAN orwM-bus parameters in the non-volatile memory. After the module is powered on/reset, the saved parameters will be read from the storage space. If the user doesn’t execute the “AT+SAVE” commands, the set parameters will be lost after power-off/ reset.

UART communication
The UART communication flow between the module and the user MCU includes three message types: command, response, and event. The command and response messages are used for parameter configuration and other operations, and the event messages are used for uplink/downlink data communication, as shown in Table 2-1.

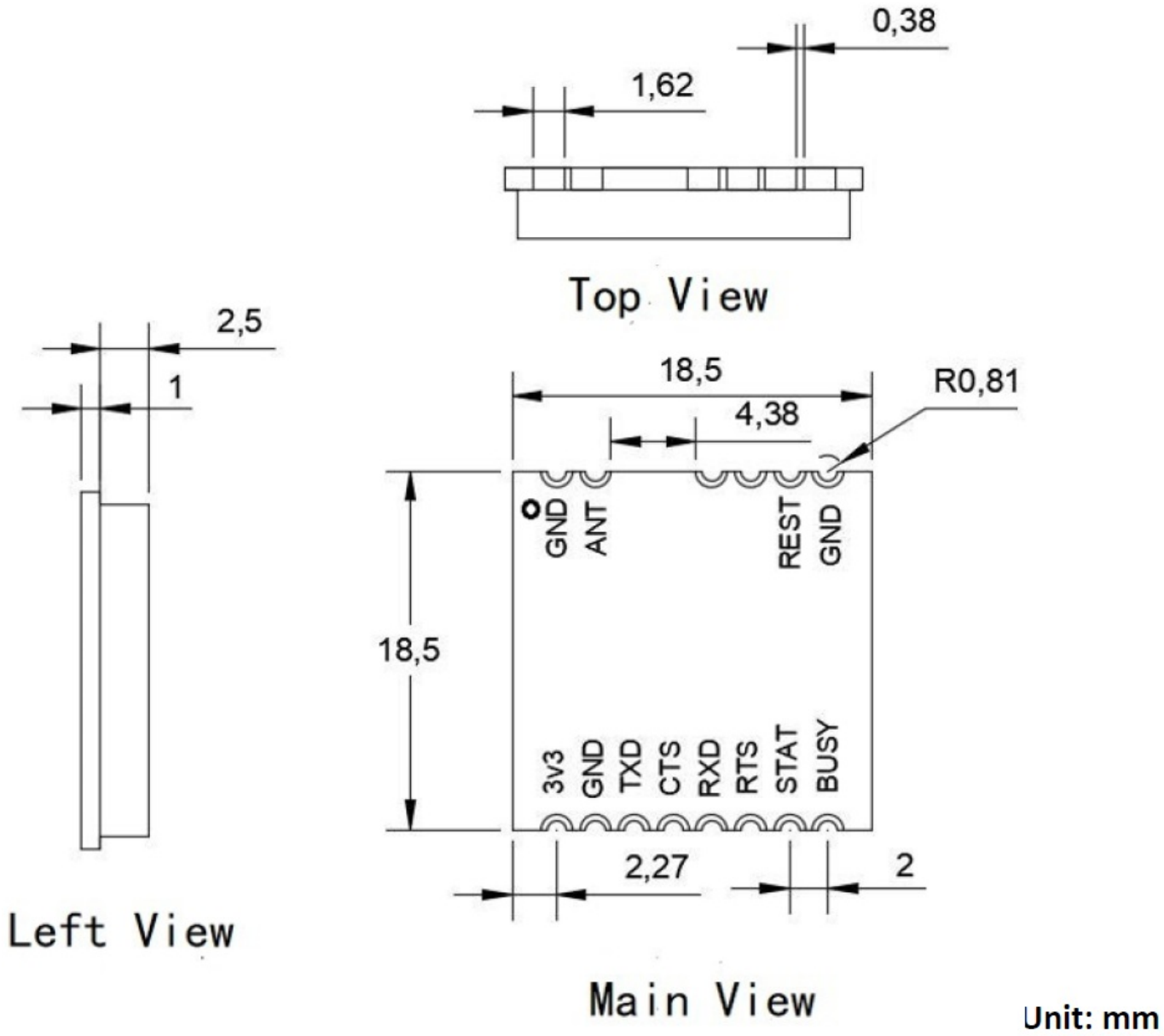
Table 2-1 UART Communication Messages Type

