

LC760Z EVB User Guide

GNSS Module Series

Version: 1.0

Date: 2023-08-25

Status: Released



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Safety Information

The following safety precautions must be observed during all phases of operation, such as usage, service, or repair of any terminal or mobile incorporating the module. Manufacturers of the terminal should notify users and operating personnel of the following safety precautions by incorporating them into all product manuals. Otherwise, Quectel assumes no liability for customers' failure to comply with these precautions.



Ensure that the product may be used in the country and the required environment, as well as that it conforms to the local safety and environmental regulations.



Keep away from explosive and flammable materials. The use of electronic products in extreme power supply conditions and locations with potentially explosive atmospheres may cause fire and explosion accidents.



The product must be powered by a stable voltage source, while the wiring must conform to security precautions and fire prevention regulations.



Proper ESD handling procedures must be followed throughout the mounting, handling and operation of any devices and equipment incorporating the module to avoid ESD damages.

About the Document

Document Information

Title	LC760Z EVB User Guide
Subtitle	GNSS Module Series
Document Type	EVB User Guide
Document Status	Released

Revision History

Version	Date	Description
-	2023-07-19	Creation of the document
1.0	2023-08-25	First official release

Contents

Safety Information.....	3
About the Document.....	4
Contents	5
Table Index.....	6
Figure Index	7
1 Introduction	8
2 General Overview.....	9
2.1. EVB Kit.....	9
2.2. Connect Cables and Antenna to EVB.....	11
3 EVB Interfaces.....	12
3.1. EVB Top View.....	12
3.2. EVB Interfaces	13
4 Test and Firmware Upgrade via QGNSS Tool	16
4.1. Test via QGNSS	16
4.2. QGNSS Interface Explanation	17
4.3. Firmware Upgrade in Normal Operating Mode.....	19
4.4. Firmware Download in Boot Download Mode	22
5 EVB and Antenna Installation.....	26
5.1. GNSS Antenna Installation	26
5.2. EVB Installation.....	26
6 Measuring Power Consumption.....	27
6.1. Power Consumption at Different Stages.....	27
6.2. VCC Power Consumption Measurement.....	27
6.3. V_BCKP Power Consumption Measurement	29
7 EVB Framework.....	31
8 Common Problems and Troubleshooting.....	32
9 Cautions	33
10 Appendix References	34

Table Index

Table 1: List of Kit Components	10
Table 2: Detailed EVB Interfaces	13
Table 3: J402 Pin Description.....	14
Table 4: QGNSS Interface Explanation.....	18
Table 5: Related Documents	34
Table 6: Terms and Abbreviations	34

Figure Index

Figure 1: EVB Kit Components	9
Figure 2: EVB and Components Assembly	11
Figure 3: EVB Top View	12
Figure 4: COM Port and Baud Rate Setting	16
Figure 5: QGNSS Interface (Connected).....	17
Figure 6: Tool Startup	19
Figure 7: Tool Setting	20
Figure 8: Firmware Selecting	20
Figure 9: Firmware Upgrade – 1	21
Figure 10: Firmware Upgrade – 2	21
Figure 11: Successful Firmware Upgrade	22
Figure 12: Tool Startup	22
Figure 13: Tool Setting	23
Figure 14: Firmware Selecting	23
Figure 15 : Firmware Downloading – 1	24
Figure 16 : Firmware Downloading – 2	24
Figure 17: Successful Firmware Downloading	25
Figure 18: Power Consumption at Different Stages	27
Figure 19: VCC Power Consumption Measured with Ammeter	28
Figure 20: VCC Power Consumption Measured with Power Consumption Meter	28
Figure 21: V_BCKP Power Consumption Measured with Ammeter.....	29
Figure 22: V_BCKP Power Consumption Measured with Power Consumption Meter	30
Figure 23: EVB Framework.....	31

1 Introduction

This document provides information on the steps needed to evaluate the Quectel LC760Z module using the Evaluation Board (EVB). The EVB is a convenient tool that allows you to become familiar with the LC760Z module.

Specifically, the document is divided into several sections:

- Chapter 2 provides the general overview of EVB kit.
- Chapter 3 describes the EVB interfaces.
- Chapter 4 describes how to test the module, download and upgrade firmware via QGNSS tool.
- Chapter 5 describes the installation of EVB and antenna.
- Chapter 6 describes how to measure power consumption for LC760Z module.
- Chapter 7 provides the EVB framework.
- Chapter 8 describes the common problems and troubleshooting.
- Chapter 9 describes the cautions.
- Chapter 10 is an appendix, which summarizes the relevant documents, terms and abbreviations appearing herein.

NOTE

Request the software tool QGNSS from Quectel Technical Support (support@quectel.com).

2 General Overview

2.1. EVB Kit

The EVB kit includes: Evaluation Board (EVB), active GNSS antenna, Type-B USB Cable, bolts and coupling nuts.

The EVB kit components are shown in the figure below. Check [Table 1: List of Kit Components](#) for details.

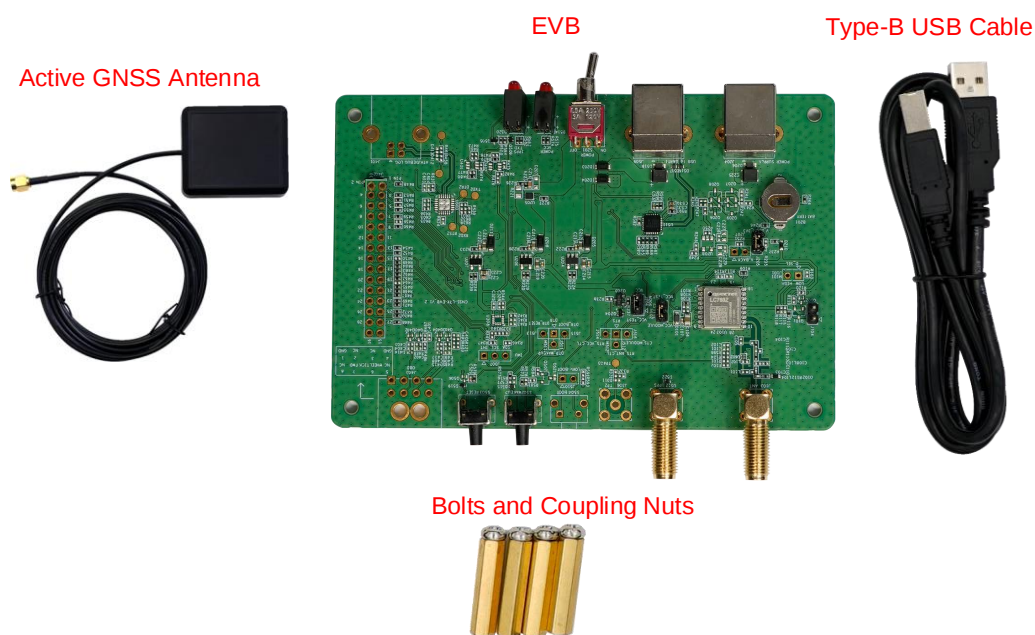


Figure 1: EVB Kit Components

Table 1: List of Kit Components

Items	Description	Quantity
EVB	Evaluation Board Size: 80 mm × 120 mm	1
USB Cable	Type-B USB Cable	1
GNSS Antenna	Active GNSS Antenna: YEGM020BA Antenna Size: 55 mm × 47 mm × 16.2 mm Cable Length: 3000 mm The GNSS antenna supports: ● GPS L1 C/A ● GLONASS L1 ● Galileo E1 ● BDS B1I, B1C ● QZSS L1 ● SBAS L1	1
Others	Bolts and Coupling Nuts	4 pairs

NOTE

Request Quectel Technical Support (support@quectel.com) for details about Quectel Active GNSS Antenna.

2.2. Connect Cables and Antenna to EVB

The connection between the EVB and its components is shown in the figure below.

