

# SAT-A EVB User Guide

**Satellite Communication Module Series**

Version: 1.0.0

Date: 2023-06-28

Status: Preliminary



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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 cellular 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.



Cellular 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 emergency help is needed in such conditions, use emergency call if the device supports it. In order to make or receive a call, the cellular 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 cellular 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 fuelling 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
-	2023-03-17	Rens REN/Angela HE	Creation of the document
1.0.0	2023-06-28	Rens REN/Angela HE	Preliminary

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# 1 Introduction

This user guide describes the application details of SAT-A EVB (evaluation board), which is an assistant tool for you to develop applications and test basic functionalities of the applicable module.

## 1.1. Applicable Module

For details about the applicable module of this EVB, see **document [1]**.

# 2 Product Overview

## 2.1. Top and Bottom Views

The size of SAT-A EVB is 146.4 mm × 115 mm, and the top and bottom views are shown as below:

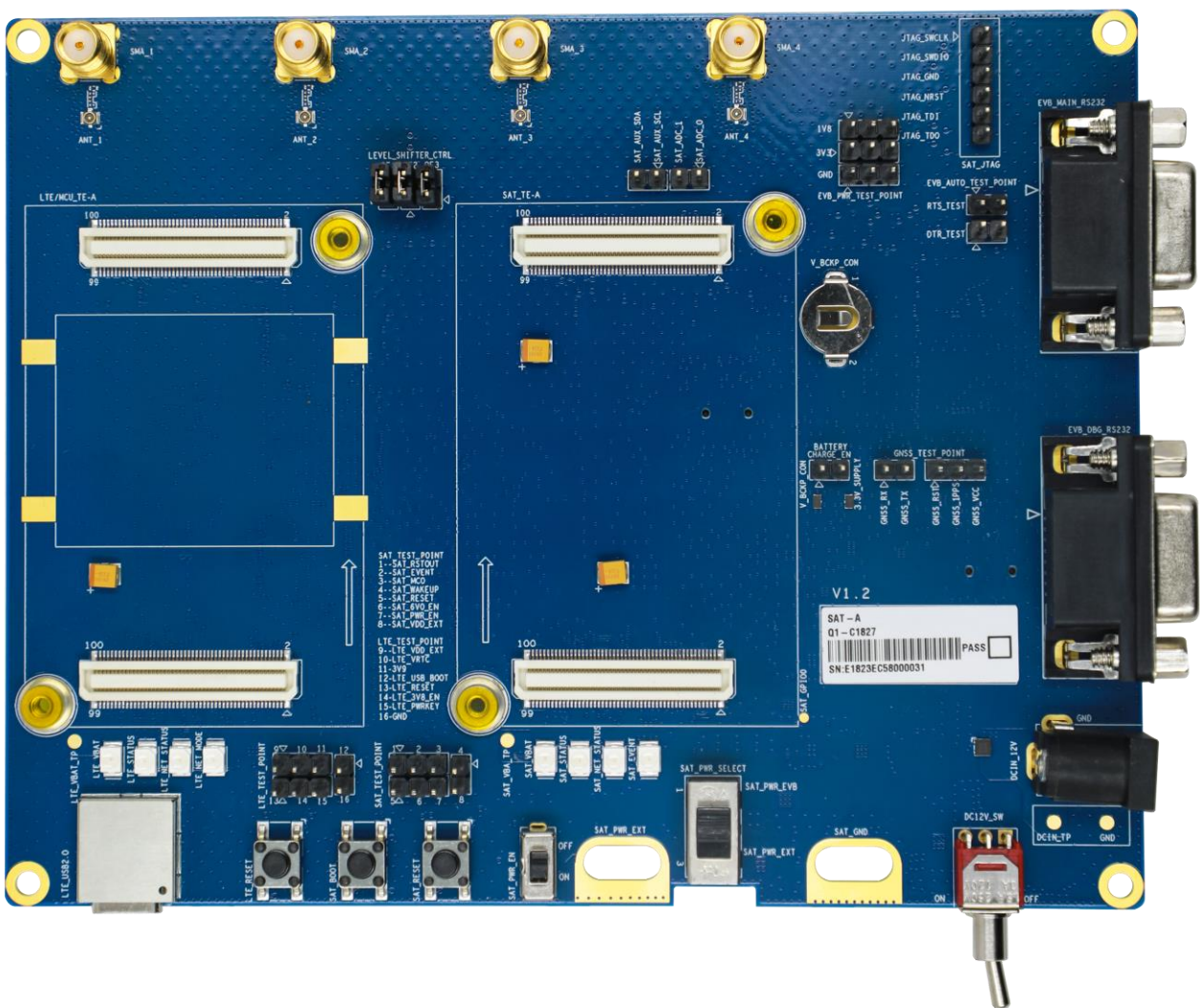


Figure 1: Top View

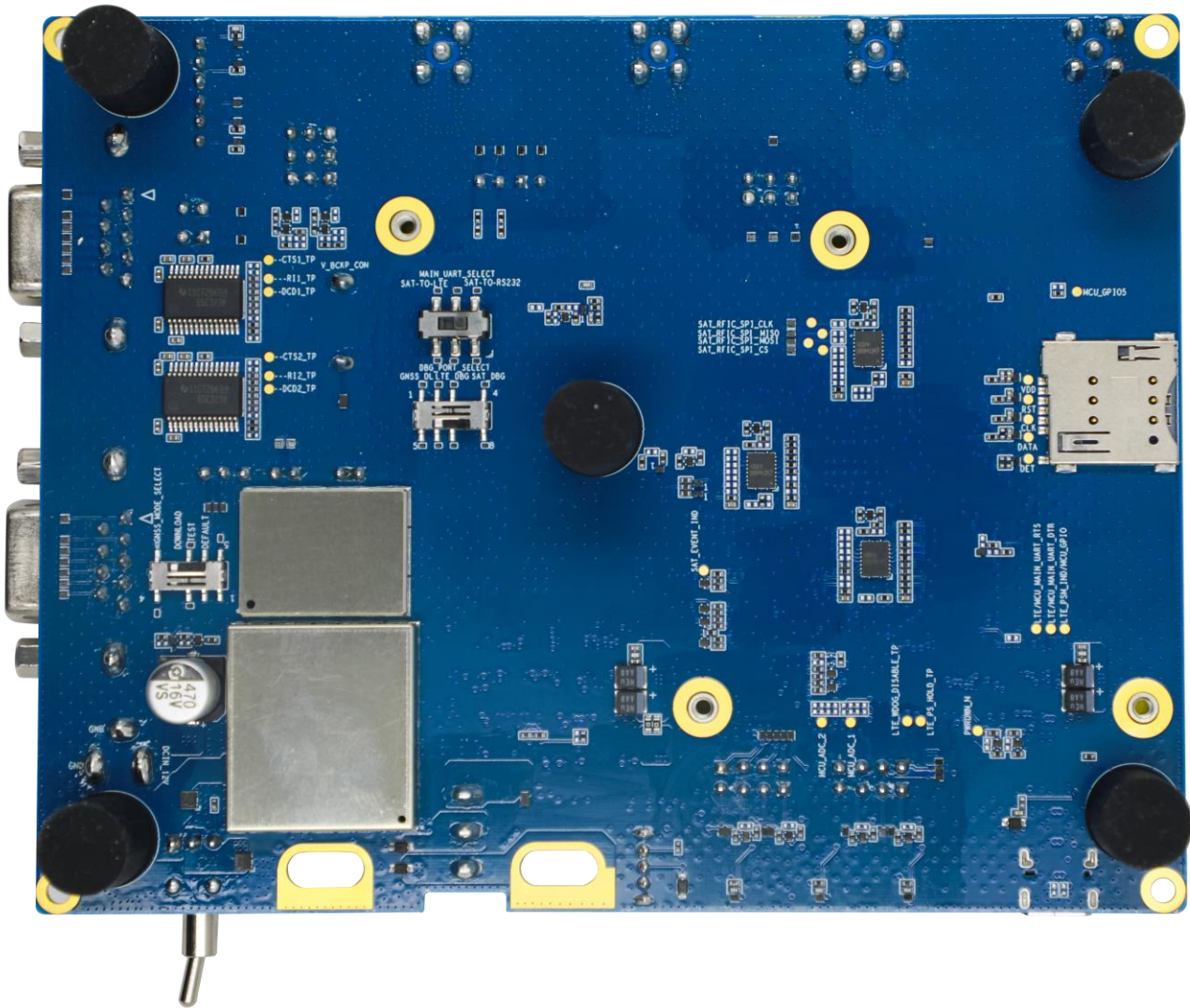


Figure 2: Bottom View

## 2.2. Component Placement

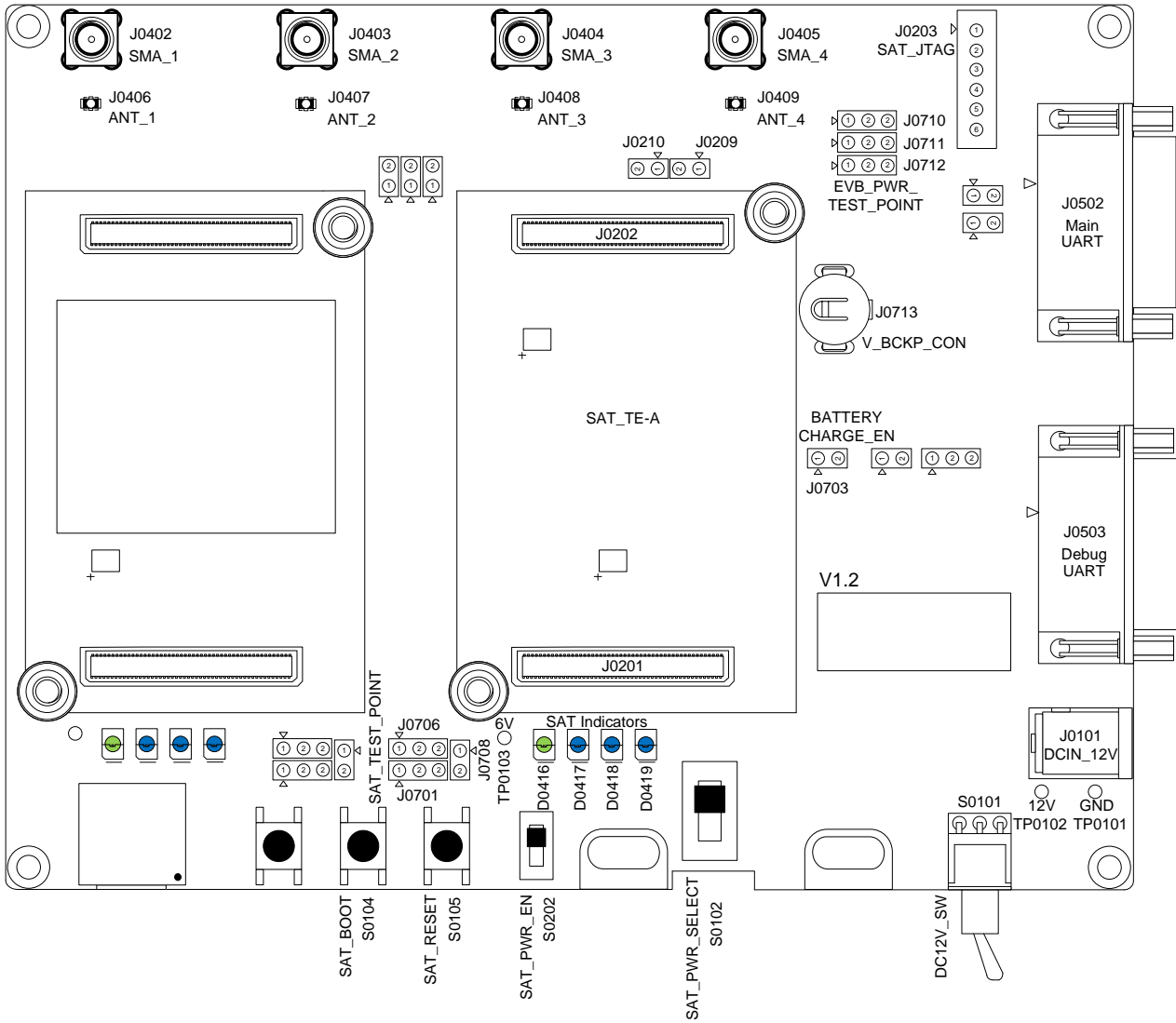
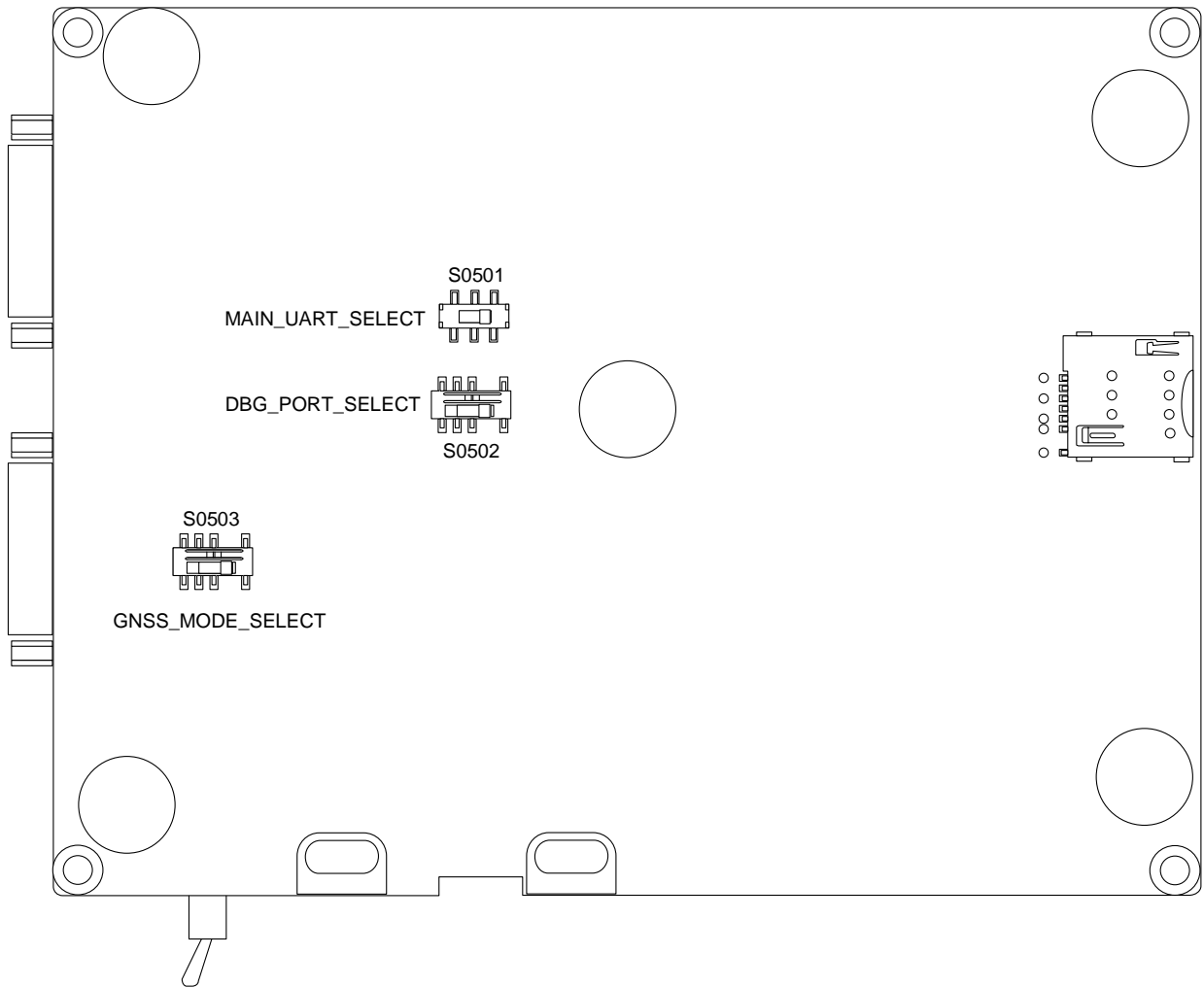


Figure 3: Top View for Component Placement



**Figure 4: Bottom View for Component Placement**

**Table 1: Components & Functions**

Component	RefDes.	Description	Comment
Power Supply	J0101	Power jack on the EVB	<ul style="list-style-type: none"> <li>● DC power supply: 12 V ±10 %</li> <li>● Typical power supply: +12 V / 3 A</li> </ul>
Power Switch	S0101	EVB Power supply on/off control	
SAT Reset Button	S0105	<ul style="list-style-type: none"> <li>● Push button</li> <li>● Resets the SAT module</li> </ul>	
