

BG77xA-GL&BG770S-GL TE-B

User Guide

LPWA Module Series

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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 information by incorporating these guidelines into all manuals of the product. Otherwise, Quectel assumes no liability for customers' failure to comply with these precautions.



Full attention must be paid to driving at all times in order to reduce the risk of an accident. Using a mobile while driving (even with a handsfree kit) causes distraction and can lead to an accident. Please comply with laws and regulations restricting the use of wireless devices while driving.



Switch off the terminal or mobile before boarding an aircraft. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communication systems. If there is an Airplane Mode, it should be enabled prior to boarding an aircraft. Please consult the airline staff for more restrictions on the use of wireless devices on an aircraft.



Wireless devices may cause interference on sensitive medical equipment, so please be aware of the restrictions on the use of wireless devices when in hospitals, clinics or other healthcare facilities.



Terminals or mobiles operating over radio signal and cellular network cannot be guaranteed to connect in certain conditions, such as when the mobile bill is unpaid or the (U)SIM card is invalid. When emergent help is needed in such conditions, use emergency call if the device supports it. In order to make or receive a call, the terminal or mobile must be switched on in a service area with adequate cellular signal strength. In an emergency, the device with emergency call function cannot be used as the only contact method considering network connection cannot be guaranteed under all circumstances.



The terminal or mobile contains a transceiver. When it is ON, it receives and transmits radio frequency signals. RF interference can occur if it is used close to TV sets, radios, computers or other electric equipment.



In locations with explosive or potentially explosive atmospheres, obey all posted signs and turn off wireless devices such as mobile phone or other cellular terminals. Areas with explosive or potentially explosive atmospheres include fueling areas, below decks on boats, fuel or chemical transfer or storage facilities, and areas where the air contains chemicals or particles such as grain, dust or metal powders.

About the Document

Revision History

Version	Date	Author	Description
-	2023-03-15	Xin XIA/ Alan LAN	Creation of the document
1.0	2023-03-29	Xin XIA/ Alan LAN	First official release
1.1	2023-10-20	Arvin WU	Updated the TE-B version and related information.
1.2	2025-06-27	Yu Kok Hoong/ Mior Abdullah Bin Mior Ahmad Nasarudin	1. Added an applicable module BG770S-GL. 2. Updated the introduction of TE-B (Chapter 1). 3. Updated the top and bottom views of the TE-B (Figure 1, Figure 2). 4. Updated top components and interfaces placement (Figure 3). 5. Added a 3.3 V LDO (Figure 3, Table 1, Figure 4, Figure 7). 6. Added J0607 and J0608 test points (Figure 3, Table 1, Figure 7). 7. Added USB-to-UART interfaces' information of BG770S-GL (Table 2, Chapter 4.1.2). 8. Updated operation procedures of using TE-B alone (Chapter 4.1.2) 9. Added a reference document related to BG770S-GL module (Table 4).

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1 Introduction

This user guide describes the application details of the BG77xA-GL and BG770S-GL TE-B boards (hereafter referred to as “TE-B”), which share the same PCB (BG770A-GL-TE-B_V2.1) but have slightly different mounted components. The TE-B is an assistant tool for engineers to develop applications and test basic functionalities of Quectel BG770A-GL, BG772A-GL, BG773A-GL or BG770S-GL modules. This document uses the BG770S-GL TE-B as an example for illustration.

NOTE

1. TE-B for BG772A-GL has 7 additional 0 Ω resistors (R0120-R0126), and leads 7 pins to the test points (except for J0602 and J0605) for subsequent testing.
2. TE-B for BG770S-GL does not have USB interface circuits populated. J0405 and the supporting circuits are not be populated.

2 Product Overview

The TE-B is a LPWA development board, which can be used alone to develop and debug applications. It communicates with infrastructures of mobile network operators through LPWA radio protocols in 3GPP Rel-13 and 3GPP Rel-14.

