



Wavelabs WL-DCM2400 Wireless RF Module User Manual

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Wavelabs WL-DCM2400 Wireless RF Module



Overview

WL-DCM2400 provides safe RF wireless communication with Point-to-Point Topology.

WL-DCM2400 is an RF wireless communication module operating in the 2.4GHz ISM Band Frequency Hopping method and can apply to equipment using serial interface, and long distance communication is possible at high speed.

WL-DCM2400 can be configured according to the required type by AT command.

Applications are conveniently configured and can be applied in various fields.

Regulatory Information

SIMPLIFIED EU DECLARATION OF CONFIRMITY

The simplified EU declaration of conformity referred to in Article 10(9) shall be provided as follows:

Hereby, Wavelabs Co., Ltd. declares that the radio equipment type 2.4GHz wireless modem is in compliance with Directive 2014/53/EU.

Frequency Range	Output Power (Max.)
2400~2483.5 MHz	Below 20 dBm

FCC Rules

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.

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

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.

Wavelabs, Inc.,: RM705, 7FL, Jangmiro 42, Bundang-gu Sungnam-City, Gyeonggi-do, Rep of KOREA

RF Radiation Exposure Statement:

This equipment complies with RF radiation exposure limits set forth for an uncontrolled environment.

This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Antenna Name	Antenna Type	Antenna Gain (dBi)
TE-2406-CH05	Dipole	5.8
W5E-WO-01	Dipole	5.0

Characteristics and functions

The main performance features of WL-DCM2400 are as follows.

- 2.4MHz ISM Band Frequency Hopping Operation(Max. 79ch)
- Maximum output power of 1W (+30dBm)
- Output power level can be adjusted according to the standards of each country
- Link rate : Max. 250kbps
- Can be set by AT command
- UART / USB interface
- Call book function
- RSSI LED indication

WL-DCM2400 specification

Electrical / General

- Supported Frequency: 2.405 ~ 2.480 GHz (CE) , 2.402 ~ 2.480 GHz (FCC)
- Spreading Method: Frequency Hopping(FHSS)
- Output Power: Up to 1W (adjustable)
- Link Rate: 100 kbps, 250 kbps (adjustable)
- Serial Baud Rate: 9600 ~ 230400 bps (adjustable)
- Core Voltage: +7 ~ +12 VDC
- Power Consumption: 1.25A@+12V

Environmental

Operation Temperature : -25°C to +85°C

Mechanical

- Dimensions : 41mm X 75.5mm X 17mm
- Weight: Max. 100g (Without antenna)
- Connectors: Antenna : RSMA
- Data : USB (Micro 5Pin) / UART

Hardware Description

This document defines the standard and general characteristics applied to the WL-DCM2400 module. WL-DCM2400 composes several interfaces as follows.

- Input DC voltage : +7 ~ +12 VDC
- Power LED indication: Red
- RSSI LED indication: Blue
- TX Data LED indication: Red
- RX Data LED indication: Green
- RS232 / UART Data Interface
- Antenna (SMA)
- USB Port (Serial to USB (Micro 5Pin))
- I/O Pins (JST Connector 6Pin (VCC / Config / UART / GND))

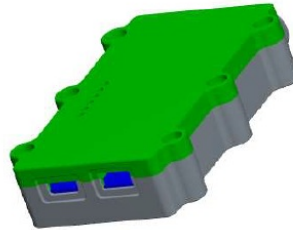
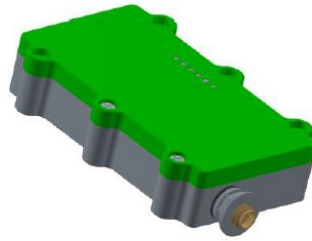