SAT Boot Button	S0104	<ul style="list-style-type: none"> <li>● Push button</li> <li>● Only used for the SAT module firmware upgrade</li> </ul>	

SAT PWR EN Switch	S0202	Turns on/off the SAT module	
Main UART Interface	J0502	Main UART connector	<ul style="list-style-type: none"> <li>● RS232 port</li> <li>● Used for data transmission, AT command communication and firmware upgrade</li> <li>● Max. baud rate: 1 Mbps</li> </ul>
Debug UART Interface	J0503	Debug UART connector	<ul style="list-style-type: none"> <li>● RS232 port</li> <li>● Used for debug log output</li> <li>● Max. baud rate: 1 Mbps</li> </ul>
SAT TE-A Interface	J0201, J0202	SAT TE-A connectors	Support Quectel SAT module TE-A
Status Indication LEDs	D0416	EVB power supply for the SAT module on/off indicator	4 LEDs available for the SAT module signal indication
	D0417	SAT module operation status indicator	
	D0418	SAT module network activity status indicator	
	D0419	SAT module URC output status indicator	
Antenna Interfaces	J0406, J0407, J0408, J0409	I-PEX cable connectors	Can be freely allocated according to demand
	J0402, J0403, J0404, J0405	SMA antenna connectors	Can be freely allocated according to demand
Backup Battery Interface	J0713	Backup battery connector	Supports 3.0–3.6 V non-chargeable 920 size battery and 3.3 V chargeable battery
Power Select Switch	S0102	Reserved (Default: SAT_PWR_EVB)	Reserved for internal use
Interface Multiple Mode Switch	S0501	Reserved (Default: SAT-TO-RS232)	Reserved for internal use
	S0502	Reserved (Default: SAT_DBG)	Reserved for internal use
SAT GNSS Mode Select Switch	S0503	Reserved (Default: DEFAULT)	Reserved for internal use

---

Test Points	J0203,	Test points for debugging and testing	
	J0209,		
	J0210,		
	J0701,		
	J0703,		
	J0706,		
	J0708,		
	J0710,		
	J0711,		
	J0712		
	TP0101,		Test points for power supply
	TP0102,		
TP0103			

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# 3 Kit Accessories & Assembly