Type	Direction	Function	Description
command	module<– user	configuration	The user’s MCU sends a command to the module
response	module–> user		Module responses to the user MCU
event	Module <–>user	data communication	Asynchronous events that occur at any time: The user sends uplink data to the module; The module sends downlink data to the user MCU; The module sends the failure report, etc.

Specification

Parts No. Items		EWRF 1022MLA
Electronics	Operating voltage	2.0-3.7v
	TX current	<125 mA @20dbm
	RX current	<10 mA
	Sleep current	<1.5μ A
	Operation current	< 20 μ A @T1 30s TX period
RF	Frequency	US 902-928 Mhz(LoRaWAN)/868.95Mhz(T1,C1)
	Modulation	LoRa/FSK
	TX power	<21dBm
	Data rate	LoRaWAN:250-5470bps T-mode: 100 kbps C-mode: 100 kbps
	RX sensitivity	-104 dBm T/C-mode
	Ant. impedance	50 Ω
Security	Data filter	CRC
	Data encryption	AES 128
General	Interface	Uart (TTL)
	Uart Format	8 N1 without parity
	Uart baud	9600bps
	Operating temperature	-30℃ 80℃
	Operating humidity	10 90% without condensation
	Communication range	>200m(T1@868Mhz/14dbm/100Kbps,LOS)

