



Emlid WL1 Dual-band radio module user manual

FCC regulatory compliance statement

§15.19 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.

§15.21 Information to user

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

- List of applicable FCC rules:

Part 15.247, 47 CFR Part 22, 74, 80, 90

- Summarize the specific operational use conditions

This module can be used in IOT devices, the input voltage to the module is nominally 5V.

- Limited module procedures

This module is a single module.

- Trace antenna designs

The antenna is not a trace antenna.

- RF exposure considerations

This Module complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 50cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

- Antennas

If you desire to increase antenna gain and either change antenna type or use same antenna type certified, a Class II permissive change application is required to be filed by us, or you (host manufacturer) can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

- Label and compliance information

Please notice that if the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains FCC ID: 2BAYEWL1" any similar wording that expresses the same meaning may be used.

§ 15.19 Labelling requirements shall be complied on end user device.

Labelling rules for special device, please refer to §2.925, § 15.19 (a)(5) and relevant KDB publications. For E-label, please refer to §2.935.

- Information on test modes and additional testing requirements

The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module.

The module is limited to installation in mobile application, a separate approval is required for all other operating configurations, including portable configurations with respect to §2.1093 and difference antenna configurations.

- FCC other Parts, Part 15B Compliance Requirements for Host product manufacturer

This modular transmitter is only FCC authorized for the specific rule parts listed on our grant, host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification.

Host manufacturer in any case shall ensure host product which is installed and operating with the module is in compliant with Part 15B requirements. Please note that For a Class B or Class A digital device or peripheral, the instructions furnished the user manual of the end-user product shall include statement set out in §15.105 *Information to the user* or such similar statement and place it in a prominent location in the text of host product manual. Original texts as following:

For Class B

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.*

ISED Compliance Statements

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 harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

This radio transmitter, [IC: 31633-WL1], has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain specified. The use of antenna types not listed, or any antenna with a gain higher than the maximum indicated for the listed types, is strictly prohibited.

Terminal Antenna	2.5dBi
Monopole Antenna	2.94dBi

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 nuisible ;
2. L'appareil doit accepter tout brouillage radioélectrique reçu, même si ce brouillage est susceptible d'en compromettre le fonctionnement.

Exigences relatives à l'étiquetage :

Si le numéro d'identification IC n'est pas visible lorsque le module est installé à l'intérieur d'un autre appareil, le boîtier extérieur de l'appareil hôte doit également porter une étiquette indiquant clairement la présence du module. Cette étiquette peut utiliser la

formulation suivante (ou toute autre formulation équivalente) :

« Contient IC : 31633-WL1 »

L'étiquette d'homologation du module d'Innovation, Sciences et Développement économique Canada doit toujours être apposée sur le produit hôte à un endroit bien en vue.

Antenne autorisée :

Ce transmetteur radio [IC : 31633-WL1] a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner uniquement avec les types d'antennes énumérés ci-dessous, avec le gain maximal admissible correspondant. L'utilisation d'antennes non listées, ou d'antennes dont le gain est supérieur à celui indiqué, est strictement interdite.

Antenne terminale	2.5dBi
Antenne monopole	2.94dBi

RF Exposure Compliance

This equipment complies with FCC/IC RSS-102 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 equipment should be installed and operated with minimum distance 50cm between the radiator and your body.

Cet équipement est conforme aux limites d'exposition aux radiations IC CNR-102 établies pour un environnement non contrôlé. Cet émetteur ne doit pas être colocalisé ou fonctionner en conjonction avec une autre antenne ou un autre émetteur. Cet équipement doit être installé et utilisé avec une distance minimale de 50cm entre le radiateur et votre corps.

Introduction

Emlid WL1 Dual-band radio module is designed to operate within the frequency ranges of 410.125 ~ 469.125 MHz, 863.3 ~ 869.7 MHz, and 902.9 ~ 927.5 MHz. The permitted frequencies for use may vary depending on the region or country. Users must ensure that the module is not operated on any frequencies other than those officially designated for unlicensed use, unless they have obtained the necessary authorization from local authorities.

Description of the module

Emlid WL1 is a radio transceiver module working on sub-GHz frequencies and capable to transmit and receive data using different modulation technics. Communication with the DTE (data terminal equipment) is performed over USB interface.

Specifications

	min	type	max	note
Tuningfrequency, MHz	410.125		469.125	GMSK modulation only
	863.3		869.7	CSS (LoRa)modulation only
	902.9		927.5	CSS (LoRa)modulation only
Channelbandwidth, KHZ	12.5		25	GMSK modulation only

	125		500	CSS (LoRa) modulation only
Frequencystability, ppm			± 1	GMSK modulation only
			± 0.5	CSS (LoRa) modulation only
Transmitterpower, W	0.1		2	410.125~469.125 MHz (2W for EU)
			0.025	863.3 ~ 869.7 MHz

Power input specifications

Parameter	min	max	note
"VCC 5V"input voltage	4.8V	5.2V	or below 1V for low power and receive-only modes of operation
"VCCIO"input voltage	3.0V	3.6V	

Module compliance with all relevant standards is guaranteed only within the above-mentioned limits.

Absolute maximum ratings

VCC 5V to GND	-0.3 to 5.5 V
VCCIO to GND	-0.3 to 3.8 V
USB_Dp, USB_Dn to GND	-0.3 to 3.6 V
RF to GND	-0.3 to 3.6 V
RF input power (receive mode)	+3 dBm

VSWR (transmit)	<10
Continuous power dissipation	8 W
Operating temperature range	-40 °C to +65 °C

Operating beyond these limits may cause permanent damage to the device

Module connections

Module has Hirose U.FL compatible connector as RF interface
Hirose DF40C-40DP-0.4V(51)V connector used as DTE connector

DTE connector pinout

Pin number	Signal name	Type	Description
2, 4	VCCIO	Power input	3.3V power input
3	USB_Dp	IO	USB Data +
5	USB_Dn	IO	USB Data -
9, 11, 13, 15, 17,19	RSVD	reserved	Do not connect
21, 23, 25, 27,29, 31, 33, 35,37, 39	VIN 5V	Power input	5V power input
1, 6-8, 10, 12,14, 16, 18, 20,22, 24, 26, 28,30, 32, 34, 36,38, 40	GND	Power ground	Power ground

Power on sequence

- Apply 3.3V at VCCIO pins
- Apply 5V at VIN 5V pins. Module may operate without 5V supply in only-receive mode (any frequency) or if the output power is less than or equal to the declared value(in 863.3 ~ 869.7 MHz or 902.9 ~ 927.5MHz frequency bands)

Power off sequence

- Turn off 5V supply if applied
- Turn off 3.3V supply

USB interface

Emlid WL1 module works as USB to Serial device when connected to DTE by USB interface

Transmitter and receiver parameters (including tuning frequency, channel bandwidth and output power) are controlled via set of AT commands. AT commands described in separate documentation

Usage

- Install module to the host computer. DTE connector should be connected to the host computer.
- Connect antenna to the RF interface
- Turn on power supply according to the power on sequence
- Configure radio modes of operation (modulation, frequency, data rate, output power) using AT commands via USB interface
- for transmission, send messages to transmit via USB interface. For receive, wait of received messages over USB interface
- Turn off power supply according to power off sequence

Module outline