## 3.1. Accessories Assembly

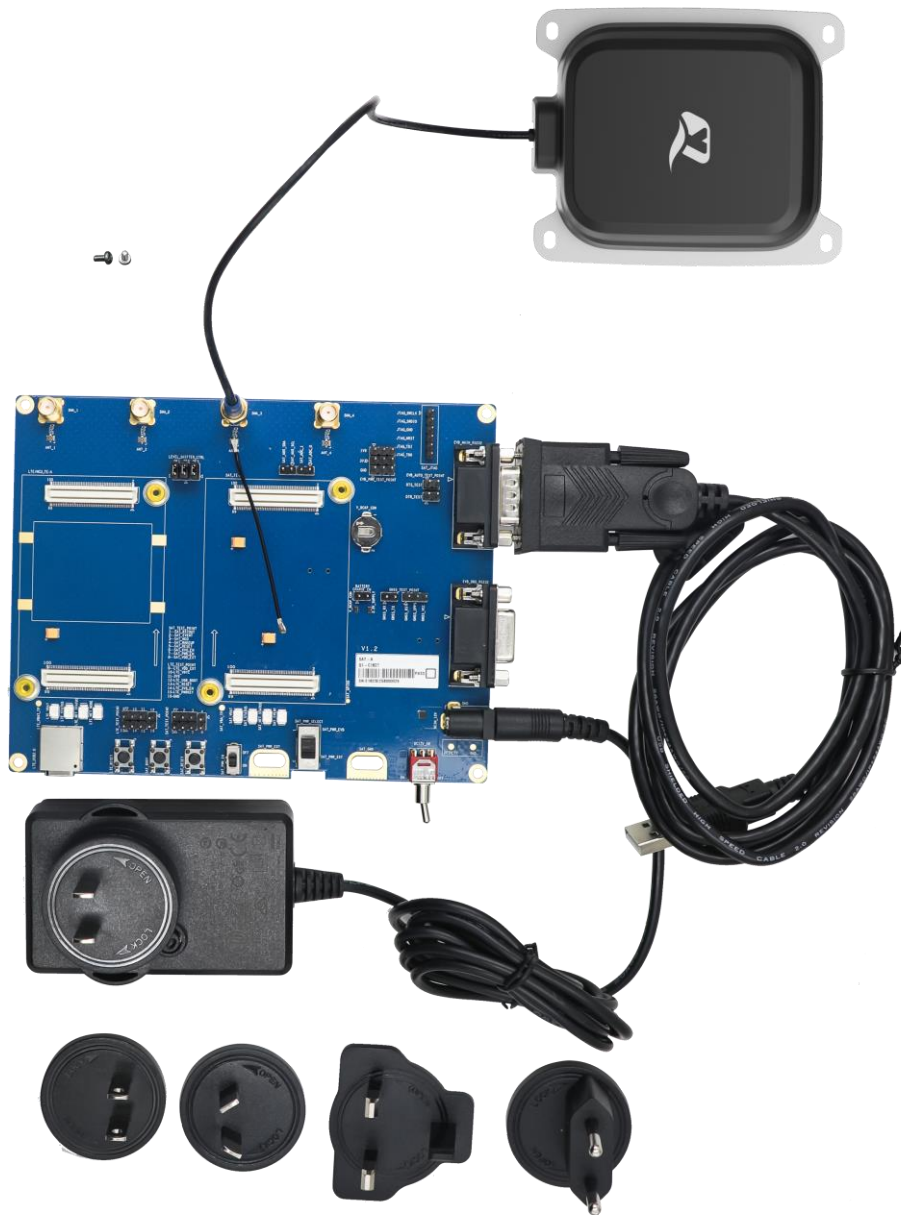


Figure 5: SAT-A EVB and Accessories Assembly



### 3.2. Accessories List

All accessories of the SAT-A EVB kit are listed as below. Please contact the supplier if there is something missing.

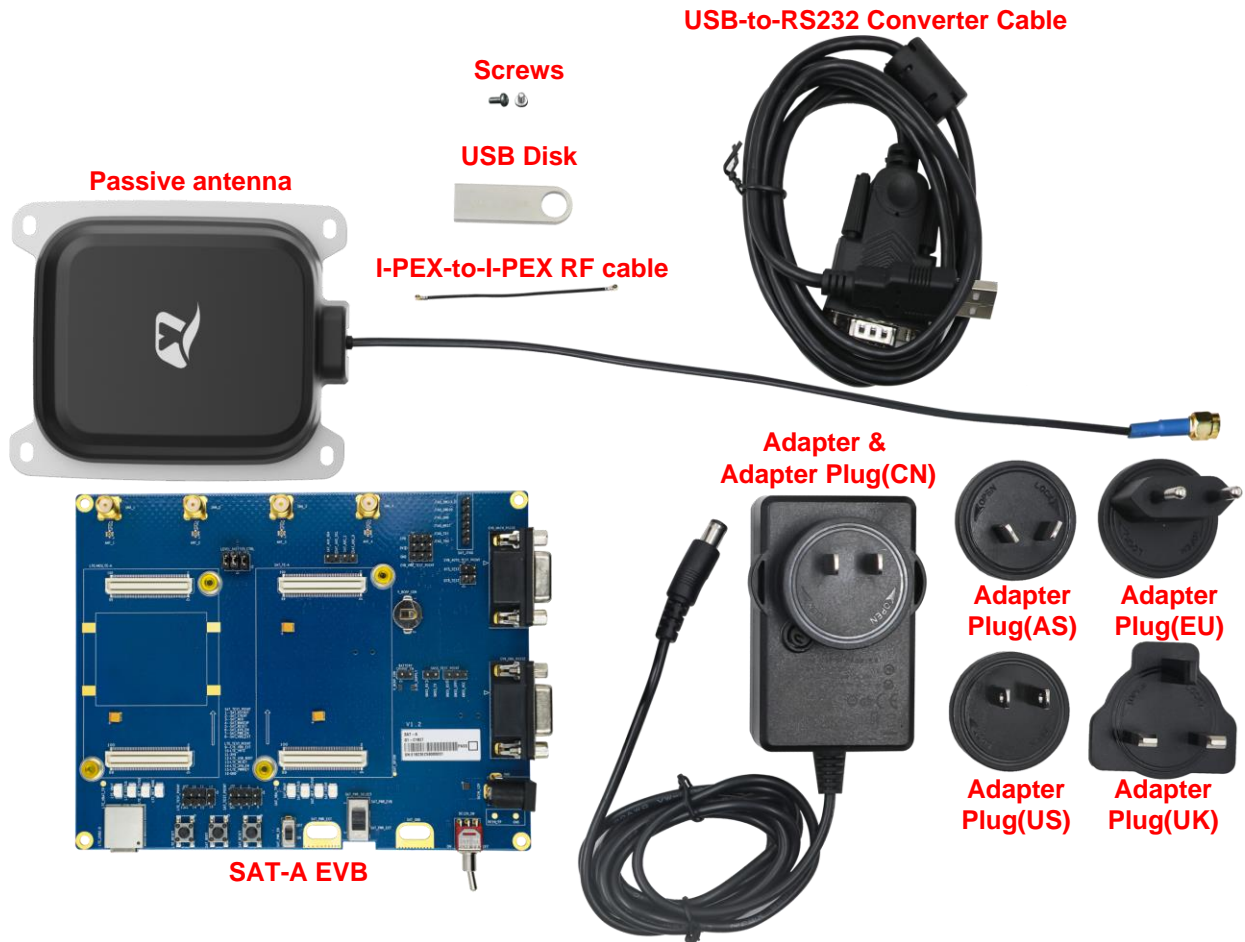


Figure 6: SAT-A EVB Kit Accessories

Table 2: Accessories List

Item	Description	Quantity (pcs)
Adapter	<ul style="list-style-type: none"> <li>An adapter with 100–240 V AC-input and 12 V/ 3 A DC-output</li> <li>Must be equipped with an adapter plug</li> </ul>	1
Cables	USB-to-RS232 converter cable	1
	I-PEX-to-I-PEX RF cable	1

---

Antenna	Passive antenna	1
EVB	SAT-A EVB	1
	Adapter plug type: EU	1
	Adapter plug type: US	1
Adapter Plugs	Adapter plug type: AS	1
	Adapter plug type: UK	1
	Adapter plug type: CN	1
USB Disk	Firmware, software and documents are stored in the USB disk	1
Instruction Sheet	A sheet of paper giving instructions for EVB connection, details of EVB accessories, etc.	1
Screws	Used to fasten TE-As on the EVB	2

---

# 4 Application Interfaces

This chapter describes the hardware interfaces of the SAT-A EVB and provides information about the buttons, switches, status indication LEDs and test points to help you to use the EVB.

- Power supply
- UART interfaces
- Status indication LEDs
- SAT TE-A interface
- Backup battery interface
- Antenna interfaces
- Switches and buttons
- Test Points

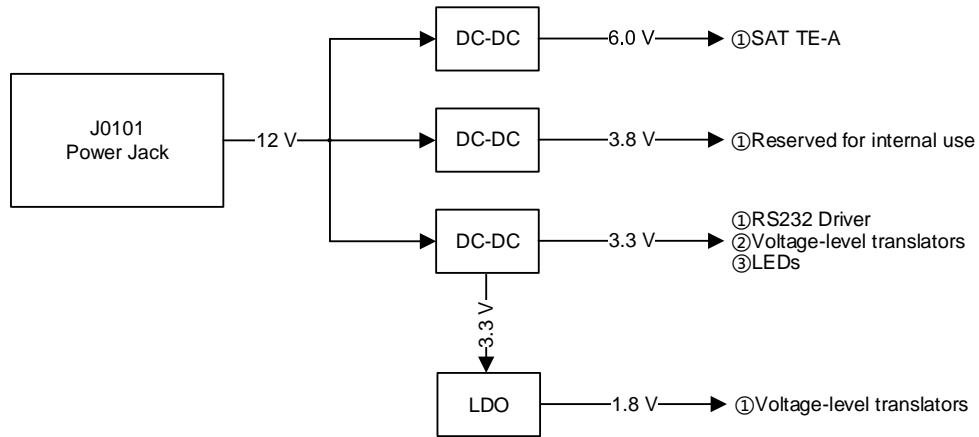
## 4.1. Power Supply

The EVB can be powered by an external power adapter through the power jack on the EVB.