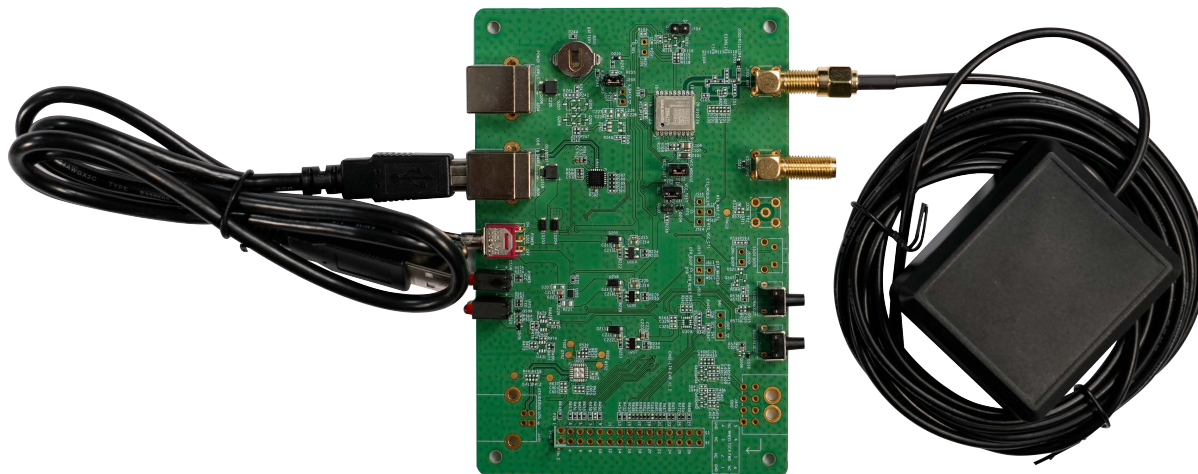


Figure 2: EVB and Components Assembly

NOTE

1. The EVB can be powered by either “**POWER SUPPLY**” (J204) or “**USB to UART**” interface (J509). Thus, it is optional to connect PC and the “**POWER SUPPLY**” (J204) on the EVB via Type-B USB. For more information, see [Chapter 3.2 EVB Interfaces](#).
2. Make sure that the active GNSS antenna is placed with a clear line of sight to the sky.

3 EVB Interfaces

3.1. EVB Top View

EVB top view is shown in the figure below.

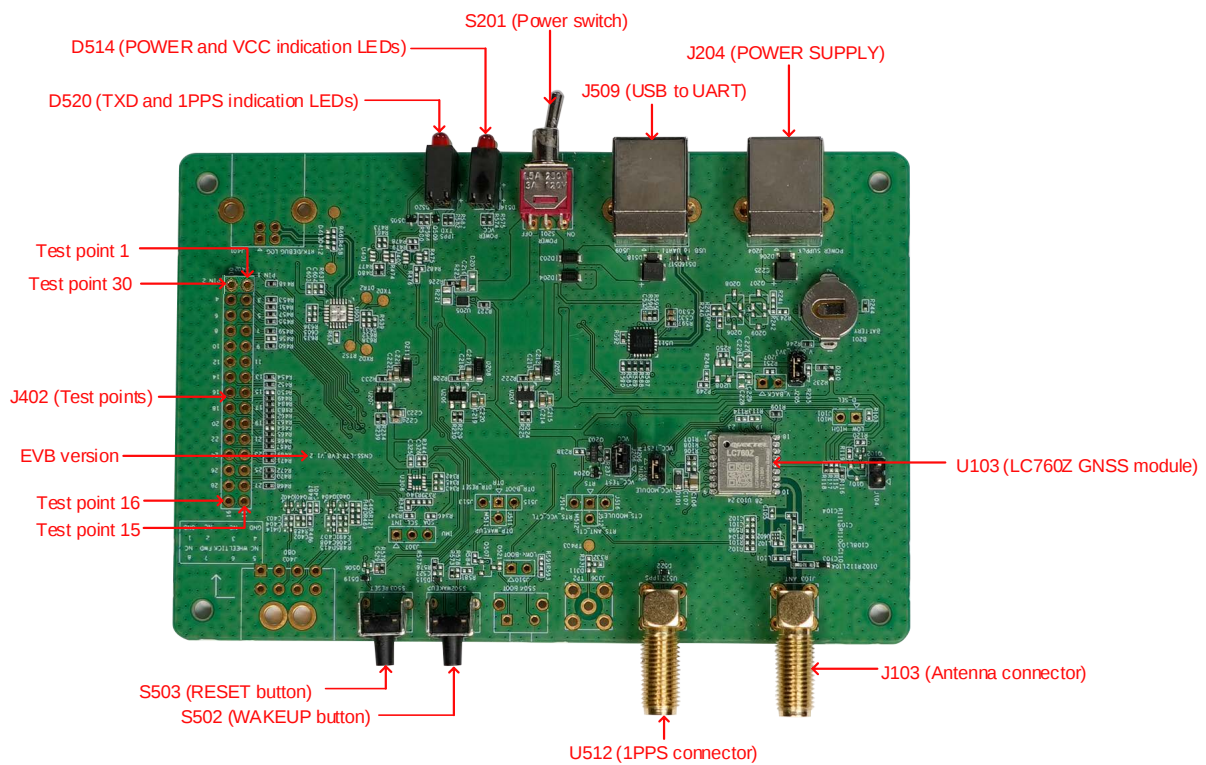


Figure 3: EVB Top View

3.2. EVB Interfaces

The EVB interfaces are detailed in the table below.

Table 2: Detailed EVB Interfaces

Function	Interfaces		Description
Power Supply	J204	POWER SUPPLY	J204: Only used to supply power to avoid the insufficient supply of J509.
	J509	USB to UART	J509: Used to communicate and supply power. Power supply input: - DC power supply: 4.5–5.5 V, Typ. 5.0 V - Current capability should be > 150 mA
Communication Interface	J509	USB to UART	Supports standard NMEA message, PQTM message, Binary message, and firmware upgrade.
SMA Connector	J103	Antenna connector	Used for connecting GNSS antenna.
	U512	1PPS connector	Used for testing 1PPS signal.
Signal Indication	D514	POWER (Red)	Bright: EVB is powered well. Extinct: EVB is not powered.
		VCC (Green)	Bright: Module is powered well. Extinct: Module is not powered.
	D520	1PPS (Red)	Flashing: Successful position fix. Frequency: 1 Hz. Extinct: No position fix.
		TXD (Green)	Unsupported.
Switches and Buttons	S201	Power switch	Powers the module VCC on/off.
	S503	RESET	Short press on the button to reset the module.
	S502	WAKEUP	Press and hold the button first and then flip the power switch to ON position to allow the module to enter Boot download mode. Note that the WAKEUP button is actually the BOOT button.

The J402 test point of LC760Z EVB is shown below:

Table 3: J402 Pin Description

Test Point No.	Test Point Label	Test Point Function	I/O	Description
1	PIN1	GND	-	Ground
2	PIN3	U103: Pin 3	DI	RXD: Receives data
3	PIN5	U103: Pin 5	-	Reserved
4	PIN7	U103: Pin 7	-	Reserved
5	PIN9	U103: Pin 9	DI	RESET_N: Resets the module
6	PIN11	U103: Pin 11	-	NC (Not Connected)
7	PIN13	U103: Pin 13	DO	ANT_ON: Controls external LNA and active antenna power
8	PIN15	U103: Pin 15	-	Reserved
9	PIN17	U103: Pin 17	DI	I2C_SCL: I2C serial clock
10	PIN19	U103: Pin 19	-	Reserved
11	PIN21	U103: Pin 21	DO	GEOFENCE: Indicates geofence status
12	PIN23	U103: Pin 23	DO	3D_FIX: 3D position fix indication
13	PIN25	U103: Pin 25	-	Reserved
14	PIN27	U103: Pin 27	-	Reserved
15	No label	-	-	NC
16	No label	-	-	NC
17	PIN28	GND	-	Ground
18	PIN26	U103: Pin 26	DO	I2C_INT: Outputs interrupt signal for I2C
19	PIN24	U103: Pin 24	-	Reserved
20	PIN22	U103: Pin 22	DO	JAM_IND: Jamming indication
21	PIN20	U103: Pin 20	-	Reserved

Test Point No.	Test Point Label	Test Point Function	I/O	Description
22	PIN18	U103: Pin 18	DI	BOOT: Controls module startup mode
23	PIN16	U103: Pin 16	DIO	I2C_SDA: I2C serial data
24	PIN14	U103: Pin 14	PO	ANT_BIAS: Supplies power for external RF components, controls external active antenna power or LNA and supports antenna status detection
25	PIN12	GND	-	Ground
26	PIN10	GND	-	Ground
27	PIN8	U103: Pin 8	PI	VCC: Main power supply
28	PIN6	U103: Pin 6	PI	V_BCKP: Backup power supply for backup domain of module
29	PIN4	U103: Pin 4	DO	1PPS: 1 pulse per second
30	PIN2	U103: Pin 2	DO	TXD: Transmits data

NOTE

1. Test points of J402 are arranged clockwise, and their serial numbers are shown in [Figure 3: EVB Top View](#).
2. A J402 test point refers to the module's corresponding function. For detailed descriptions, see [document \[1\] hardware design](#).

