

# BG77xA-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	2023-10-18	Arvin WU	Updated the TE-B version and related information.

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# 1 Introduction

This user guide describes the application details of BG77xA-GL TE-B, which is an assistant tool for engineers to develop applications and test basic functionalities of Quectel BG770A-GL, BG772A-GL and BG773A-GL. This document will take BG770A-GL TE-B as a representative to introduce BG77xA-GL TE-B.

**NOTE**

TE-B for BG772A-GL has 7 additional 0  $\Omega$  resistors (R0120-R0126), and leads 7 pins to the test points for subsequent testing.



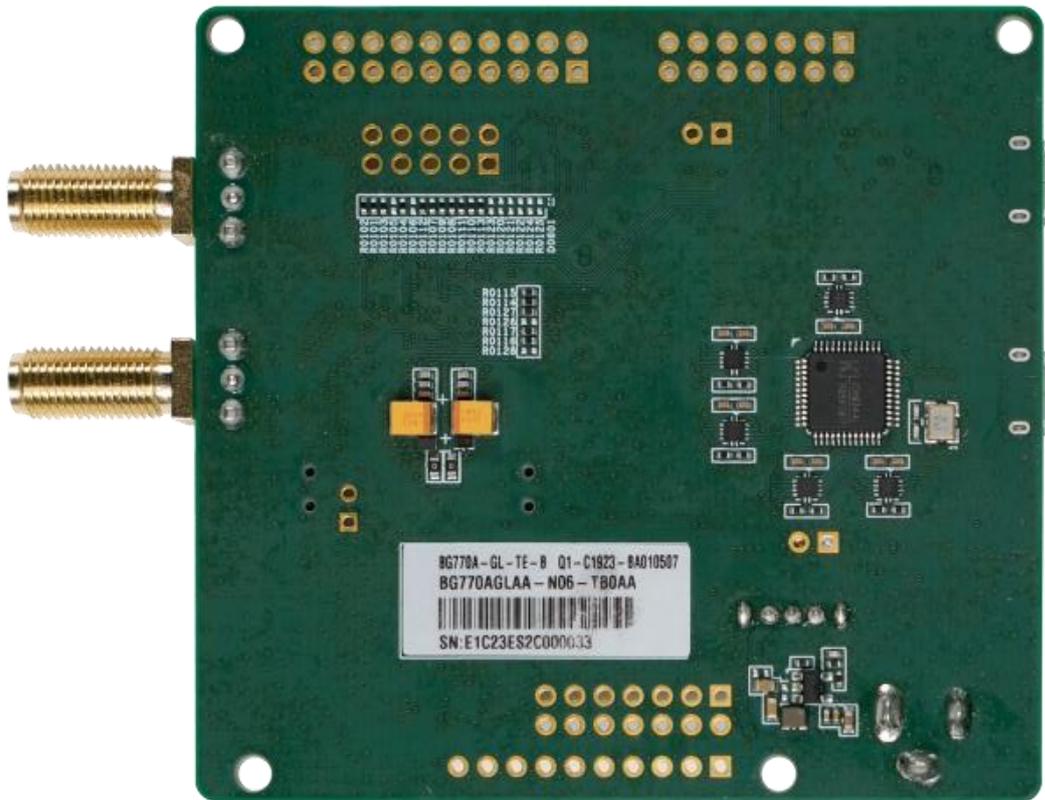
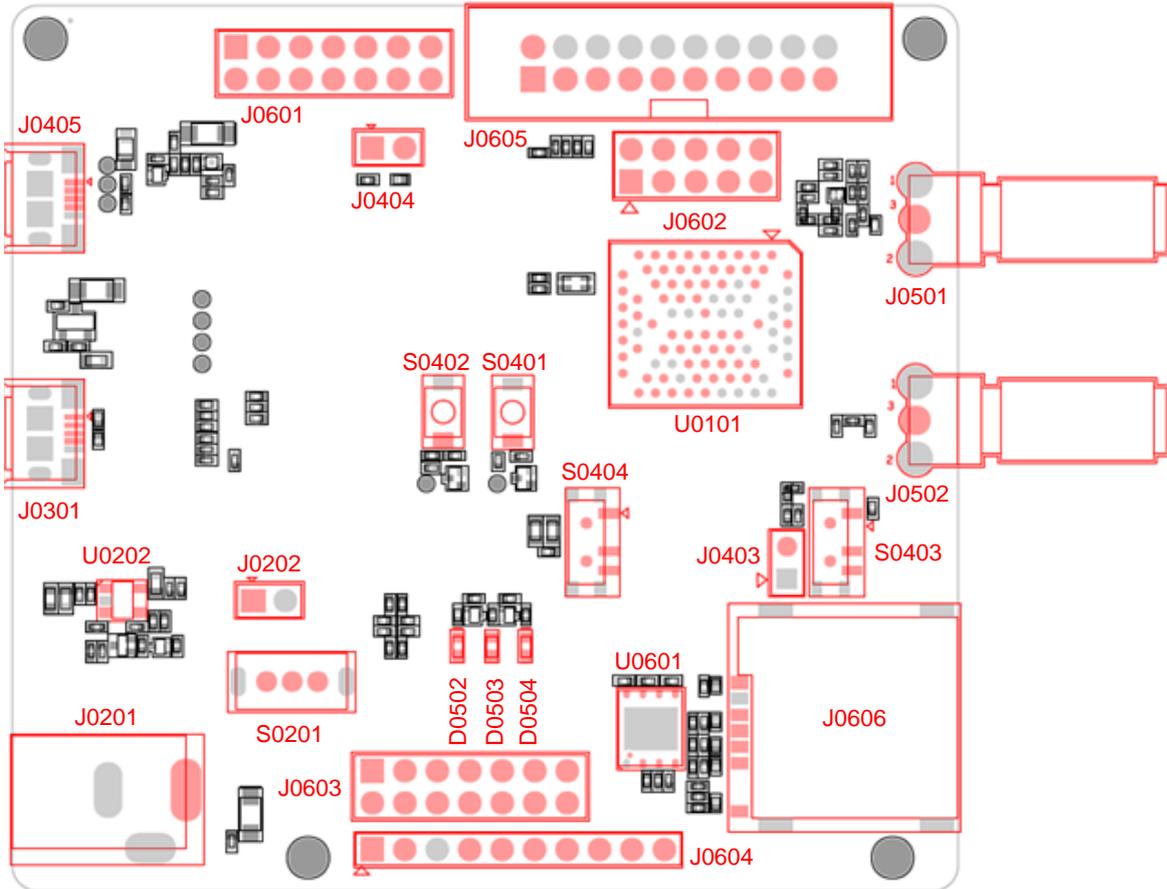
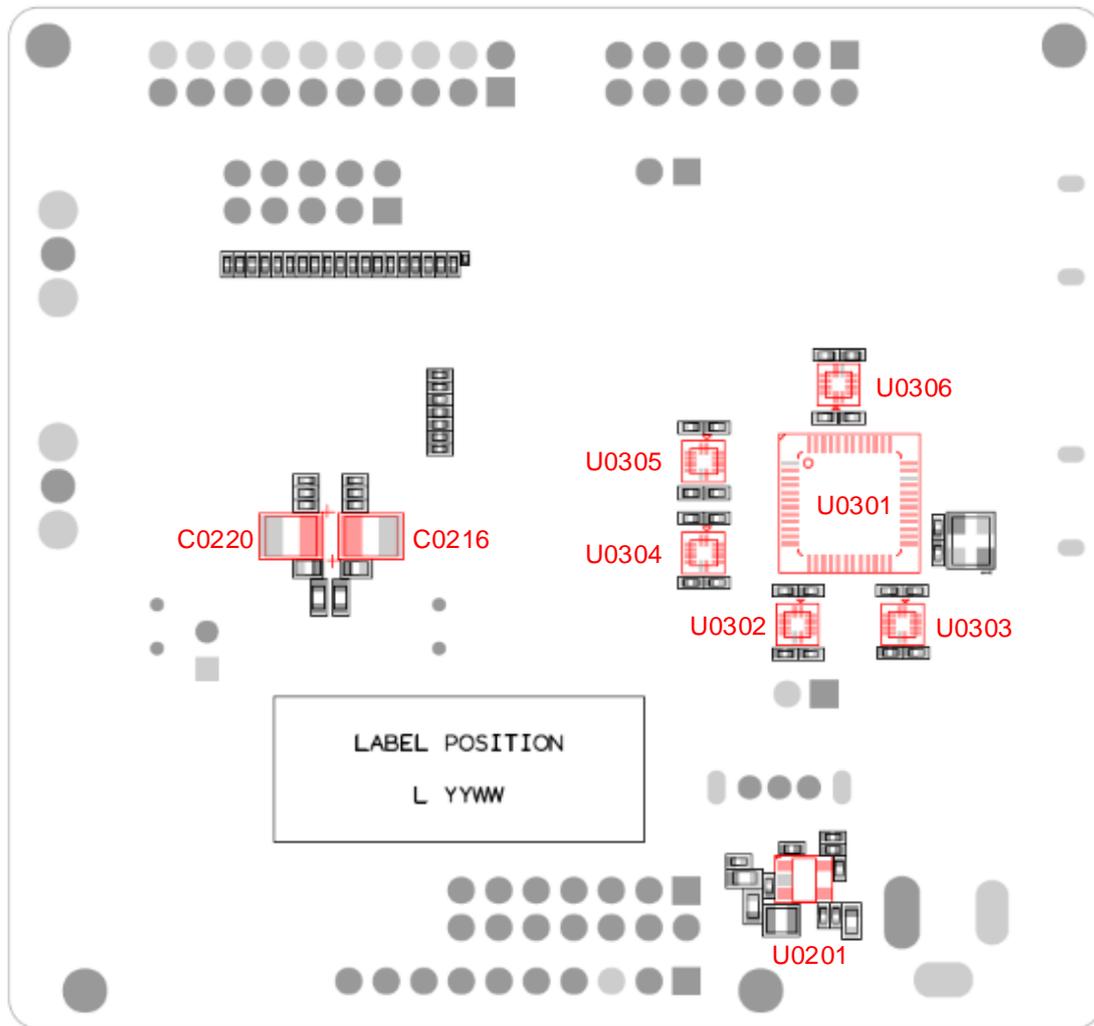