Mechanics



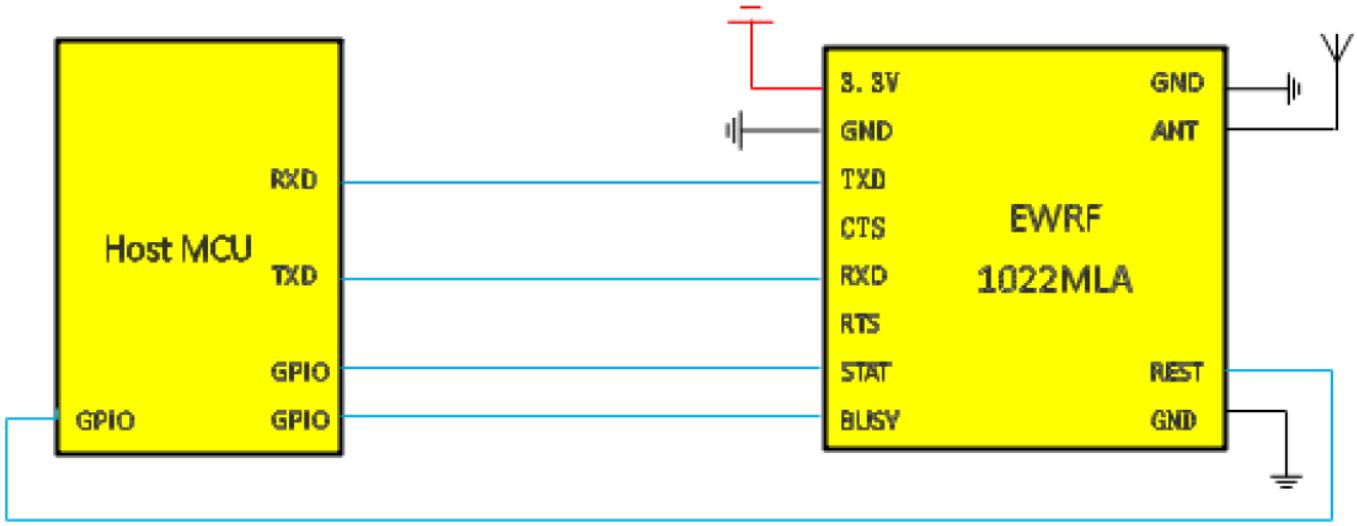
Pin Description

- Pin descriptions are shown in

Table 2-2 Table 2-2 Pin Descriptions of the Module

No.	Pin	I/0	Notes
1	VCC	–	Power DC 2.0~3.7V
2	GND	–	GND
3	TXD	Output	UART_TXD
4	CTS		UART_CTS Reserved
5	RXD	Input	UART_RXD
6	RTS		UART_ RTS Reserved
7	STAT	Output	Data communication status pin
8	BUSY	Output	Module idle indication pin
9	GND	–	GND
10	RST	Input	Reset active low
11	ANT		Antenna
12	GND	–	GND

TypicalApplicationCircuit



Note: When using Transparent Transmission for data transmission and reception, it is recommended to connect the BUSY and STAT pins of the module to detect the status of the module. When using the AT+LSEND command to transmit and receive data in LoRaWAN, the BUSY and STAT pins fail and can be ignored.

Command Mode

The command mode is used for module parameter configuration, status reading, etc. Users can access the module by sending AT commands through the UART, to perform operations such as reading or writing configuration or query of status from registers. After the module is powered on/reset, it enters the command mode by default. In this case, the user can perform AT command operations directly. In command mode, the format of UARTport is fixed as: baud rate 9600bps, no parity, 8 bits data, 1 stop bit. The user sends an AT command to the module, the module parses the command, and returns a command response immediately, indicating the execution result of the command. If the module does not respond for a long time, it means the module status is abnormal.

AT Command Format

AT commands are used in uppercase ASCII format, starting with “AT” and ending with a carriage return and line feed (ie “\r\n”). The maximum length of the command string is 255 characters (including “\r\n”) . AT commands can be subdivided into four types, as shown in Table 3-1

Table 3-1 AT Command Type

Type	Format	Description
query command	AT+<x>?	return the current value of the parameter
set command	AT+<x>=<…>	set user-defined parameter values
execute comma nd	AT+<x>	execute the internal program of the module without parameters
special command	0x00 0x00 0x00	exit from the transparent transmission mode to AT command mode

Notes: Special command0x00 0x00 0x00 is only valid in transparent transmission mode, and does not contain the terminator “\r\n”.

Table 3-2 Error codes of AT command

Code	Description
2	AT results have a generic error
3	AT command format error or no way to execute
4	ATcommandexpressionis error
5	AT command arguments parse is error

LoRaWAN Activation

According to the LoRaWAN specification, the necessary parameter configuration is required before using the module. There are two activation modes to choose from (OTAA activation mode is mainly used at present). The parameters required for each mode are different, as shown in Table 3-2.

Table 3-2Activation Mode and Required Parameters

Activation	Description	Parameters
Over the Air Activation (OTAA)	The module obtains the network security key by joining the network	DevEui AppEui AppKey OTAA activation
Activation by personalization (ABP)	The module has saved the network session key and application encryption key locally and can join the specified LoRaWANserver	DevAddr NwkSkey AppSkey, ABP activation