2.1. Top and Bottom Views

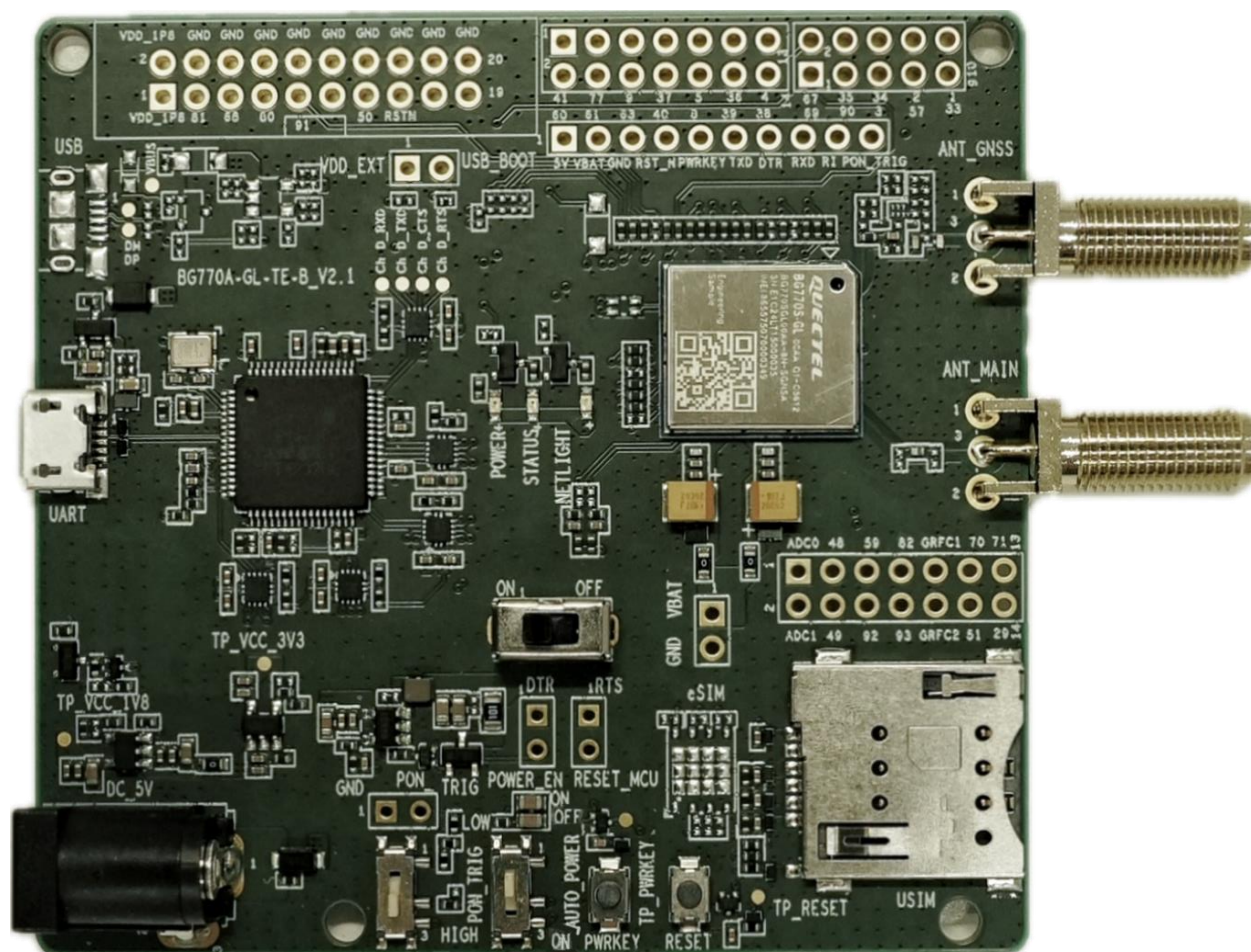


Figure 1: Top View



Figure 2: Bottom View

NOTE

The BG77xA-GL TE-B may appear slightly different in top and bottom views. For more details, please contact Quectel Technical Support.

