

GNSS-MODULE EVB

User Guide

GNSS Module Series

Version: 1.0

Date: 2025-05-20

Status: Released



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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	GNSS-MODULE EVB User Guide
Subtitle	GNSS Module Series
Document Type	EVB User Guide
Document Status	Released

Revision History

Version	Date	Description
-	2024-01-15	Creation of the document
1.0	2025-05-20	First official release

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1 Introduction

This document provides information on the steps needed to evaluate Quectel GNSS modules using the Evaluation Board (GNSS-MODULE EVB). It is divided into several chapters as follows:

- Chapter 2 provides the general overview of the EVB kit.
- Chapter 3 provides the EVB block diagram.
- Chapter 4 describes the EVB interfaces.
- Chapter 5 describes the installation of EVB and antenna.
- Chapter 6 describes the console and related commands.
- Chapter 7 describes how to upgrade EVB and module firmware.
- Chapter 8 describes the features supported by the EVB.
- Chapter 9 describes the general usage scenarios and provides the operating guide for the EVB.
- Chapter 10 describes the common issues and troubleshooting.
- Chapter 11 provides the cautions.
- Chapter 12 is an appendix, which lists the related documents, and the terms and abbreviations appearing in the user guide.

1.1. Applicable Modules

For more information about EVB applicable modules, see [document \[1\] list of EVB applicable modules](#).

NOTE

1. Request the latest versions of QGNSS software tool and EVB MCU firmware from Quectel Technical Support (support@quectel.com).
2. For more information about the QGNSS tool, see [document \[2\] QGNSS user guide](#).

2 General Overview

2.1. EVB Kit

The EVB kit includes:

- GNSS-MODULE EVB,
- Type-C USB cables,
- Active GNSS antenna,
- 4G antenna and 4G antenna RF cable, and
- Bolts and coupling nuts,

MCU (GD32F470ZIT6), which is shipped with pre-burned firmware, is embedded in the GNSS-MODULE EVB. You can directly test and evaluate Quectel GNSS module after acquiring the EVB kit and the corresponding module TE-A(s).

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

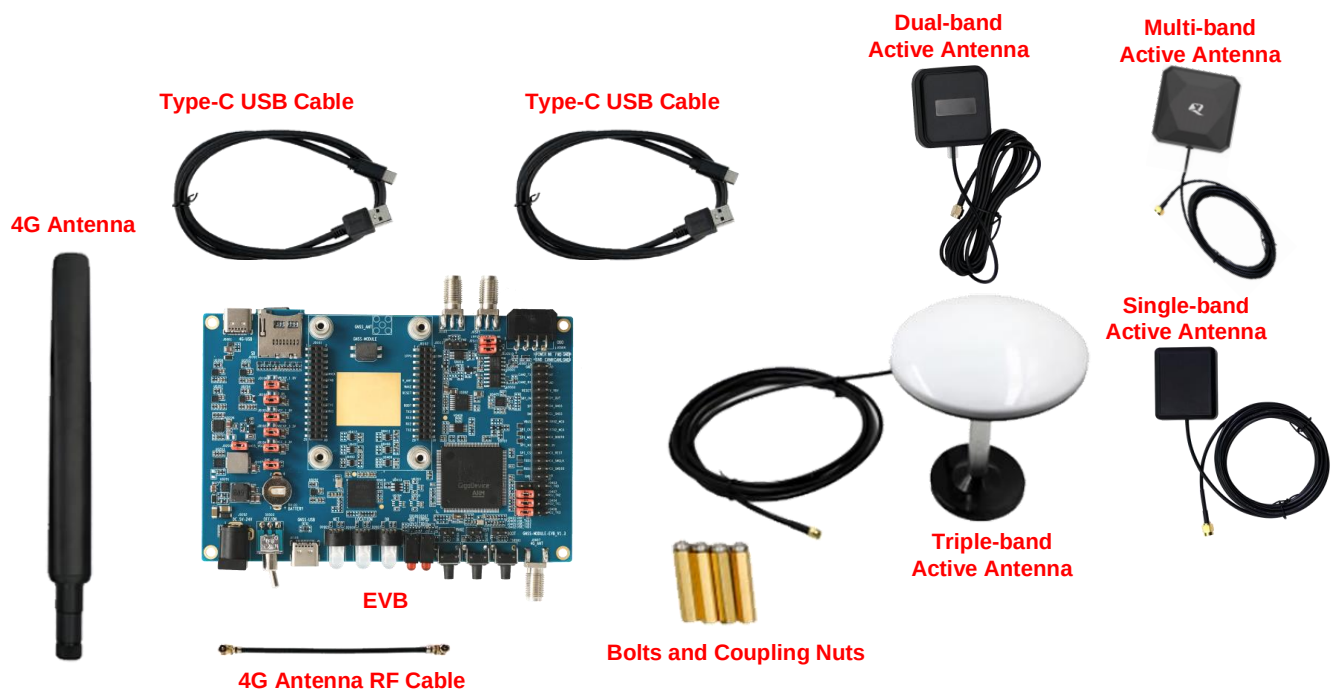


Figure 1: EVB Kit Components

Table 1: List of Kit Components

Items	Description	Quantity
EVB	GNSS-MODULE EVB Size: 120 mm × 80 mm	1
USB Cable	Type-C USB Cable	2
GNSS Antenna	Single-band Active Antenna: YEGM020BA	1
	Dual-band Active Antenna: YB0017AA	
	Triple-band Active Antenna: YEGM011AA	
	Multi-band Active Antenna: YEGB006U1A	
4G Components	4G Antenna	1
	4G Antenna RF Cable	1
Others	Bolts and Coupling Nuts	4 pairs

NOTE

1. Contact Quectel Technical Support (support@quectel.com) for details about Quectel active GNSS antenna and schematics of EVB.
2. The GNSS antenna model depends on the ordered EVB kit.

2.2. Connect Kit Components and Module TE-A(s) to EVB

To test a GNSS module with the EVB you must order the corresponding TE-A for the GNSS module.

2.2.1. Test GNSS Modules with RTK

If the GNSS module under test supports RTK function, you should also purchase the TE-A for the matching 4G module. In this case, the example connection between the EVB, EVB kit components, and the GNSS/4G module TE-As are shown in the figure below.

If 4G module TE-A is not available, you can also simply connect the EVB to a PC and test the RTK function with QGNSS tool.

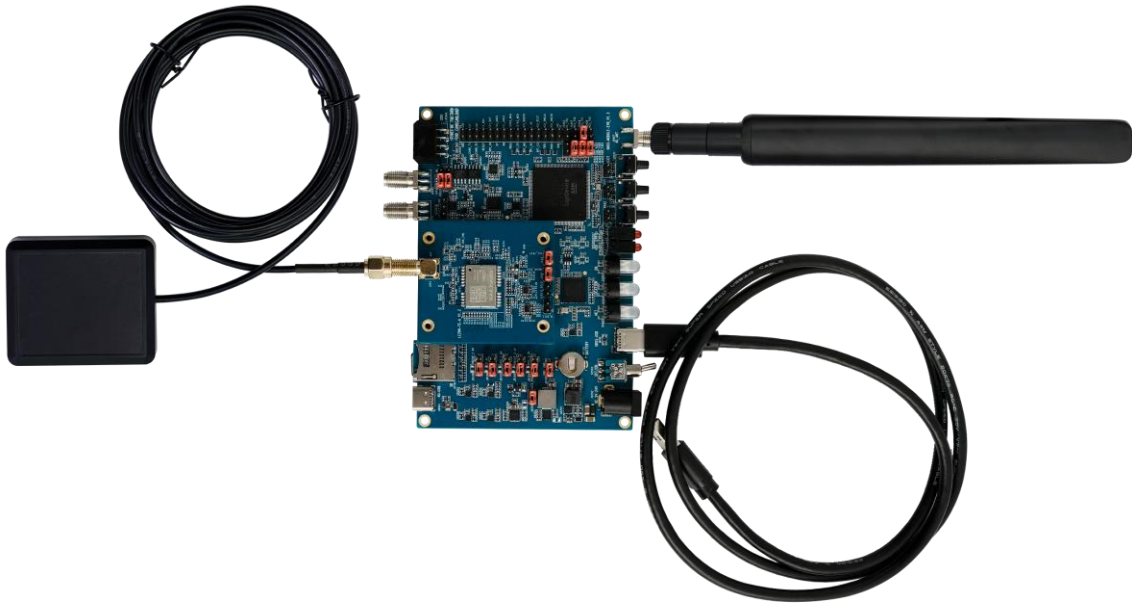


Figure 2: GNSS/4G Module TE-As and Kit Components Mounted on EVB (Top View)

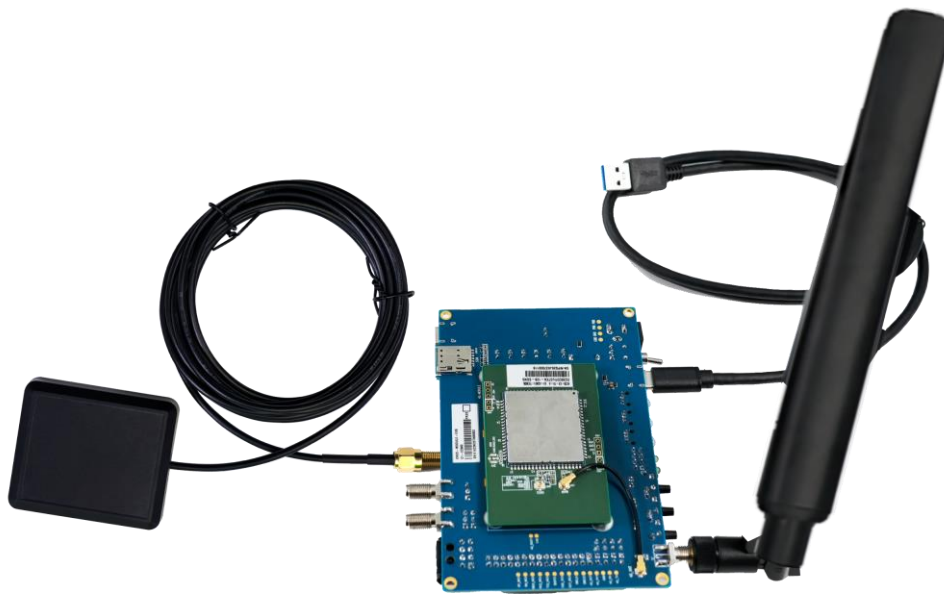


Figure 3: GNSS/4G Module TE-As and Kit Components Mounted on EVB (Bottom View)

NOTE

1. Make sure that the active GNSS antenna is placed with a clear line of sight to the sky.
2. If you use a 4G module for RTK functionality test and verification, please make sure a (U)SIM card is inserted to the J0605 interface to enable network registration.
3. EVB can be used with TE-As of the following 4G modules:
 - EG25-G (EG25GGBR07A08M2G),
 - EC600U-CN (EC600UCNLBR03A02M08_QTH).

2.2.2. Test GNSS Modules without RTK

If the RTK function is not supported, you do not need to purchase the 4G module TE-A and the 4G antenna.

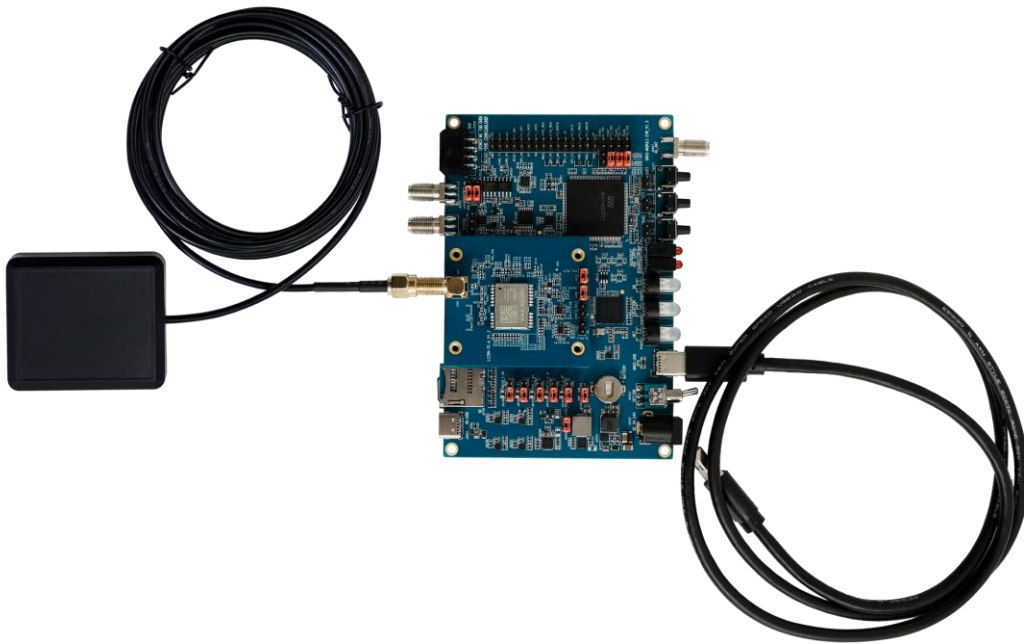


Figure 4: GNSS Module TE-A and Kit Components Mounted on EVB (Without 4G Module TE-A)

NOTE

Make sure that the active GNSS antenna is placed with a clear line of sight to the sky.

3 EVB Block Diagram

Block diagram of GNSS-MODULE EVB includes:

- USB-to-UART Bridge Chip (FT4232HAQ),
- Interfaces of GNSS module, 4G module and MCU, and
- Peripheral interfaces.