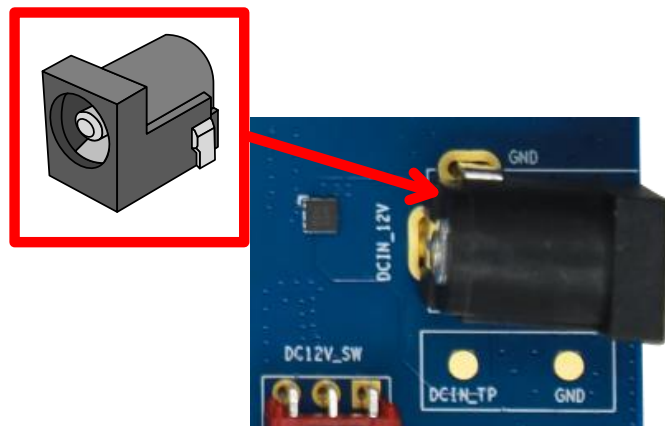
**Table 3: Description of Power Supply**

RefDes.	Description
J0101	Power jack on the EVB

The following figures show the simplified power supply block diagram and power supply interface of the EVB.

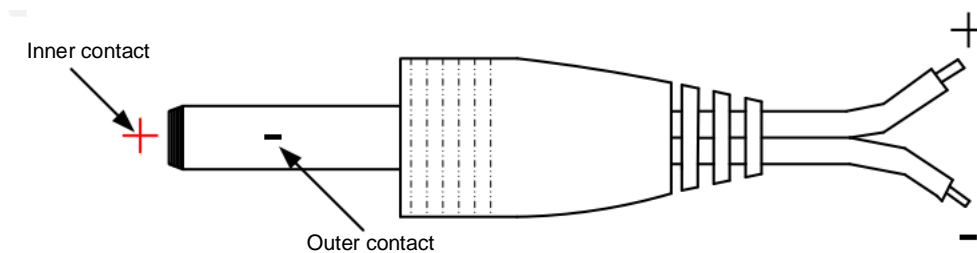


**Figure 7: Block Diagram of EVB Power Supply**



**Figure 8: EVB Power Supply Interface**

If the power jack is used for power supply, the power plug design of the adapter is shown as below.



**Figure 9: Power Plug Design**

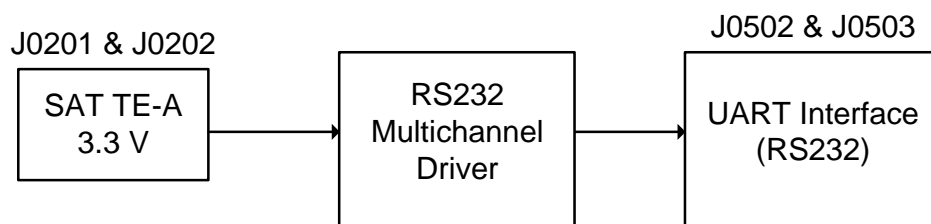
## 4.2. UART Interfaces

The EVB supports two UART interfaces: main UART and debug UART. The maximum baud rate of main UART and debug UART is 1 Mbps. The actual baud rate depends on the module. For more details, see **document [2]**. The main UART interface is used for data transmission, AT command communication and firmware upgrade. The debug UART interface is used for debug log output by default.

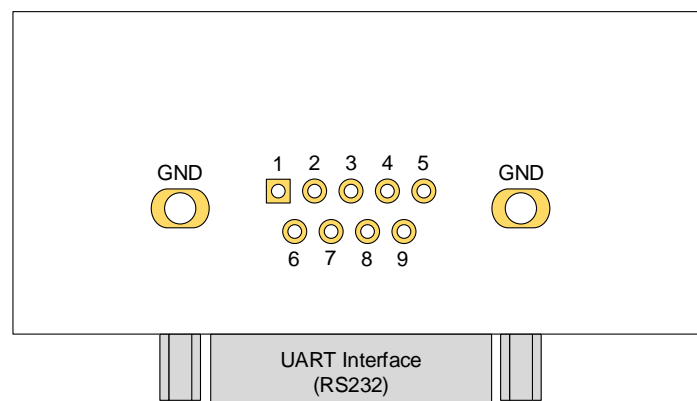
**Table 4: Description of UART Interfaces**

RefDes.	Description
J0502	Main UART connector
J0503	Debug UART connector

The following figure shows a block diagram of UART interfaces of the EVB.



**Figure 10: UART Block Diagram**



**Figure 11: Pin Assignment of UART**

**Table 5: Pin Assignment of J0502 & J0503**

J0502 & J0503	Pin Name	I/O	Description
1	NC	-	Not connected
2	RS232_RXD	DI	Receive data
3	RS232_TXD	DO	Transmit data
4	RS232_DTR	DI	Wake up the SAT Module from Deep Sleep Mode
5	RS232_GND	-	Ground
6	NC	-	Not connected
7	NC	-	Not connected
8	NC	-	Not connected
9	RS232_RI	DO	Reserved

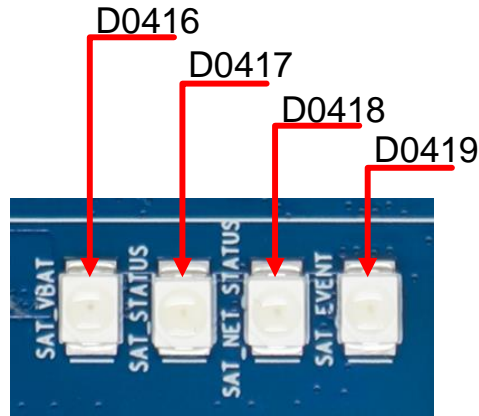
### 4.3. Status Indication LEDs

The EVB provides four SAT module status indication LEDs.

**Table 6: Description of SAT module Status Indication LEDs**

RefDes.	Description
D0416	Indicates whether the EVB power supply for the SAT Module is ready Light ON: EVB power supply for the SAT Module is turned on Light OFF: EVB power supply for the SAT Module is turned off
D0417	Indicates the operation status of the SAT module Light ON: the module is turned on Light OFF: the module is turned off
D0418	Indicates the network activity status of the SAT module Light ON: TBD Light OFF: TBD
D0419	Indicate the URC output status of the SAT module Light ON: the module does not have URC output Light OFF: the module has URC output

The following figure shows the positions of these LEDs.



**Figure 12: Status Indication LEDs**

#### 4.4. SAT TE-A Interface

SAT TE-A interface is designed to accommodate the TE-A of the SAT module. The TE-A is connected to the EVB via BTB connectors J0201 and J0202. You can easily test the functionalities of the SAT module or to develop applications based on it.

**Table 7: Description of SAT TE-A Interface**

RefDes.	Description
J0201	SAT TE-A connectors
J0202	

The following figure shows the connection between SAT TE-A and EVB.