2.2. Components & Interfaces Placement

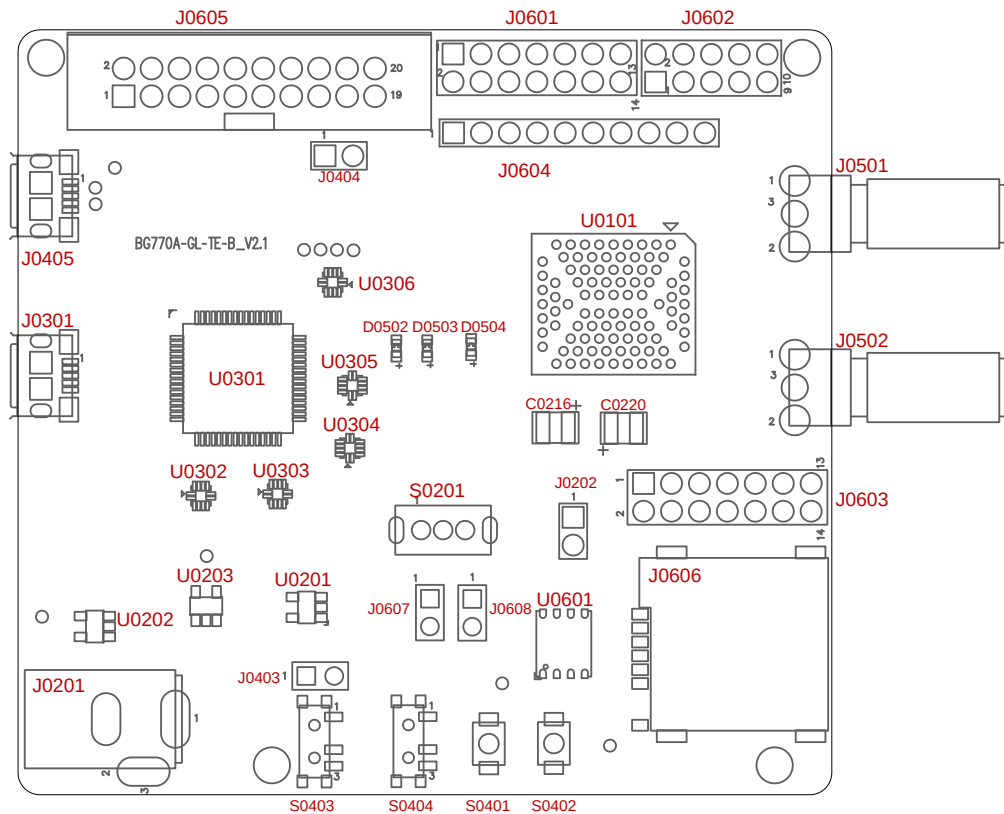


Figure 3: Top Components & Interfaces Placement

NOTE

There is no component placed on the bottom side of the PCB except for the label.

Table 1: Components & Interfaces Information

Components/Interfaces	RefDes	Description
BG77xA-GL/BG770S-GL	U0101	BG77xA-GL/BG770S-GL module
DC-DC	U0201	DC-DC converter
LDO	U0202	1.8 V Low dropout voltage linear regulator
	U0203	3.3 V Low dropout voltage linear regulator

USB-to-UART Bridge	U0301	USB-to-UART bridge controller
Voltage-level Translators	U0302, U0303 U0304, U0305 U0306	Used for level shift between 1.8 V and 3.3 V
eSIM	U0601	1.8 V eSIM card
Power Supply Interfaces	J0301, J0405	USB power supply interfaces
	J0201	Power adapter power supply interface
	J0202	External power supply interface
USB-to-UART Interface	J0301	Multiplex 4 UART interfaces
USB Interface	J0405	USB interface
GNSS Antenna Interface	J0501	GNSS SMA connector
Main Antenna Interface	J0502	RF SMA connector
USIM Interface	J0606	Micro SIM card connector
Power Switch	S0201	Power switch
PWRKEY Button	S0401	Turns on/off the module
RESET_N Button	S0402	Resets the module
PON_TRIG Switch	S0403	● Enters/exits e-I-DRX, sleep mode, PSM and turn-off mode ● Enables/disables the main UART
AUTO_POWER_ON Switch	S0404	Automatic turn-on circuit
Power Indicator	D0502	Indicates the power up/down status
STATUS	D0503	Indicates the operation status
NETLIGHT	D0504	Indicates the network connection status
Tantalum Capacitors	C0216, C0220	Used for the front-end module energy storage
Test Points	J0403, J0404, J0601, J0602, J0603, J0604, J0605, J0607, J0608	Test pins

2.3. Key Features

Table 2: Key Features of TE-B

Parameter	Details
Power Supply	USB interface: - Supply voltage range: 4.75–5.25 V - Typical supply voltage: 5.0 V Power adapter interface: - Supply voltage range: 4.75–5.25 V - Typical supply voltage: 5.0 V
Transmitting Power	23 dBm $\pm$ 2.7 dB
Temperature Ranges	- Operating temperature range: -35 to +75 °C ¹ - Extended temperature range: -40 to +85 °C ² - Storage temperature range: -40 to +90 °C
USIM Interface	Supports 1.8 V external USIM card only
PON_TRIG Switch	- Used to enter/exit e-I-DRX, sleep mode, PSM and turn-off mode - Enables/disables the main UART interface communication function
USB-to-UART Interface	Multiplex 4 UART interfaces ³ : BG77xA-GL: Main UART: - Used for data transmission and AT command communication 115200 bps baud rate by default - The default frame format is 8N1 (8 data bits, no parity, 1 stop bit) - Supports RTS and CTS hardware flow control Debug UART: - Used for firmware upgrade, software debugging, DM log output and NMEA sentences output. 115200 bps baud rate by default - The default frame format is 8N1 (8 data bits, no parity, 1 stop bit) - Supports RTS and CTS hardware flow control Auxiliary UART:

¹ Within operating temperature range, the module is 3GPP compliant.