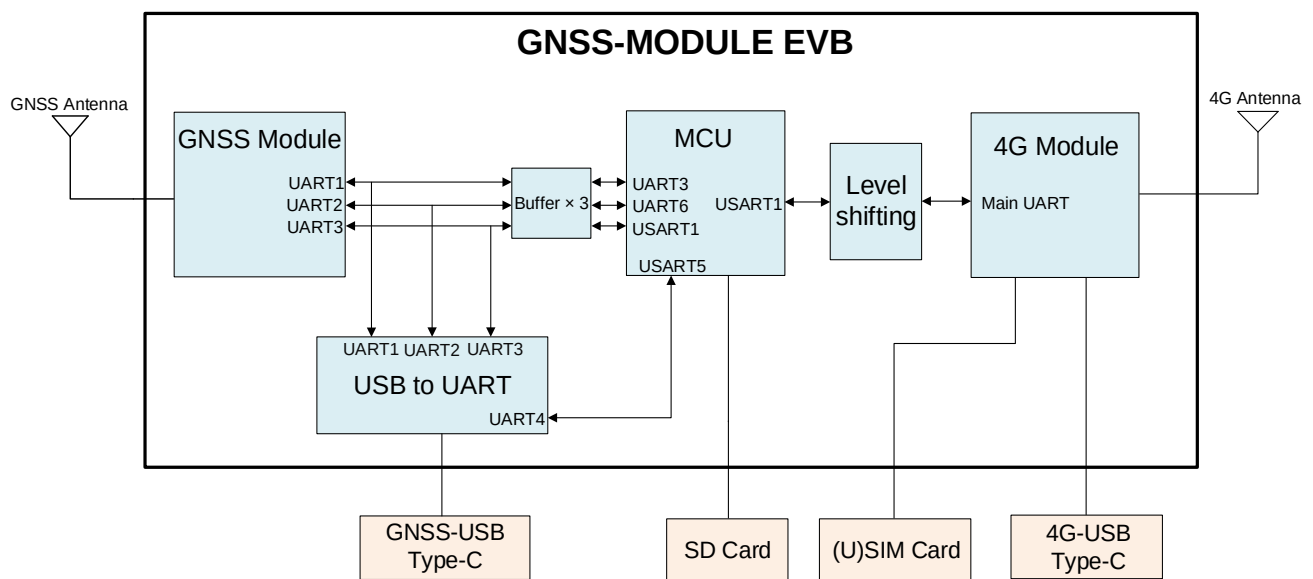


Figure 5: EVB Block Diagram

4 EVB Interfaces

4.1. EVB Top View

EVB top view is shown in the figure below.

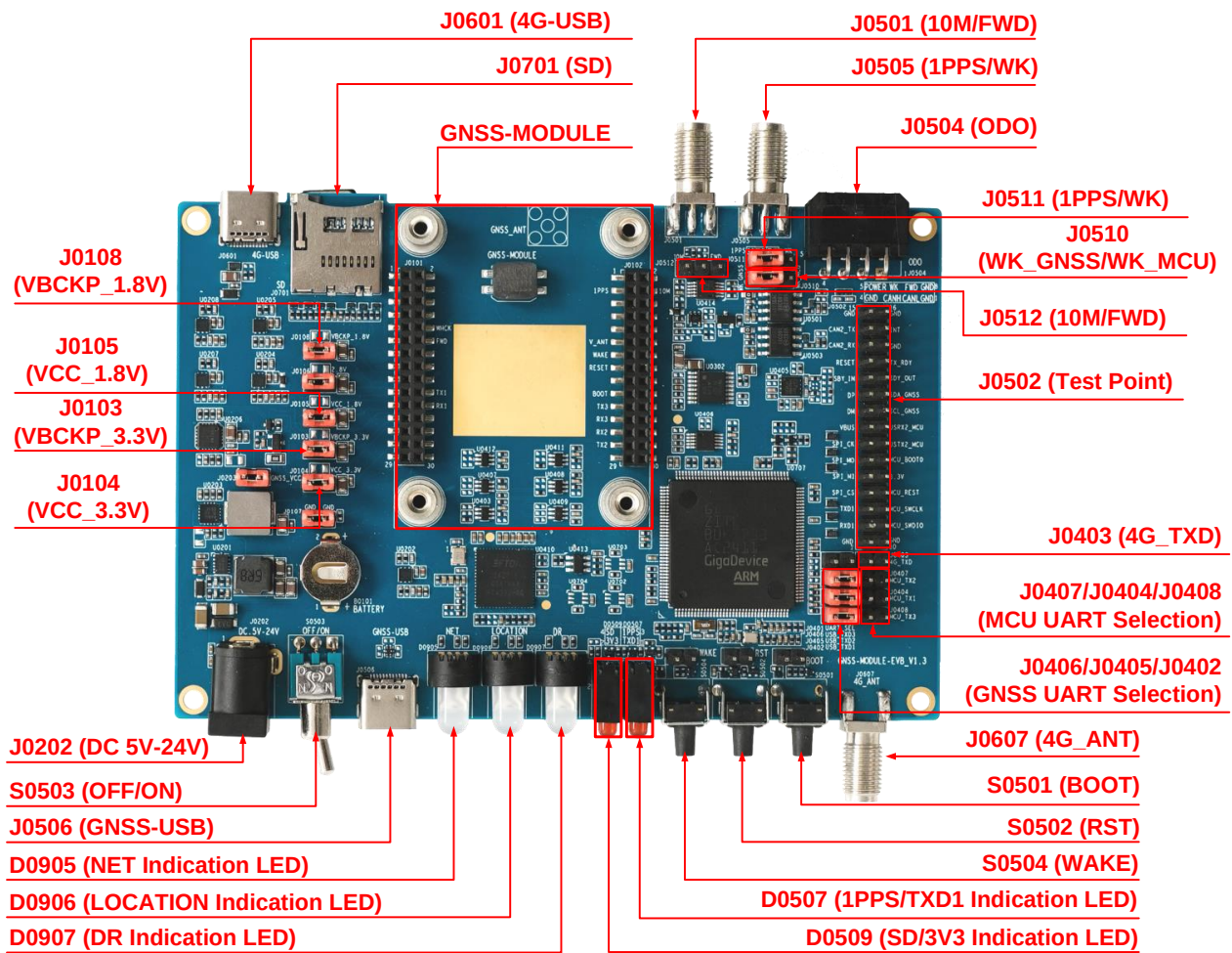


Figure 6: EVB Top View

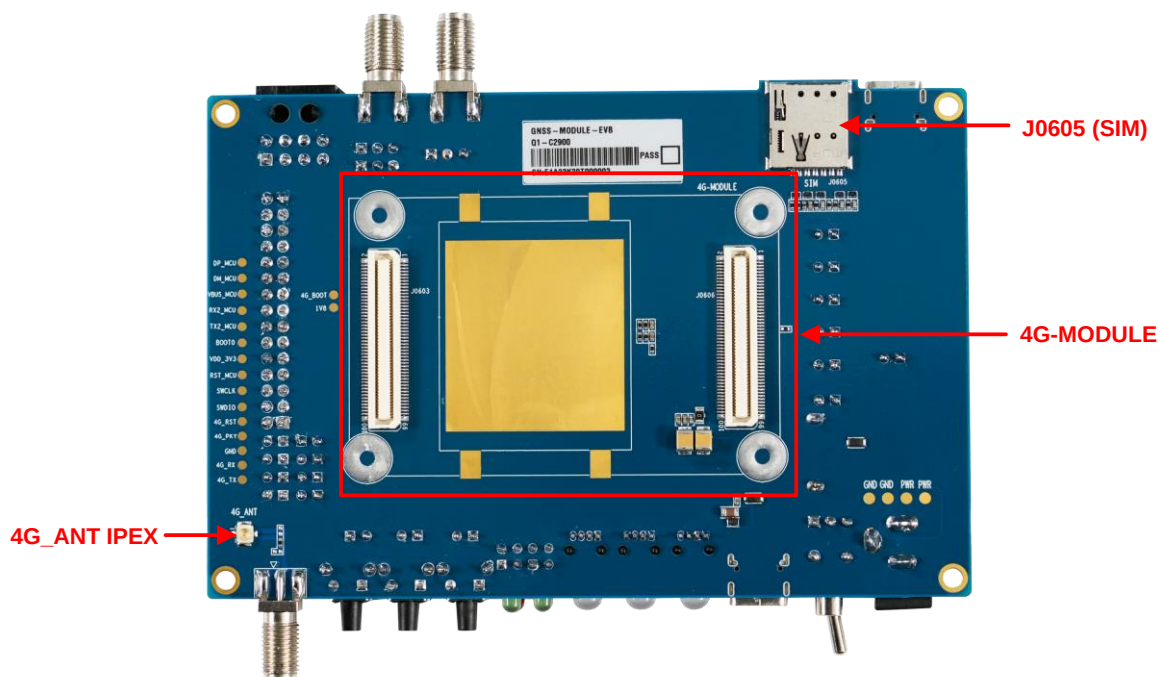


Figure 7: EVB Bottom View

4.2. EVB Interfaces

4.2.1. EVB Interface Descriptions

The EVB interfaces are detailed in the table below.

Table 2: EVB Interface Descriptions

Function	Interfaces	Description	Remark
Power Supply	J0202 DC 5V–24V	• EVB power supply: 5–24 V, typ. 12 V	The EVB can be powered by any of these four interfaces. • For long-term tests with higher stability requirements, it is recommended to use J0202. • For short-term or temporary tests,
	J0504 ODO	• Current capability: > 2 A	
	J0506 GNSS-USB		
	J0601 4G-USB	• EVB power supply: 4.5–5.5 V, typ. 5.0 V • Current capability: > 500 mA	

Function	Interfaces	Description	Remark
Communication Interface			J0506 can be used.
	J0506 GNSS-USB	Supports data transmission and firmware upgrade for GNSS module.	
	J0407/J0404/J0408 MCU UART Selection	When the jumper cap on J0404 is inserted: Connects TXD of MCU UART3 and RXD of GNSS module UART1 (com1). NOTE: If the 4G module is used to implement the RTK function, place the jumper caps on J0404 and J0402. J0407 with jumper cap inserted: Connects TXD of MCU UART6 to RXD of GNSS module UART2 (com2). J0408 with jumper cap inserted: Connects TXD of MCU USART1 to RXD of GNSS module UART3.	See Chapter 4.4.1 J0407/J0404/J0408 (UART Interface Selection for MCU) for details.
	J0406/J0405/J0402 GNSS UART Selection	J0402 with jumper cap inserted: Enables data transmission from COM5 (illustrated in Chapter 6.1 Connect to Console) to UART1 (com1) of GNSS module. J0405 with jumper cap inserted: Enables data transmission from COM6 (illustrated in Chapter 6.1 Connect to Console) to UART2 (com2) of GNSS module. J0406 with jumper cap inserted: Enables data transmission from COM7 (illustrated in Chapter 6.1 Connect to Console) to UART3 of GNSS module.	See Chapter 4.4.2 J0406/J0405/J0402 (UART Interface Selection for GNSS Module) for details.
	J0601 4G-USB	Used for 4G module debugging.	
	J0501/J0512 10M/FWD	Used for outputting 10 MHz or inputting FWD signal.	See Chapter 4.3.1 J0501/J0512

Function	Interfaces	Description	Remark
Signal Indication			(10M/FWD) for details.
	J0505/J0511 1PPS/WK	Used for outputting 1PPS or inputting WHEELTICK signal.	See Chapter 4.3.2 J0505/J0511 (1PPS/WK) for details.
	J0607 4G_ANT	Used for connecting 4G antenna.	
	D0905 NET Indication LED	- Red: Network searching and registration failed. - Green: Network registration succeeded. The 4G module is in standby state. - Blue: Data transmission in progress (network is active).	
	D0906 LOCATION Indication LED	- Red: RTK single-point solution. - Green: RTK float solution. - Blue: RTK fixed solution.	
	D0907 DR Indication LED	- Red: Not calibrated. - Green: Calibration in progress. - Blue: Calibrated.	
	D0509 Indication LED	Red: - Flashing: SD card is storing data. - Extinct: SD card is not storing data.	
		Green: - Bright: VCC power supply for module is powered. - Extinct: VCC power supply for module is not powered.	
		Red: - Flashing: 1PPS signal output. - Extinct: 1PPS is unavailable.	
	D0507 Indication LED	Green: - Flashing: Data output from UART1 TXD. - Bright/Extinct: No data output from UART1 TXD.	

Function	Interfaces	Description	Remark
Switch and Buttons	S0503 OFF/ON	Powers the EVB on/off. When the switch is turned to the right (“ON”), the EVB is turned on.	
	S0504 WAKE	Short press to wake up the GNSS module.	
	S0502 RST	Short press to reset the GNSS module.	
	S0501 BOOT	Press and hold before EVB is powered on to set the module to Boot download mode.	
Others	J0103 VBCKP_3.3V	If the module is powered by 3.3 V, the 3.3 V V_BCKP power supply of the GNSS module can be controlled by inserting or removing the jumper cap on this interface.	
	J0104 VCC_3.3V	If the module is powered by 3.3 V, the 3.3 V VCC power supply of the GNSS module can be controlled by inserting or removing the jumper cap on this interface.	
	J0105 VCC_1.8V	If the module is powered by 1.8 V, the 1.8 V VCC power supply of the GNSS module can be controlled by inserting or removing the jumper cap on this interface.	
	J0108 VBCKP_1.8V	If the module is powered by 1.8 V, the 1.8 V V_BCKP power supply of the GNSS module can be controlled by inserting or removing the jumper cap on this interface.	
	J0510 WK_GNSS/WK_MCU	Used to select the input interface of WHELTICK signals.	See Chapter 4.3.3 J0510 (WK_GNSS/WK_MCU) for details.
	J0504 ODO	Used to input WHELTICK and FWD signals, and inject vehicle speed information into GNSS module via CAN interface.	
	J0701 SD Card Slot	Stores GNSS log data.	
	J0605	(U)SIM card inserted at J0605 is	

Function	Interfaces	Description	Remark
	SIM	used by the 4G module to register on the network.	
	4G_ANT IPEX	4G_ANT IPEX connector on the EVB is used to connect 4G module's antenna via 4G antenna RF cable.	
	J0403 4G_TXD	J0403 with jumper cap inserted: Enables UART communication between the 4G module and the GNSS module, achieving RTK functionality without an external MCU.	Not supported by default.

4.2.2. J0502/J0504 Pin Descriptions

4.2.2.1. J0502

J0502 test point pin description is shown below:

Table 3: J0502 Pin Description

Pin No.	Pin Name	I/O	Description
1	GND	-	Ground
2	RXD1	DI	RXD1 receives data. This pin connects directly to UART1 interface of GNSS module.
3	TXD1	DO	TXD1 transmits data. This pin connects directly to UART1 interface of GNSS module.
4	SPI_CS	DO	Pins for SPI connection between the MCU and the GNSS module. ● If the GNSS module supports SPI, these pins can be used to verify/test waveforms. ● If the GNSS module does not support SPI, these pins can connect SPI peripheral devices to the MCU.
5	SPI_MI	DI	
6	SPI_MO	DO	
7	SPI_CK	DO	
8	VBUS	PI	Reserved. These pins can be used to verify/test the USB interface of GNSS module.
9	DM	DIO	
10	DP	DIO	

Pin No.	Pin Name	I/O	Description
11	SBY_IN	DI	Reserved
12	RESET	DI	Reset the GNSS module. This pin connects directly to the RESET_N pin of GNSS module.
13	CAN2_RX	DI	Reserved
14	CAN2_TX	DO	Reserved
15	GND	-	Ground
16	GND	-	Ground
17	INT	-	Reserved
18	GND	-	Ground
19	TX_RDY	-	Reserved
20	SDY_OUT	DO	Reserved
21	SDA_GNSS	OD	Pins for I2C connection between the MCU and the GNSS module. ● If the GNSS module supports I2C, these pins can be used to verify/test waveforms. ● If the GNSS module does not support I2C, these pins can connect I2C peripheral devices to the MCU.
22	SCL_GNSS	OD	
23	USRX2_MCU	DI	Debug the MCU. MCU firmware can be downloaded through this port.
24	USTX2_MCU	DO	
25	MCU_BOOT0	DI	Set the MCU to Boot download mode. When burning the BootLoader firmware into the MCU, this pin must be connected to 3.3V (pin 26).
26	3.3V	PO	3.3 V power supply.
27	MCU_REST	DI	Reset the MCU
28	MCU_SWCLK	DI	Debug the MCU. MCU firmware can be downloaded through this port.
29	MCU_SWDIO	DIO	
30	GND	-	Ground

4.2.2.2. J0504

J0504 pin assignment is shown below.