4 Test and Firmware Upgrade via QGNSS Tool

This chapter explains how to use the QGNSS software tool for verifying the status of GNSS module and firmware upgrade. For more information about QGNSS use, see [document \[2\] QGNSS user guide](#).

4.1. Test via QGNSS

Step 1: Assemble the EVB components.

Step 2: Connect the EVB and the PC with a Type-B USB cable, then flip the power switch (S201) to **ON** position to power on the EVB.

Step 3: Start the QGNSS and click  “**Set Device Information**” (default baud rate: 115200 bps ¹).

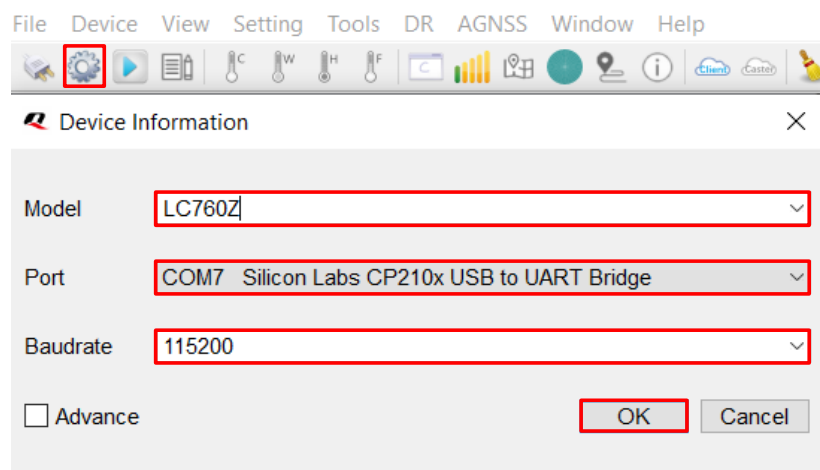


Figure 4: COM Port and Baud Rate Setting

Step 4: Click the  “**Connect or disconnect**” button. The interface shown in the figure below appears once the module is connected.

¹ UART interface default settings may vary depending on software versions.

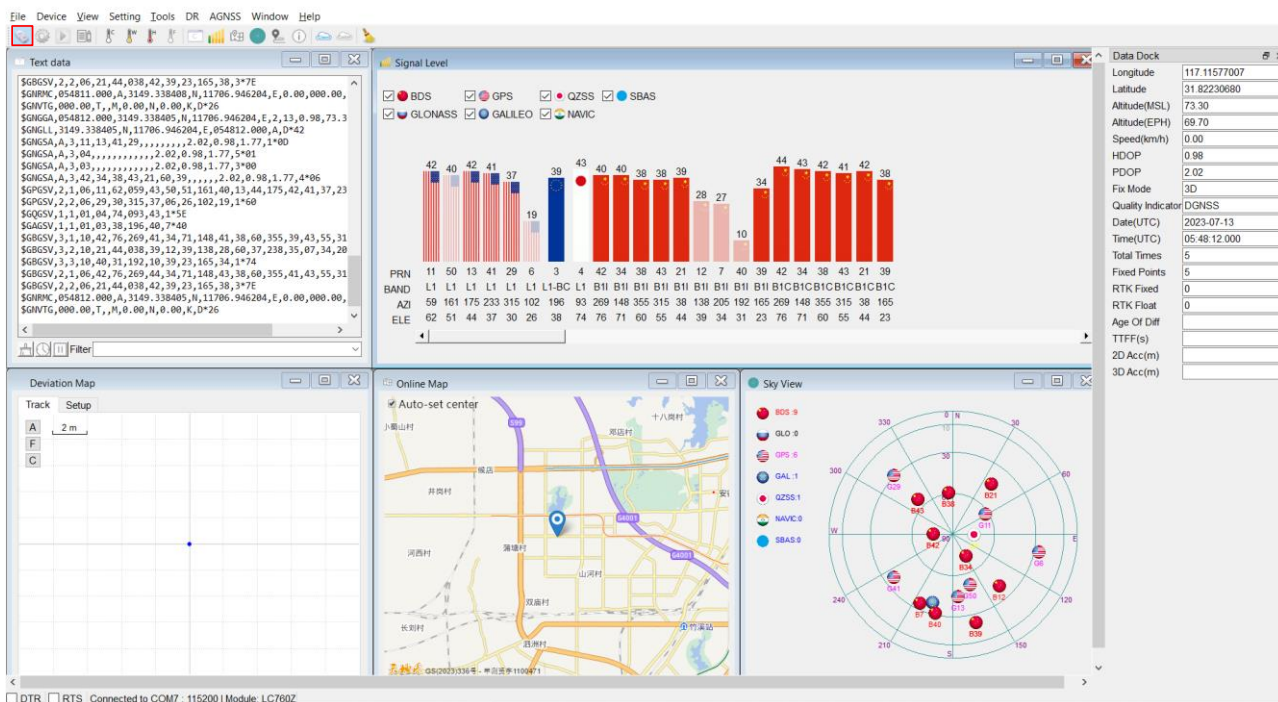


Figure 5: QGNSS Interface (Connected)

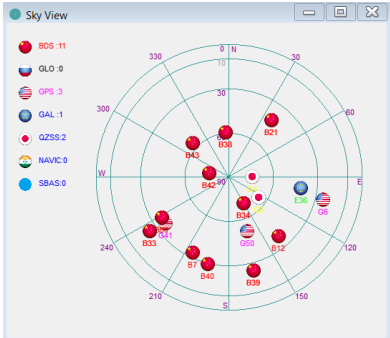
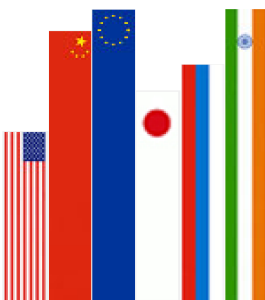
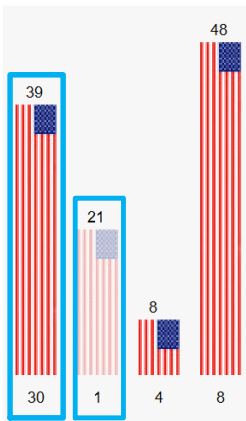
NOTE

Ensure the CP210x driver has been installed when you use the QGNSS tool for the first time. For more information about the driver, please contact the Quectel Technical Support (support@quectel.com).

4.2. QGNSS Interface Explanation

You can view GNSS information, such as C/N₀ message, time, position, speed, and precision in the QGNSS interface. See the following table to find out more about these parameters.

Table 4: QGNSS Interface Explanation

Icon	Explanation
	This sky view interface shows the position of the satellites in use. 1) The left column icons show the satellites in use and their number. ● BDS: 11 ● GLO (GLONASS): 0 ● GPS: 3 ● GAL (Galileo): 1 ● QZSS: 2 ● NAVIC: 0 ● SBAS: 0 2) The sky view on the right shows the position of the satellites in use and their PRN numbers.
	The signal view shows the C/N₀ values for each satellite on each supported band and is identified by the corresponding country flags. - GPS satellite - BDS satellite - GLONASS satellite - Galileo satellite - QZSS satellite - NavIC satellite
	Visible satellites and their used status examples are shown below: ● Column in bright colour means that the navigation data of that satellite is used. ● Column in light colour means that the satellite is visible but not used. ● Examples are shown below: ➤ PRN 30 C/N₀ is 39 dB-Hz and used in solution. ➤ PRN 1 C/N₀ is 21 dB-Hz and not used in solution.

Data Dock	
Longitude	117.11578572
Latitude	31.82223592
Altitude(MSL)	62.10
Altitude(EPH)	58.50
Speed(km/h)	0.00
HDOP	0.87
PDOP	1.48
Fix Mode	3D
Quality Indicator	DGNSS
Date(UTC)	2023-07-13
Time(UTC)	06:02:01.000
Total Times	834
Fixed Points	834
RTK Fixed	0
RTK Float	0
Age Of Diff	
TTFF(s)	
2D Acc(m)	
3D Acc(m)	

- Longitude (unit: °) (Decimal Degrees)
- Latitude (unit: °) (Decimal Degrees)
- Altitude (MSL) (unit: m)
- Altitude (EPH) (unit: m)
- Receiver speed (unit: km/h)
- Horizontal dilution of precision
- Position dilution of precision
- Fix Mode: 2D, 3D
- Quality Indicator: DGNSS, DGPS, GPS SPS, Float RTK and Fixed RTK modes
- Date: UTC date
- Time: UTC time
- Total Times
- Fixed Points
- RTK Fixed
- RTK Float
- Age of differential GPS data
- Last TTFF (unit: s)
- 2D accuracy (unit: m)
- 3D accuracy (unit: m)

4.3. Firmware Upgrade in Normal Operating Mode

Power on the EVB before you upgrade the firmware, see [Chapter 4.1 Test via QGNSS](#) for details.