² Within extended temperature range, the module remains the ability to establish and to maintain functions such as SMS and data transmission, without any unrecoverable malfunction. Radio spectrum and radio network will not be influenced, while one or more specifications, such as P_{out}, may exceed the specified tolerances of 3GPP. When the temperature returns to the normal operating temperature range, the module will meet 3GPP specifications again.

³ There is one multiplexed serial port that is not connected to the module, and only the test point is reserved.

- Used for RF calibration and log output.
- 921600 bps baud rate by default
- The default frame format is 8N1 (8 data bits, no parity, 1 stop bit)
- Supports RTS and CTS hardware flow control

BG770S-GL:

Main UART:

- Used for data transmission and AT command communication
- 115200 bps baud rate by default
- The default frame format is 8N1 (8 data bits, no parity, 1 stop bit)
- Supports RTS and CTS hardware flow control

Debug UART:

- Used for firmware upgrade, software debugging, RF calibration, SFP log output and NMEA sentences output.
- 115200 bps baud rate by default
- The default frame format is 8N1 (8 data bits, no parity, 1 stop bit)
- Supports RTS and CTS hardware flow control

RESET Button	Resets the module
PWRKEY Button	Turns on/off the module
Size	(70.0 +0.1/-0.15) mm × (74.0 +0.1/-0.15) mm × (1.6 ±0.16) mm
Firmware Upgrade	● Via debug UART or DFOTA ● Via USB (for BG77xA-GL only)
Antenna Interface	50 Ω characteristic impedance

2.4. Functional Diagram

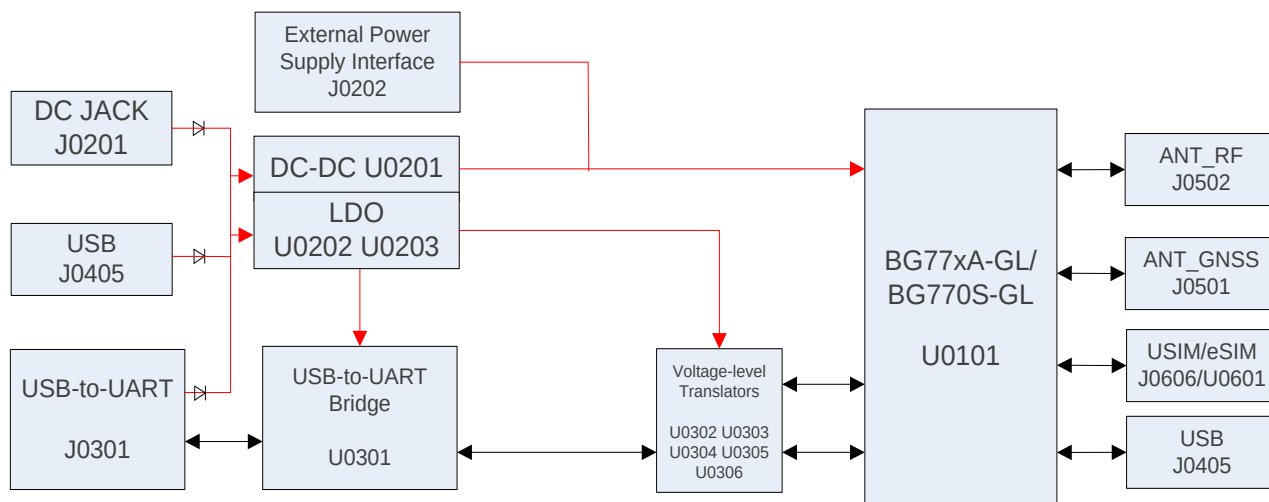


Figure 4: Functional Diagram of TE-B

NOTE

TE-B for BG770S-GL will not have J0405 and the supporting circuits populated.

