LG77L EVB User Guide

GNSS Module Series

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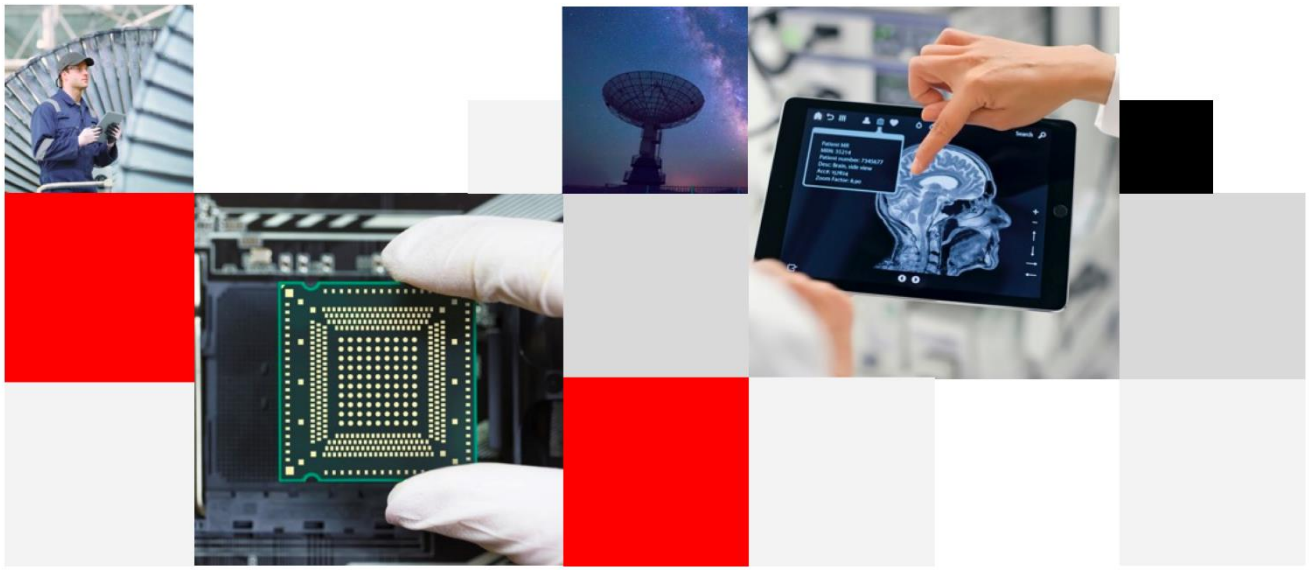

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	Keep away from explosive and flammable materials. The use of electronic products in extreme power supply conditions and locations with potentially explosive atmospheres may cause fire and explosion accidents.
	The product must be powered by a stable 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 that incorporate the module to avoid ESD damages.

About the Document

Document Information	
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-	2021-03-23	Creation of the document
1.0	2021-03-23	First official release

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1 Introduction

This document provides information on how to develop and test the Quectel LG77L module using the Evaluation Board (EVB). The EVB is a convenient tool that allows you to become familiar with the LG77L module.

This document describes the interfaces on the EVB; how to test the module with the software tool (PowerGPS); and how to upgrade the firmware.

The user guide is divided into several sections:

- Chapter 2 provides the general overview of EVB Kit accessories;
- Chapter 3 describes the EVB user interfaces;
- Chapter 4 describes how to communicate with a module by using the QCOM tool;
- Chapter 5 describes how to test the module by using the PowerGPS tool;
- Chapter 6 describes how to upgrade the module;
- Chapter 7 is an appendix, which summarizes the relevant documents, terms and abbreviations appearing herein.

2 General Overview

2.1. EVB Kit Accessories

The EVB Kit includes: Evaluation Board (EVB), Active GNSS Antenna, Micro-USB Cable, USB Flash Drive, Bolts and Coupling Nuts. The software tools are placed in the USB flash drive.

The EVB Kit accessories are shown in the figure below, and check ***Table 1*** for details.