Transparent Transmission

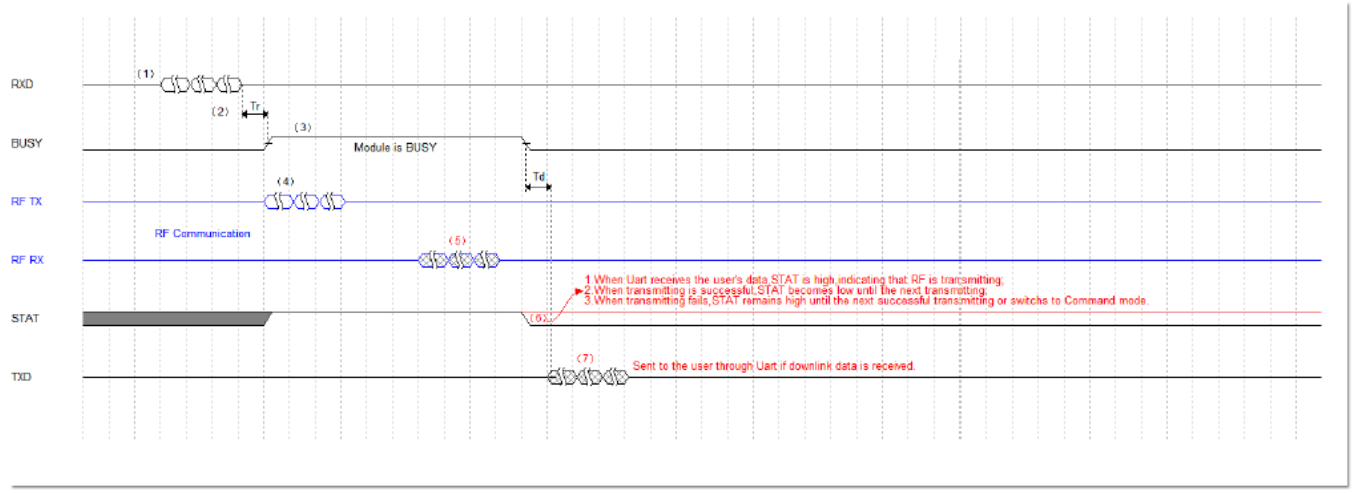
- A transparent transmission mode is used to send and receive application data.
- In the command mode, use “AT + SWTMD” to select LoRaWAN communication or wM-bus communication .
- In LoRaWAN, The module does not work until the module successfully join the network.

Data Communication Timing

Figure 4-1 describes in detail the flow of a complete data interaction after the module successfully joins the network when the user operates the module.

1. The user waits for the module to be ready, that is, waits for BUSY to be low. When the module is ready, the user sends serial port data to the module.
2. Wait for the serial port framing timeout (the data size transmitted by the user at one time is less than the maximum data packet limit of LoRaWAN or wM-bus), that is, wait for the completion of user data transmission from UART.
3. When the module receives a frame of the user’s data, it will pull the BUSY pin high, indicating that the module is busy, and pull up the STAT pin at the same time.
4. The module transmits data (uplink), and BUSY remains high. In LoRaWAN mode, if the Confirmed frame fails to be transmitted, the module will automatically retransmit.
5. In LoRaWAN mode, if the current frame is Confirmed or the server has downlink data, the module will receive the data.
6. The module completes data (uplink and downlink) processing, the BUSY pin is pulled low. If the communication data is abnormal, the STAT pin will remain high for indication. The STAT pin will not return to low until new data is coming from UART or the module switches to the command mode (inputting 0x00 0x00 0x00). If there is no abnormality, the STAT pin also becomes low.
7. In LoRaWAN, if the server has downlink data, the module first completes data analysis and then sends it to the user through the UART after Td (default 10ms) time.

Figure 4-1 Communication Timing of theModule in Transparent Transmission Mode



Note: According to the duty cycle requirements in CE RED, in LoRaWAN communication the next transmission interval is approximately 100 times the duration of the communication in the air. Otherwise, the LoRaWAN program may be forcibly stop sending user data.

The UART packet format in wM-bus
In wM-bus, the user's device needs to send the packet to the UART of the module in the following format:

L	C	CI	DATA
1 byte	1 byte	1 byte	nbytes

- **L:** Packet length(excluding itself)
- **C:** Packet type, for example, SND-NR is 0x44
- **CI:** Packet communication ID, for example, the short header of SND-NR is 0x7A
- **DATA:** User application data, which is formed according to the data format of M-BUS, includes an 8-bit BCD meter readout, collection time in a certain format (year, month, day, hour), error flags, etc.

AT Command Set

- The AT command set is classified into the Basic, LoRaWAN configuration, and wM-bus configuration.