3 Kit Accessories & Assembly

3.1. Accessories List



Figure 5: TE-B Kit Accessories

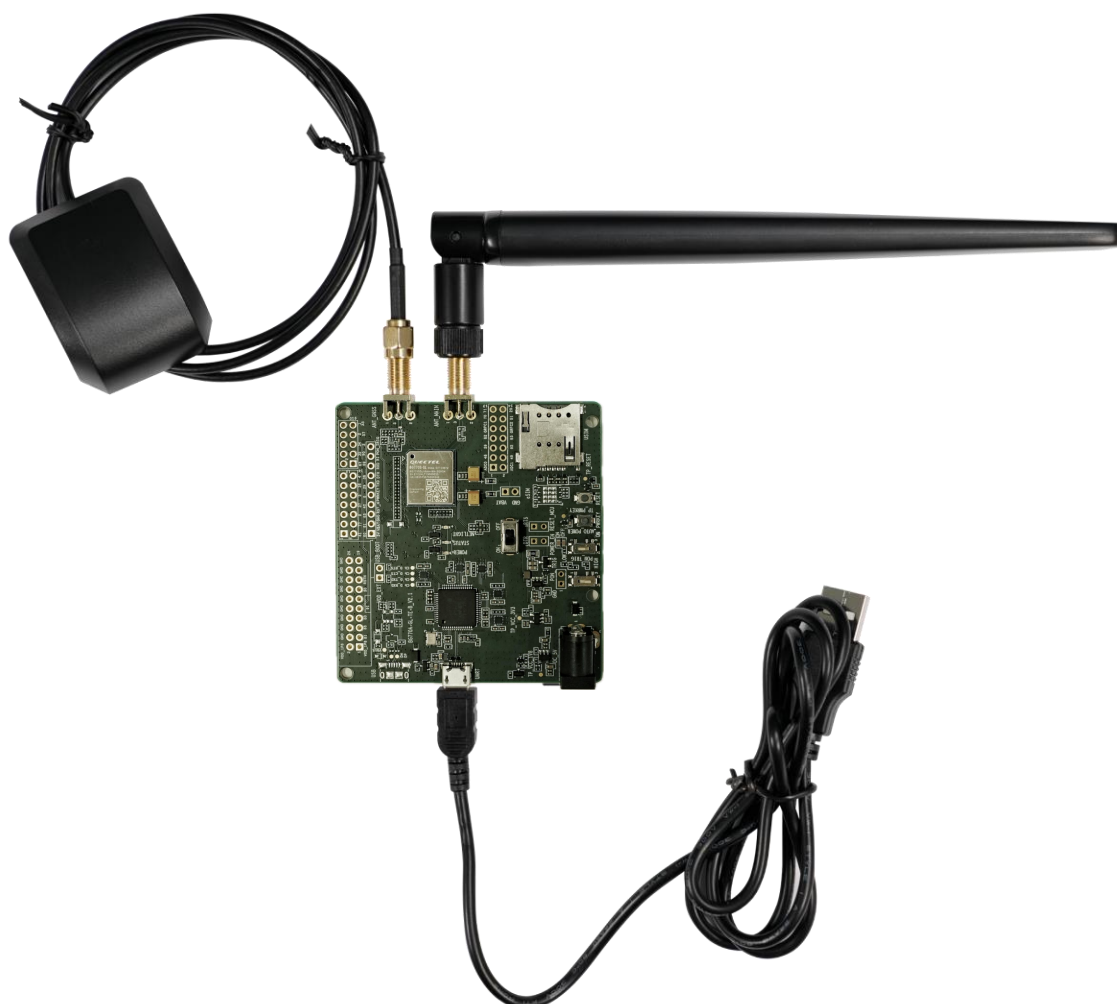
NOTE

Images above are for illustration only and may differ from the actual module. For authentic product information, please refer to the accessories received from Quectel.

Table 3: Accessories List

Item	Description	Quantity (pcs)
BG77xA-GL/BG770S-GL TE-B	Test the development board.	1
Antenna	LTE antenna 699 MHz–2690 MHz SMA-J 200 mm	1
	External GPS antenna, black	1
Cable	Micro-USB cable	1

3.2. Accessories Assembly


Figure 6: TE-B Kit Accessories Assembly

4 Operation Procedures

BG77xA-GL and BG770S-GL TE-B can be used alone to upgrade firmware and debug applications based on BG77xA-GL and BG770S-GL. The following describes the operation procedures of using TE-B alone.