Figure 2: Bottom View

## 2.2. Components & Interfaces Placement



**Figure 3: Top Components & Interfaces Placement**



**Figure 4: Bottom Components & Interfaces Placement**

**Table 1: Components & Interfaces Information**

Components/Interfaces	RefDes	Description
BG77xA-GL	U0101	BG77xA-GL module
DC-DC	U0201	DC-DC converter
LDO	U0202	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	eSIM card
Power Supply Interfaces	J0301, J0405	USB power supply interface
	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	Turn on/off the module
RESET_N Button	S0402	Reset the module
PON_TRIG Switch	S0403	<ul style="list-style-type: none"> <li>● Enter/exit e-I-DRX, sleep mode, PSM or turn-off mode</li> <li>● Enable/disable the main UART</li> </ul>
AUTO_POWER_ON Switch	S0404	Automatic turn-on circuit
Power Indicator	D0502	Indicate the power up/down status
STATUS	D0503	Indicate the operation status
NETLIGHT	D0504	Indicate 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	Test pins

## 2.3. Key Features

Table 2: Key Features of TE-B

Parameter	Details
Power Supply	<p><b>USB interface:</b></p> <ul style="list-style-type: none"> <li>● Supply voltage range: 4.75–5.25 V</li> <li>● Typical supply voltage: 5.0 V</li> </ul> <p><b>Power adapter interface:</b></p> <ul style="list-style-type: none"> <li>● Supply voltage range: 4.75–5.25 V</li> <li>● Typical supply voltage: 5.0 V</li> </ul>
Transmitting Power	23 dBm $\pm$ 2.7 dB
Temperature Ranges	<ul style="list-style-type: none"> <li>● Operating temperature range: -35 to +75 °C <sup>1</sup></li> <li>● Extended temperature range: -40 to +85 °C <sup>2</sup></li> <li>● Storage temperature range: -40 to +90 °C</li> </ul>
USIM Interface	Support 1.8 V external USIM card only
PON_TRIG Switch	Used to enter/exit e-I-DRX, sleep mode, PSM and turn off mode Enable/disable the main UART interface communication function
USB-to-UART Interface	<p>Multiplex 4 UART interfaces <sup>3</sup>:</p> <p><b>Main UART:</b></p> <ul style="list-style-type: none"> <li>● Used for data transmission and AT command communication</li> <li>● 115200 bps baud rate by default</li> <li>● The default frame format is 8N1 (8 data bits, no parity, 1 stop bit)</li> <li>● Supports RTS and CTS hardware flow control</li> </ul> <p><b>Debug UART:</b></p> <ul style="list-style-type: none"> <li>● Used for firmware upgrade, software debugging, DM log output and NMEA sentences output.</li> <li>● 115200 bps baud rate by default</li> <li>● The default frame format is 8N1 (8 data bits, no parity, 1 stop bit)</li> <li>● Supports RTS and CTS hardware flow control</li> </ul> <p><b>Auxiliary UART:</b></p> <ul style="list-style-type: none"> <li>● Used for RF calibration and log output.</li> <li>● 921600 bps baud rate by default</li> <li>● The default frame format is 8N1 (8 data bits, no parity, 1 stop bit)</li> </ul>