Firmware upgrade steps:

Step 1: Open QGNSS tool, and click “**Tools**” and select “**Firmware Download**” in the drop-down box.

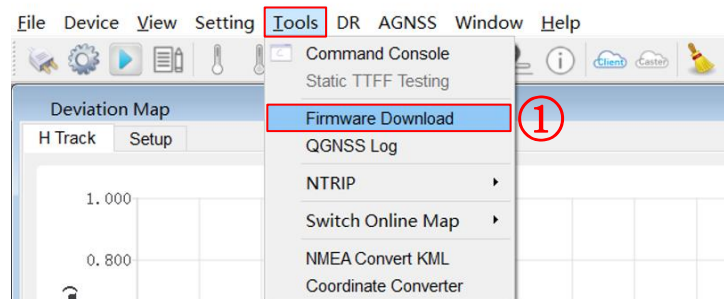


Figure 6: Tool Startup

Step 2: Select the “Download Baudrate” (460800 bps) in the drop-down box of “Settings”.

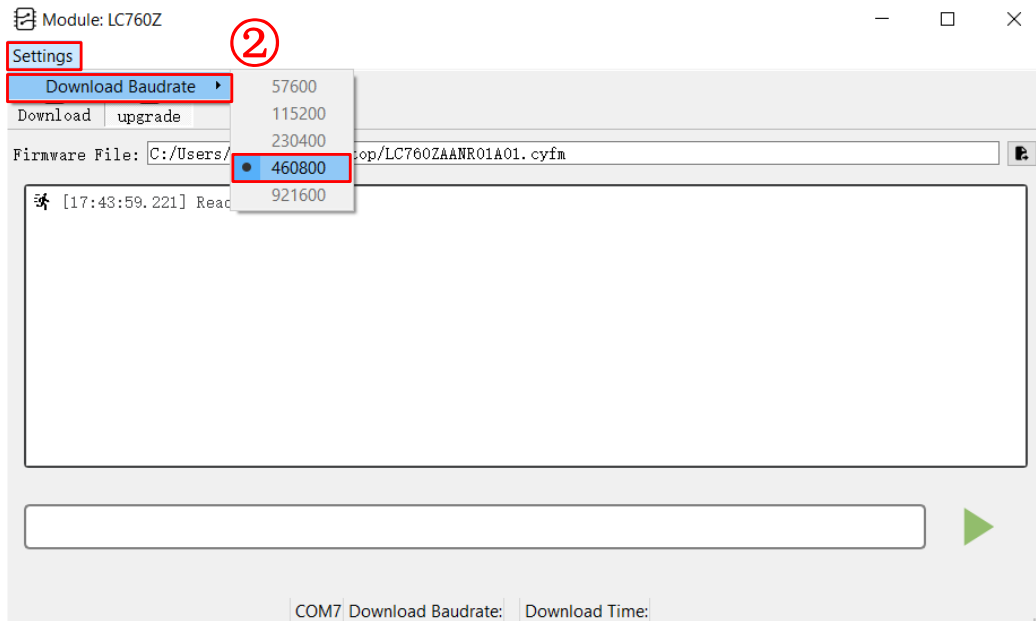


Figure 7: Tool Setting

Step 3: Select the “upgrade”, and then click the  “Open” button to select file, e.g., “LC760ZAANR01A01.cyfm”.

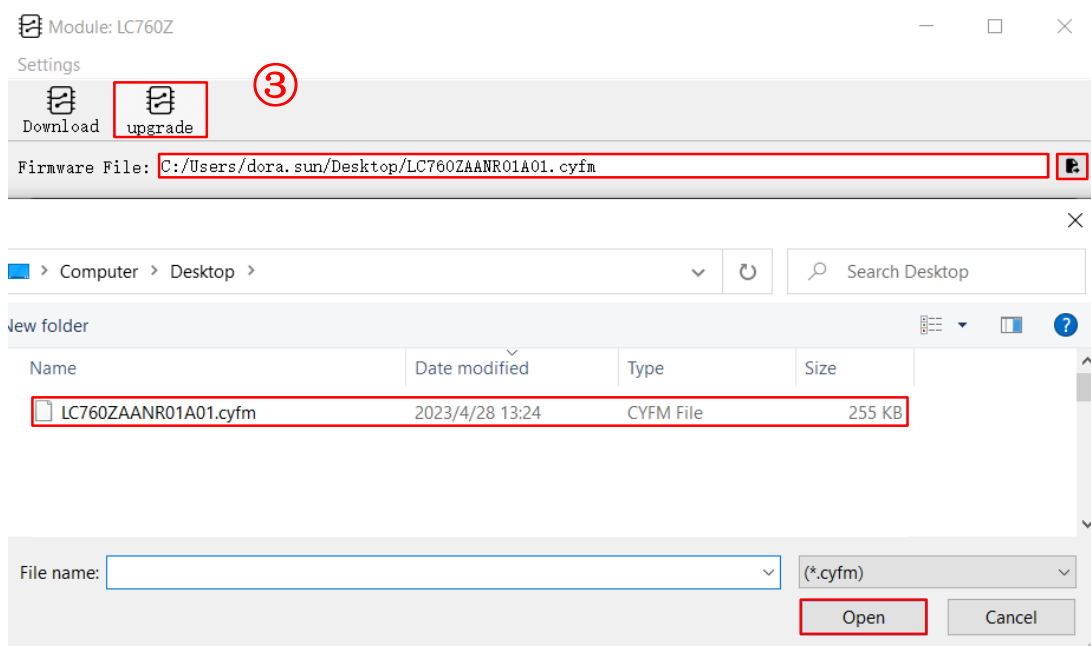


Figure 8: Firmware Selecting

Step 4: Click the “Run” button to start downloading the firmware.