4.1. Operation Procedure with Single Board

4.1.1. Interface Diagram of Using TE-B Alone

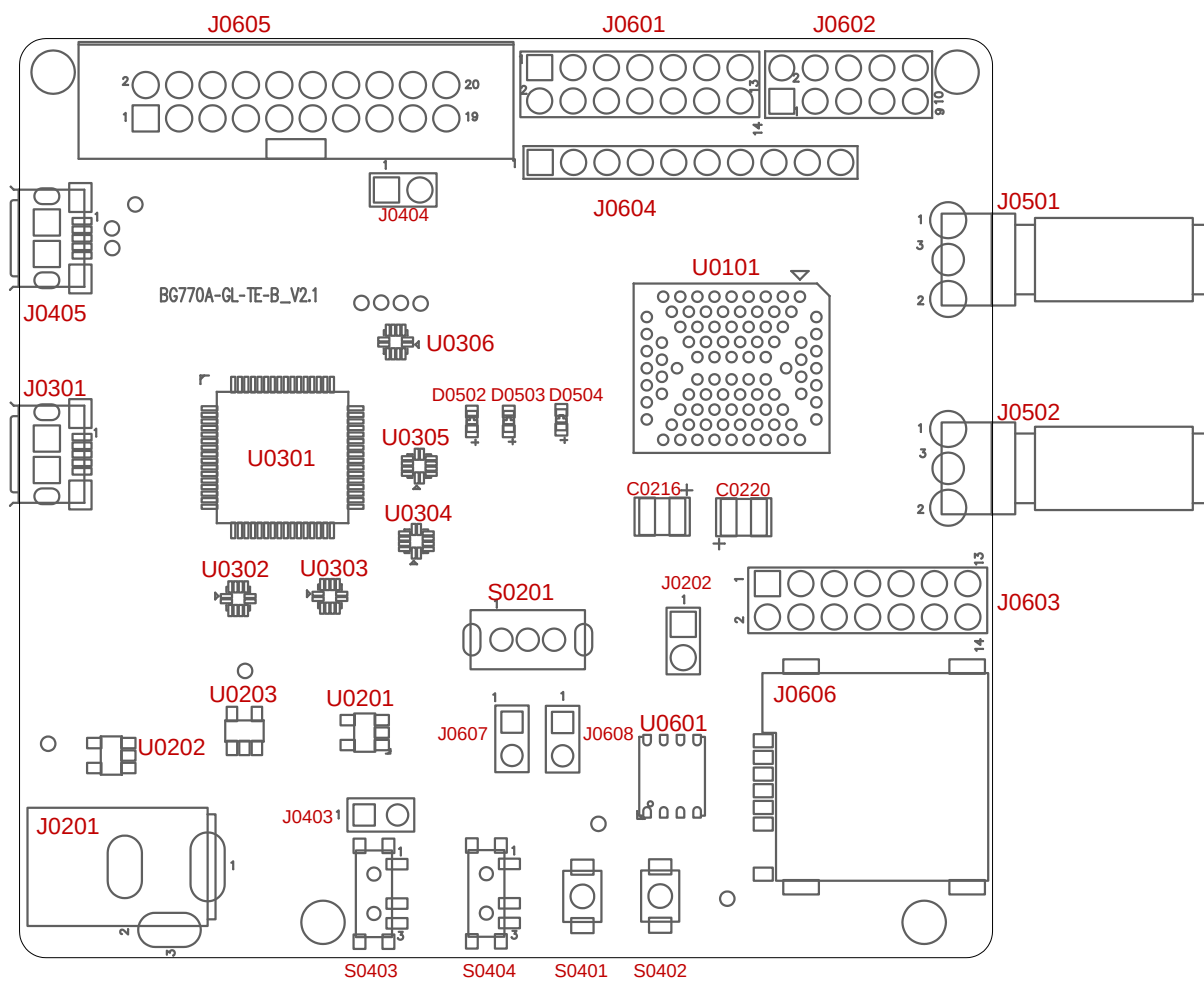


Figure 7: Interface Diagram of Using TE-B Alone

4.1.2. Operation Procedures of Using TE-B Alone

1. Install USB-to-UART driver which can be downloaded from the following link:
<https://ftdichip.com/drivers/vcp-drivers/>.
2. Insert a micro SIM card into J0606 (USIM interface), and note that an NB-IoT or Cat M USIM card should be selected according to actual needs.
3. Connect the rod antenna to the SMA connector at J0502 (main antenna connector).
4. Switch S0403 (PON_TRIG Switch) to **"HIGH"** state.
5. For BG77xA-GL, connect J0301 (the USB-to-UART interface) to PC via a Micro-USB cable. After turning on TE-B, serial port information will appear on **"Device Manager"** of PC.
 - 1) Among them, **"USB Serial Converter A"** is connected to the main UART of BG77xA-GL, which can be used for AT command communication, and data transmission.
 - 2) Among them, **"USB Serial Converter B"** is connected to the debug UART of BG77xA-GL, which can be used for firmware upgrade, software debugging, DM log output and NMEA sentences output.
 - 3) Among them, **"USB Serial Converter C"** is connected to the auxiliary UART of BG77xA-GL, which can be used for RF calibration and log output. For details of UART configuration, see **document [1]**.
6. For BG770S-GL, connect J0301 (the USB-to-UART interface) to PC via a Micro-USB cable. After turning on TE-B, serial port information will appear on **"Device Manager"** of PC.
 - 1) Among them, **"USB Serial Converter A"** is connected to the main UART of BG770S-GL, which can be used for AT command communication and data transmission.
 - 2) Among them, **"USB Serial Converter B"** is connected to the debug UART of BG770S-GL, which can be used for firmware upgrade, software debugging, RF calibration, SFP log output and NMEA sentences output. For details of UART configuration, see **document [2]**.