<sup>1</sup> Within operating temperature range, the module is 3GPP compliant.

<sup>2</sup> 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<sub>out</sub>, may exceed the specified tolerances of 3GPP. When the temperature returns to the normal operating temperature range, the module will meet 3GPP specifications again.

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

	<ul style="list-style-type: none"> <li>● Supports RTS and CTS hardware flow control</li> </ul>
RESET Button	Reset the module
PWRKEY Button	Turn 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	<ul style="list-style-type: none"> <li>● Via debug UART or DFOTA</li> <li>● Via USB</li> </ul>
Antenna Interface	50 Ω characteristic impedance

## 2.4. Functional Diagram

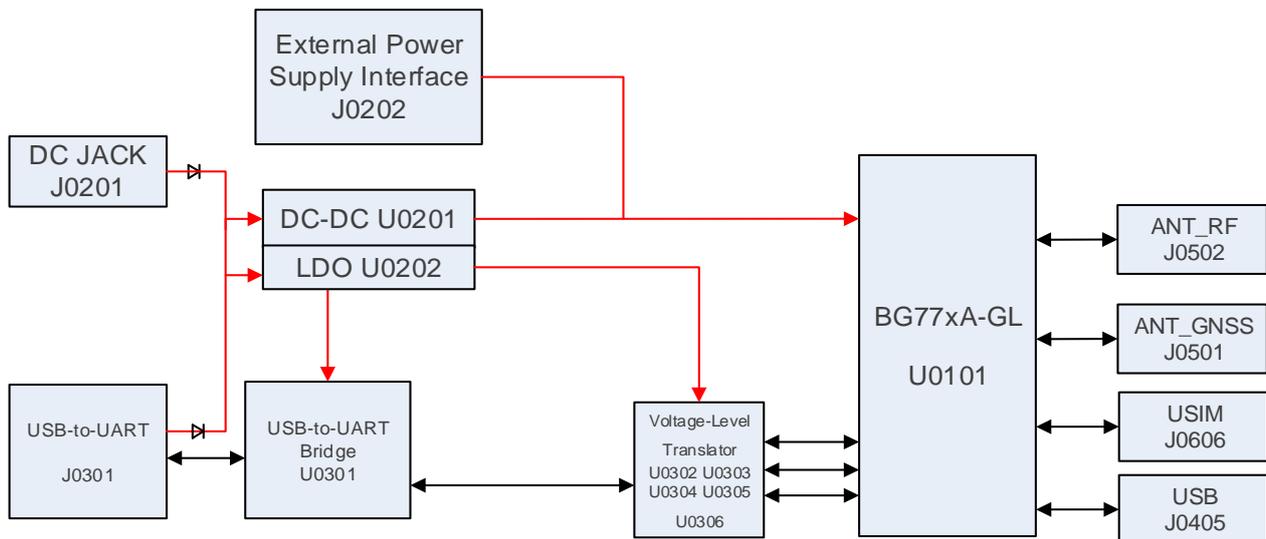


Figure 5: Functional Diagram of TE-B

# 3 Kit Accessories & Assembly

## 3.1. Accessories List



Figure 6: 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 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 7: TE-B Kit Accessories Assembly**

# 4 Operation Procedures

BG77xA-GL TE-B can be used alone to upgrade firmware and debug applications based on BG77xA-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