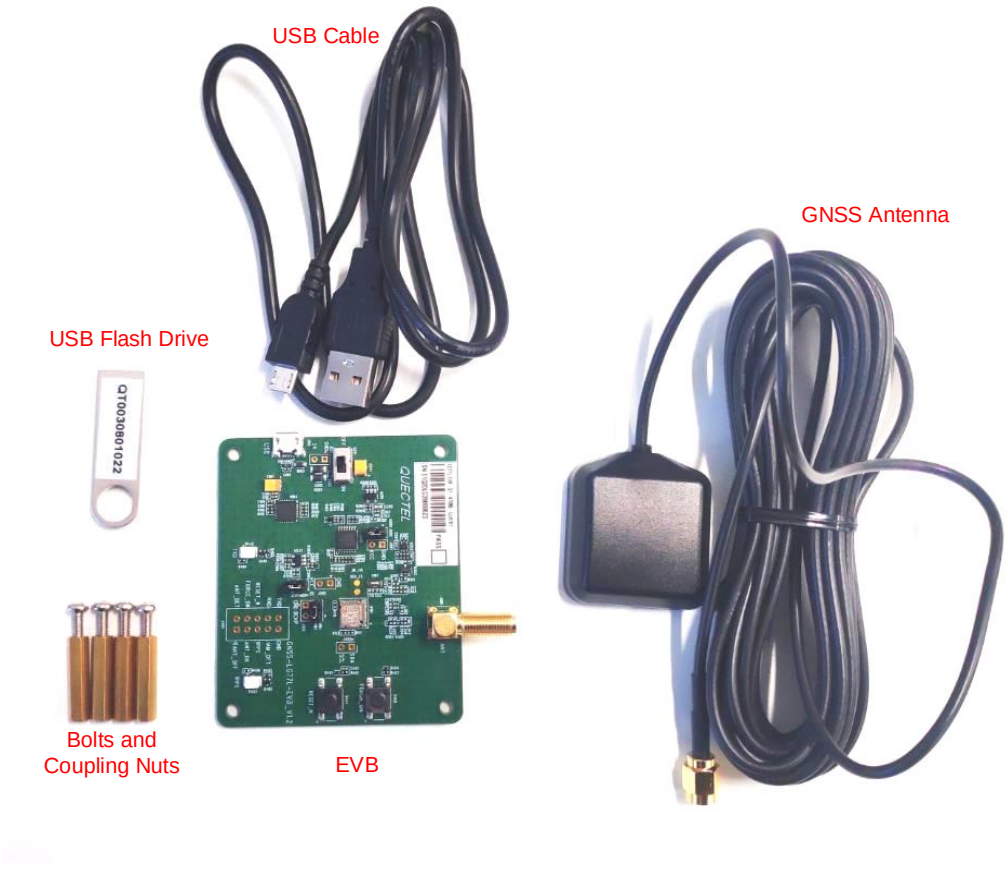


Figure 1: EVB Kit Accessories

Table 1: List of Accessories

Items	Description	Quantity
EVB	Evaluation Board Size: 60 mm × 70 mm	1
USB Cable	Micro-USB Cable	1
GNSS Antenna	Active GNSS Antenna Request the Antenna Datasheet from your local FAE.	1
USB Flash Drive	USB Flash Drive (including the module-related documents, tools, and drivers)	1
Instruction Sheet	A sheet of paper giving instructions on how to connect the EVB, details on EVB accessories, and much more.	1
Other	Bolts and Coupling Nuts	4 pairs

2.2. Connecting Cables and Antenna to EVB

The connection between the EVB and its accessories is shown in the figure below. For detailed information on how to connect the EVB and its accessories, refer to the instruction sheet inside the EVB Kit.

Figure 2: EVB and Accessories Assembly

NOTE

Place the active GNSS antenna where it can detect the satellites with a clear view of the sky.