Basic commands

- The Basic AT commands are mainly to restart and configure UART and other application parameters that are not related to the network operation, as shown in Table 5-1

Table5-1 Basic Commands

Command	Description
AT	Test and start AT commands
AT+RST	Reset module
AT+GMI	View version information
AT+SWTMD	Switch from AT command mode to Transparent transmission mode
AT+RESTORE	Restore to the factory default settings
AT+SAVE	Save the parameters in the non-volatile memory
0x00 0x00 0x00 Hex	Switch from Transparent transmission mode to command mode

AT—AT Test

Write & Response	AT	OK or +ERROR:<err>
	<err> error code	
Example	AT OK	

AT+RST—Reset module

Command & Response	AT+RST	OK or +ERROR:<err>
Value & Return	<err> error code	
Example	AT+RST OK	

AT+GMI—read information on module

Command & Response	AT+GMI?	+ GMI:<info> OK
Value & Return	<info> includes manufacture ID, module name, version of hardware, LoRaWAN, and wM-BUSstacks <err> error code	
Example	AT+GMI? + GMI:EWRF,1022MLA,V1.0.1,L1.0.3,W1.0.2 OK	

AT+SAVE—Save parameters in the non-volatile memory

Command & Response	AT+SAVE	OK or +ERROR:<err>
Value & Return	<err> error code	
Example	AT+SAVE OK	

AT+RESTORE—Restore to the factory default settings

Command & Response	AT+RESTORE	OK or +ERROR:<err>
Value & Return	<err> error code	
Example	AT+RESTORE OK	

AT+SWTMD—SwitchAT Command Mode to Transparent Transmission Mode

Command & Response	AT+SWTMD=<mode>,[confirm],[port]	OK or +ERROR:<err>
Value & Return	<mode> Transparent Transmission l 0 LoRaWAN l 1 wM-bus [confirm] data transmission type (only valid in the LoRaWAN) l 0 Unconfirmed l 1 Confirmed [port] data transmission port, value in decimal, default 10.(only valid in the LoRaWAN) <err> error code	
Example	AT+SWTMD=0,1,12 OK The example shows that the module is in the LoRaWAN, using the confirmed transmission on Port 12.	

0x00 0x00 0x00 —Switch Transparent Transmission Mode to AT Command Mode

Command & Response	0x00 0x00 0x00	OK or +ERROR:<err>

Value & Return	<err> error code
Example	0x00 0x00 0x00 OK

LoRaWAN Configuration Commands

- The LoRaWAN AT commands configure the network parameters of LoRaWAN as shown in Table 5-2.

Table 5-2 LoRaWAN Configuration AT Commands

AT+LAPPEUI	read/write Application Eui
AT+LAPPKEY	read/write Application Key
AT+LDEVEUI	read/write Device EUI
AT+LNWKSKEY	read/write Network Session Key
AT +LAPPSKEY	read/write Application Session Key
AT+LDEVADDR	read/write Device address
AT+LSTATUS	Read the online status of the end device
AT+LJOIN	Join a LoRaWAN
AT+LSEND	Send data
AT+LADR	read/write Adaptive data rate
AT+LDATARATE	read/write RF data rate
AT+LCLASS	read/write the Class of end-device
AT+LJN1DL	read/write Join Accept RX1 delay, in ms
AT+LJN2DL	read/write Join Accept RX2 delay, in ms
AT+LRX1DL	read/write receiving RX1 delay, in ms
AT+LRX2DL	read/write receiving RX2 delay, in ms
AT+LRX2DR	read/write the data rate of Rx2
AT+ LRX2FQ	read/write the frequency of Rx2, in Hz
AT+ LTXP	read/write RF TX power

AT+LAPPEUI—read/write Application Eui

Read& **Response**	AT+LAPPEUI?	+APPEUI:<eui> OK
Write& Response	AT+LAPPEUI=<eui>	OK or +ERROR:<err>
Value& **Return**	<eui> Application EUI <err> error code	
Example	AT+LAPPEUI=AABBCCDD00112233 OK	

Notes	Valid in OTAA mode, when read/ write AppEUI, the module returns Y1Y2…Y8 in hex, 8 bytes.

AT+LAPPKEY—read/write Application Key

Read & Response	AT+LAPPKEY?	+LAPPKEY:<key> OK
Write & Response	AT+LAPPKEY=<key>	OK +ERROR:<err>
Value & Return	<key> Application Key <err> error code	
Example	AT+LAPPKEY=AABBCCDD00112233AABBCCDD00112233 OK	
Notes	Valid in OTAA mode, when read/write Application Key, module returns Y1Y2…Y16 in hex, 16 bytes.	