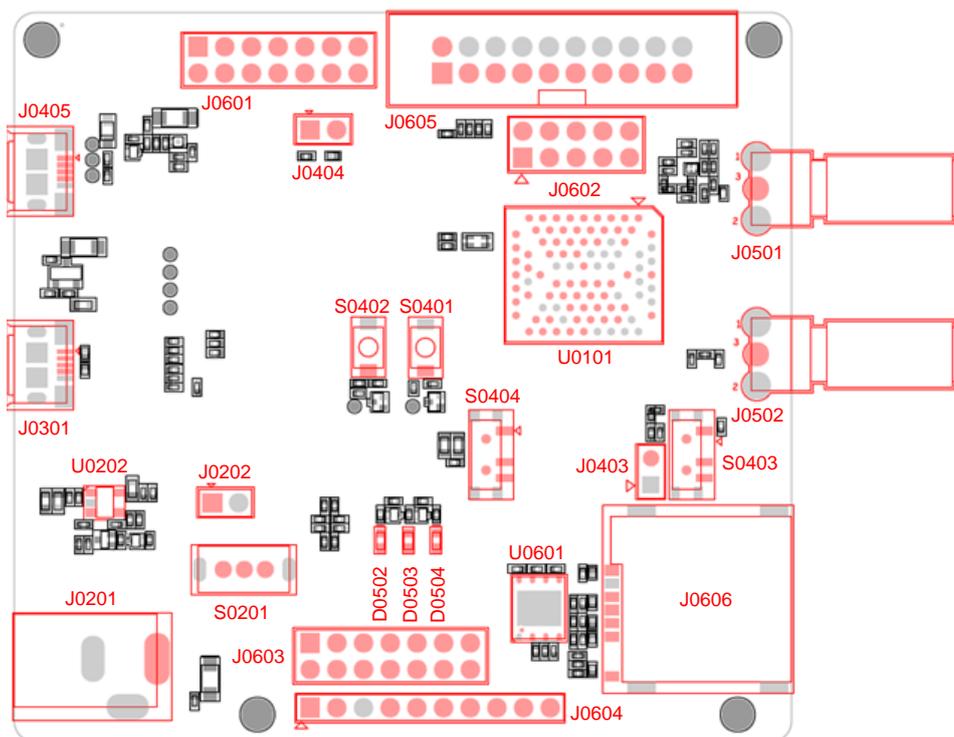


Figure 8: Interface Diagram of Using TE-B Alone

### 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://www.wch.cn/downloads/USBMSER\\_exe.html](https://www.wch.cn/downloads/USBMSER_exe.html)

2. Insert a micro SIM card into J0606, and note that a NB-IoT or Cat M USIM card should be selected according to actual needs.
3. Connect the rod antenna with SMA connector on J0502 (main antenna connector).
4. Switch S0403 (PON\_TRIG Switch) to “HIGH” state.
5. Connect J0301 (the USB-to-UART interface) with PC via a Micro-USB cable. After turning on TE-B, serial port information will be shown on “**Device Manager**” of PC.
  - 1) Among them, “**WCH USB-SERIAL Ch A**” is connected to the main UART of BG77xA-GL, which can be used for AT command communication, data transmission.
  - 2) Among them, “**WCH USB-SERIAL Ch 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, “**WCH USB-SERIAL Ch 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]**.



**Figure 9: USB-to-UART Interface Displayed on PC**

**NOTE**

In the procedures above, pressing S0402 (RESET\_N button) at least 100 ms on the BG770A-GL TE-B can reset the module.

## 4.2. Power Consumption Test Guide

### 4.2.1. Test Tools

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

- BG77xA-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, you need to modify the TE-B as follows:

1. Switch the power switch S0201 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.

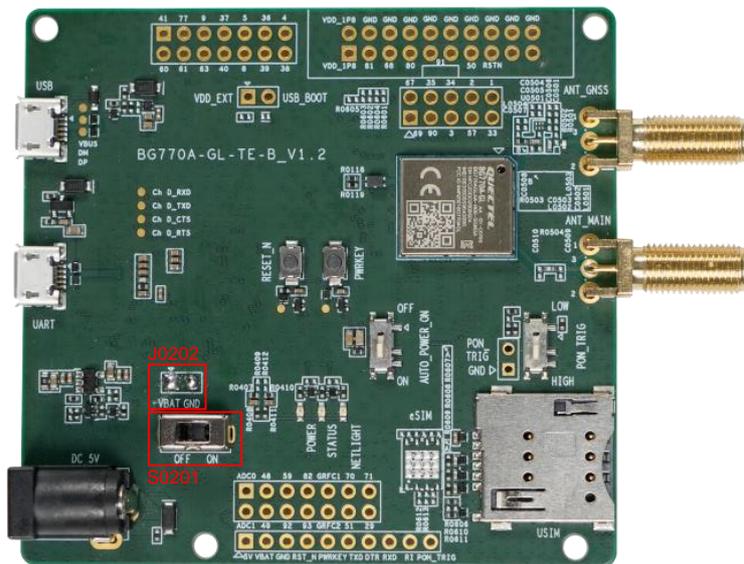


Figure 10: Schematic Diagram of TE-B Before Modification

### 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.

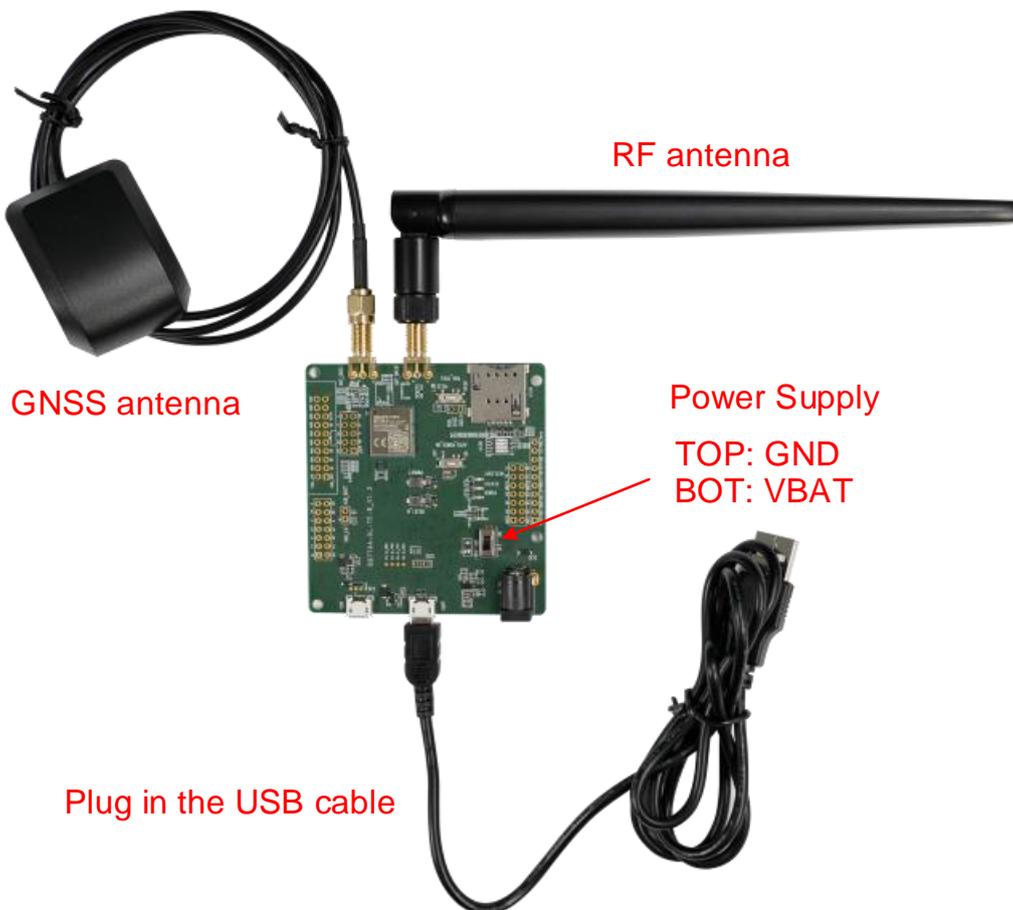


Figure 11: TE-B Wiring Diagram

# 5 Appendix References

**Table 4: Related Document**

Document Name
[1] Quectel_BG77xA-GL_Hardware_Design

**Table 5: Terms and Abbreviations**

Abbreviation	Description
3GPP	3rd Generation Partnership Project
DC	Direct Current
DFOTA	Delta Firmware Upgrade Over-the-Air
GND	Ground
GNSS	Global Navigation Satellite System
LDO	Low-dropout Regulator
LPWA	Low-Power Wide-Area
PC	Personal Computer
RF	Radio Frequency
SMA	Sub Miniature Version A
UART	Universal Asynchronous Receiver & Transmitter
USB	Universal Serial Bus
USIM	Universal Subscriber Identification Module
VBAT	Voltage at Battery