POWER (5)	WK (6)	FWD (7)	GND (8)
GND (4)	CANH (3)	CANL (2)	GND (1)

J0504 interface pin description is shown below:

Table 4: J0504 Pin Description

Pin Name	I/O	Description
POWER	PI	Supply power for GNSS module
WK	DI	WHEELTICK: Odometer/Wheel-tick pulse input
FWD	DI	Forward/Backward status signal input
GND	-	Ground
GND	-	Ground
CANL	DIO	CAN transceiver low line
CANH	DIO	CAN transceiver high line
GND	-	Ground

4.3. 10M/FWD, 1PPS/WK and WK_GNSS/WK_MCU Function Selection

4.3.1. J0501/J0512 (10M/FWD)

J0501 (10M/FWD) is used to output 10 MHz signal or input FWD signal. To configure it, place the jumper cap on J0512 according to the instructions below.

J0512 configuration:

- For 10 MHz signal output on J0501:
Short the middle and left pins of J0512 with a jumper cap;
- For FWD signal input on J0501:
Short the middle and right pins of J0512 with a jumper cap.

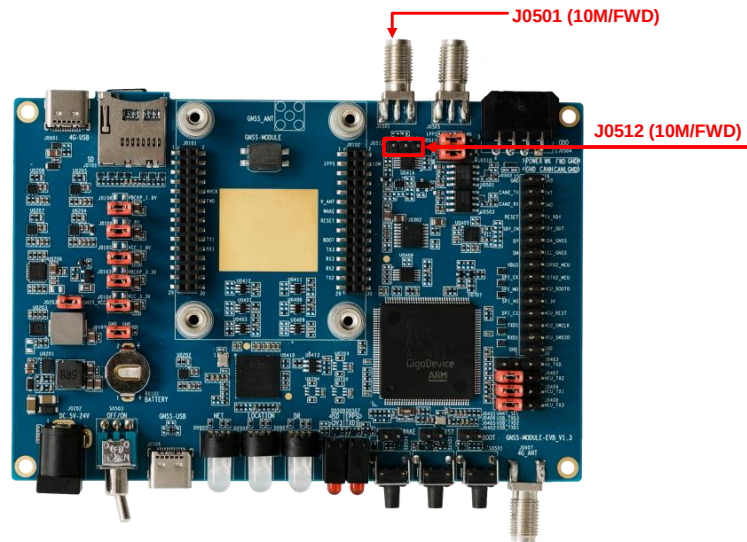


Figure 8: Jumper Cap on J0512 for 10M/FWD Selection

4.3.2. J0505/J0511 (1PPS/WK)

J0505 (1PPS/WK) is used to output 1PPS signal or input the WHEELTICK signal. To configure it, place the jumper cap on J0511 according to the instructions below.

J0511 configuration:

- For 1PPS signal output on J0505:
Short the middle and left pins of J0511 with a jumper cap;
- WHEELTICK signal input on J0505:
Short the middle and right pins of J0511 with a jumper cap.

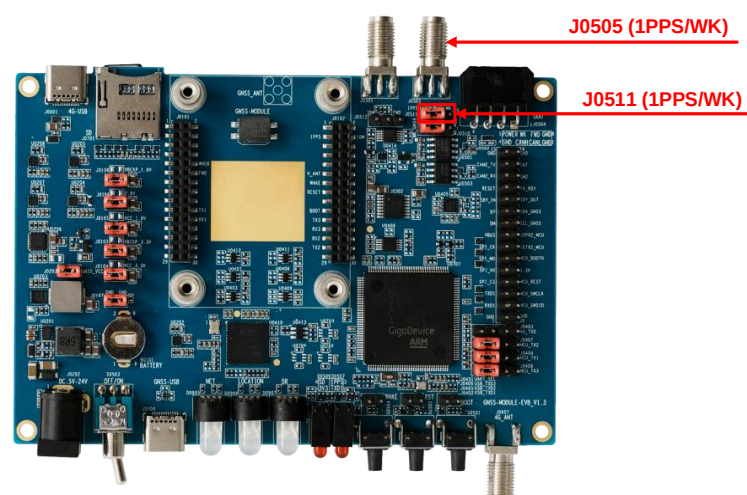


Figure 9: Jumper Cap on J0511 for 1PPS/WK Selection

4.3.3. J0510 (WK_GNSS/WK_MCU)

J0510 (WK_GNSS/WK_MCU) is the input pin for WHEELTICK signal. You can connect J0510 to either the GNSS module or MCU by placing a jumper cap according to the instruction below.

J0510 configuration:

- To connect J0510 to the WHEELTICK pin of GNSS module:
Short the middle and left pins with a jumper cap.
- To connect J0510 to the GPIO pin of MCU:
Short the middle and right pins with a jumper cap.

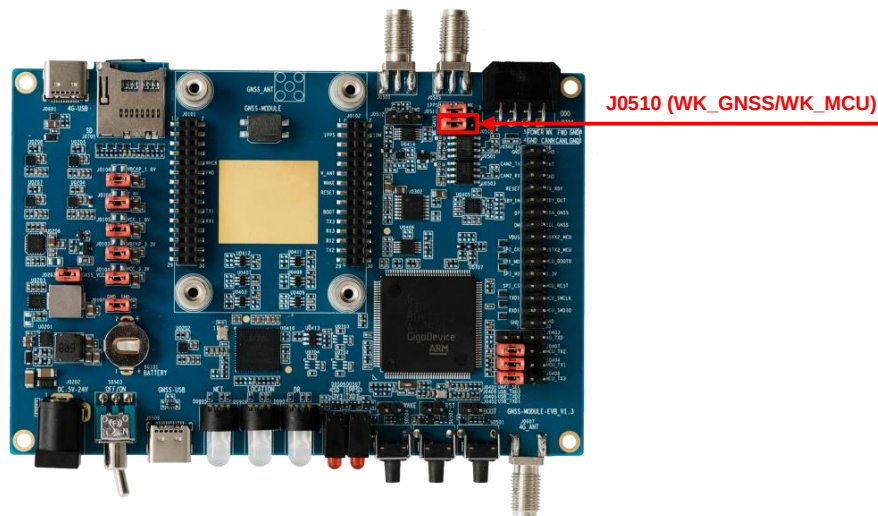


Figure 10: Jumper Cap on J0510 for WK_GNSS/WK_MCU Selection

4.4. UART Interface Selection

4.4.1. J0407/J0404/J0408 (UART Interface Selection for MCU)

UART interface selection for MCU is shown below:

- J0407 controls the connection between TXD of MCU UART6 and RXD of GNSS module UART2 for RTK calibration data transmission.
- J0404 controls the connection between TXD of MCU UART3 and RXD of GNSS module UART1 for RTK correction data transmission. If the 4G module is used to implement the RTK function, place jumper caps on J0404 and J0402.
- J0408 controls the connection between USTX of MCU USART1 and RXD of GNSS module UART3 for RTK calibration data transmission.

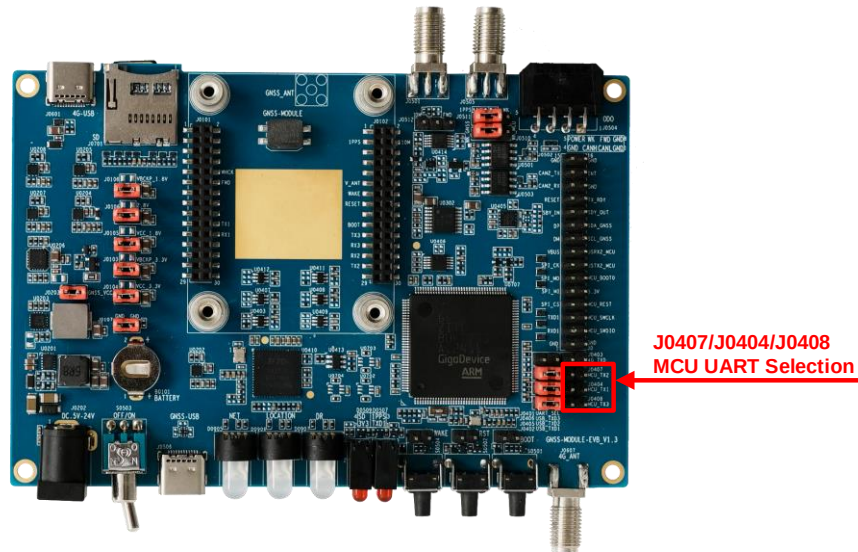


Figure 11: Jumper Caps on J0407/J0404/J0408 for MCU UART Interface Selection

4.4.2. J0406/J0405/J0402 (UART Interface Selection for GNSS Module)

UART interface selection for the GNSS module is shown below:

- J0402 controls the connection between TXD of U0410 (FT4232HAQ) and RXD of GNSS module UART1.
- J0405 controls the connection between TXD of U0410 and RXD of GNSS module UART2.
- J0406 controls the connection between TXD of U0410 and RXD of GNSS module UART3.

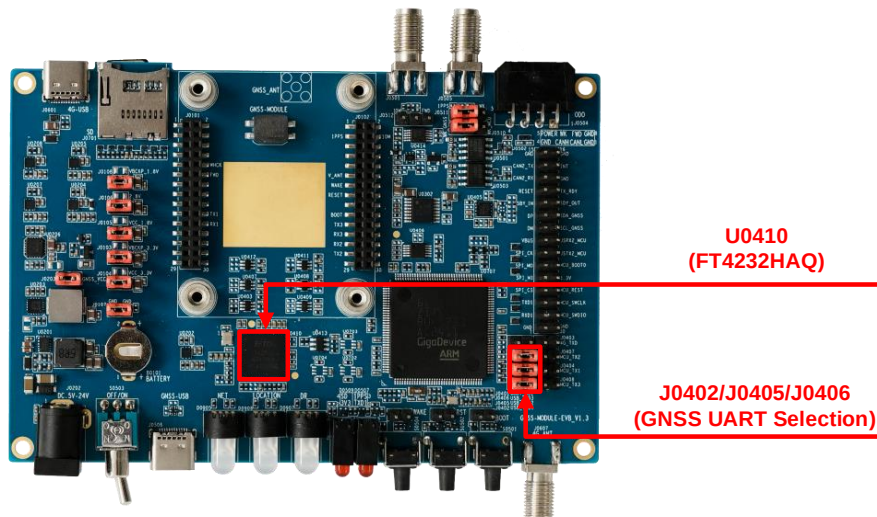


Figure 12: Jumper Caps on J0402/J0405/J0406 for GNSS Module UART Interface Selection

5 EVB and Antenna Installation

5.1. GNSS Antenna Installation

GNSS antenna installation requirements:

- The installation environment affects antenna reception quality and satellite visibility, which in turn affect the positioning performance of a GNSS receiver.
- Antenna's position and direction can also impact its reception quality. Therefore, it is important to avoid obstacles and interference when installing the antenna.
For automotive applications, it is recommended to fix the antenna firmly on the roof of the car, as shown in the figure below. Place the ceramic patch antenna horizontally and make sure it radiates toward the sky.
- Ensure that the antenna cable is undamaged, as any damage to the cable may affect reception quality and test results.
- 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.

For more information about GNSS antenna installation, see [document \[3\] GNSS antenna application note](#).

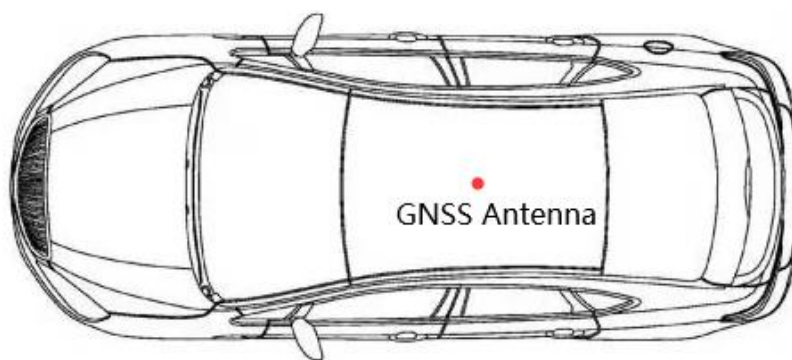


Figure 13: GNSS Antenna Installation

5.2. EVB Installation

If dynamic testing and DR performance testing are required, make sure the EVB is firmly fixed to the device under test to prevent any movement or vibration.

Keep the EVB sufficiently away from the GNSS antenna, to avoid MCU crystal oscillator harmonics interfering with antenna performance.

6 Console and Commands

Similar to the Windows command prompt or Linux terminal, the EVB provides a simple command-line interface called the console for obtaining device information and controlling the device.

6.1. Connect to Console

Prerequisite:

To realize communication between the console and the EVB, the USB-to-serial port driver and the QGNSS tool must be installed on the PC.

Connection steps:

1. Connect EVB to PC:
Connect the EVB's GNSS-USB interface (J0506) to your PC using a USB Type-C cable.
2. Install USB-to-serial driver on PC:
 - In Windows 10 or 11 systems, the PC automatically recognizes and installs the driver.
 - If the PC does not install the driver automatically, click [here](#) to download the USB-to-serial driver of FT4232HAQ, and install it manually.