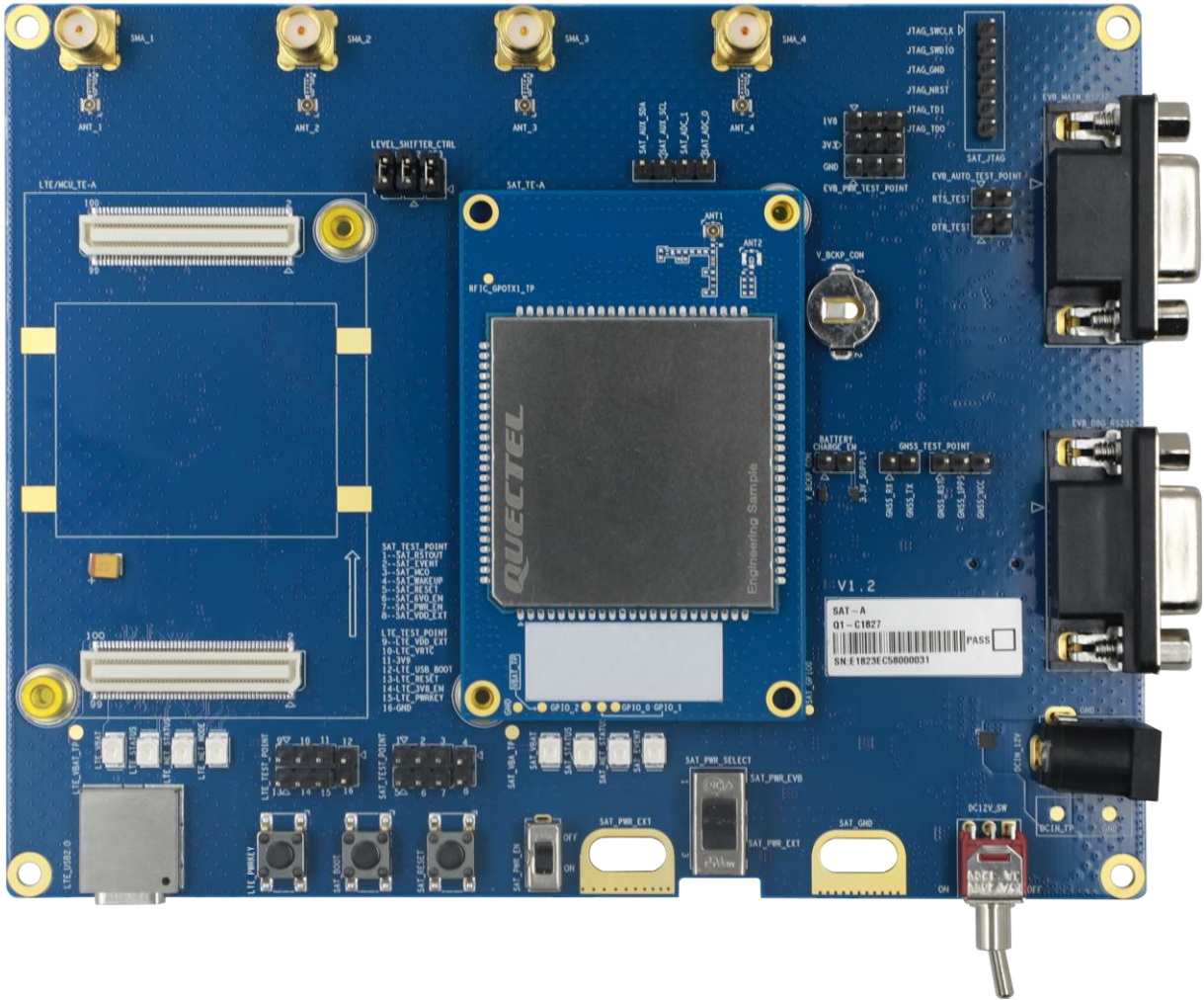


Figure 13: Connection between SAT TE-A and SAT-A EVB

### 4.5. Backup Battery Interface

The EVB provides a backup battery interface, which is compatible with 920 size cell battery. Note that it is necessary to consider the battery's suitability in high or low temperature environment.



Figure 14: Backup Battery Interface



**Table 8: Description of Backup Battery Interface**

RefDes.	Description
J0713	Backup battery connector

If you use backup battery charging function, you should connect J0703.1 to J0703.2 and keep switch S0101 to the "ON" side, then the battery can get 3.3 V power supply from EVB. The charging function is applicable to batteries with an output voltage of 3.3 V.

When the battery is not connected to the connector, and J0703.1 is connected to J0703.2, keep S0101 to the "ON" side and switch S0202 to the "OFF" side, then the hot start related circuit of the SAT module is powered by the 3.3 V power supply of the EVB instead of the backup battery.

**NOTE**

1. Note that the metal connector can only be connected to the positive electrode of the battery, and the negative electrode of the battery should be connected to the PCB, otherwise the module and EVB will be damaged.
2. If you use a backup chargeable battery with an output voltage of 3.6 V, EVB can only charge this battery to 3.3 V.
3. If you use a backup chargeable battery with an output voltage of 3.0 V, do not connect J0703.1 to J0703.2.

## 4.6. Antenna Interfaces

The EVB has four antenna interface groups:

**Table 9: Description of Antenna Interfaces**

RefDes.	Description
J0406, J0407, J0408, J0409	I-PEX cable connectors
J0402, J0403, J0404, J0405	SMA antenna connectors

The following figure shows the positions of these antenna interfaces.



Figure 15: Antenna Interfaces

### 4.7. Switches and Buttons

The EVB includes six switches (S0101, S0102, S0202, S0501, S0502, S0503) and two buttons (S0104, S0105), as shown in the following table and figure.

**NOTE**

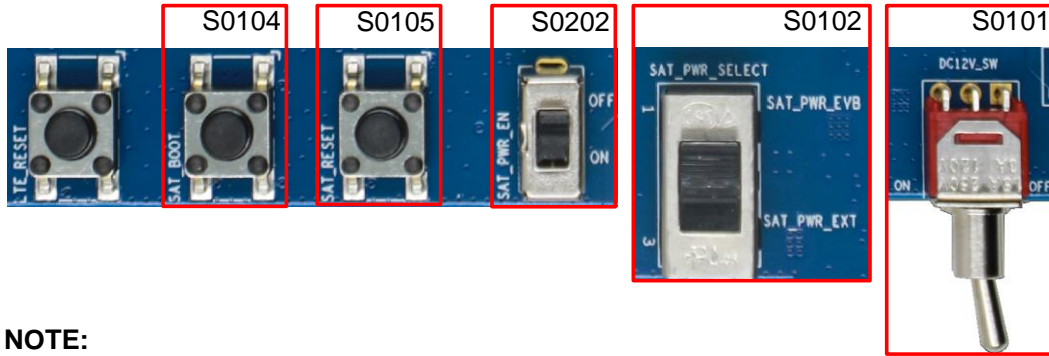
It is recommended to set the switches to the default state as shown in *Figure 16*.

Table 10: Description of Switches and Buttons

RefDes.	Function	Description
S0101	DC12V_SW	<ul style="list-style-type: none"> <li>Switch to the “OFF” side, EVB power supply is turned off.</li> <li>Switch to the “ON” side, EVB power supply is turned on.</li> </ul>
S0102	SAT_PWR_SELECT	Reserved (Default: SAT_PWR_EVB)
S0104	SAT_BOOT	<ul style="list-style-type: none"> <li>Push button</li> <li>Only used for the SAT module firmware upgrade</li> </ul>
S0105	SAT_RESET	<ul style="list-style-type: none"> <li>Push button</li> <li>Resets the SAT module</li> </ul>
S0202	SAT_PWR_EN	<ul style="list-style-type: none"> <li>Switch to the “OFF” side, the module is turned off. (Default: OFF)</li> <li>Switch to the “ON” side, the module is turned on.</li> </ul>
S0501	MAIN_UART_SELECT	Reserved (Default: SAT-TO-RS232)

S0502	DBG_PORT_SELECT	Reserved (Default: SAT_DBG)
S0503	GNSS_MODE_SELECT	Reserved (Default: DEFAULT)

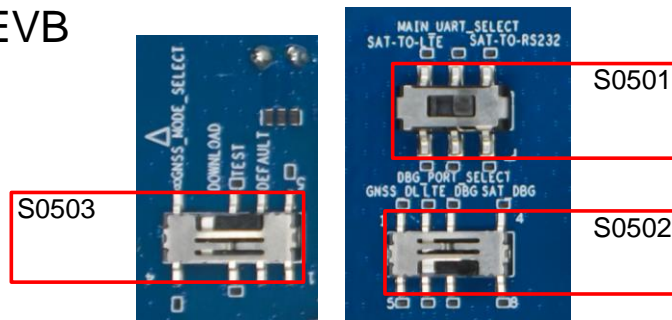
**TOP OF EVB**



**NOTE:**

For S0102, the default position is on the side near the center of the SAT-A EVB.

**BOT OF EVB**



**NOTE:**

For S0501, S0502 and S0503, the default position is on the side near the center of the SAT-A EVB.

**Figure 16: Switches and Buttons**

The following figure shows the logic control diagram of these switches and buttons. For more details, see *Chapter 5*.

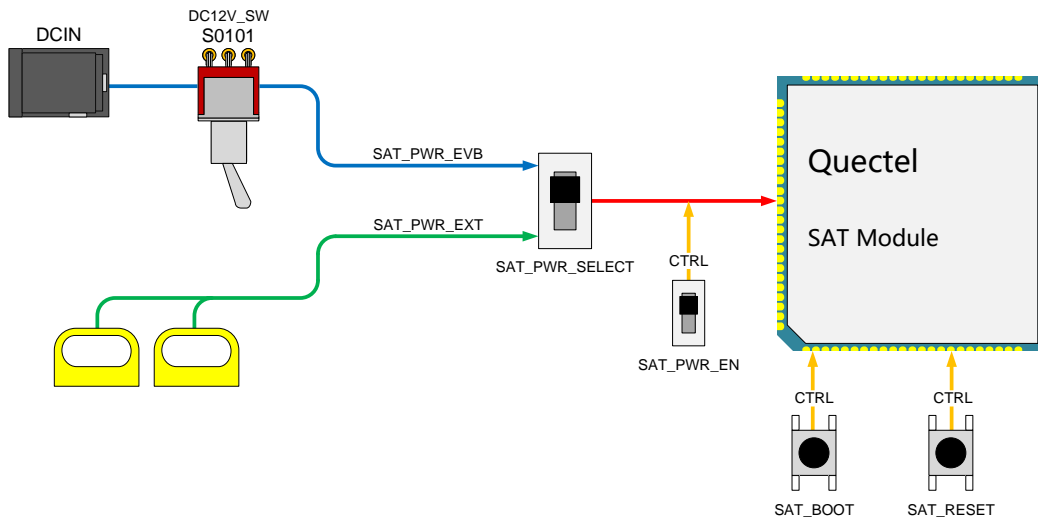


Figure 17: Logic Control Diagram of Switches and Buttons

### 4.8. Test Points

The EVB provides test points which help you obtain the corresponding waveforms of some signals. The following figure shows the details of all test points.