AT+LNWKSKEY—read/write Network Session Key

Read & Response	AT+LNWKSKEY?	+LNWKSKEY:<key> OK
Write & Response	AT+LNWKSKEY=<key>	OK or +ERROR:<err>
Value & Return	<key> Network Session Key <err> error code	
Example	AT+LNWKSKEY=AABBCCDD00112233AABBCCDD00112233 OK	
Notes	Valid in ABP mode, when read/write Network Session Key, the module returns Y1Y2…Y16 in hex, 16 bytes.	

AT+LAPPSKEY—read/write Application Session Key

Read & Response	AT+LAPPSKEY?	+LAPPSKEY:<key> OK
Write & Response	AT+LAPPSKEY=<key>	OK or +ERROR:<err>
Value & Return	<key> Application Session Key <err> error code	
Example	AT+LAPPSKEY=AABBCCDD00112233AABBCCDD00112233 OK	
Notes	Valid in ABP mode, when read/write Application Session Key, the module returns Y1Y2…Y16 in hex,16 bytes.	

AT+LDEVADDR—read/write End-device Address

Read & Response	AT+LDEVADDR?	+LDEVADDR:<addr> OK
Write & Response	AT+LDEVADDR=<addr>	OK or +ERROR:<err>
Value & Return	<addr> Device address <err> error code	
Example	AT+LDEVADDR=00112233 OK	
Notes	Valid in ABP mode, when read/write Device Address, the module returns Y1Y2…Y4 in hex,4 bytes.	

AT+LDEVEUI—read/write End-device identifier

Read & Response	AT+LDEVEUI?	+LDEVEUI:<eui> OK
Write & Response	AT+LDEVEUI=<eui>	OK or +ERROR:<err>
Value & Return	<eui> Device EUI, default is a globally unique ID generated by the chip. <err> error code	
Example	AT+LDEVEUI? +LDEVEUI=AABBCCDD00112233 OK	
Notes	When read/write Device EUI, the module returns Y1Y2…Y8 in hex,8 bytes.	

AT+LSTATUS—Read the online status of the End-device

Value & Return	<value> Status l 0 unjoin l 1 joined <err> error code
Example	AT+LSTATUS? +LSTATUS=1 OK
Notes	Query whether the device is connected to a LoRaWAN

AT+LJOIN—Join a LoRaWAN

Write & Response	AT+LJOIN=<mode>,[dr],[nb]	OK or +ERROR:<err> If the AT command is valid, then return OK, start authentication of joining, and return the authentication result +LEVT: JOIN OK +LEVT: JOIN FAIL
Value & Return	<mode> Join mode l 0:ABP, l 1:OTAA [dr] Join data rate l 0 SF12 BW125 l 1 SF11 BW125 l 2 SF10 BW125 l 3 SF9 BW125 l 4 SF8 BW125 l 5 SF7 BW125 [nb] Max attempts of Join <err> error code	
Example	AT+LJOIN=1,3,8 JOIN settings OTAA SF9-BW125 Max attempts 8 OK +LEVT: JOIN OK	

AT+LSEND—Send data

Write & Response	AT+LSEND=<port>,<confirm>,<length>	> <Input data which length is defined in the AT command > **Notes: Wait until the cursor comes out before entering the data to be sent** If joined a LoRaWAN, then returns: +LEVT: SENDCONFIRMED/UNCONFIRMED OK +LEVT: SEND FAIL
Value & Return	<port> transmission port, in decimal <confirm> data transmission type l 0 Unconfirmed l 1 Confirmed .<length> data length <err> error code	
Example	AT+LSEND=12,1,10 > 0123456789	

	+LEVT: SENDCONFIRMED OK
Notes	**Users can send or receive data inTransparenttransmissionmode. This AT command only adds an option for** **communication and ignore the pins of BUSY and STAT.**