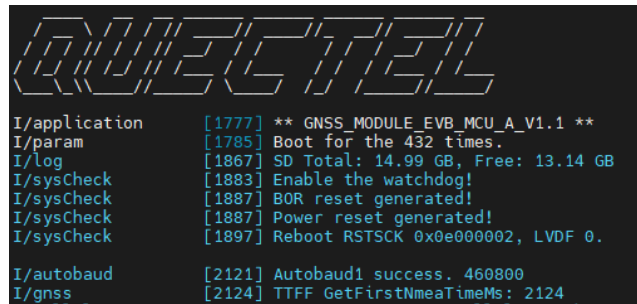


Figure 14: COM Port in Device Manager

NOTE

After the driver is installed, the system's Device Manager displays four COM ports with randomly assigned, consecutive port numbers. Taking the four ports shown in the figure above as an example:

- USB Serial Port (COM5), USB Serial Port (COM6), and USB Serial Port (COM7) correspond to the GNSS module's UART1, UART2 (if supported by the GNSS module), and UART3 (if supported by the GNSS module) interfaces, respectively.
 - USB Serial Port (COM8) corresponds to the EVB serial port connected to the MCU (i.e., UART4 as shown in [Figure 5: EVB Block Diagram](#)).
3. To connect to COM8 serial port for communication with MCU, open the QGNSS tool, select COM8 port, and set the baud rate to 921600 bps, data bit to 8 bits, stop bit to 1 bit, no parity check, and no flow control.
 4. Power on the EVB (turn S0503 to the right) and verify the connection to the console. If connected successfully, the EVB log data will appear in the QGNSS tool as shown below.



```

I/application [1777] ** GNSS_MODULE EVB MCU A V1.1 **
I/param [1785] Boot for the 432 times.
I/log [1867] SD Total: 14.99 GB, Free: 13.14 GB
I/sysCheck [1883] Enable the watchdog!
I/sysCheck [1887] B0R reset generated!
I/sysCheck [1887] Power reset generated!
I/sysCheck [1897] Reboot RSTCK 0x0e000002, LVDF 0.

I/autobaud [2121] Autobaud1 success. 460800
I/gnss [2124] TTFF GetFirstNmeaTimeMs: 2124
  
```

Figure 15: Successfully Connected to Console

6.2. Operation of Console

After connecting the EVB to the console, you can input commands listed in [Chapter 6.4 Commands](#) via the console interface to query or configure parameters.

The following keys can be used to improve input efficiency.

- Enter key: if there is no input, it creates a new line; if there is input, it executes the input and then creates a new line.
- Tab key: if there is no input, it displays the help list; if there is input, it autocompletes commands.
- Up/Down arrows: used to navigate through previously executed content, moving either up or down in the history.
- Left/Right arrows: used to move the cursor either left or right.

```
msh >
msh >help
gnss module evb shell commands:

help          - Shell help.
ver           - Show firmware version.
reboot        - Restart MCU.
rtc           - rtc time.
adc           - Temperature & Voltage.
can           - CAN config.
cell          - Cellular config.
uart          - Uart config.
vehicle       - Vehicle speed injection config.
gnss          - GNSS config.
agnssonline   - AGNSS Online config.
ntrip         - Ntrip config.
ntripserver   - Ntrip Server config.
ntripclient   - Ntrip Client config.
ls            - Lists all files in the root directory.
cat           - Show file content.
rm            - Remove files or directories.
mkfs          - Format SD card.
time          - Time calender.
```

Figure 16: Help List

6.3. Rules of Commands

Table 5: Composition Rules of Commands

Composition	Description
cmd	- cmd, option and args are separated by a space. - Multiple options can be executed simultaneously.
option	- Option format: ✓ For MCU firmware versions prior to <i>GNSS_MODULE_EVB_MCU_A_V1.1</i>: Only long options are supported (e.g., --help).
args	✓ For <i>GNSS_MODULE_EVB_MCU_A_V1.1</i> and later versions: Both short options (e.g., -h) and long options are supported.

Table 6: Format and Usage of Commands

Format	Description	Usage Rules
cmd	Command without options or arguments (e.g., help).	Execute the command by typing it and pressing Enter . See Figure 17: Executing Command Without Options or Arguments (e.g., ver) .

Format	Description	Usage Rules
cmd args	Command with arguments (e.g., rm *).	Execute the command by typing it and pressing Enter .
cmd --option or cmd -o	Command with options (e.g., gnss --help or gnss -h).	1. Help documentation support (--help/-h): - All such commands support --help or -h to display full help information. - Output: all supported options, valid parameter ranges for each option, and brief description of each option. - Example: Figure 18: Help Documentation Support (gnss --help).
cmd --option args or cmd -o args	Command with both options and arguments (e.g., gnss --autobaud on or gnss -a on).	2. Query mode support: - If the command is executed without any options or arguments, it defaults to query mode. - Output: current parameter settings of all options. - Example: Figure 19: Query Mode Support (gnss).

```
msh >ver
GNSS_MODULE_EVB_MCU_A_V1.1
msh >
```

Figure 17: Executing Command Without Options or Arguments (e.g., ver)

```
msh >gnss --help
-m --module      Module name. See supported module:  gnss -m help
-p --port        Main port.  See supported port:    gnss -p help
-P --auxport     Aux port.   See supported auxport:  gnss -P help
-a --autobaud    <on/off>    Baud rate adaptive
-A --auxlog      <on/off>    GNSS AUX port log
-n --nmealog     <on/off>    Extract main port NMEA logs
-r --rtcmlog     <on/off>    Extract main portRTCM logs
-v --vrslog      <on/off>    Save corrected data
-S --logsize     <1-2048>    Maximum size of a GNSS log, unit:MB
-d --debug       <on/off>
-R --rstpar      Reset all parameters.
-h --help        Display this help message.
msh >
```

Figure 18: Help Documentation Support (gnss --help)

```
msh >gnss
module          Generic
port            com1
auxport         none
autobaud        on
auxlog          off
nmealog         off
rtcmlog         off
vrslog          off
logsize         1024 MB
debug           off
```

Figure 19: Query Mode Support (gnss)

6.4. Commands

6.4.1. uart Query/Configure MCU Serial Port Parameters

Cmd	Option	Args	Description
uart	-	-	Query parameter settings of MCU serial ports.
	-c --cfg	1	Select the MCU serial port to be configured: 1 = USART1, connected to the 4G module
		2	2 = UART2, reserved
		3	3 = UART3, connected to the UART1 (com1) of GNSS module
		6	6 = UART6, connected to the UART2 (com2) of GNSS module See Figure 5: EVB Block Diagram for details.
	-b --baud	9600	Configure baud rate. Unit: bps.
		38400	
		115200	
		460800	
		921600	
		2000000	
		3000000	
	-s --send	<string>	Send string data, automatically adding the \r\n characters.
	-d --debug	on	Enable or disable displaying raw data read from the MCU serial port on the console. on = Enable off = Disable
		off	
	-R --rstpar	-	Reset all parameters.
	-h --help	-	Display help information.

Example:

Configure the baud rate of MCU UART3 to 460800 bps.

```
msh >uart -c 3 -b 460800
cfg          3
baud         460800                                ok
```

or

```
msh >uart --cfg 3 --baud 460800
cfg          3
baud         460800                                ok
```

NOTE

1. When using **uart** to configure **--baud**, **--send**, and **--debug**, it is necessary to specify the serial port with **--cfg**.
2. 2000000 and 3000000 bps baud rates are only supported on *GNSS_MODULE_EVB_MCU_A_V1.1* or later MCU firmware versions.

6.4.2. rtc Query MCU Time

Cmd	Option	Args	Description
rtc	-	-	Query system time of MCU.

6.4.3. can Query/Configure CAN Port Connection

Cmd	Option	Args	Description
can	-	-	Query CAN port connection.
	-l	--link gnss mcu	Connect CAN port of J0504 (ODO) interface to GNSS module or MCU. gnss = Connect to GNSS module mcu = Connect to MCU
	-R	--rstpar -	Reset all parameters.
	-h	--help -	Display help information.

Example:

Connect CAN port of ODO interface to GNSS module.

```
msh >can -l gnss
link          gnss          ok
```

or

```
msh >can --link gnss
link          gnss          ok
```

6.4.4. adc Query Internal Temperature and Supply Voltage of MCU

Cmd	Option	Args	Description
adc	-	-	Query MCU internal temperature and EVB supply voltage levels.

Example:

```
msh >adc
Temp: 33 deg
Vref: 1.211V
Vbat: 3.319V
VDD_1V8: 1.871V
VDD_GNSS_3V3: 3.273V
VBAKP_3V3: 3.379V
VCC_2V8: 2.846V
```

6.4.5. help Query Commands Supported by MCU

Cmd	Option	Args	Description
help	-	-	Query all commands supported by MCU.

6.4.6. reboot Restart MCU

Cmd	Option	Args	Description
reboot	-	-	Restart MCU.

6.4.7. cell Query/Configure 4G Module

Cmd	Option	Args	Description
cell	-	-	Query 4G module connection parameters.
	-s	--state on off	Enable or disable 4G module function. on = Enable off = Disable See the NOTE for default value setting.
	-l	--link gnss1 gnss2	Connect 4G module to either UART1 (com1) or UART2 (com2) of GNSS module. The 4G module must be properly connected to the GNSS module at hardware level for this command to take effect. gnss1 = UART1 (com1) of GNSS module gnss2 = UART2 (com2) of GNSS module
	-a	--apn <apnname>	String type. e.g., CMNET/3GNET. NOTE: To clear the APN, set it to "NONE". Changes take effect after reboot.
	-i	--info -	Display information about 4G module.
	-R	--rstpar -	Reset all parameters.
	-h	--help -	Display help information.

Example:

Display information about 4G module.

```
msh >cell -i
Model Id:      EG25
Firmware version: EG25GGBR07A08M2G
SN:           MPY23GT110043661P
IMEI:         867929065777643
ICCID:        89860122801376991662
RSRP:         -86
ok
```

Set 4G module APN.

```
msh >cell -a 3GNET
cell -a 3GNET
apn          3GNET          ok

msh >cell
cell
```

state	on	
link	gnss1 (PA6:1)	
apn	3GNET	//4G module APN successfully set.
info	See more information: cell -i	

NOTE

Default setting of 4G module function and supported options:

- For MCU firmware versions prior to *GNSS_MODULE_EVB_MCU_A_V1.1*, 4G module function is enabled by default, and **--state**, **--apn**, **--info** and **--rstpar** options are not supported.
- For *GNSS_MODULE_EVB_MCU_A_V1.1* or later versions, the 4G module function is disabled by default, and **--state**, **--apn**, **--info** and **--rstpar** options are supported.

6.4.8. gnss Query/Configure GNSS Module Parameters

Cmd	Option	Args	Description
	-	-	Query GNSS module parameters.
	-m --module	View with gnss -m help .	Module type. Default: Generic.
	-p --port	com1 com2 iic spi none	GNSS module data output port. com1 = UART1 com2 = UART2 iic = I2C spi = SPI none = None View configurable parameters with gnss -p help .
gnss	-P --auxport	com1 com2 iic spi none	GNSS module data output auxiliary port. com1 = UART1 com2 = UART2 iic = I2C spi = SPI none = None View configurable parameters with gnss -P help .
	-a --autobaud	on off	Enable or disable baud rate adaptation feature of the MCU serial port connected to the GNSS module UART1 (com1) or UART2 (com2). on = Enable off = Disable
	-A --auxlog	on off	Enable or disable logging of data from auxiliary port. on = Enable off = Disable

Cmd	Option	Args	Description
	-n --nmealog	on off	Enable or disable logging of NMEA data from GNSS module port. on = Enable off = Disable
	-r --rtcmlog	on off	Enable or disable logging of RTCM data from GNSS module port. on = Enable off = Disable
	-v --vrslog	on off	Enable or disable logging of the RTK correction data injected into the GNSS module port. on = Enable off = Disable
	-S --logsize	1–2048	Configure maximum log file size. When the log size exceeds this limit, a new file will be created. Unit: MB. Default: 1024.
	-d --debug	on off	Enable or disable the transparent transmission of parsed data from module port on the console. on = Enable off = Disable (default)
	-R --rstpar	-	Reset all parameters.
	-h --help	-	Display help information.

Example:

Configure the maximum log size and enable logging of RTK correction data injected into the GNSS module port.

```
msh >gnss -l 2048
```

```
gnss -l 2048
```

```
logsize      2048                                ok
```

```
msh >gnss -v on
```

```
gnss -v on
```

```
vrslog       on                                  ok
```

or

```
msh >gnss --logsize 2048
```

```
gnss --logsize 2048
```

```
logsize      2048                                ok
```

```
msh >gnss --vrslog on
```

```
gnss --vrslog on
```

```
vrslog       on                                  ok
```

NOTE

1. The UART baud rate adaptation feature of the MCU takes effect only during the initialization process. If you modify the baud rate of the GNSS module after power-on, you need to restart the MCU program to apply the new baud rate.
2. The **--module**, **--port**, **--auxport**, **--auxlog** options are supported on *GNSS_MODULE_EVB_MCU_A_V1.1* or later MCU firmware versions.

6.4.9. ntrip Query/Configure NTRIP Parameters

Cmd	Option	Args	Description
	-	-	Query NTRIP parameters and configuration.
	-m --mode	base rover none	Working mode. base = Base station. rover = Rover station none = Turn off NTRIP service, saved on power-off.
	-s --stop	-	Stop NTRIP.
ntrip	-S --start	-	Start NTRIP.
	-d --debug	on off	Enable or disable displaying data injected into the GNSS module port on the console. on = Enable off = Disable
	-R --rstpar	-	Reset all parameters.
	-h --help	-	Display help information.

Example:

Set NTRIP to rover mode.

```
msh >ntrip -m rover
mode          rover          ok
```

or

```
msh >ntrip --mode rover
mode          rover          ok
```

6.4.10. ntripserver Query/Configure NTRIP Server Parameters

Cmd	Option	Args	Description
ntripserver	-	-	Query NTRIP server parameters and configuration.
	-H --host	<host>	NTRIP Caster IP address.
	-p --port	<port>	NTRIP Caster port.
	-u --user	<username>	Username.
	-P --pwd	<password>	Password.
	-m --mnt	<mount point>	Mount point.
	-R --rstpar	-	Reset all parameters.
	-h --help	-	Display help information.

Example:

Configure IP address and port.

```
msh >ntripserver -H 192.168.1.100 -p 1001
```

```
ntripserver -H 192.168.1.100 -p 1001
```

```
host      192.168.1.100      ok
port      1001               ok
```

or

```
msh >ntripserver --host 192.168.1.100 --port 1001
```

```
ntripserver --host 192.168.1.100 --port 1001
```

```
host      192.168.1.100      ok
port      1001               ok
```

6.4.11. ntripclient Query/Configure NTRIP Client Parameters

Cmd	Option	Args	Description
ntripclient	-	-	Query NTRIP Client parameters and configuration.
	-t --type	SelfBuild	Server type. SelfBuid = Standard NTRIP Client (default)
	-H --host	<host>	NTRIP Caster IP address.
	-p --port	<port>	NTRIP Caster port.