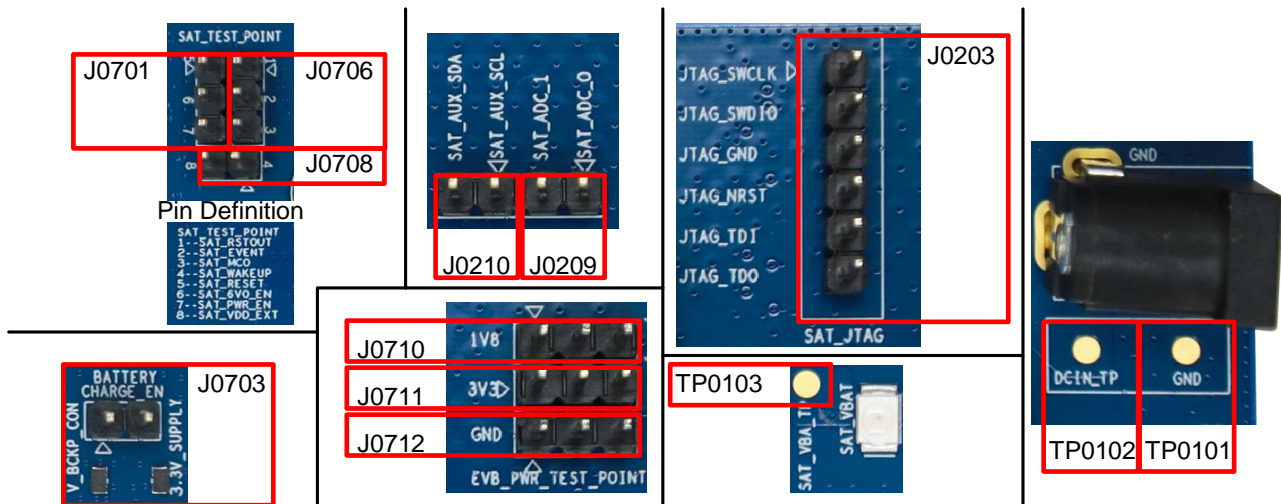


Figure 18: Test Points

Table 11: Pin Definition of Test Points

J0706			
Pin No.	Pin Name	Module Pin No.	Description
1	SAT_RSTOUT	25	Reserved
2	SAT_EVENT	10	Indicate the module's URC output status
3	SAT_MCO	15	Reserved
J0701			
Pin No.	Pin Name	Module Pin No.	Description
1	SAT_RESET	-	Pull up to 3.3 V to reset the module
2	SAT_6V0_EN	-	Pull up to 3.3 V to disable the EVB 6.0 V Power Supply for the SAT module
3	SAT_PWR_EN	-	NC or connecting to GND will turn on the SAT Module; Connecting to 3.3 V will turn off the SAT module
J0708			
Pin No.	Pin Name	Module Pin No.	Description
1	SAT_WAKEUP	4	Wake up the module
2	SAT_VDD_EXT	23	Provide 3.3 V for external circuit
J0710			
Pin No.	Pin Name	Module Pin No.	Description
1			
2	1V8	-	EVB 1.8 V power supply
3			
J0711			
Pin No.	Pin Name	Module Pin No.	Description
1			
2	3V3	-	EVB 3.3 V power supply
3			

J0712			
Pin No.	Pin Name	Module Pin No.	Description
1			
2	GND	-	GND of EVB
3			
J0703			
Pin No.	Pin Name	Module Pin No.	Description
1	V_BCKP_CON	42	Connect this pin to the backup battery connector, and you can activate the battery charging function by shorting this pin to J0703.2.
2	3.3V_SUPPLY	-	Connect this pin to the EVB 3.3 V power supply, and you can activate the battery charging function by shorting this pin to J0703.1.
J0203			
Pin No.	Pin Name	Module Pin No.	Description
1	JTAG_SWCLK	21	Reserved
2	JTAG_SWDIO	22	Reserved
3	JTAG_GND	-	Reserved
4	JTAG_NIRST	105	Reserved
5	JTAG_TDI	104	Reserved
6	JTAG_TDO	103	Reserved
TP0101, TP0102 & TP0103			
Pin No.	Pin Name	Module Pin No.	Description
TP0101	GND	-	GND
TP0102	DCIN_TP	-	12 V power supply
TP0103	SAT_VBAT_TP	-	6 V power supply

# 5 Operation Procedures

This chapter introduces how to use the SAT-A EVB for testing and evaluation of the applicable module. Before the procedures below, please ensure the module and the EVB are correctly assembled.

## NOTE

Every time before using the EVB, it is necessary to set all switches to their default states. For details, see [Chapter 4.7](#).

## 5.1. Turn On the SAT Module

1. Connect the DC adapter to the EVB via power jack J0101.
2. Connect the SAT TE-A to the EVB via connectors J0201 and J0202.
3. Connect the SAT TE-A to the I-PEX cable connector on the EVB with an I-PEX-to-I-PEX cable.
4. Connect the passive antenna to the SMA antenna connector which corresponds to the I-PEX cable connector on the EVB.
5. Switch S0101 (EVB Power Switch) to the “**ON**” side, then the EVB power supply will be turned on. Then D0416 (SAT\_VBAT) will light up, which indicates that the EVB power supply for the SAT module is ready.
6. Switch S0202 (SAT\_PWR\_EN) to the “**ON**” side, then the SAT module will be turned on and D0417 (SAT\_STATUS) will light up.

## NOTE

1. If the S0202 (SAT\_PWR\_EN) has been switched to the “**ON**” side before the EVB power supply is turned on, the module will turn on automatically when S0101 is switched to the “**ON**” side.
2. The power supply turn-on should be performed only after the EVB assembling is completed to avoid any possible damage.

## 5.2. Turn Off the SAT Module

There are two methods to turn off the SAT module.

- Switch S0202 (SAT\_PWR\_EN) to the “OFF” side, then the SAT module will be turned off.
- Switch S0101 (EVB Power Switch) to the “OFF” side, then all power supply of the EVB will be turned off and as a result, the SAT module will also be turned off.

## 5.3. Reset the SAT Module

Reset is only used in case of emergency or abnormality. For example, the software fails to respond for more than 5 seconds due to some serious problems.

Press the button S0105 (SAT\_RESET) for more than 1 second, and then release it to reset the module. Please note that this operation may cause loss of information in the memory as the module will be initialized after the resetting.

## 5.4. SAT Module Communication Via UART Interface

1. Connect the main UART or debug UART interface to a PC with USB-to-RS232 converter cable, which is crucial, and install the USB-to-RS232 driver from the Driver Disk.
2. Power up the SAT-A EVB and turn on the SAT module according to the procedure in **Chapter 5.1**.
3. Serial port number can be viewed through the PC Device Manager, such as below:

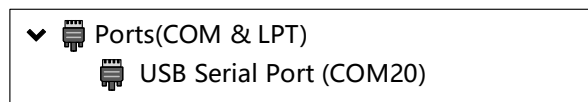


Figure 19: USB Serial Port

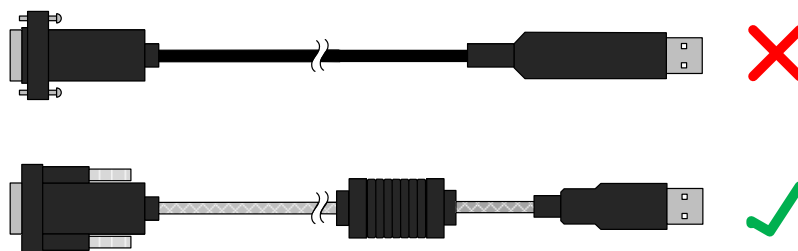


Figure 20: The Right USB-to-RS232 Converter Cable

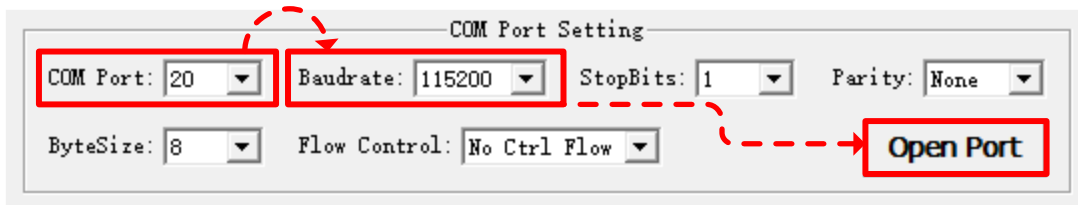


- Find the QCOM tool from the USB disk in the EVB kit. Install and run QCOM.exe. to realize the communication between the module and the PC.



**Figure 21: QCOM Tool and QCOM User Guide**

- Configure COM Port Setting Window, set correct baud rate (such as 115200 bps, the EVB supports a maximum baud rate up to 1 Mbps) and COM number which can be checked by the Device Manager on PC, then operate the module via AT commands. For further information about QCOM, see *document [3]*.



**Figure 22: COM Port Setting Field on QCOM**

## 5.5. SAT Module Firmware Upgrade

Firmware of the SAT module can be upgraded through SAT-A EVB. Related software can be found from the USB disk in the EVB kit.

The following are the specific installation and usage of the relevant software and hardware.

### 5.5.1. Preparation of Software

The firmware upgrade tool is stored in the folder named as QMloader. This tool will be used in the following upgrade operations.

You can find a PDF document named as *Quectel\_QMloader\_User\_Guide* in the folder. It is recommended to refer to this document if you encounter operational problems.



**Figure 23: QMloader and QMloader User Guide**

Double-click QMloader to run the application. The software can be executed without any installation procedures.

**NOTE**

1. Note that only "\_" can be used to connect words of the QMloader and firmware saving path. Using other symbols or spaces may cause QMloader malfunctions.
2. QMloader does not support the operation of selecting one firmware to upgrade when multiple firmware versions are stored in one folder. For ease of use, it is recommended to store different versions of the firmware in different folders.