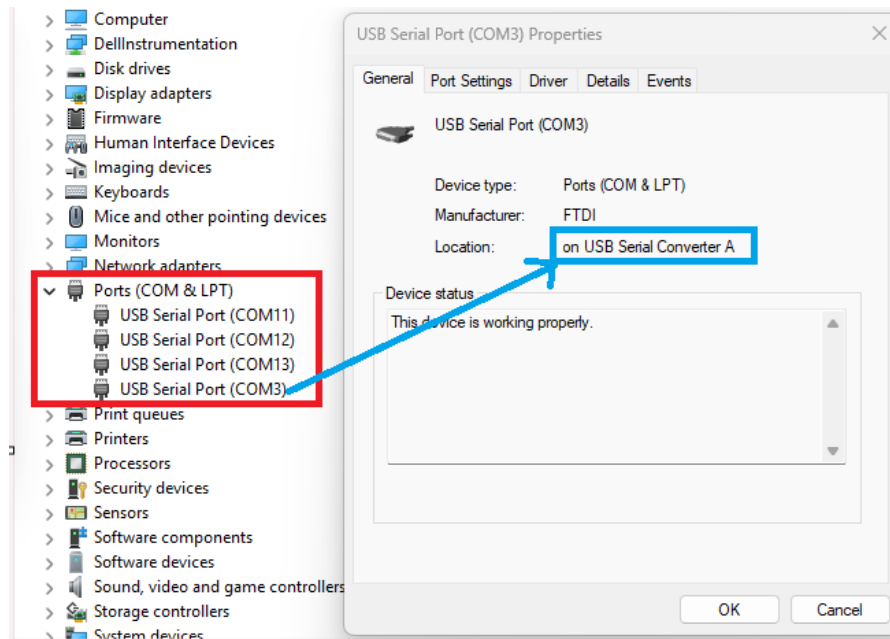


Figure 8: USB Serial Converter A Displayed on PC

NOTE

In the procedures above, pressing the S0402 (RESET_N button) for at least 100 ms on the BG77xA-GL and BG770S-GL TE-B will reset the module.

4.2. Power Consumption Test Guide

4.2.1. Test Tools

The following equipment and tools are needed for the power consumption test:

- BG77xA-GL/BG770S-GL TE-B
- DC power analyzer
- Wire, soldering iron, tin wire, and wire stripping pliers, etc. to weld the power supply cord on TE-B.

This power consumption test guide is based on Keysight's N6705C DC power analyzer for testing.

4.2.2. Modify TE-B

If you use the TE-B to test the power consumption of the BG77xA-GL or BG770S-GL, you need to modify the TE-B as follows:

1. Switch the S0201 (power switch) to **“OFF”** to disconnect the module from other parts.
2. Solder two wires respectively to the two pins (VBAT and GND) of the J0202. One wire is used as VBAT, and the other is used as GND, so that the external power supply can supply power to the module separately.

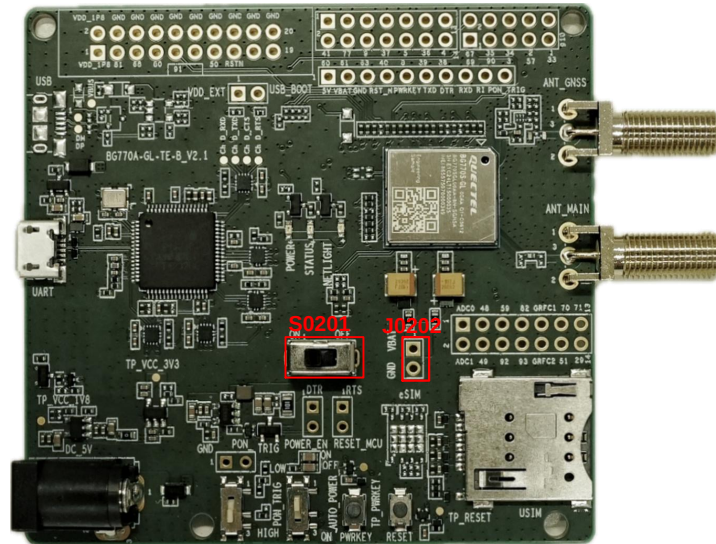


Figure 9: Schematic Diagram of TE-B Before Modification

4.2.3. Test Procedures of Power Consumption

Please refer to the following steps to test the current consumption of the module on the modified TE-B:

1. Insert the USIM card.
2. Connect the USB cable to the J0301 (USB-to-UART interface) of the TE-B.
3. After S0201 is turned off, set the output voltage on N6705C to 3.3 V, and connect the positive and negative wires of N6705C to the two wires (VBAT, GND) welded on J0202 to supply the module separately.
4. Turn on the output voltage set by N6705C, and turn on the module after power up.
5. Conduct current consumption tests in different operation modes.