-u	--user	<username>	Username.
-P	--pwd	<password>	Password.
-m	--mnt	<mount point>	Mount point.
-R	--rstpar	-	Reset all parameters.
-h	--help	-	Display help information.

Example:

Configure NTRIP client parameters.

```
msh >ntripclient -H 192.168.1.100 -p 1001 -u quectel -P 123456 -m AUTO
ntripclient -H 192.168.1.100 -p 1001 -u quectel -P 123456 -m AUTO
host          192.168.1.100          ok
port          1001                   ok
user          quectel                ok
pwd           123456                 ok
mnt           AUTO                   ok
```

or

```
msh >ntripclient --host 192.168.1.100 --port 1001 --user quectel --pwd 123456 --mnt AUTO
ntripclient --host 192.168.1.100 --port 1001 --user quectel --pwd 123456 --mnt AUTO
host          192.168.1.100          ok
port          1001                   ok
user          quectel                ok
pwd           123456                 ok
mnt           AUTO                   ok
```

6.4.12. vehicle Query/Configure Parameters for Vehicle Speed Injection

Cmd	Option	Args	Description
	-	-	Query parameters for vehicle speed injection.
vehicle	-m --mode	0	Vehicle speed injection mode.
		1	0 = Default configuration, no conversion function.
		2	1 = CAN-to-UART/WHEELTICK
		3	2 = UART-to-WHEELTICK
			3 = WHEELTICK-to-UART
	-s --dbcspeed	-	Configure speed.
	-g --dbcgear	-	Configure gears.

-M	--msgid	<MSG_ID>	CAN message ID.
-S	--startbit	<StartBit>	Start bit of the data.
-b	--bitsize	<BitSize>	Bit size.
-B	--byteorder	<ByteOrder>	Byte order. 0 = Big Endian (Motorola mode) 1 = Little Endian (Intel mode)
-v	--valuetype	<ValueType>	Fixed to 0 (currently not supported).
-f	--factor	<Factor>	Data scaling factor.
-o	--offset	<Offset>	Offset parameter.
-i	--min	<Min>	Minimum data value.
-a	--max	<Max>	Maximum data value.
-G	--reversegear	<Value>	Vehicle reverse gear value.
-d	--debug	on off	Enable or disable showing of debug message. on = Enable off = Disable (default)
-R	--rstpar	-	Reset all parameters.
-h	--help	-	Display help information.

Example:

Configure CAN message ID, start bit of the data, and the bit size.

```
msh >vehicle -m 1
mode          1          ok

msh >vehicle -s -M 585 -S 0 -b 13
dbcspeed
msgid         585        ok
startbit      0          ok
bitsize       13         ok
```

or

```
msh >vehicle --mode 1
mode          1          ok

msh >vehicle --dbcspeed --msgid 585 --startbit 0 --bitsize 13
dbcspeed
msgid         585        ok
```

startbit	0	ok
bitsize	13	ok

6.4.13. ver Query Firmware Version

Cmd	Option	Args	Description
ver	-	-	Check the current firmware version number.

Example:

```
msh >ver
GNSS_MODULE_EVB_MCU_A_V1.1
```

6.4.14. ls Display Current Files of EVB SD Card

Cmd	Option	Args	Description
ls	-	-	View all files in the EVB SD card.

Example:

```
msh >ls
1:/RunLog/evb_b0280_n000000.log      2025-02-27 21:17:40      2.29 KB      2345 Byte
1:/com1_20250227_211658.log          2025-02-27 21:17:10      54.32 KB      55627 Byte
1:/com1_b0280_n000000.log            2025-02-27 21:17:40     121.86 KB     124781 Byte

SD Total: 14.99 GB, Free: 14.99 GB
```

6.4.15. cat Display Specified File Content of SD Card

Cmd	Option	Args	Description
cat	-	<Path>	View the content of a file in the SD card.

NOTE

For *GNSS_MODULE_EVB_MCU_A_V1.1* or later MCU firmware versions, only the latest 5 KB of data in the specified file can be displayed.

6.4.16. rm Remove Files or Directories

Cmd	Option	Args	Description
rm	-	<Path>	Delete files under the specified path. If the parameter is "*", all files in the root directory will be deleted.

Example:

Remove all files in the root directory.

```
msh >rm *
rm *
Remove all files of rootfs success.
OK
```

6.4.17. mkfs Format Current EVB SD Card

Cmd	Option	Args	Description
rm	-	-	Format SD card.

6.4.18. time Query/Configure System Time

Cmd	Option	Args	Description
time	-	-	Query system time and configurations.
	-c	--calibration none auto cellular gnssrmc	Select time calibration method. none = no calibration of MCU system time auto = calibrate the MCU system time via the 4G module or GNSS RMC sentence. cellular = calibrate the MCU system time via the 4G module gnssrmc = calibrate the MCU system time via the GNSS RMC sentence.
	-z	--timezone <-96~96>	Set time zone, e.g., executing time --timezone 32 to set the time zone to UTC+8.
	-R	--rstpar -	Reset all parameters.
	-h	--help -	Display help information.

Example:

Set time zone to UTC+8.

```
msh >time -z 32
```

```
time zone: 32
```

```
ok
```

or

```
msh >time --timezone 32
```

```
time zone: 32
```

```
ok
```

7 Upgrade Firmware

We can use the QGNSS tool to upgrade the EVB MCU firmware and GNSS module firmware.

7.1. Upgrade EVB MCU Firmware

The MCU on EVB comes with pre-installed default firmware.

- The default firmware supports functions such as log saving, NTRIP Client, NTRIP Server and vehicle speed injection.
- The partitions of the default firmware in the MCU are as follows:

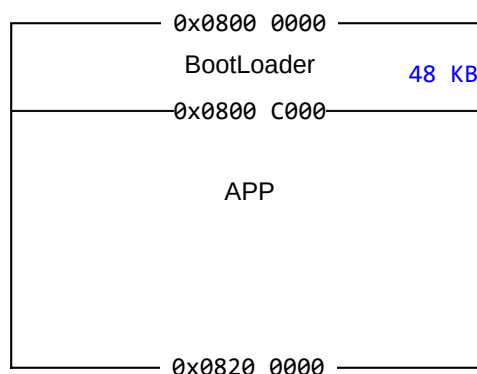


Figure 20: Default MCU Partition

- ✓ **BootLoader Space:** Stores the factory preset BootLoader, which supports upgrading the APP Space code via the QGNSS tool. If you reprogram BootLoader Space, you must use the flashing tool provided by the MCU vendor to flash the MCU firmware.
- ✓ **APP Space:** Stores the factory preset application firmware.

7.1.1. Update BootLoader Space

Steps to update BootLoader Space:

1. Short MCU_BOOT0 and 3.3V pins on J0502 with a jumper cap.
2. Connect USRX2_MCU and USTX2_MCU pins on J0502 to the USB-to-Serial board, and connect the

USB-to-Serial board to your PC.

3. Turn the EVB power switch (S0503) to the "ON" position.
4. Update MCU BootLoader by using the MCU firmware download tool. The relevant document and firmware download tool for the MCU (GD32F470ZIT6) can be obtained on the *GigaDevice official website*.

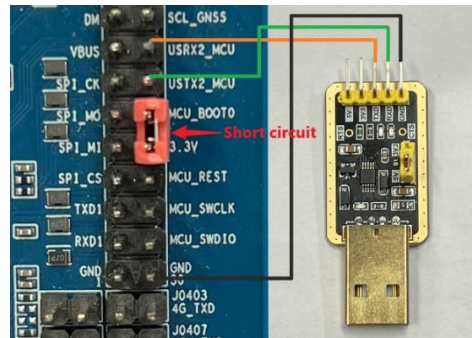


Figure 21: Connection for Firmware Upgrading

7.1.2. Update APP Space

Steps to update APP Space:

1. Connect the EVB to QGNSS tool via the MCU serial port (COM8) as shown in [Figure 14: COM Port in Device Manager](#).

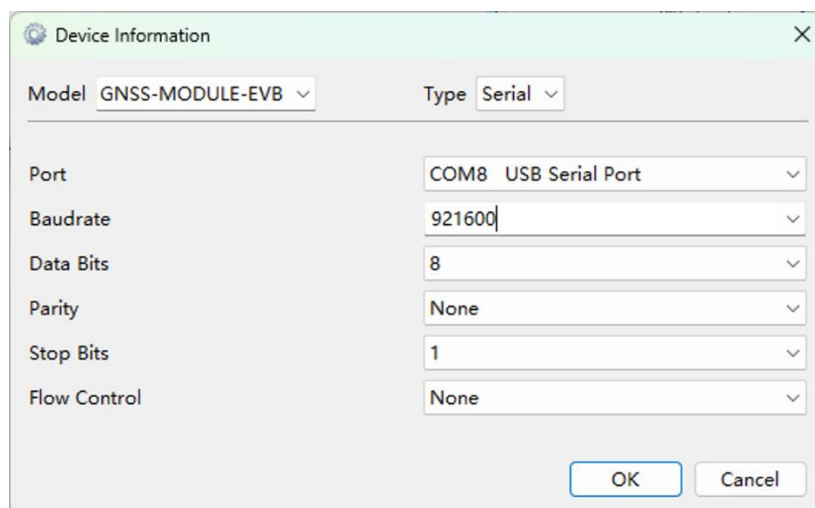


Figure 22: Connect EVB to QGNSS via COM8

2. After the EVB connects to the QGNSS tool successfully, click **"Tools"** and select **"Firmware Update"** to open the **"Firmware Download"** window.

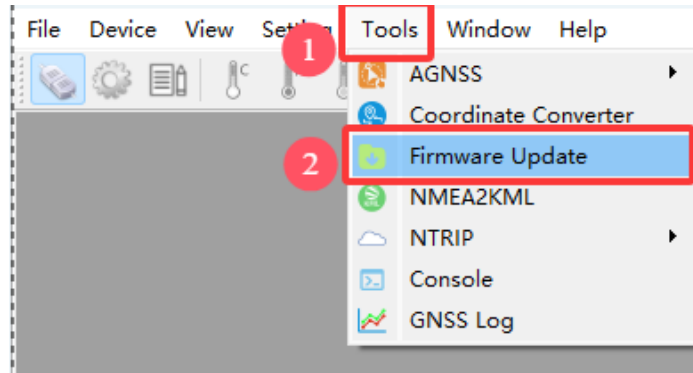


Figure 23: Open "Firmware Download" Window

3. Follow steps below to start APP space update.
 - ① Select the firmware you want to download.
 - ② Click the start button.
 - ③ Restart the MCU when the screen displays **"Synchronize..."**. The firmware update can be started after the synchronization is finished.

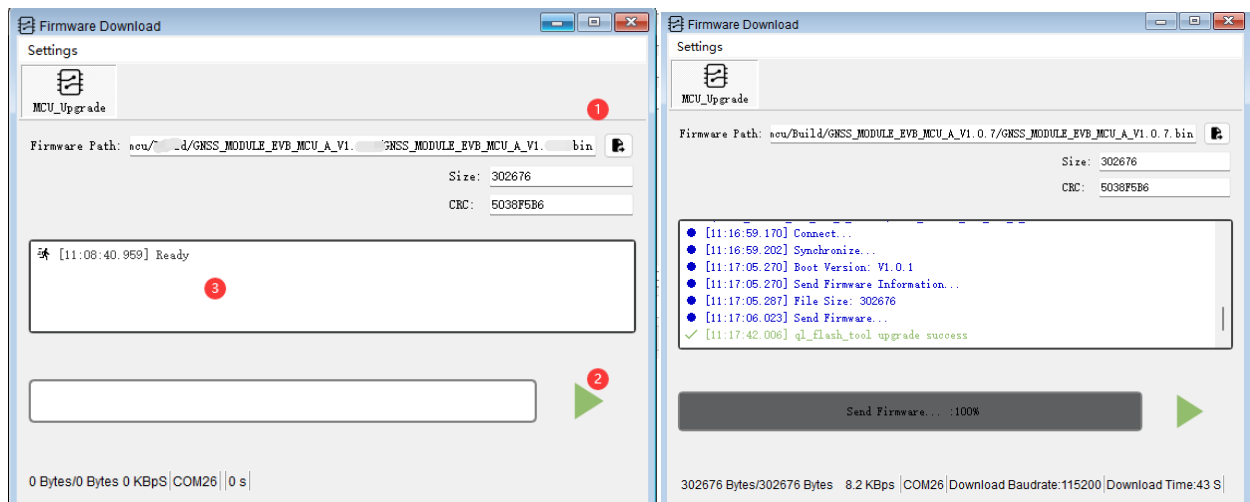


Figure 24: Update MCU APP Firmware

7.2. Upgrade GNSS Module Firmware

Steps to upgrade the GNSS module firmware:

1. As illustrated below, on the EVB, remove the jumper cap on J0404 (MCU_TX1), and place it on J0402 (USB_TXD1).

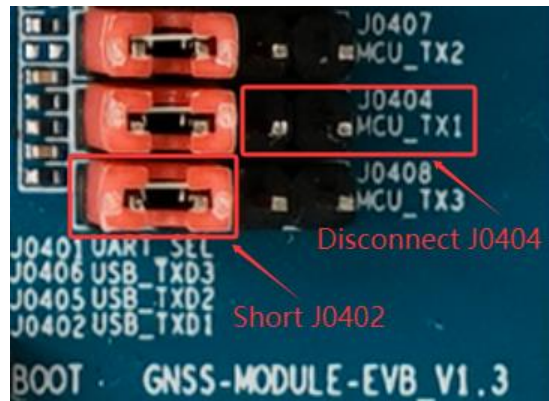


Figure 25: Jumper Placement for GNSS Module Firmware Upgrade

2. By referring to [Figure 5: EVB Block Diagram](#), disconnect RXD of GNSS module UART1 (com1) from TXD of MCU UART3, and then connect it to TXD of USB-to-UART Bridge Chip UART1.
3. Connect the EVB to your PC through the USB interface, and open the QGNSS tool.
4. Select COM5 shown in [Figure 14: COM Port in Device Manager](#) and establish the connection between the EVB and the QGNSS tool. For detailed instructions on upgrading GNSS module firmware, see [document \[2\] QGNSS user guide](#) or the firmware upgrade document for the corresponding module.