**5.5.2. Preparation of Hardware**

The operation procedures depicted in **Figure 24** are as follows.

1. Switch S0101 (EVB Power Switch) to the "OFF" side.
2. Connect J0502 (main UART connector) to a PC through a USB-to-RS232 converter cable.
3. Switch S0202 (SAT\_PWR\_EN) to the "ON" side, and then press the button S0104 (SAT\_BOOT).
4. Switch S0101 (EVB Power Switch) to the "ON" side.
5. Release the button S0104 (SAT\_BOOT), and keep switch S0202 (SAT\_PWR\_EN) to the "ON" side.

**NOTE**

1. Please note that after completing all the above operation procedures, only D0416 (SAT\_VBAT) will light up while other indication LEDs will light off.
2. When D0417 (SAT\_STATUS) lights up, it means that the SAT module has exited firmware upgrade mode.
3. If the D0417 (SAT\_STATUS) lights up during the above operation procedures, it is recommended to check the EVB switches and the assembly of the EVB and module before operating again.

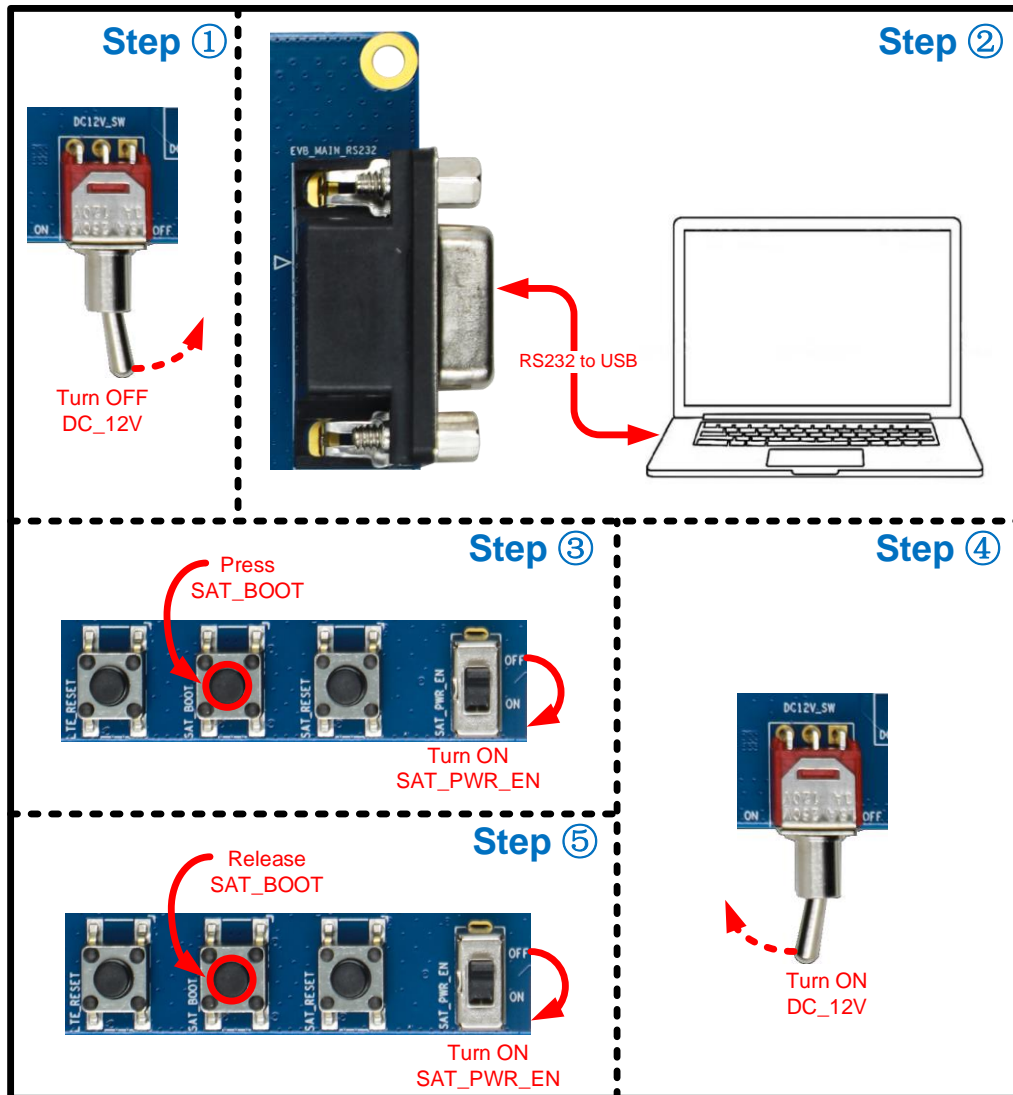
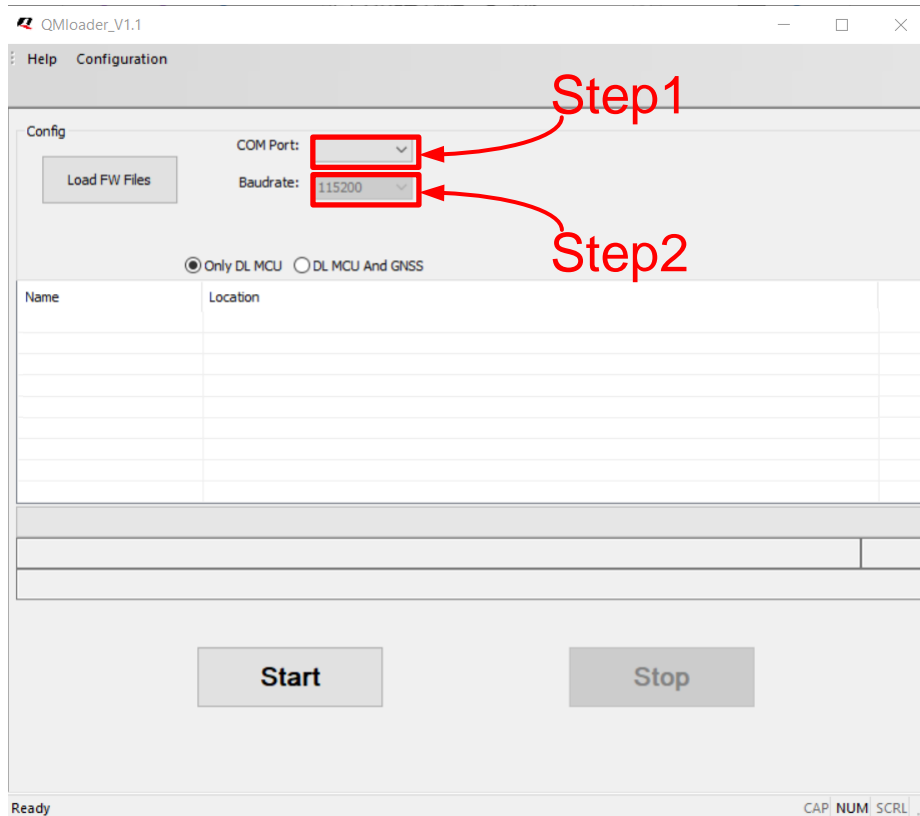


Figure 24: Hardware Preparation for SAT Module Firmware Upgrade

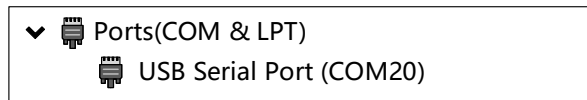
### 5.5.3. Upgrade Firmware via Main UART

Ensure that all hardware operation procedures described in *Chapter 5.5.2* are completed before software upgrade operations.

1. Double-click QMloader to run the application.
2. Select the "COM Port" marked by Step 1 in *Figure 25* according to the COM port number that you get from PC Device Manager in *Figure 26*. If the desired Port is not in the option, please close and run QMloader again.
3. Select the default "Baud rate" (115200 bps) marked by Step 2 in *Figure 25*, but it can also be customized to suit your needs.



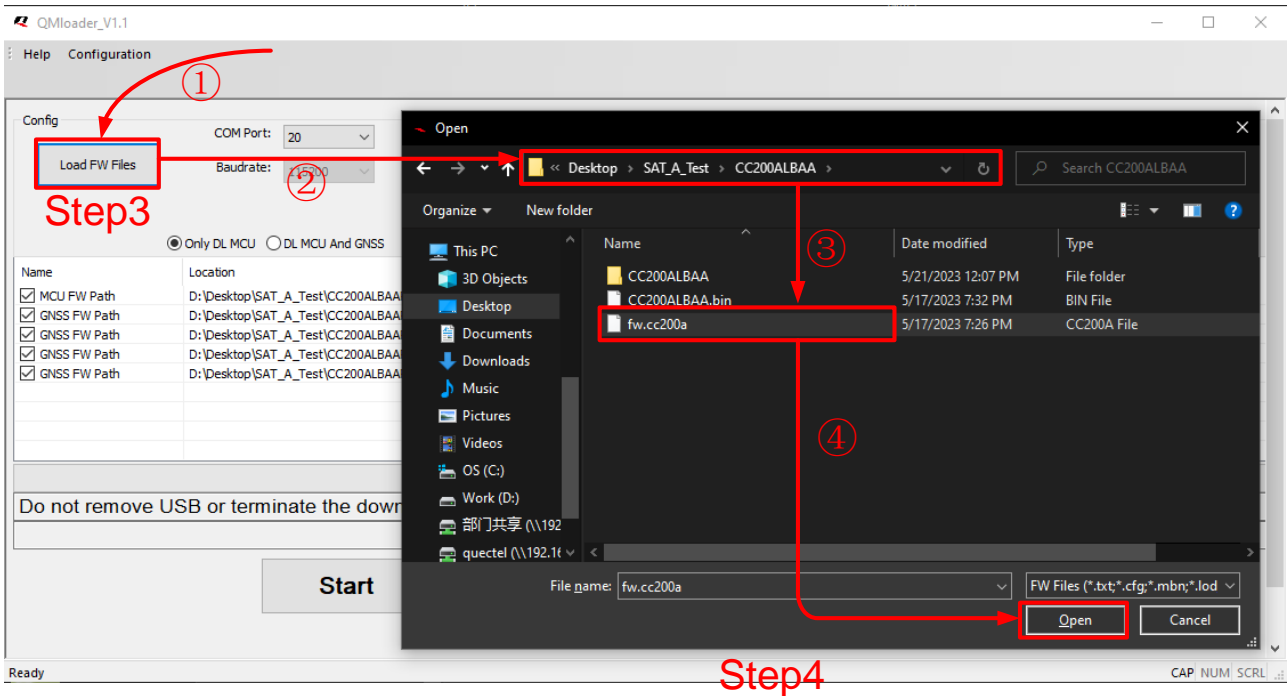
**Figure 25: Operation Steps of Firmware Upgrade Tool**