3 Board User Interfaces

3.1. EVB Top View

The EVB includes:

LG77L Module (U101), Antenna Connector (J301), Power Switch (S201), Micro-USB Connector (J102), FORCE_ON Button (S402), RESET_N Button (S401), Indication LEDs (D402, D403), Test Points (J401).

EVB top view is shown in the figure below.

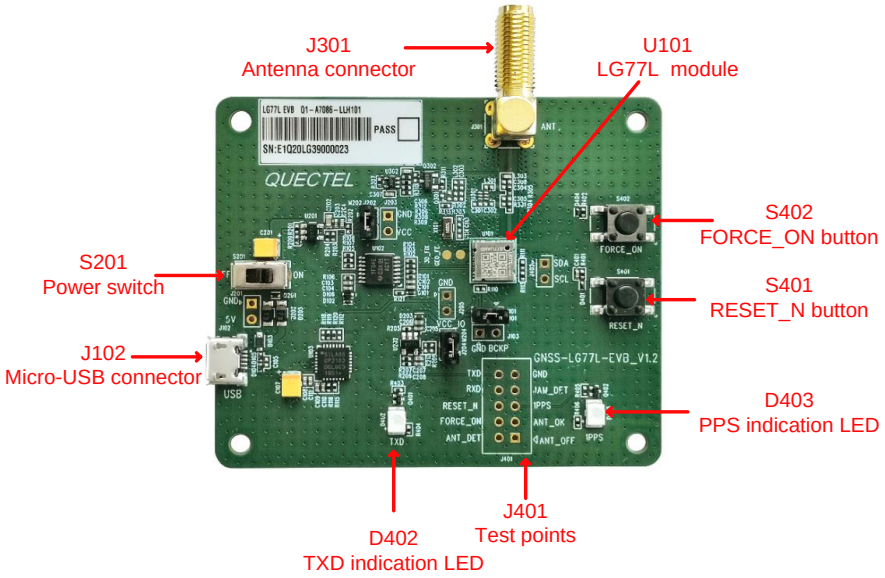


Figure 3: EVB Top View

3.2. Board User Interfaces

The EVB interfaces are detailed in the table below.

Table 2: Detailed EVB Interfaces

Function	Interfaces	Description
Power Supply	J102 Micro-USB	Power supply input: ● DC power supply: 4.5–5.5 V, typ. 5.0 V ● Current capability should be >100 mA
User Interface	J102 Micro-USB	NMEA sentence output and command input
RF Input	J301 Antenna Connector	Support: ● GPS L1 C/A ● GLONASS L1 ● BeiDou B1I ● Use with the antenna provided with the Kit
Signal Indication	D402 TXD Indication LED	Flash: The module is turned on successfully. Data output from UART TXD pin. Extinct or Bright: Failed to turn on the module.
	D403 PPS Indication LED	Flash: Successful position fix. The frequency is 1 Hz. Extinct: No position fix.
Switches and Buttons	S201 Power Switch	Power the EVB on/off
	S401 RESET_N	Short press the button to reset the module.
	S402 FORCE_ON	Short press the button to wake up the module from the backup mode.
Test Points	J401 Test Points	Pins are detailed in ***Table 3*** below

Test point distribution is shown below:

J401 Pin Assignment:

TXD	GND
RXD	JAM_DET
RESET_N	1PPS
FORCE_ON	ANT_OK
ANT_DET	ANT_OFF

Table 3: J401 Pin Detailed Description

Pin Name	I/O	Description
TXD	DO	Transmits data
RXD	DI	Receives data
RESET_N	DI	Resets the module
FORCE_ON	DI	Wakes up the module from backup mode
ANT_DET	DI	Detects active antenna open-circuit
GND	-	Ground
JAM_DET	DI	Detects jamming signal
1PPS	DO	1 pulse per second
ANT_OK	DI	Detects active antenna short-circuit
ANT_OFF	DO	Controls active antenna power

4 Using QCOM Tool to Communicate

This chapter illustrates how to use the QCOM tool to communicate with the module via the Micro-USB interface.

Find the QCOM tool on the USB flash drive in the EVB Kit, or request it from your local FAE.