AT+LADR—read/write RF data-rate adaptation

Read & Response	AT+LADR?	+LADR:<adr> OK
Write & Response	AT+LADR=<adr>	OK or +ERROR:<err>
Value & Return	<adr> ADR enable control, default is 1 • ADR disable • ADR enable <err> error code	
Example	AT+LADR=1 OK	
Notes		

AT+LDATARATE—read/write data- rate

Read & Response	AT+LDATARATE?	+LDATARATE:<datarate> OK
Write & Response	AT+LDATARATE=<datarate>	OK or +ERROR:<err>
Value & Return	<datarate>: default is 3 range: • 0 SF12 BW125 • 1 SF11 BW125 • 2 SF10 BW125 • 3 SF9 BW125 • 4 SF8 BW125 • 5 SF7 BW125 <err> error code	
Example	AT+LDATARATE=1 OK	
Notes	If want to change the RF data rate, must disable ADR (AT+LADR=0).	

AT+LCLASS—read/write End-device class

Read & Response	AT+LCLASS?	+LCLASS:<class> OK
Write & Response	AT+LCLASS=<class>	OK or +ERROR:<err>
Value & Return	<class> default classA • 0 class A • 1 class B reserved • 2 class C <err> error code	
Example	AT+LCLASS=2 OK	
Notes	Must set before joining a LoRaWAN network	

AT+LJN1DL—read/writeJoin Accept RX1 delay

Read & Response	AT+LJN1DL?	+LJN1DL:<delay> OK
Write & Response	AT+LJN1DL=<delay>	OK or +ERROR:<err>
Value & Return	<delay> default is 5000 in milliseconds <err> error code	
Example	AT+LJN1DL=5000 OK	
Notes		

AT+LJN2DL—read/writeJoin Accept RX2 delay

Read & Response	AT+LJN2DL?	+LJN2DL:<delay> OK
Write & Response	AT+LJN2DL=<delay>	OK or +ERROR:<err>
Value & Return	<delay> default is 6000 in milliseconds <err> error code	
Example	AT+LJN2DL=6000 OK	
Notes		

AT+LRX1DL—read/writeRX1 delay

Read & Response	AT+LRX1DL?	+LRX1DL:<delay> OK
Write & Response	AT+LRX1DL=<delay>	OK or +ERROR:<err>
Value & Return	<delay> default is 1000 in milliseconds <err> error code	
Example	AT+LRX1DL=5000 OK	
Notes		

AT+LRX2DL—read/writeRX2 delay

Read & Response	AT+LRX2DL?	+LRX2DL:<delay> OK
Write & Response	AT+LRX2DL=<delay>	OK or +ERROR:<err>
Value & Return	<delay> default is 2000 in milliseconds <err> error code	
Example	AT+LRX2DL=5000 OK	
Notes		

AT+LRX2DR—read/write data rate of RX2

Read & Response	AT+LRX2DR?	+LRX2DR:<datarate> OK
Write & Response	AT+LRX2DR=<datarate>	OK or +ERROR:<err>
Value & Return	<datarate> default 0, range: • 0 SF12 BW125 • 1 SF11 BW125 • 2 SF10 BW125 • 3 SF9 BW125 • 4 SF8 BW125 • 5 SF7 BW125	

	<err> error code
Example	AT+LRX2DR=0 OK
Notes	

AT+LRX2FQ—read/write frequency of RX2

Read & Response	AT+LRX2FQ?	+LRX2FQ:<freq> OK
Write & Response	AT+LRX2FQ=<freq>	OK or +ERROR:<err>
Value & Return	<freq> default 869525000 in hz <err> error code	
Example	AT+LRX2FQ=869525000 OK	
Notes		

AT+LTXP—read/write TX power

Read & Response	AT+LTXP?	+AT+LTXP:<power> OK
Write & Response	AT+LTXP=<power>	OK or +ERROR:<err>
Value & Return	<power> default 0 ranger: • 0 16 dBm • 1 14 dBm • 2 12 dBm • 3 10 dBm • 4 8 dBm • 5 6 dBm • 6 4 dBm • 7 2 dBm <err> error code	
Example	AT+LTXP=1 OK	
Notes	If want to change the transmitting power, must disable ADR (AT+LADR=0).	

wM-bus Configuration Commands

- The wM-bus AT commands config the parameters of wM-bus, as shown in Table 5-2.