**Figure 26: USB Serial Port**

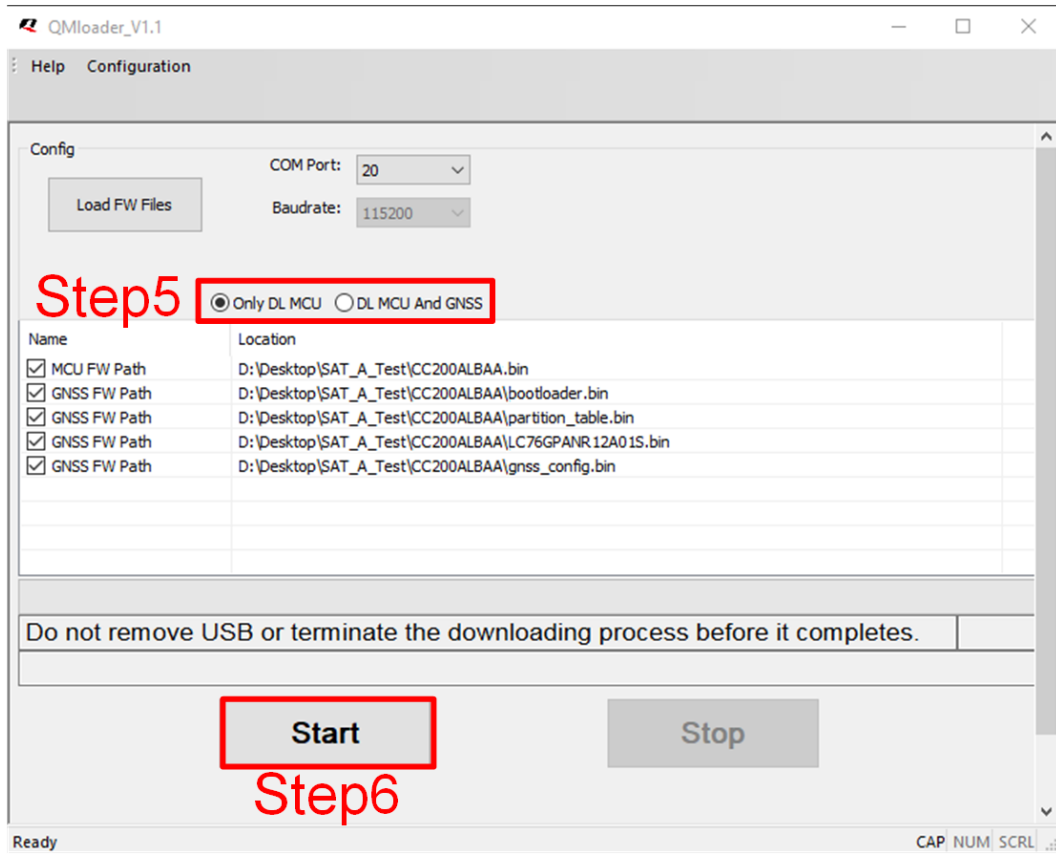
**NOTE**

1. It is recommended to set the baud rate to 115200 bps or higher. The maximum baud rate supported by the SAT-A EVB is 1 Mbps. The maximum baud rate may be limited by the USB-to-RS232 cable.
  2. If the baud rate is slower than 115200 bps, it may cause QMloader to report an error due to timeout.
- 
4. Click the **“Load FW Files”** marked by Step 3 in **Figure 27**. Choose the desired firmware file folder and find the specific file named after the module name.
  5. Open this specific file to make the module enter the QMloader upgrade mode as indicated by Step 4 in **Figure 27**.



**Figure 27: Click “Load FW Files” to Open the Desired Firmware File**

6. Choose the upgrade mode: either select both firmware or choose specific one to upgrade the module. This option is marked by Step 5 in **Figure 28**.
7. Click "Start" in the main screen of the QMloader marked by Step 6 in **Figure 28** to start firmware upgrade.



**Figure 28: Click “Start” to Start Upgrade**

When you receive the message as indicated by the red box in **Figure 29**, it means that the upgrade has been completed successfully.

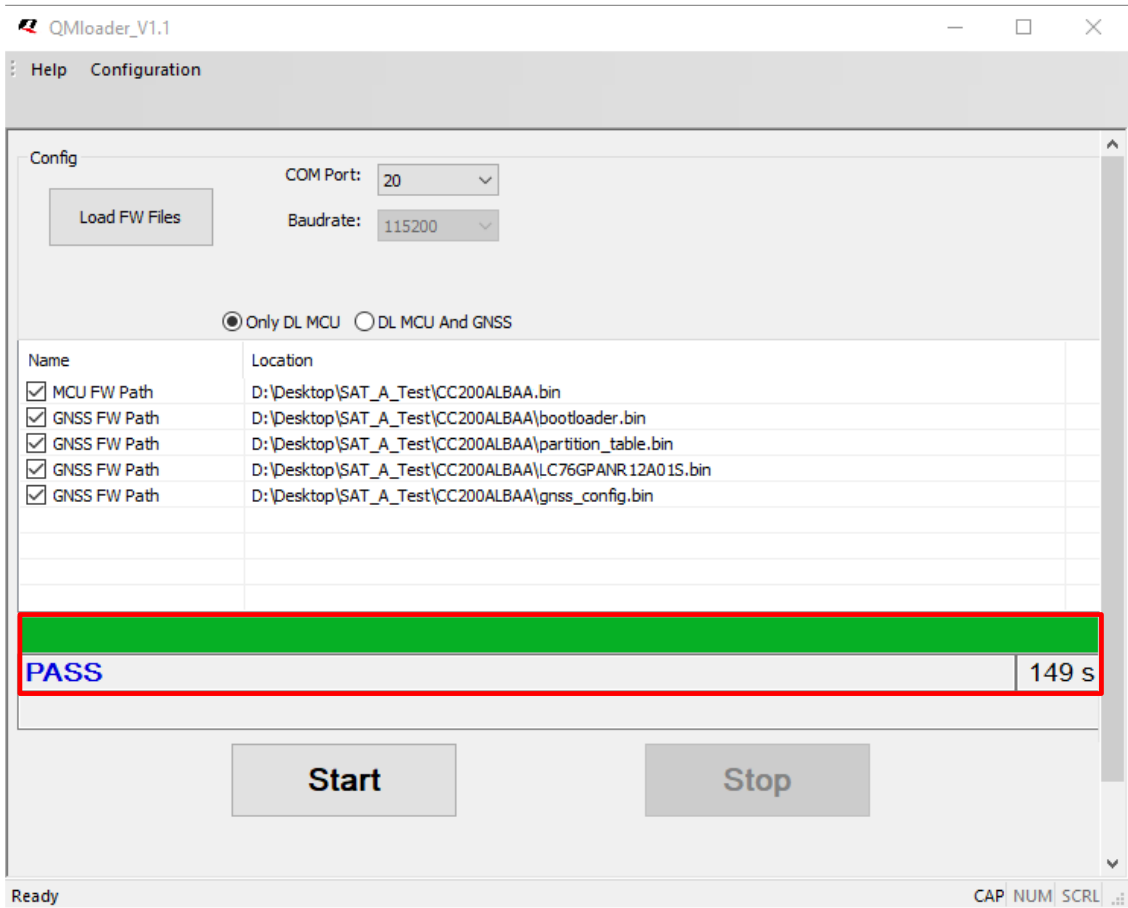


Figure 29: Page of Completed Upgrade

# 6 Appendix References

**Table 12: Related Documents**

Document Name
[1] Quectel_List_of_EVB_Applicable_Modules
[2] Quectel_CC200A-LB_Hardware_Design
[3] Quectel_QCOM_User_Guide
[4] Quectel_QMloader_User_Guide
[5] Quectel_CC200A-LB_Reference_Design

**Table 13: Terms and Abbreviations**

Abbreviation	Description
AC	Alternating Current
BTB	Board-to-Board
COM	Communication Port
DC	Direct Current
EVB	Evaluation Board
GND	Ground
GNSS	Global Navigation Satellite System
JTAG	Joint Test Action Group
LED	Light Emitting Diode
NC	Not connected



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RF	Radio Frequency
SAT	Satellite
SMA	SubMiniature version A
UART	Universal Asynchronous Receiver/Transmitter
URC	Unsolicited Result Code
USB	Universal Serial Bus

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