Fig 1. WL-DCM240

WL-DCM2400 Drawings

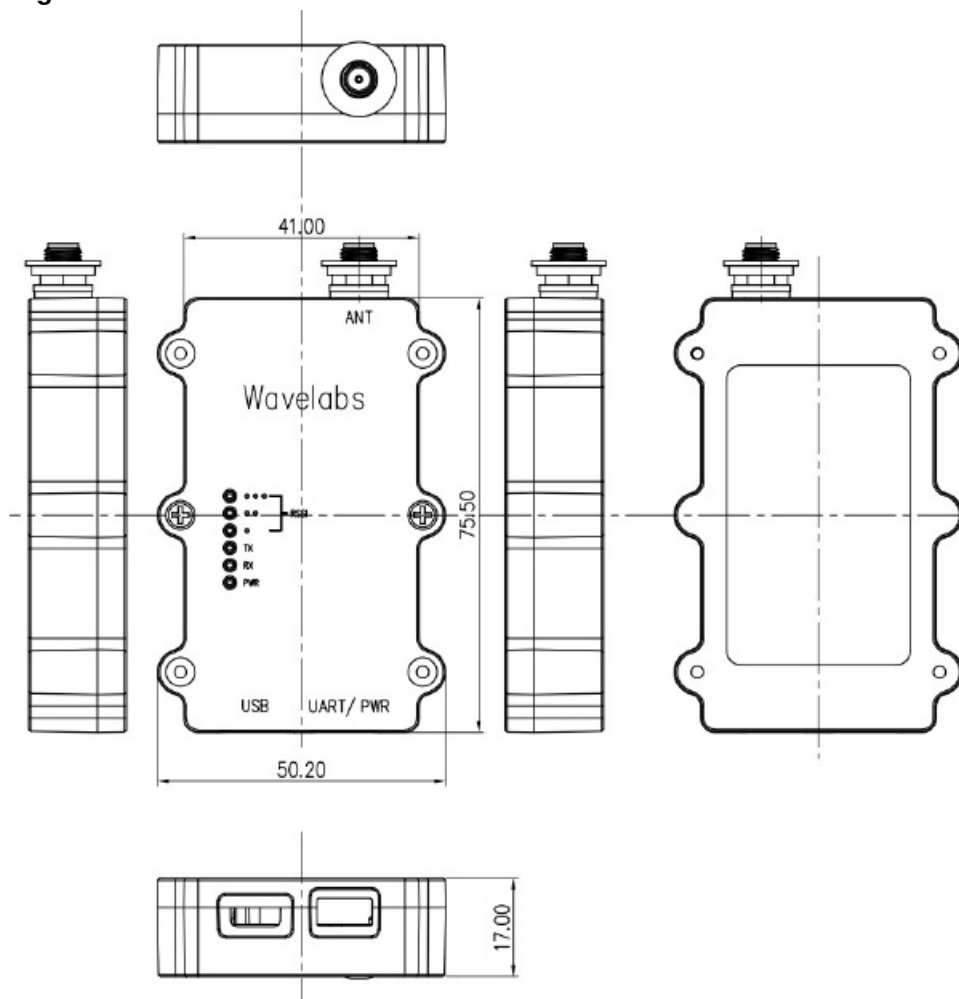


Fig 2. Drawings

WL-DCM2400 Connectors & LED indication

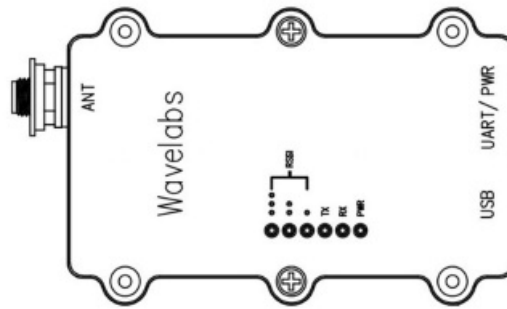


Fig 3. LED indication

- PWR (Red)
Red LED turns on when WL-DCM2400 input voltage (+7 ~ +12 VDC) is applied.
- TX LED (Red)
TX red LED is ready and TX red LED blinks repeatedly to indicate data transmission status.
- RX LED (Green)
RX green LED is ready and RX green LED blinks repeatedly to indicate data reception status.
- Indication of received signal strength (Blue) : RSSI
As the received signal strength increases, 1 to 3 blue LED lights increase.

MODE	Unit Type	LED status			
		PWR	TX	RX	RSSI
COMMAND	ALL	ON	OFF	OFF	OFF
DATA	RX	ON	Blinking : Transmission state	ON : Ready state Blinking : Reception state	LED lights up according to signal strength
	TX	ON	ON : Ready state Blinking : Transmission state	Blinking : Reception State	LED lights up according to signal strength

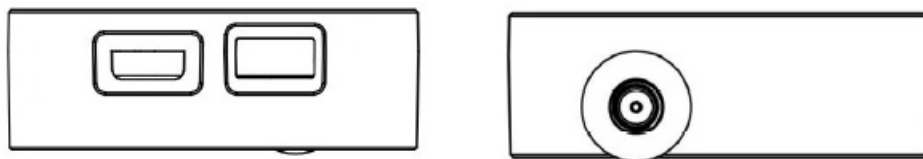


Fig 4. Connector & USB

- USB

When connected to a PC, a USB port provided for user convenience through a serial to USB port .(Micro 5 Pin to USB)

- JST Connector (6 Pin)

Input DC volatage : +7 ~ +12 VDC

Config (COMMAND) : Using for firmware download

UART (DATA) : UART communication between devices

- ANT

SMA Connector

Pin No.	Signal	
1	VCC	
2	Config	
3	UART	RX
4		TX
5		GND
6	GND	

RF module command

RF module can be controlled by AT command, and it is composed in the form of "AT+<Command>[Enter]"
 [Enter] means newline character, CR(0x0D) + LF(0x0A) character

Enter command mode

- Check whether to enter "Command Mode" for 5 seconds after powering on the RF module.
 (When entering "command mode" command is not input, "RF transmit/receive mode" is automatically switched)
- RF module setting can be checked and changed after entering "command mode"
- When changing the RF module setting, the changed setting value is applied only after flash saving is completed. (If Flash cannot be saved, the setting change will not be applied)
- After "command mode" is finished, "RF transmission/reception mode (=RF Mode)" is automatically switched.