8 EVB Feature Introduction

8.1. Power Consumption at Different Stages

Module power consumption is measured in four stages:

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

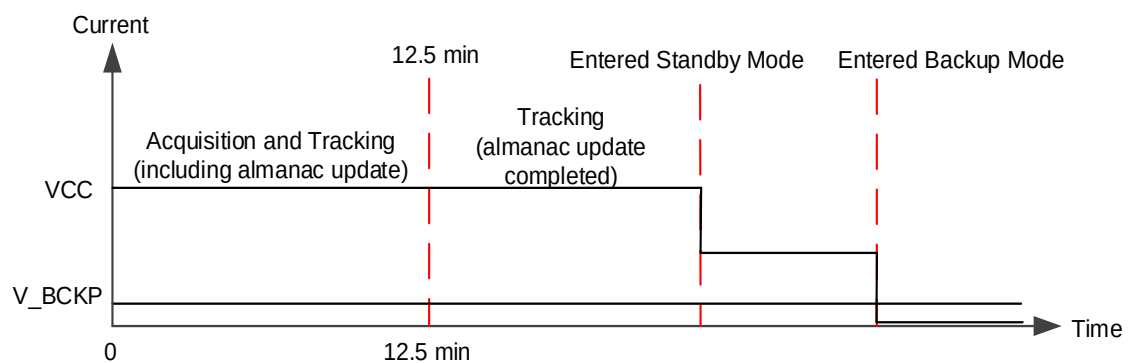


Figure 26: Power Consumption at Different Stages

For detailed steps to enter different power modes, please refer to the hardware design manual of corresponding module. When measuring the power consumption of VCC and V_BCKP using an ammeter or current consumption meter, the connection steps between the EVB and the ammeter/current consumption meter are described in the following subchapters.

8.1.1. VCC Power Consumption Measurement

Before measuring the VCC power consumption, you must connect the module TE-A(s) and kit components to the EVB to ensure that the GNSS module can communicate and obtain a position fix normally.

Detailed steps for measuring VCC power consumption with an **ammeter**:

1. Switch off the EVB power supply (S0503) and remove the jumper cap from J0104 (VCC_3.3V).

2. Connect the ammeter in series to J0104 as shown below: connect the red probe to the left pin of J0104 and, the black probe to the right pin of J0104, as shown below.
3. Switch on the EVB power supply (S0503) and read the VCC power consumption from the ammeter.

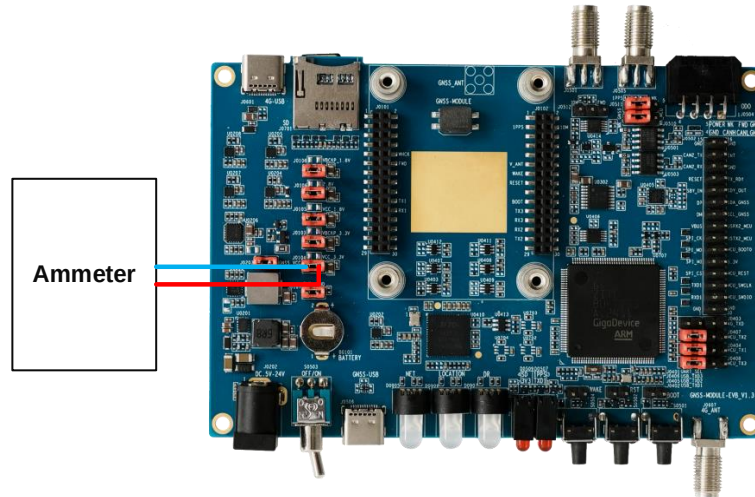


Figure 27: VCC Power Consumption Measured with Ammeter

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

1. Switch off the EVB power supply (S0503) and remove the jumper cap from J0104 (VCC_3.3V).
2. Make sure the positive terminal of the power consumption meter is connected to the right pin of J0104, and the negative terminal is connected to GND, as shown below.
3. Switch on the EVB power supply (S0503) and power consumption meter, and read the VCC power consumption from the meter.

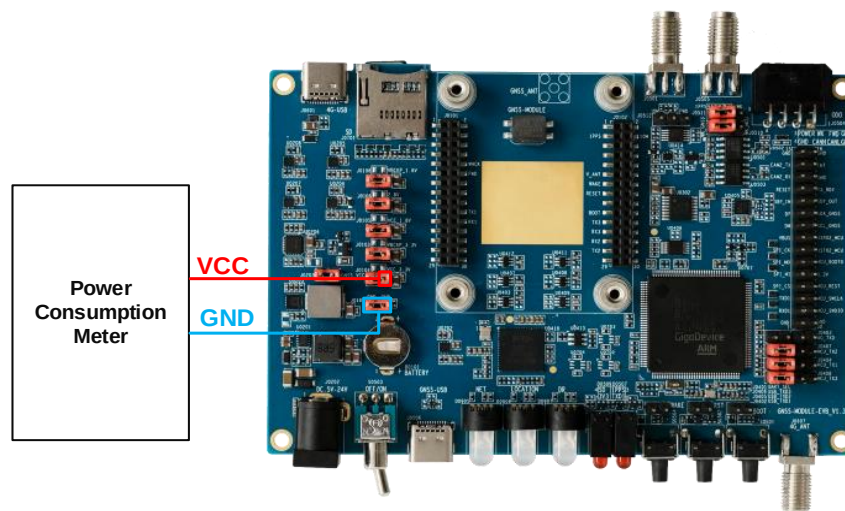


Figure 28: VCC Power Consumption Measured with Power Consumption Meter

8.1.2. V_BCKP Power Consumption Measurement

Before measuring the V_BCKP power consumption, you must connect the module TE-A(s) and kit components to EVB to ensure that the GNSS module can communicate and obtain a position fix normally.

Detailed steps for measuring V_BCKP power consumption with an **ammeter**:

1. Switch off the power supply (S0503) and remove the jumper cap from J0103 (VBCKP_3.3V).
2. Connect the ammeter in series to J0103 as shown below: connect the red probe to the left pin of J0103 and, the black probe to the right pin of J0103, as shown below.
3. Switch on the EVB power supply (S0503) and read the V_BCKP power consumption from the ammeter.

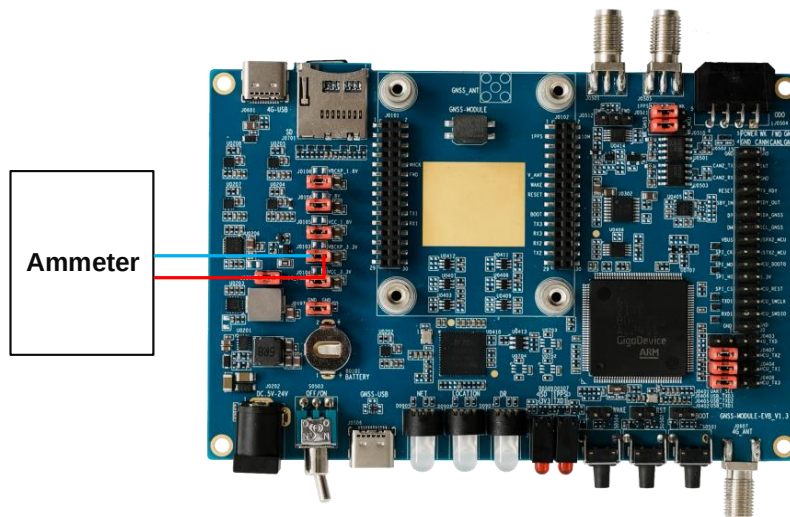


Figure 29: V_BCKP Power Consumption Measured with Ammeter

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

1. Switch off the EVB power supply (S0503) and remove the jumper cap from J0103 (VBCKP_3.3V).
2. Make sure the positive terminal of the power consumption meter is connected to the right pin of J0103, and the negative terminal is connected to GND, as shown below.
3. Switch on the power consumption meter and the EVB power supply (S0503), and then read the VCC power consumption from the meter.

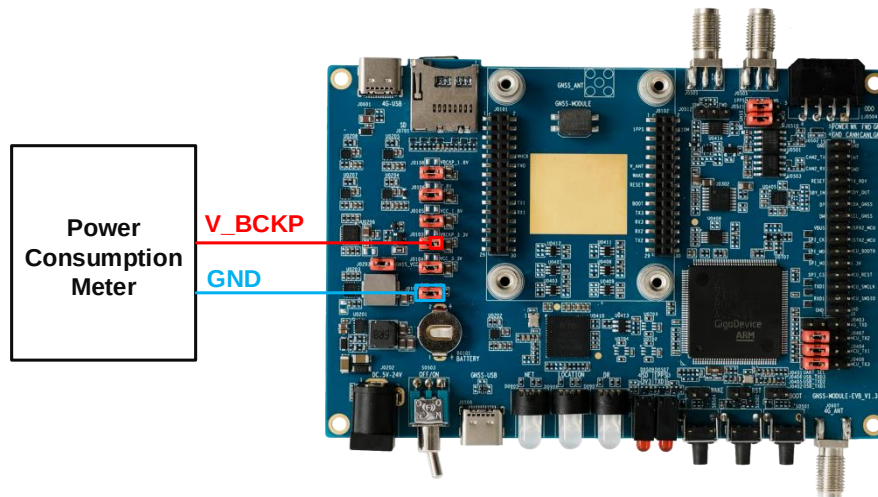


Figure 30: V_BCKP Power Consumption Measured with Power Consumption Meter

NOTE

1. Adjust the current measurement resolution before using the power consumption meter.
2. Formula for calculating the power consumption value: $P = V_{\text{Supply}} \times I_{\text{Test}}$.
3. Before measuring the V_BCKP power consumption in Backup mode, ensure that the module has entered Backup mode, and then remove the jumper cap from J0104 (VCC_3.3V) to disconnect the VCC power supply. For more information about how to enter/exit Backup mode, see the hardware design manual of the corresponding module.
4. The current consumption tests for J0105 (VCC_1.8V) and J0108 (VBCKP_1.8V) are the same as explained above.

8.2. Log Recording

The naming convention for logs is different depending on whether the EVB MCU's internal time is calibrated or not.

- **MCU time not calibrated (EVB powering-up stage):**

Format of <number> in the table below: **b<xxxx>_n<yyyyyy>**:

- ✓ <xxxx> MCU boot count (4 digits)
- ✓ <yyyyyy> Log file sequence number (4 digits)

- **MCU time calibrated (After EVB power-up or reset):**

Format of <number> in the table below: **<yyyymmdd>_<hhmmss>**:

- ✓ <yyyymmdd> Date (yyyy: year, mm: month, dd: day)
- ✓ <hhmmss> Time (hh: 2-digit hour, mm: 2-digit minute, ss: 2-digit second).

Table 7: Logging Instructions

Log Type	Path	Description
EVB operation logs.	./RunLog/evb_<number>.log	Enabled by default. Max. file size: 128 MB. Not configurable.
Full output from GNSS module port. Default: UART1 (COM1).	./com1_<number>.log	Enabled by default. Max. file size: 1024 MB. Enable/disable status and maximum file size (Range: 1–2048 MB) configurable.
Full output from GNSS module aux port. Default: None; it can be configured as UART2 (COM2).	./com2_<number>.log	Disabled by default.
NMEA output of the GNSS module port.	./NMEA/com1_nmea_<number>.txt	Max. file size: 1024 MB. Enable/disable status and maximum file size (Range: 1–2048 MB) configurable.
RTCM output of the GNSS module port.	./RTCM/com1_rtc_<number>.rtcm	
RTK correction data input via the GNSS module port.	./VRS/com1_rtk_<number>_vrs.bin	

When the EVB MCU writes data to the SD card, the SD card indicator (D0509) flashes briefly to indicate the writing activity.

NOTE

For *GNSS_MODULE_EVB_MCU_A_V1.0*, the maximum supported log file size is 512 MB.

8.3. NTRIP Function

NTRIP is an application layer protocol for transmitting RTK data over the internet. It supports all RTK data formats (NCT, RTCM, CMR, CMR+, etc.). For more information about NTRIP and RTK, see [document \[4\] RTK application note](#).

NTRIP consists of three main components: NTRIP Server, NTRIP Caster, and NTRIP Client.

NTRIP functionalities of EVB:

- The EVB supports the NTRIP Server and NTRIP Client functionalities.
- The console provides **ntrip**, which allows you to select among three different modes:
 - ✓ Disable NTRIP: **ntrip -m none** or **ntrip --mode none**

- ✓ Work in NTRIP Server mode: **ntrip -m base** or **ntrip --mode base**
- ✓ Work in NTRIP Client mode: **ntrip -m rover** or **ntrip --mode rover**
- In NTRIP Server or NTRIP Client modes, you can also start and stop services at any time.

8.3.1. NTRIP Server Function

Before using the NTRIP Server functionality, you must set up an NTRIP Caster to forward the calibration data of the receiver. QGNSS tool supports the NTRIP Caster function. For detailed setup instructions, see [document \[2\] QGNSS user guide](#).

NOTE

Quectel provides a test NTRIP Caster to facilitate RTK functionality verification.

- IP Address: 172.29.104.32
- Port Number: 7990
- User Name: QL_NTRIP
- Password: 123456

If you set up your own NTRIP Caster, ensure that the IP Address and Port Number are accessible from the external network.

The following example, which configures the LG290P (03) module to operate in base station mode, illustrates how to connect the EVB to an NTRIP Caster:

1. The LG290P (03) module operates in rover mode by default. The module operating mode can be switched through **PQTMCFGRCVRMODE** as shown in the following example:

```
//Set the module operating mode to base station mode
$PQTMCFGRCVRMODE,W,2*29
//Command executed successfully
$PQTMCFGRCVRMODE,OK*64
//Save the configuration
$PQTMSAVEPAR*5A
//Command executed successfully
$PQTMSAVEPAR,OK*72
//Reboot the module to make the configurations effective
```

2. Get the precise coordinates of LG290P (03) module.
 - If the exact coordinates of the module antenna are known, set the module to the Fixed mode and send the true coordinate to LG290P (03) module in ECEF format. For example:

```
$PQTMCFGSVIN,W,2,0,0,-2519265.0514,4849534.9045,3277834.6432*2A
$PQTMCFGSVIN,OK*70
```

- If the exact coordinates of the module antenna are not known, set the module to the Survey-in

mode so that the LG290P (03) can automatically determine precise coordinates. For example:

```
$PQTMCFGSVIN,W,1,3600,1.2,0,0,0*0A
$PQTMCFGSVIN,OK*70
```

- Execute **PQTMSAVEPAR** to save the coordinate information to the module after the LG290P (03) module gets the precise coordinates:

```
$PQTMSAVEPAR*5A
$PQTMSAVEPAR,OK*72
```

- Execute **ntripserver** to configure the relevant EVB parameters and set the EVB to the Base Station mode. After successfully connecting to the NTRIP Caster, the following log is displayed:

```
msh >ntripserver --help
--host <host>
--port <port>
--user <username>
--pwd <password>
--mnt <mount point>
--rstpar          Reset all parameters.
--help

msh >ntripserver --host 220.180.239.212 --port 7990 --user QL_NTRIP --pwd 123456 --mnt HTEST
host      220.180.239.212      ok
port      7990                 ok
user      QL_NTRIP             ok
pwd       123456               ok
mnt       HTEST                ok

msh >ntrip --mode base
mode      base                  ok

I/CELL_HANDLE [2024/05/24 09:05:47] last_work_mode = 0,current_workmode = 1
I/NCli        [2024/05/24 09:05:47] No ntrip client service is running
I/NtripSvr    [2024/05/24 09:05:47] attempt to connect to 220.180.239.212:7990.

msh >I/NtripSvr [2024/05/24 09:05:47] len[59],login_buff:
SOURCE 123456 /HTEST
Source-Agent: QNTRIP Quectel-GNSS

I/NtripSvr    [2024/05/24 09:05:48] rsp:
ICY 200 OK

I/NtripSvr    [2024/05/24 09:05:48] login success
I/NtripSvr    [2024/05/24 09:05:48] Transferring rtc...
```

Figure 31: Set Module to NTRIP Server Mode and Connect to NTRIP Caster Successfully

After successfully connecting to the NTRIP Caster, MCU will send the raw data of base station to NTRIP Caster. At this point, the D0905 indicator light remains steadily illuminated in blue.