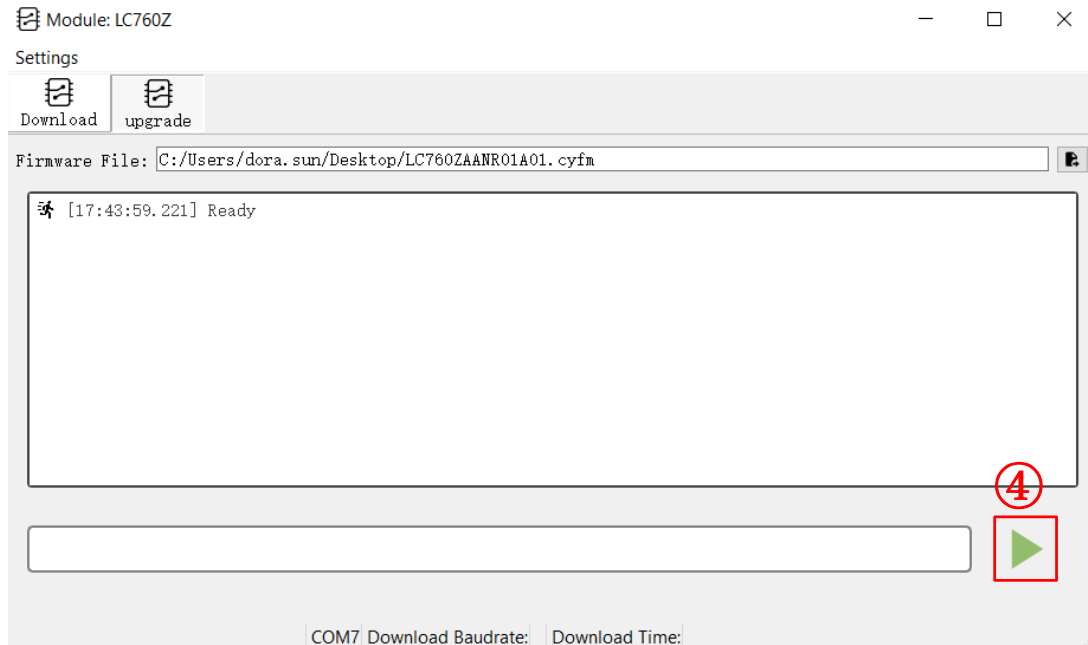


Figure 9: Firmware Upgrade – 1

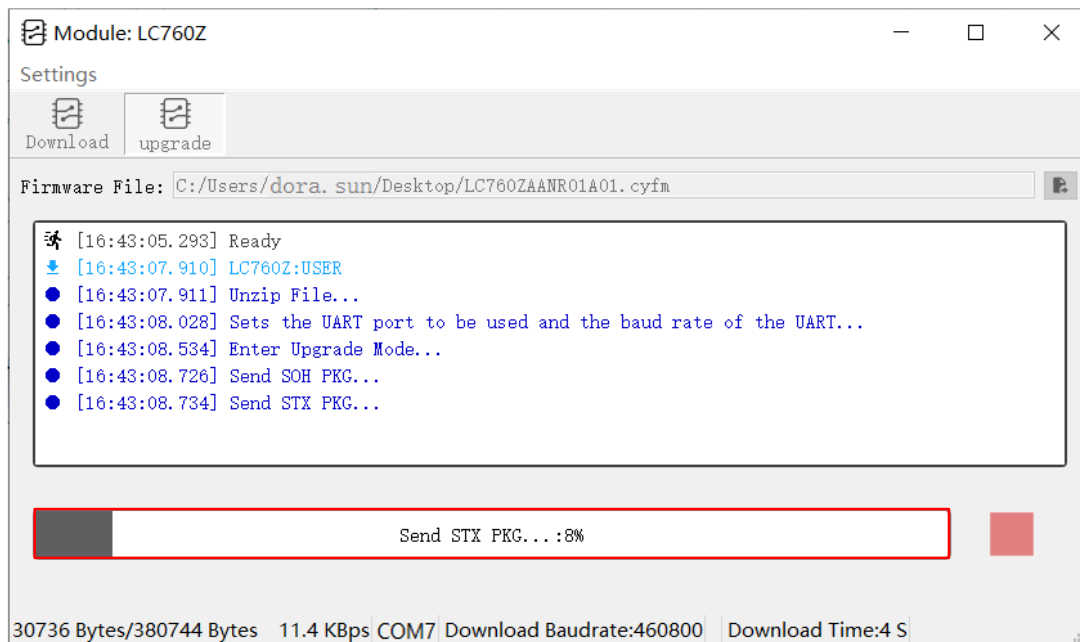


Figure 10: Firmware Upgrade – 2

Step 5: Upon successful firmware upgrade, the QGNSS tool's progress bar on the screen will indicate "100 %".

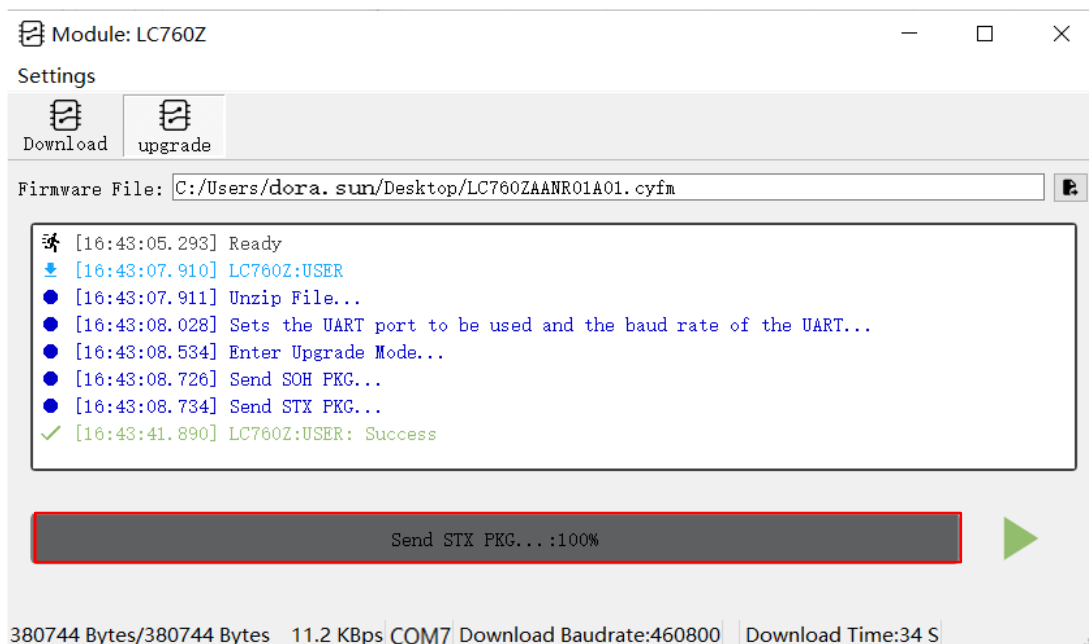


Figure 11: Successful Firmware Upgrade

4.4. Firmware Download in Boot Download Mode

Before firmware download process, connect the EVB to a PC with one Type-B USB cable and flip the power switch (S201) to **OFF** position.

Firmware downloading steps:

Step 1: Open QGNSS tool, and click "**Tools**" and select "**Firmware Download**" in the drop-down box.

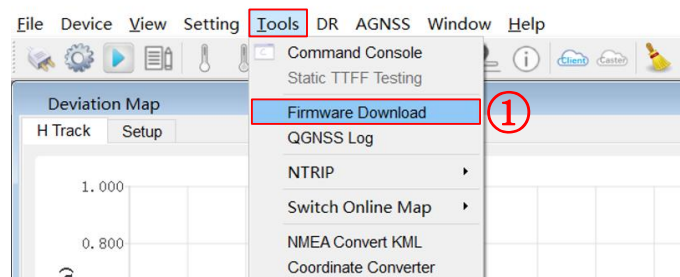


Figure 12: Tool Startup

Step 2: Select the “Download Baudrate” (460800 bps) in the drop-down box of “Settings”.

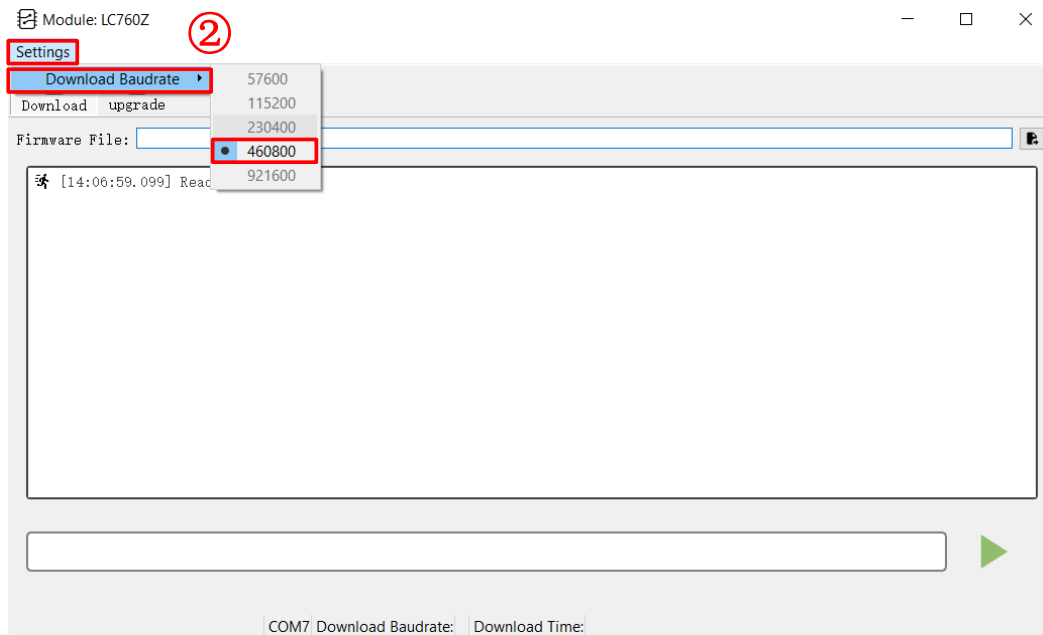


Figure 13: Tool Setting

Step 3: Select “Download” and then click the  “Open” button to select firmware file, e.g., “LC760ZAANR01A01.cyfm”.