	Check whether to enter “Command Mode” for 5 seconds after powering on the RF module.	
(When entering “command mode” command is not input, “RF transmit/receive mode” is automatically switched)		(When entering “command mode” command is not input, “RF transmit/receive mode” is automatically switched)
	RF module setting can be checked and changed after entering “command mode”	

Configuration Command

Basic commands

■ ■ ■	■ ■
AT+I	Display module information
AT+F	Module frequency band setting
AT+C	Calling up default settings related to module control
AT+S	Save module current settings flash memory
AT+V	Module current setting output

3.2.1 AT+I

Function	Module information output	
Example	TX	AT+I<Index>[Enter]
Example	RX	<Information>[Enter]
Parameter	<Index>	0 : Product Name 1 : Firmware Version 2 : Module MAC Address
Remark		

Table 5. AT+I description

3.2.2 AT+F

Function	Module frequency band setting	
Example	TX	AT+F<Space><Fstart> <Space> <Fstop> <Space> <Spacing> <Space> <Count>[Enter]
Example	RX	OK
Parameter	<Fstart>	Communication frequency start value, unit : MHz (Default : 2405.0, Min : 2402.0)
	<Fstop>	Communication frequency start value, unit : MHz (Default : 2480.0, Max : 2480.0)
	<Spacing>	Communication frequency interval, unit : MHz (Default : 5.0, Min : 1.0 / Max : 5.0)
	<Count>	Frequency hopping number, unit : ea (Default : 16, Min : 1 / Max : 79)
Remark	Separation of parameters is determined by spaces (=space, 0x20) For <Spacing> and <Count> items, Min & Max values are automatically changed according to the value. → Spacing = (1.0) / Count = (Min : 1, Max : 79) → Spacing = (5.0) / Count = (Min : 1, Max : 16) Ex : (<Fstart>) + (<Spacing>*<Count>) <= (<Fstop>)	

Table 6. AT+F description

3.2.3 AT+C

Function	Calling up default settings related to module control	
Example	TX	AT+C<Index>[Enter]
Example	RX	OK [Enter]
Parameter	<Index>	0 : Master (Transmit Mode) 1 : Slave (Receive Mode)
Remark	Set to the default setting of the selected <Index> mode	

Table 7. AT+C description

3.2.4 AT+S

Function	Saving the module current setting to the flash memory	
Example	TX	AT+S[Enter]
Example	RX	OK[Enter]
Parameter		
Remark	After changing the settings in "command mode", go to "RF transmission/reception mode" without saving, previously changed values are not applied when switching	

Table 8. AT+S description

3.2.5 AT+V

Function	Module current setting output	
Example	TX	AT+V[Enter]
Example	RX	<Information>[Enter]
Parameter		
Remark	The previously saved Flash value and the current changed value are separated and output.	

Table 9. AT+V description

Installation

There are several factors to consider when preparing to deploy a wireless network, and several factors are described below in no specific order.

Network Topology

WL-DCM2400 operates in

2.4GHz ISM band and supports Point to Point Topology.

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WL-DCM2400 operates in 2.4GHz ISM band and supports Point to Point Topology.

Throughput

WL-DCM2400 supports up to 250kbps asynchronous transmission speed

Distance

Physical distance between products is affected by required antenna performance and height

Terrain

Along with distance, terrain should take into account antenna performance considerations. The term "line of sight" (LOS) means being able to see one location from another location, which is the minimum requirement for a radio signal path. That is, the LOS should be secured to minimize the effect on the RF communication link.

Power requirements

Along with distance, terrain should take into account antenna performance considerations. The term "line of sight" (LOS) means being able to see one location from another location, which is the minimum requirement for a radio signal path. That is, the LOS should be secured to minimize the effect on the RF communication link.

User description

POWER SUPPLY

The module supply power is +7 ~ +12V, and the user should consider the current capacity when applying power.

UART PORT

It processes transmission/reception data by connecting it to the UART Port of the connecting device.

USB PORT

PORT is an added function for user convenience, and it is directly connected to the PC without using a separate conversion device.

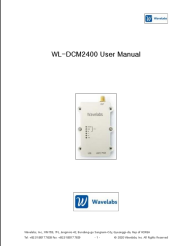
LED status indication

LED status indication is as follows.

Item	Description	LED Color	Number of LEDs
RSSI	Received signal strength indication	Blue	3 EA
TX	RF data transmission status indication	Red	1 EA
RX	RF data reception status display	Green	1 EA
POWER	Module power status indication	Red	1 EA

* In Command Mode, only the power LED is on.

Documents / Resources

	<p>Wavelabs WL-DCM2400 Wireless RF Module [pdf] User Manual FCWLDCM2400A, 2AZDSFCWLDCM2400A, WL-DCM2400 Wireless RF Module, WL-DCM2400, Wireless RF Module</p>
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