8.3.2. NTRIP Client Function

You can set the EVB to standard NTRIP Client mode by executing **ntripclient -t SelfBuild** or **ntripclient --type SelfBuild**. In this mode, the Client exchanges data with NTRIP Caster using the standard NTRIP protocol.

```

msh >ntripclient --help
--type <QuecRTK/SelfBuild>
--host <host>
--port <port>
--user <username>
--pwd <password>
--mnt <mount point>
--rstpar Reset all parameters.
--help

msh >ntripclient --host 220.129.212 --port 7990 --user QL_ --pwd 12 --mnt QNSS_Srv
host 220.129.212 ok
port 7990 ok
user QL_ ok
pwd 12 ok
mnt QNSS_Srv ok

msh >ntrip --mode rover
mode rover ok
I/CELL_HANDLE [2024/05/24 11:36:24] last_work_mode = 0,current_workmode = 2
I/CELL_HANDLE [2024/05/24 11:36:24] no ntrip server service is in progress
I/Ncli [2024/05/24 11:36:24] CorsType[2]
I/Ncli [2024/05/24 11:36:24] CorsType[2],Ntrip_Step[-1]
I/Ncli [2024/05/24 11:36:24] ----- NtripCLI WaitBits[0x1] -----
I/Ncli [2024/05/24 11:36:24] CorsType[2],connect to [220.129.212:7990]

msh >I/Ncli [2024/05/24 11:36:25] rsp:
ICY 200 OK

I/Ncli [2024/05/24 11:36:25] NtripClient login OK
I/Ncli [2024/05/24 11:36:25] Receiving rtcm & sending GGA...

```

Figure 32: Set to Standard NTRIP Client Mode and Connect to NTRIP Caster Successfully

After the rover connects to NTRIP Caster successfully, the D0906 indicator light changes from red (GNSS single-point solution) to green (RTK float solution) and then to blue (RTK fixed solution). Once the RTK fixed solution is established, the D0905 indicator light remains steadily illuminated in blue.

8.4. Vehicle Speed Injection

GNSS modules supporting Dead Reckoning (DR) have an integrated IMU, which provides the device's three-axis or six-axis parameters to determine the vehicle's movement status.

“Vehicle speed injection” refers to the process of transmitting the current vehicle speed obtained from an external source at the same frequency as the IMU data. This injected speed data is then used in the Dead Reckoning (DR) algorithms to improve the accuracy and effectiveness of DR calculations.

LG69T(AP) is used as an example in the following subchapters for illustrative purposes only. To enable and view the results of vehicle speed injection, use QGNSS tool to send the following commands to LG69T(AP), then reboot the module to enable the echo function of vehicle speed injection.

```

$PQTMCFGMSGRATE,W,PQTMVEHMSG,1,1*4C
$PQTMSAVEPAR*5A

```

8.4.1. Direct Injection

When the provided vehicle speed source interface is the same as the vehicle speed injection interface of the GNSS module, direct injection method is recommended for injecting vehicle speed.

8.4.1.1. Injection via CAN Port

1. Execute **can --link gnss** command to connect the CAN port of J0504 (ODO) on the EVB to the GNSS module.

```
msh >can --link gnss
link      gnss      ok

msh >can
link      gnss      (PB14:0)

msh >
```

Figure 33: Connect CAN Port of EVB ODO Interface to GNSS Module

2. Then connect the CANH and CANL pins of the J0504 (ODO) interface on the EVB, and input the vehicle speed information (in format as below) to the EVB through the CAN.

CANID: 0x249 DATA: 6E 04 12 02 02 02 02

When using a serial tool, we can see that the LG69T(AP) module outputs sentences below (display after filtering):

```
$PQTMVEHMSG,1,233854,17.719*1B
$PQTMVEHMSG,1,233940,17.719*1F
$PQTMVEHMSG,1,234032,17.719*14
$PQTMVEHMSG,1,234132,17.719*15
$PQTMVEHMSG,1,234232,17.719*16
$PQTMVEHMSG,1,234332,17.719*17
$PQTMVEHMSG,1,234433,17.719*11
$PQTMVEHMSG,1,234532,17.719*11
$PQTMVEHMSG,1,234813,17.719*1F
```

Figure 34: Vehicle Speed Injection and Echo Display

8.4.1.2. Injection via UART

1. Remove jumper caps from J0402 and J0404.
2. Connect TXD1, RXD1, and GND of J0502 (test point) on the EVB, and input the vehicle speed information in the format illustrated below.

\$PQTMVEHMSG,1,0,20.000*2B

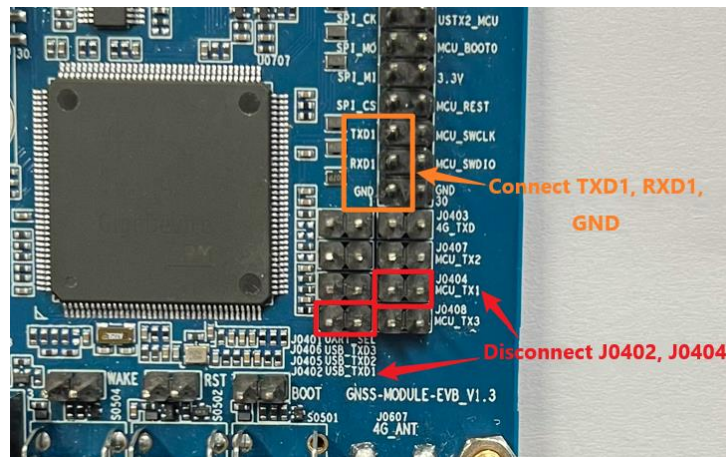


Figure 35: Connection for Direct Vehicle Speed Injection via UART

After injecting vehicle speed successfully, sentences the same as the ones in [Figure 34: Vehicle Speed Injection and Echo Display](#) will be displayed.

8.4.1.3. Injection via WHEELTICK

1. Connect J0510 to WHEELTICK pin of GNSS module:
Short the middle and left pins of J0510 with a jumper cap, to connect it to the GNSS module's WHEELTICK pin.
2. Enable WHEELTICK signal input on J0505:
Short the middle and right pins of J0511 with a jumper cap, making J0505 a WHEELTICK signal input interface.
3. Enable FWD signal input on J0501:
Short the middle and right pins of J0512 with a jumper cap, making J0501 an FWD signal input interface.
4. Input the vehicle speed pulses:
 - **Option 1:** Use the J0504 (ODO) interface to input both WHEELTICK and FWD signals.
 - **Option 2:** Use the SMA port (J0501 for FWD and J0505 for WHEELTICK) to input the vehicle speed pulses.

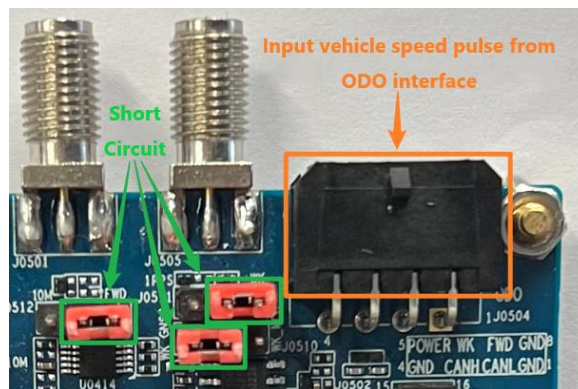


Figure 36: Connection for Direct Vehicle Speed Injection via Pulse Signal

After injecting vehicle speed successfully, sentences the same as the ones in [Figure 34: Vehicle Speed Injection and Echo Display](#) will be displayed.

8.4.2. Relay/Forward Injection

When the provided vehicle speed source interface is different from the vehicle speed injection interface of the GNSS module, relay/forward injection method can be used to inject vehicle speed.

After connecting the CAN port to MCU, you can execute **vehicle -m** or **vehicle --mode** to set different data transmission modes. For more information about configuration, see [Chapter 6.4.12 vehicle Query/Configure Parameters for Vehicle Speed Injection](#).

8.4.2.1. Injection via CAN-to-UART/WHEELTICK Mode

1. Execute the following command to connect the CAN port of J0504 (ODO) interface on the EVB to the MCU.

```
can --link mcu
```

2. Execute the following command to set the vehicle speed injection mode to “CAN-to-UART/WHEELTICK”.

```
vehicle --mode 1
```

3. To choose CAN-to-UART injection mode, short J0402 and J0404 with a jumper cap respectively, and remove the jumper cap on J0510 to disconnect its WK_GNSS and WK_MCU pins.

To choose CAN-to-WHEELTICK injection mode, short J0402, disconnect J0404, and short the WK_GNSS and WK_MCU pins of J0510.

4. Connect the CANH and CANL pins of J0504 (ODO) interface on the EVB, and input the vehicle speed

information (in format below) to the EVB through the CAN port.

CANID: 0x249 DATA: 6E 04 12 02 02 02 02 02

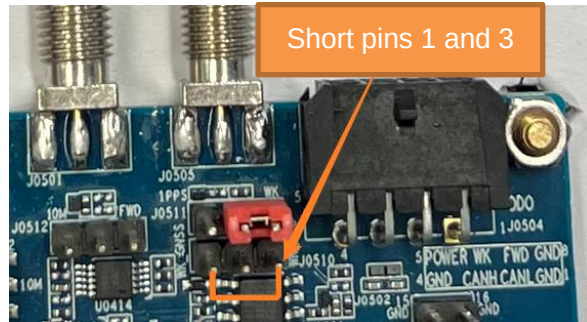


Figure 37: Connection for CAN-to-WHEELTICK Speed Injection Mode

8.4.2.2. Injection via UART-to-WHEELTICK Mode

1. Execute the following command to set the vehicle speed injection mode to “UART-to-WHEELTICK”.

```
vehicle --mode 2
```

2. Short the WK_GNSS and WK_MCU pins on J0510.
3. Connect USTX2_MCU, USRX2_MCU, and GND of J0502 (test point) on the EVB, and input vehicle speed information in the format illustrated below.

\$PQTMVEHMSG,1,0,20.000*2B

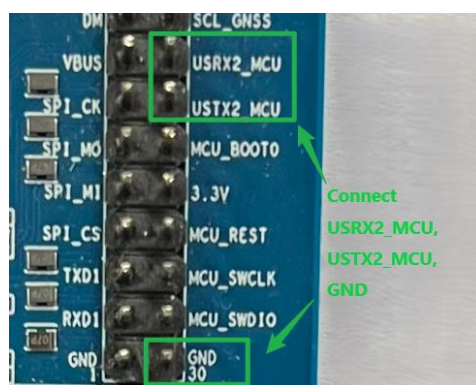


Figure 38: Connection for UART-to-WHEELTICK Speed Injection Mode

8.4.2.3. Injection via WHEELTICK-to-UART Mode

1. Execute **vehicle --mode 3** to set the vehicle speed injection mode to “WHEELTICK-to-UART”.
2. Connect J0510 to GPIO pin of MCU:
Short the middle and right pins of J0510 with a jumper cap, to connect it to the MCU’s GPIO pin.
3. Enable WHEELTICK signal input on J0505:
Short the middle and right pins of J0511 with a jumper cap, making J0505 a WHEELTICK signal input interface.
4. Enable FWD signal input on J0501:
Short the middle and right pins of J0512 with a jumper cap, making J0501 an FWD signal input interface.
5. Input the vehicle speed pulses:
Short J0402 and J0404 respectively, and then use the J0504 (ODO) interface to input WHEELTICK and FWD signals.

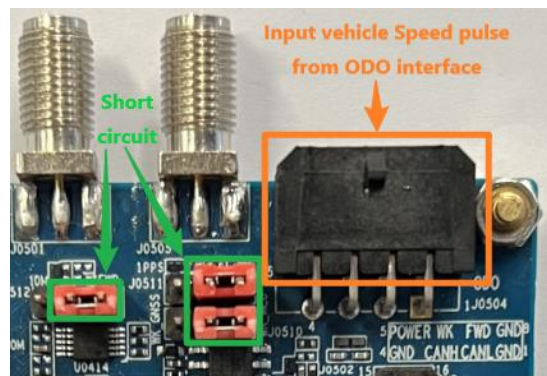


Figure 39: Connection for WHEELTICK-to-UART Speed Injection Mode

8.5. DR Calibration

EVB can be used for DR calibration. Since DR calibration procedures vary by module type, refer to the corresponding DR application note document for detailed steps.

During the DR calibration process and upon completion, the EVB DR indicator light displays as follows:

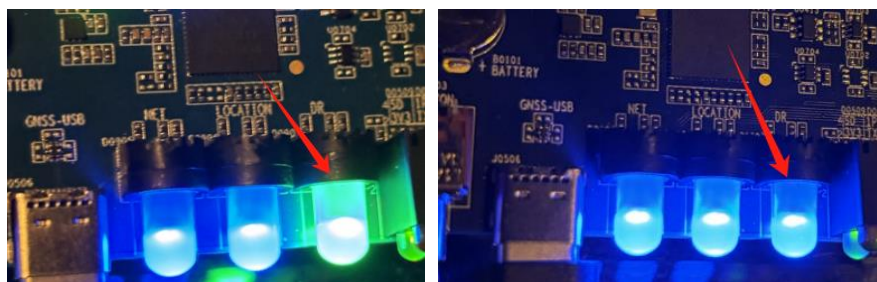


Figure 40: DR Calibration in Progress (Left-green) and DR Calibration Completed (Right-blue)

9 EVB Usage Scenarios

9.1. Connect to PC to Verify GNSS Module Function

If you want to quickly verify some basic functions of the GNSS module, such as GNSS module positioning or view the GNSS module information output, you can connect the module to your PC as explained below. This method applies to all Quectel GNSS modules.