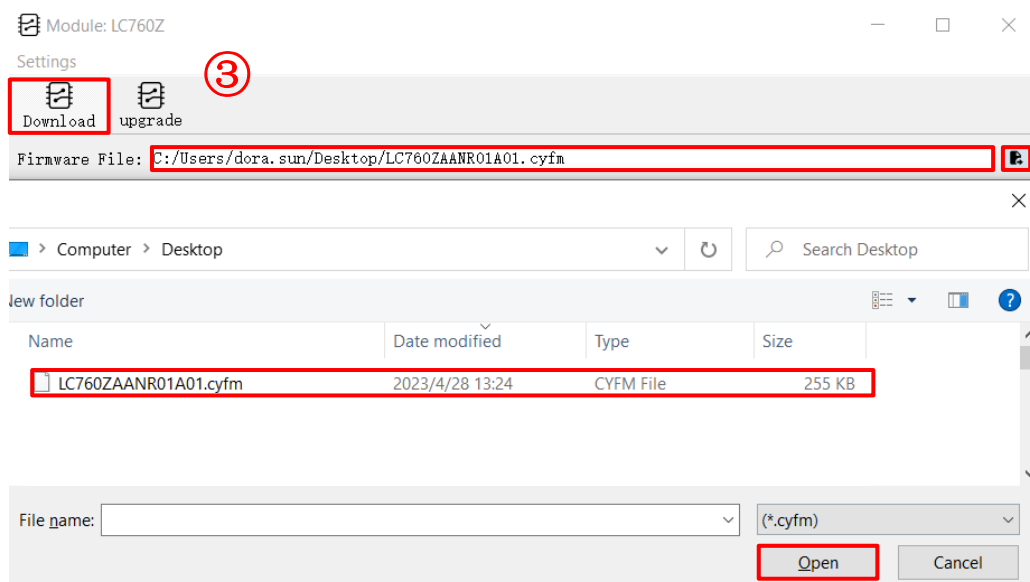


Figure 14: Firmware Selecting

Step 4: Press and hold the **WAKUP** button (S502) before flipping the power switch to **ON** position, and

release the **WAKEUP** button to set the module to Boot download mode. Then click  “Run” button to download the firmware.

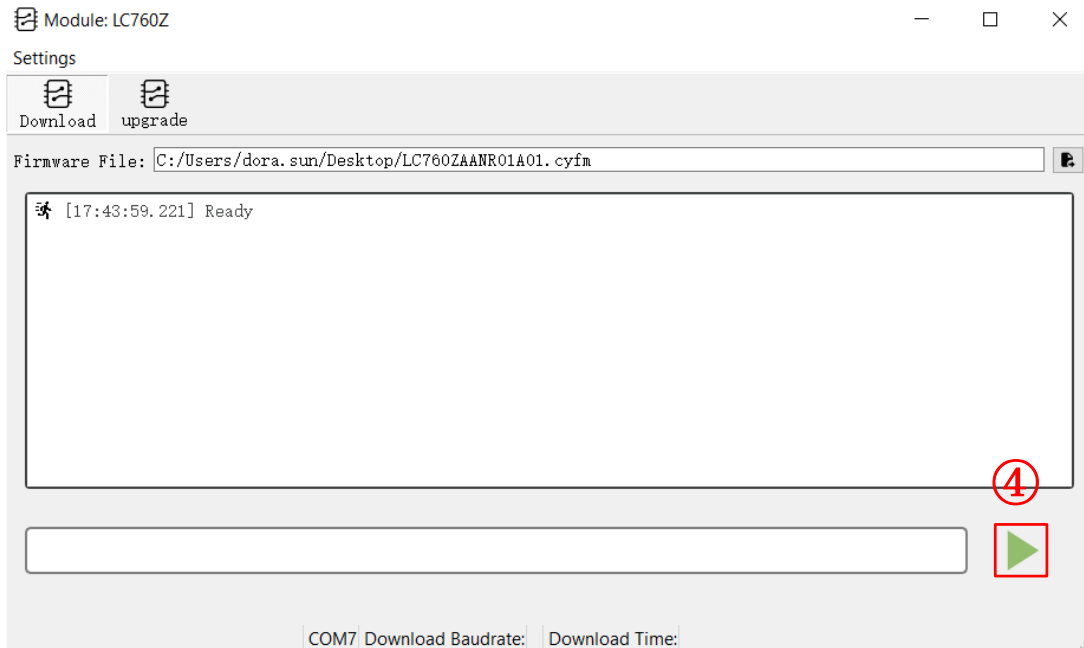


Figure 15 : Firmware Downloading – 1

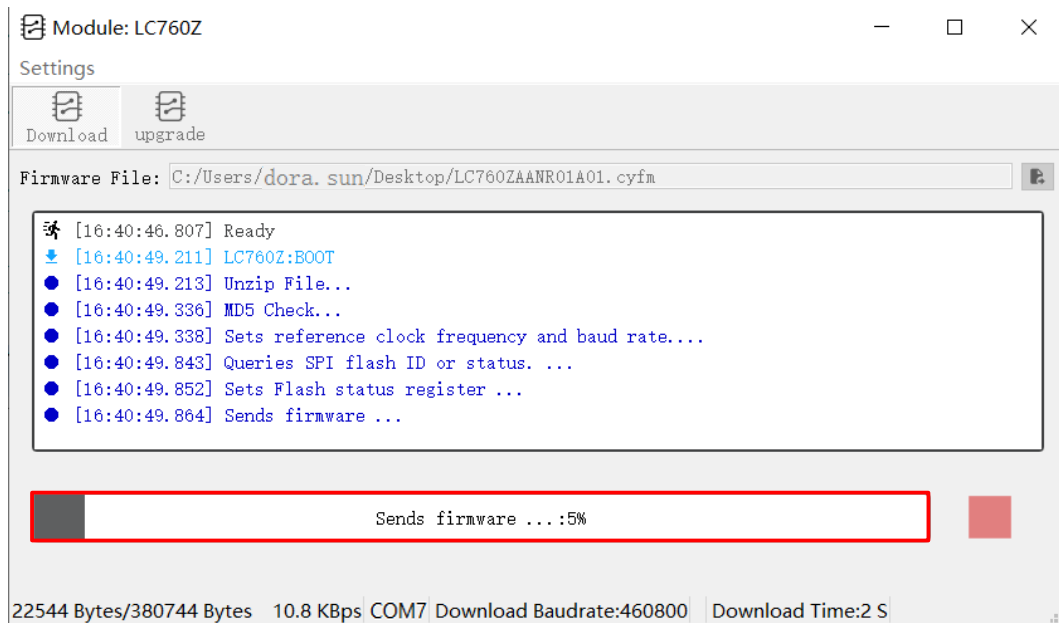


Figure 16 : Firmware Downloading – 2

Step 5: Upon successful firmware downloading, the QGNSS tool's progress bar on the screen will indicate "100 %".

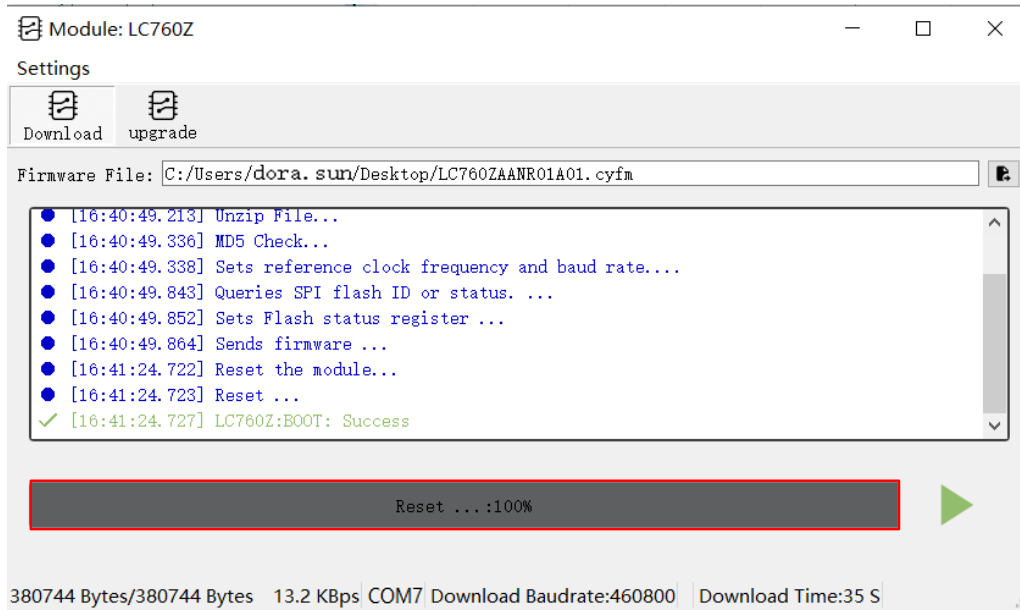


Figure 17: Successful Firmware Downloading

NOTE

Firmware download in boot download mode is only required if the bootloader in normal operating mode has been corrupted or requires updating.