4.1. Communication via the Micro-USB Interface

Step 1: Connect the EVB and the PC with a Micro-USB cable via the Micro-USB interface.

Step 2: Flip the power switch (S201) to ON position to power on the EVB.

Step 3: Plug in the USB flash drive to the PC and run the provided driver installer to install the USB driver.

Step 4: View the USB port numbers in the Device Manager, as shown in ***Figure 4*** below.

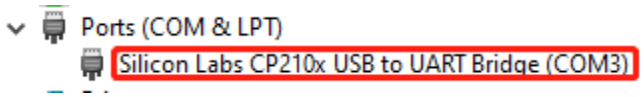


Figure 4: USB Ports

Step 5: Install the QCOM tool provided by Quectel. The COM Port Setting interface of QCOM is shown in ***Figure 5*** below.

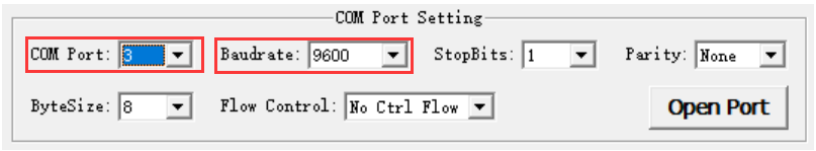


Figure 5: COM Port Setting Interface of QCOM

Step 6: Select the correct "**COM Port**" (USB Port shown in ***Figure 4*** above).

Step 7: Set the correct "**Baudrate**" (default value: 9600 bps). For more details on QCOM usage, see ***document [1]***.

5 Using PowerGPS Tool to Test

This chapter explains how to use the PowerGPS tool for checking the status of GNSS receivers, when you are working with the EVB.

Find the PowerGPS tool on the USB flash drive in the EVB Kit, or request it from your local FAE.

5.1. COM Port and Baud Rate Setting

Step 1: Assemble the EVB accessories.

Step 2: Flip the power switch (S201) to ON position to power on the EVB.

Step 3: Start the PowerGPS (*PowerGPS Trial 2.3.5* is used as an illustration in this document) and select a correct COM port and baudrate (the module supports 9600 bps by default) at the bottom of the interface, as shown in the figure below.