Required hardware and software components:

Hardware:

- GNSS Antenna
- GNSS-MODULE EVB
- GNSS Module TE-A (e.g., LG290P TE-A)
- USB Type-C cable
- PC on Windows operating system

Software:

- USB-to-serial driver for EVB
- QGNSS tool (V1.10 or later)

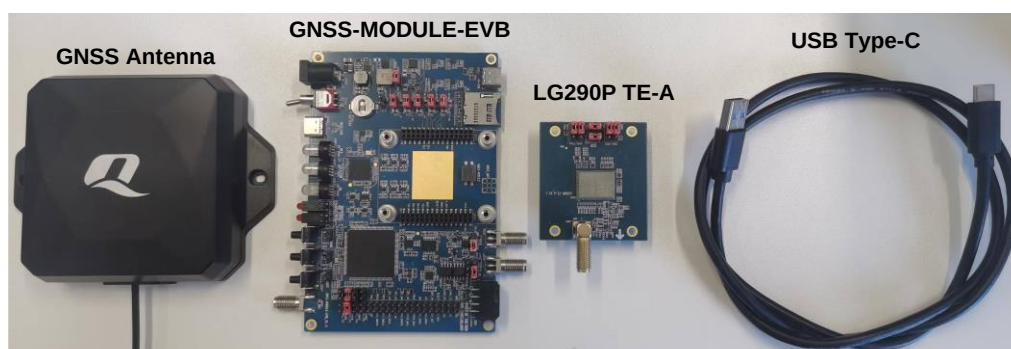


Figure 41: Required Hardware Components

Hardware components assembly and software installation steps:

1. Assemble the hardware components as shown below.

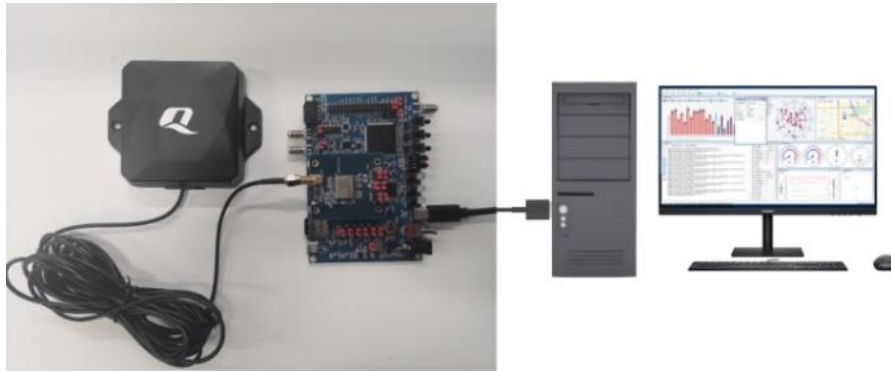


Figure 42: EVB and PC Connection

2. Use USB Type-C cable to connect the GNSS-USB (J0506) interface on the EVB to your PC.
3. Install USB-to-serial driver on PC (see step 2 in [Chapter 6.1 Connect to Console](#)). After the driver is installed, four consecutive COM ports will appear in the system's Device Manager. The port numbers are randomly assigned by the system and are consecutive. The port with the lowest number (COM5) is directly connected to the UART1 of the GNSS module.
4. Install the QGNSS tool on PC.
5. Use the QGNSS tool to open the port (COM5), and select a baud rate synchronized with the GNSS module's. For LG290P module, select 460800.

After you finish the above steps, the data output from the GNSS module can be read successfully, as shown in the following screenshot:



Figure 43: QGNSS Displays GNSS Module Data

To ensure stable and effective communication between the GNSS module and QGNSS tool, disconnect J0404 on EVB and short J0402.

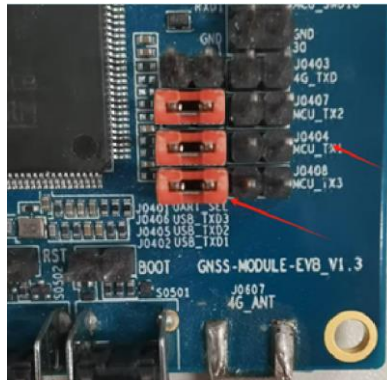


Figure 44: J0402 Short-circuited and J0404 Disconnected

NOTE

When testing and verifying in the office, place the antenna outside the window as far as possible, so that the antenna is in an open area with minimum obstruction. Antennas perform optimally when placed on the rooftop.

9.2. Field Testing and Saving GNSS Module Logs

If you need to do a field test but cannot bring a PC, you can refer to this chapter to save logs first for further analysis. The chapter applies to all Quectel GNSS modules.

As described in [Chapter 8.2 Log Recording](#), the EVB supports log saving functionality. By default, data from GNSS UART1 (com1) is recorded to the SD card. If you need to save more information, you can execute **gnss** to enable the corresponding log saving function.

Required hardware and software components:

Hardware:

- GNSS Antenna
- GNSS-MODULE EVB
- GNSS Module TE-A (e.g., LG290P TE-A)
- USB Type-C cable
- PC on Windows operating system
- SD card

Software:

- USB-to-serial driver for EVB
- QGNSS tool

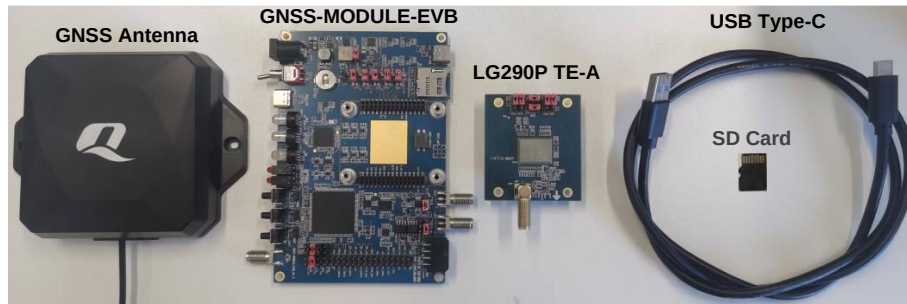


Figure 45: Required Hardware Components

Hardware components assembly and software installation steps:

1. Insert the SD card into the SD card slot (J0701) on the bottom plate of the EVB, and assemble the hardware components as shown below.

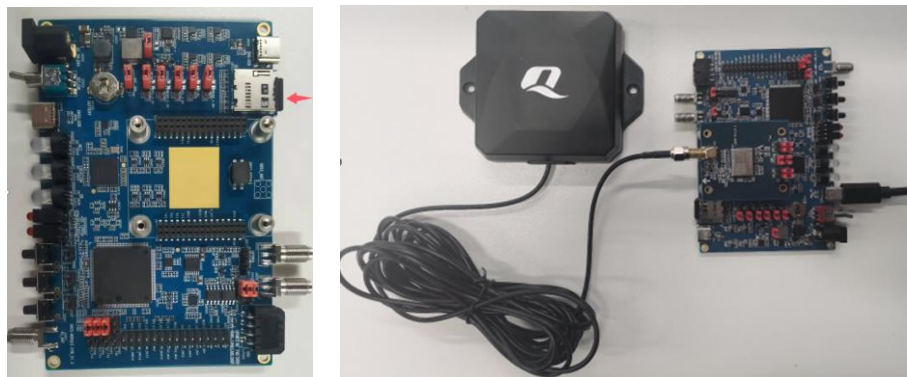


Figure 46: Insert SD Card into Card Slot and Assemble Hardware Components

2. Connect the GNSS-USB (J0506) interface on EVB to PC with the USB type-C cable.
3. Refer to [Chapter 6.1 Connect to Console](#) to connect to the EVB's console.

After you finish the above steps, execute **ls** to view the log file saved on the SD card, as shown below.

```
msh >ls
1:/RunLog/evb_b0295_n000000.log      2025-03-03 12:02:14    < 1 KB    1022 Byte
1:/com1_b0295_n000000.log          2025-03-03 12:02:14    50.58 KB  51789 Byte
```

Figure 47: Log File Saved on SD Card

For some complex scenarios, such as when GNSS modules output NMEA sentences and RTCM data simultaneously, EVB also supports enabling logging of NMEA or RTCM data from GNSS module port. The following uses saving NMEA data as an example to illustrate log saving steps.

1. Executing **gnss --nmealog on --logsize 512** to enable logging of NMEA data, and configure maximum log file size to 512 MB.

```
msh >gnss --nmealog on --logsize 512
nmealog          on          ok
logsize          512         ok
```

Figure 48: Command Configuration for NMEA Log Saving

2. Reboot the device for the commands to take effect.
3. Execute **ls** to check if the NMEA log is saved.

```
msh >
msh >reboot

  QUECTEL

I/application [1026] ** GNSS MODULE EVB MCU_A_V1.1 **
I/param       [1029] Boot for the 52 times.
I/log         [1070] SD Total: 14.99 GB, Free: 14.98 GB
I/sysCheck    [1083] Enable the watchdog!
I/sysCheck    [1087] Software reset generated!
I/sysCheck    [1102] Reboot RSTCK 0x10000002, LVDF 0.

I/autobaud    [1735] Autobaud1 success. 921600
I/autobaud    [1740] Autobaud2 success. 460800
I/gnss        [1763] TTFF GetFirstNmeaTimeMs: 1763
ls
1:/RunLog/evb_b0050_n000001.log      2025-02-28 08:38:40      3.57 KB      3654 Byte
1:/RunLog/evb_b0051_n000000.log      2025-02-28 09:08:16     33.91 KB     34723 Byte
1:/RunLog/evb_b0052_n000000.log      2025-02-28 09:08:20      < 1 KB       953 Byte
1:/com1_b0050_n000001.log            2025-02-28 08:38:40    171.77 KB    175889 Byte
1:/com1_b0051_n000000.log            2025-02-28 09:08:16      4.63 MB     4851196 Byte
1:/NMEA/com1_nmea_b0052_n000000.txt  2025-02-28 09:08:20      7.67 KB       7858 Byte
1:/com1_b0052_n000000.log            2025-02-28 09:08:20      4.84 KB       4960 Byte

SD Total: 14.99 GB, Free: 14.98 GB
```

Figure 49: Verify Command Execution

NOTE

During field testing, ensure that the antenna is positioned in an open area with minimal obstructions to maintain signal quality.

9.3. High-precision Positioning and Inertial Navigation

If you are using a GNSS module that supports high-precision positioning (e.g., LG290P) or inertial navigation (e.g., LC29H (BA), LC29H (CA)), see the module-specific application notes for these functionalities such as RTK, heading and DR.

10 Common Issues and Troubleshooting

1. **COM port is not detected in the Device Manager when EVB is connected to your PC via a USB cable.**
 - Verify if the EVB communication interface is properly connected to the PC.
 - Verify if the USB-to-serial driver for FT4232HAQ has been installed successfully.
2. **Communication interface is not outputting any messages or commands.**
 - Verify if the power supply indication LED on the EVB is illuminated.
 - When RTK function testing is necessary, verify if the kit components, GNSS module TE-A, 4G module TE-A and EVB are connected correctly, as shown in [Figure 2: GNSS/4G Module TE-As and Kit Components Mounted on EVB \(Top View\)](#).
When RTK function testing is not needed, verify if the jumper caps are connected correctly, as shown in [Figure 4: GNSS Module TE-A and Kit Components Mounted on EVB \(Without 4G Module TE-A\)](#).
 - Check the module power supply status via the D0509 power indicator. If the green LED is extinct, the module has not been powered up correctly.
3. **Module is unable to search for satellite signals.**
 - If there is no transponder indoors, test the module in an open-sky environment.
4. **Module is unable to enter Boot download mode or upgrade mode.**
 - Verify if the module is in Boot download mode.
 - Check if the downloaded firmware is correct.
 - Verify if the correct COM port has been selected.
5. **GNSS data is still output when the jumper cap on J0104 (VCC_3.3V) is removed.**
 - Check whether J0103 (VBCKP_3.3V) and J0104 (VCC_3.3V) has been shorted through a jumper cap on GNSS TE-A.

NOTE

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

11 Cautions

1. Make sure to conduct tests in the same environment when comparing different parameters of GNSS modules.
2. Ensure that the measurement method is correct. If there are significant differences between parameters tested via EVB and those provided by Quectel, contact Quectel Technical Support.
3. 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.

12 Appendix References

Table 8: Related Documents

Document Name
[1] Quectel_List_of_EVB_Applicable_Modules
[2] Quectel_QGNSS_User_Guide
[3] Quectel_GNSS_Antenna_Application_Note
[4] Quectel_GNSS_RTK_Application_Note

Table 9: Terms and Abbreviations

Abbreviation	Description
1PPS	One Pulse Per Second
APN	Access Point Name
APP	Application
CMR	Compact Measurement Record
COM Port	Communication Port
DC	Direct Current
DI	Digital Input
DO	Digital Output
DR	Dead Reckoning
ECEF	Earth-Centered, Earth-Fixed
ESD	Electrostatic Discharge
EVB	Evaluation Board

Abbreviation	Description
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
ICCID	Integrated Circuit Card Identifier
ID	Identifier
IMEI	International Mobile Equipment Identity
IMU	Inertial Measurement Unit
I/O	Input/Output
IP	Internet Protocol
LED	Light Emitting Diode
MCU	Microcontroller Unit
NCT	NovAtel Correction Transmission
NMEA	NMEA (National Marine Electronics Association) 0183 Interface Standard
NTRIP	Networked Transport of RTCM via Internet Protocol
ODO	Odometer
PC	Personal Computer
PI	Power Input
PO	Power Output
RF	Radio Frequency
RMC	Recommended Minimum Specific GNSS Data
RSRP	Reference Signal Received Power
RTCM	Radio Technical Commission for Maritime Services
RTK	Real Time Kinematic
RXD	Receive Data (Pin)
SD Card	Secure Digital Card

Abbreviation	Description
SIM	Subscriber Identity Module
SMA	SubMiniature Version A
TTFF	Time to First Fix
TXD	Transmit Data (Pin)
UART	Universal Asynchronous Receiver/Transmitter
USART	Universal Synchronous/Asynchronous Receiver/Transmitter
USB	Universal Serial Bus
(U)SIM	(Universal) Subscriber Identity Module
UTC	Coordinated Universal Time
VRS	Virtual Reference Station