5 EVB and Antenna Installation

5.1. GNSS Antenna Installation

The installation environment affects antenna reception performance and satellite visibility, which in turn affect the positioning performance of a GNSS receiver. In addition, antenna's position and direction can also impact its reception performance. Therefore, it is important to avoid obstacles and interference when installing antenna. Place the ceramic patch antenna horizontally and make sure it radiates toward the sky.

If dynamic testing is required, make sure that the antenna is firmly fixed to the device under test. No relative movement or vibration between the antenna and device is allowed.

5.2. EVB Installation

If dynamic testing is required, make sure the EVB is fixed to the device under test so as to avoid any movement or vibration with respect to the device.

6 Measuring Power Consumption

6.1. Power Consumption at Different Stages

Module power consumption is measured in four stages: acquisition and tracking (including almanac update), tracking (almanac update is over), upon entering Standby mode and upon entering Backup mode.

- Acquisition and tracking (including almanac update): 0 s to 12.5 min
- Tracking (almanac update is over): > 12.5 min
- Entering Standby mode
- Entering Backup mode

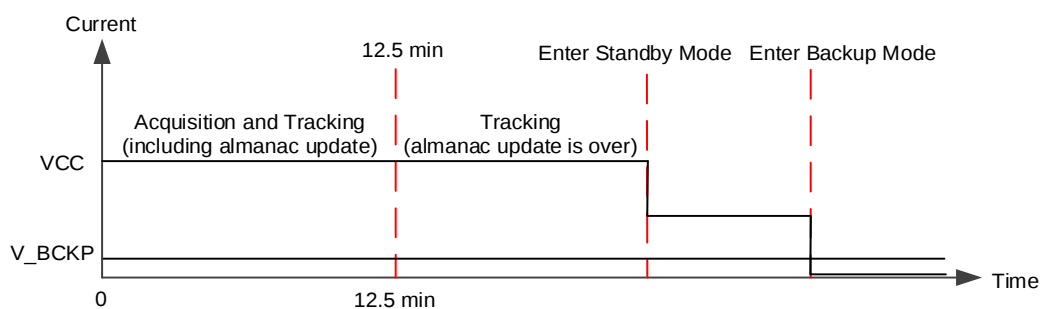


Figure 18: Power Consumption at Different Stages

6.2. VCC Power Consumption Measurement

Before measuring the VCC power consumption, you must connect the components to the EVB to ensure that the module can communicate and fix normally. See [Chapter 4.1 Test via QGNSS](#).

Detailed steps for measuring VCC power consumption with an ammeter:

Step 1: Switch off the power supply (S201) of the module and pull out the VCC_MODULE jumper cap (J102). Connect the ammeter in series to the pins of J102 as shown below.

Step 2: Switch on the power supply (S201) of the module and read the ammeter.

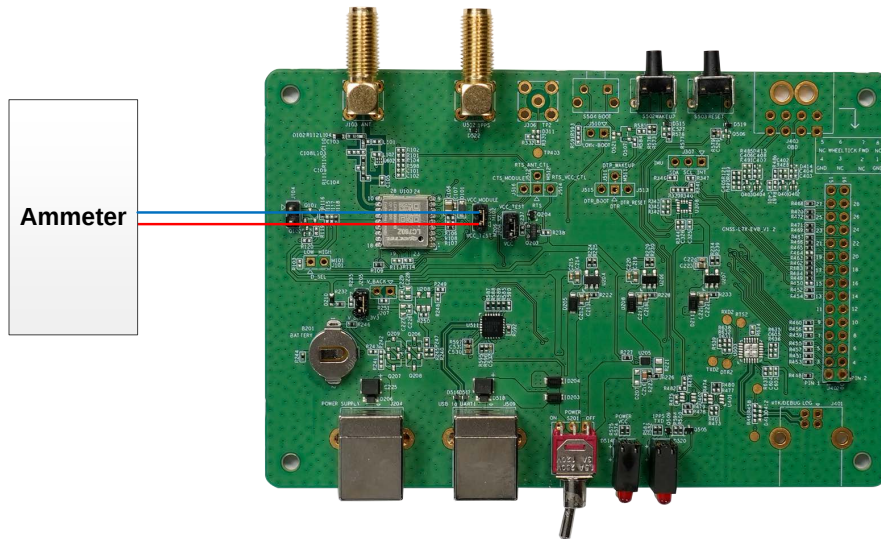


Figure 19: VCC Power Consumption Measured with Ammeter

Detailed steps for measuring VCC power consumption with a power consumption meter:

- Step 1:** Switch off the power supply (S201) of the module and pull out the VCC_MODULE jumper cap (J102). Make sure the positive pole of the power consumption meter is to be connected to pin 2 (without arrow silkscreen) of J102, and the negative pole is connected to GND.
- Step 2:** Switch on the power supply (S201) of the module and power consumption meter, then read the power consumption meter.

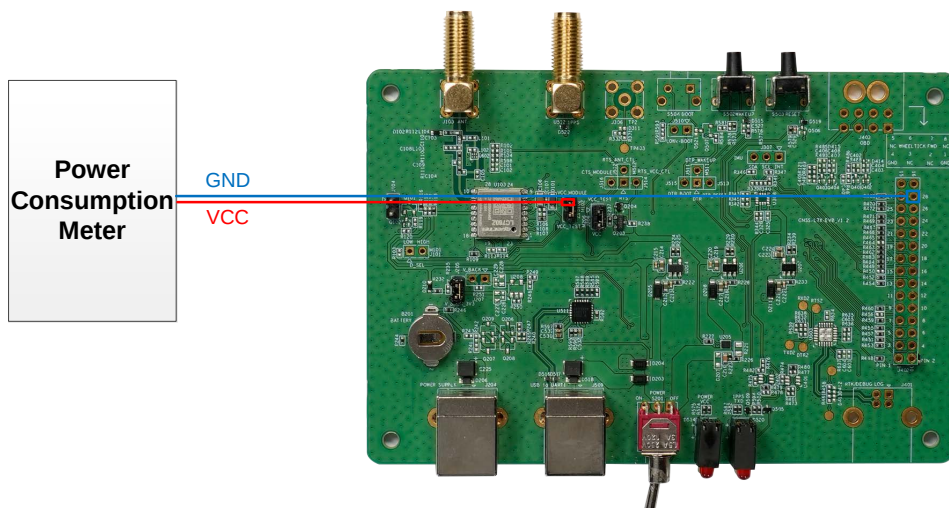


Figure 20: VCC Power Consumption Measured with Power Consumption Meter

NOTE

To measure the module's standard power consumption, mount a 0 Ω resistor on R115 on the EVB, and leave R118 unmounted. If the active antenna is connected to the EVB, the measured data will include the power consumption when the module supplies power to the active antenna. As a result, the measured value will be higher than the standard value. For more information about the standard value, see the performance parameters in [document \[1\] hardware design](#).

6.3. V_BCKP Power Consumption Measurement

Before measuring the V_BCKP power consumption, you must connect the components to EVB to ensure that the module can communicate and fix normally. See [Chapter 4.1 Test via QGNSS](#).

Detailed steps for measuring V_BCKP power consumption with an ammeter:

Step 1: Switch off the power supply (S201) and pull out the V_BACK_3V3 jumper cap (J205). Connect the ammeter in series to the pins of J205, as shown below.

Step 2: Switch on the power supply (S201) and read the ammeter.

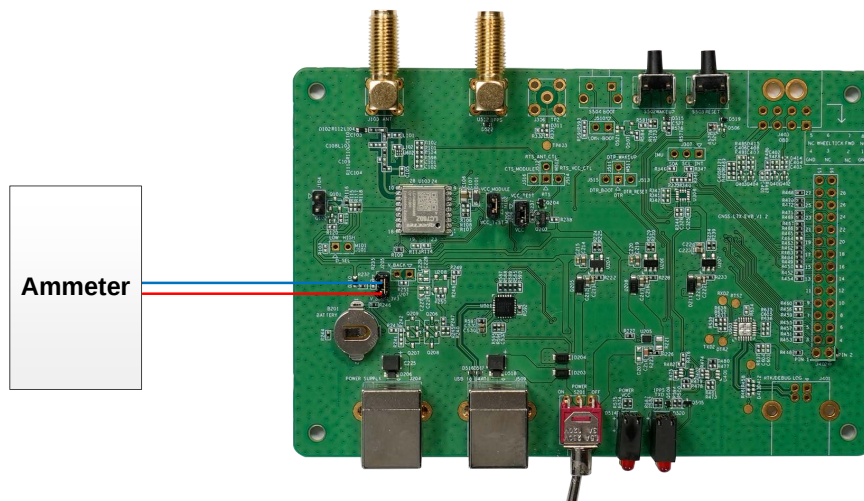


Figure 21: V_BCKP Power Consumption Measured with Ammeter

Detailed steps for measuring V_BCKP power consumption with power consumption meter:

Step 1: Switch off the power supply (S201) of the module and pull out the V_BCKP_3V3 jumper cap (J205). Then, ensure the positive pole of the power consumption meter is connected to pin 1 (with arrow silkscreen) of J205, and the negative pole is connected to GND. Then switch on the power consumption meter.