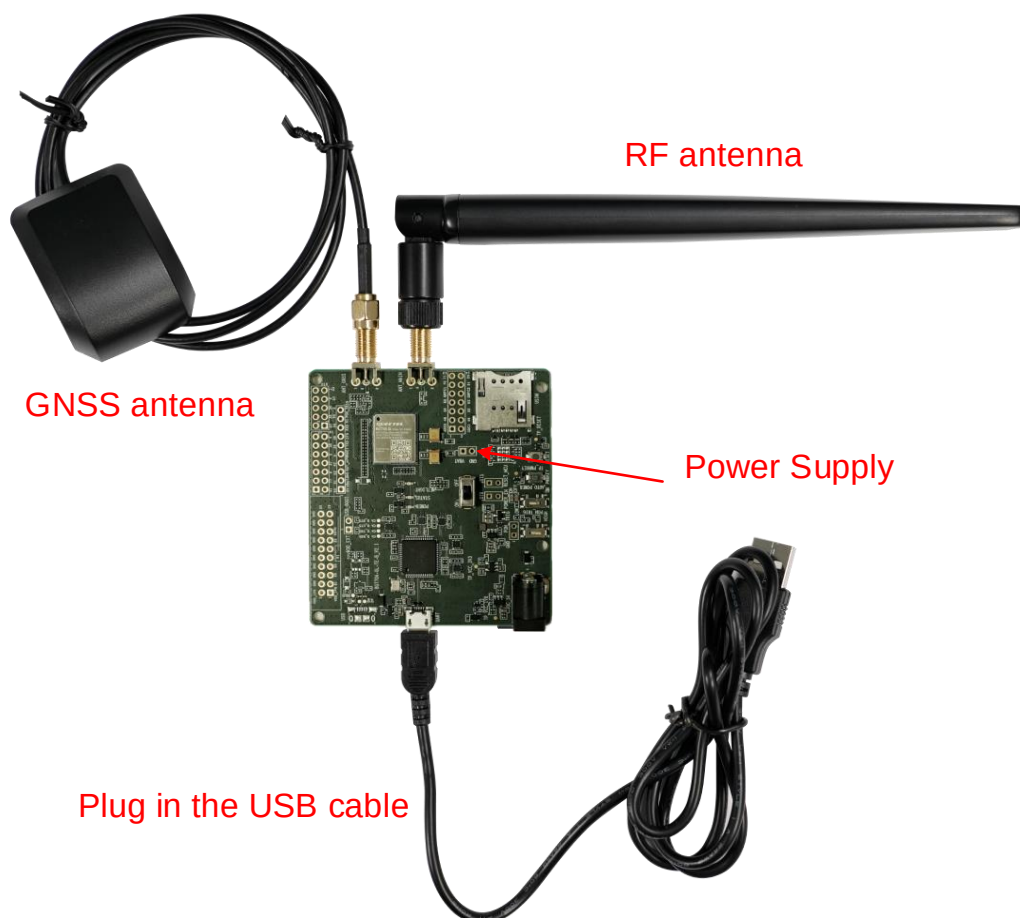


Figure 10: TE-B Wiring Diagram

5 Appendix References

Table 4: Related Document

Document Name
[1] Quectel_BG77xA-GL_Hardware_Design
[2] Quectel_BG770S-GL_Hardware_Design

Table 5: Terms and Abbreviations

Abbreviation	Description
CTS	Clear To Send
DC	Direct Current
DFOTA	Delta Firmware Upgrade Over-the-Air
GND	Ground
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
LDO	Low-dropout Regulator
LPWA	Low-Power Wide-Area
PC	Personal Computer
PSM	Power Saving Mode
RF	Radio Frequency
RTS	Request to Send
SMA	Sub Miniature Version A
SMS	Short Message Service

UART	Universal Asynchronous Receiver & Transmitter
USB	Universal Serial Bus
USIM	Universal Subscriber Identification Module
VBAT	Voltage at Battery