Table 5-2 wM-bus Configuration AT commands

Command	Description
AT+WMODE	Read/write wM-bus mode
AT+WTXP	Read/write wM-busTX power
AT+WADDR	Read/write the address of the wM-bus device
AT+WKEY	Read/write AES key of wM-bus device
AT+WEBC	Read/write the number of encrypted blocks

Notes: The maximum response time for the above AT commands is 300 milliseconds

AT+WMODE—Read/write wM-bus mode

Read & Response	AT+WMODE?	+WMODE:<mode> OK
Write & Response	AT+WMODE=<mode>	OK or +ERROR:<err>
Value & Return	<mode> wM-busmode, default is 0 • 0 T1 • 1 C1 <err> error code	
Example	AT+WMODE=0 OK	

AT+ WTXP—Read/write wM-busTX power

Read & Response	AT+WTXP?	+WTXP:<power> OK
Write & Response	AT+WTXP=<power>	OK or +ERROR:<err>
Value & Return	<power> TX power, default is 2 • 0 20dBm • 1 17 dBm • 2 14 dBm • 3 10 dBm	

	<err> error code
Example	AT+WTXP=1 OK

AT+ WADDR—Read/write the address of the wM-bus device

Read & Response	AT+WADDR?	+WADDR:<addr> OK
Write & Response	AT+WADDR=<addr>	OK or +ERROR:<err>
Value & Return	<addr> wM-bus device,8 bytes in Hex. <err> error code	
Example	AT+WADDR=AABBCCDD00112233 OK	

AT+ WKEY—Read/write AES key of wM-bus device

Read & Response	AT+WKEY?	+WKEY:<key> OK
Write & Response	AT+WKEY=<key>	OK or +ERROR:<err>
Value & Return	<key> wM-bus encryption KEY, 16 bytes in Hex. <err> error code	
Example	AT+WKEY=AABBCCDD00112233AABBCCDD00112233 OK	

AT+WEBC—Read/write the number of encrypted blocks

Read & Response	AT+WEBC?	+WEBC:<ebc> OK
Write & Response	AT+WEBC=<ebc>	OK or +ERROR:<err>
Value & Return	<ebc> the number of encrypted blocks(16 bytes in a block) <err> error code	
Example	AT+WEBC=2 OK	

List of applicable FCC rules

- FCC CFR Title 47 Part 15 Subpart C Section 15.247

Summarize the specific operational use conditions

- The module has been certified for Mobile applications.
- This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Limited module procedures

- Not applicable

Trace antenna designs

- Not applicable

RF exposure considerations

This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and the user body.

Antennas

- Integral antenna with antenna gain1.5dBi, The antenna is permanently attached, and can’t be replaced.

Label and compliance information

- The end product must carry a physical label or shall use e-labeling followed by KDB784748D01 and KDB

784748 stating “Contains Transmitter Module FCC ID:2BG9A-E1022MLA

Information on test modes and additional testing requirements

- For more information on testing, please contact the manufacturer.

Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for the specific rule parts (FCC Part 15.247) listed on the grant, and the host product manufacturer is responsible for compliance with any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed when contains digital circuity.

FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, under 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 by 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 the receiver.
- Connect the equipment to 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.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

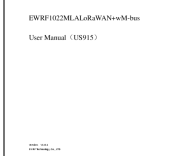
1. This device may not cause harmful interference, and
2. this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.

FCC 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 a minimum distance of 20cm between the radiator & your body.

Documents / Resources

	**EWRF Technology US915 LoRaWAN RF Module** [pdf] User Manual US915, US915 LoRaWAN RF Module, LoRaWAN RF Module, RF Module, Module

References

- **User Manual**

Manuals+, **Privacy Policy**

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