Step 2: Switch on the power supply (S201) of the module and read the power consumption meter.

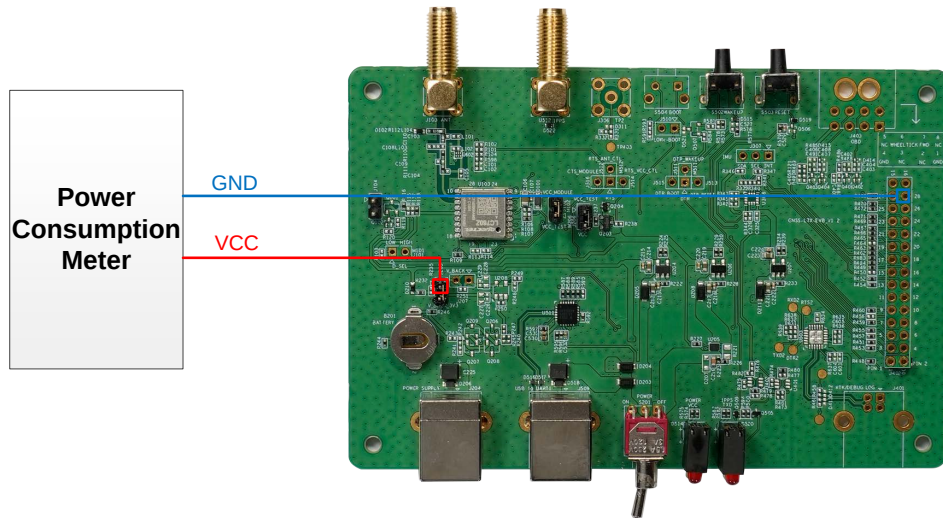


Figure 22: V_BCKP Power Consumption Measured with Power Consumption Meter

NOTE

1. Adjust the current resolution when using the power consumption meter.
2. The power value can be calculating according to the following formula: $P = V_{\text{Supply}} \times I_{\text{Test}}$.
3. When measuring the V_BCKP power consumption in Backup mode, ensure that the module has entered Backup mode, and then remove the jumper cap of VCC_MODULE (J102) to cut off the power supply of VCC. For more information about the way to enter/exit Backup mode, see [document \[1\] hardware design](#).

7 EVB Framework

The power is supplied to EVB via Type-B, and then to the GNSS module via a Low-dropout Regulator (LDO). GNSS module outputs the signals from communication interface on EVB via USB to UART Bridge Chip (CP2102N). There are an antenna interface and control buttons on EVB. All functions of the module are available, including debugging.

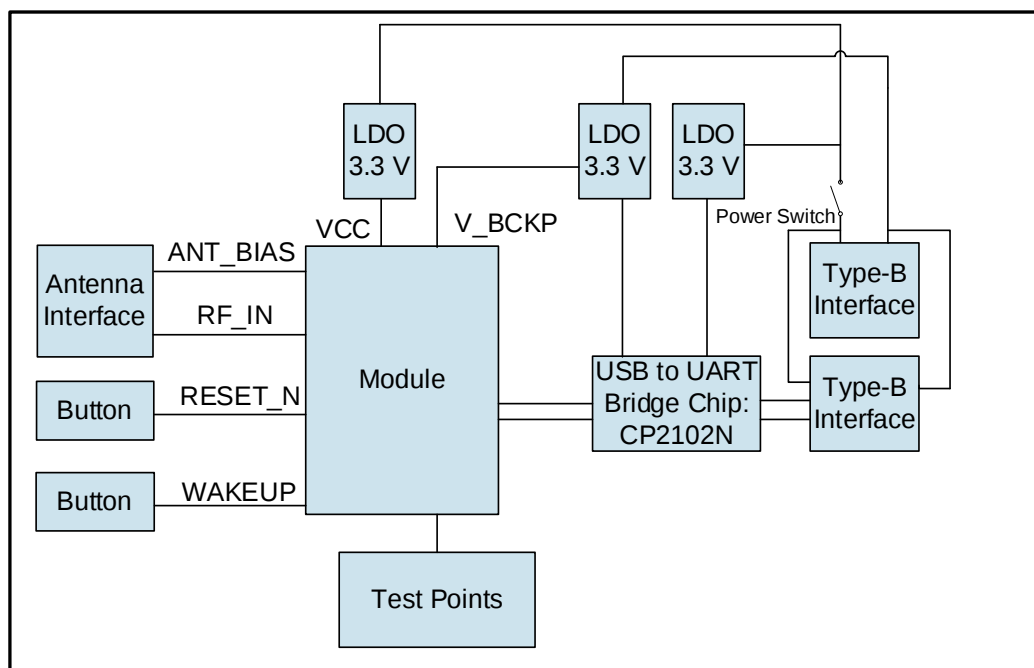


Figure 23: EVB Framework

8 Common Problems and Troubleshooting

1. **Unable to find COM port in the Device Manager when EVB is connected to PC with a USB cable.**
 - Check that the EVB communication interface is properly connected to the PC.
 - Verify that CP210x Driver has been installed successfully.
2. **Communication interface not outputting any messages or commands.**
 - Check that the power supply indication LED on the EVB is illuminated.
 - Verify that the jumper cap(s) is(/are) connected correctly, as shown in [Figure 3: EVB Top View](#).
 - Ensure that the module's power supply is normal.
3. **Module unable to search for satellite signals.**
 - If there is no transponder indoors, test the module in an open-sky environment.
4. **Module unable to enter BOOT download mode or upgrade.**
 - Verify whether the module is in BOOT download mode or normal operating mode.
 - Check that the downloaded firmware is correct.
 - Confirm that the correct COM port has been selected.

NOTE

For the problem(s) that cannot be solved, you can contact Quectel Technical Support (support@quectel.com).

9 Cautions

- Make sure to conduct tests at the same time and under the same environment when comparing different parameters of GNSS modules.
- Note that parameters, such as cold start, acquisition and tracking, may be defined differently by chip suppliers.
- Ensure that the measurement method is correct. If there are significant differences between parameters tested via EVB and those provided by Quectel, please contact Quectel Technical Support.
- Note that momentary data obtained from measurement cannot always be regarded as reference data, because it may be affected by various factors, such as satellite positions at different times, environmental conditions, temperature, humidity and altitude.
- Keep in mind that the QGNSS tool may be updated periodically to fix bugs or improve performance. Please make sure that you are using the latest version of the tool. If an update is published and is more recent than the one you have, an automatic prompt will open up and provide an option to upgrade when opening the tool.

10 Appendix References

Table 5: Related Documents

Document Name
[1] Quectel_LC760Z_Hardware_Design
[2] Quectel QGNSS User Guide

Table 6: Terms and Abbreviations

Abbreviation	Description
2D	2 Dimension
3D	3 Dimension
BDS	BeiDou Navigation Satellite System
COM Port	Communication Port
DC	Direct Current
DI	Digital Input
DO	Digital Output
DR	Dead Reckoning
EPH	Ellipsoidal Height
ESD	Electrostatic Discharge
EVB	Evaluation Board
Galileo	Galileo Satellite Navigation System (EU)
GLONASS	Global Navigation Satellite System (Russia)
GND	Ground

Abbreviation	Description
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
I2C	Inter-Integrated Circuit
I/O	Input/Output
LED	Light Emitting Diode
LNA	Low-Noise Amplifier
MSL	Mean Sea Level
NAVIC	Indian Regional Navigation Satellite System
NMEA	NMEA (National Marine Electronics Association) 0183 Interface Standard
PC	Personal Computer
PCB	Printed Circuit Board
PI	Power Input
PO	Power Output
PPS	Pulse Per Second
PRN	Pseudo Random Noise
QZSS	Quasi-Zenith Satellite System
RF	Radio Frequency
RTK	Real Time Kinematic
RXD	Receive Data (Pin)
SBAS	Satellite-Based Augmentation System
SCL	Serial Clock Line
SDA	Serial Data Line
SMA	SubMiniature Version A
TTFF	Time to First Fix

Abbreviation	Description
TXD	Transmit Data (Pin)
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus
UTC	Coordinated Universal Time