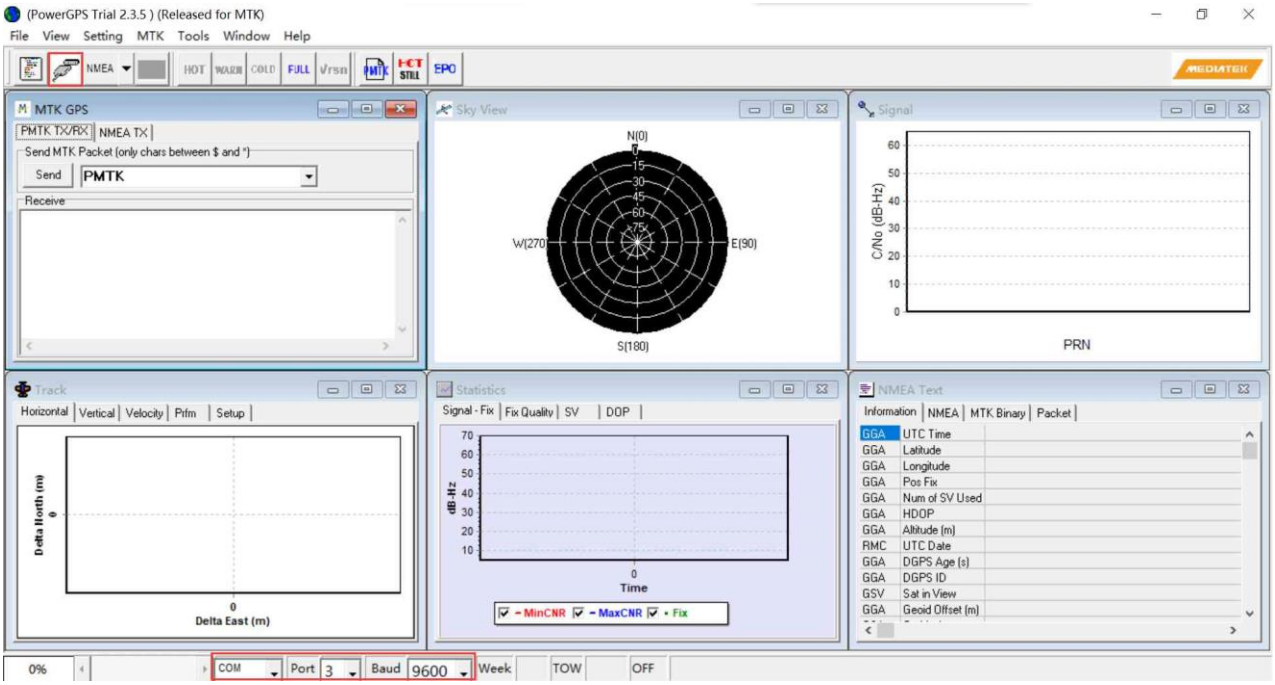


Figure 6: PowerGPS Main Interface (Not Connected)

Step 4: Click the  "**Create Connection**" button. The interface shown in the figure below appears when the module is connected.

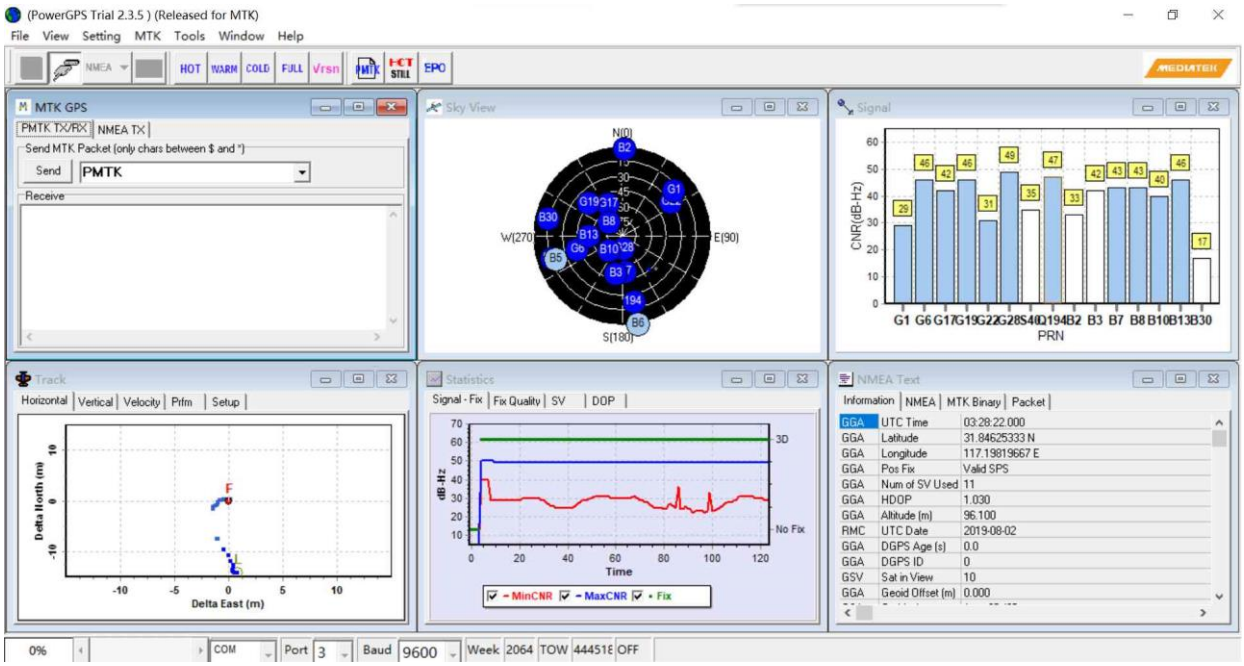


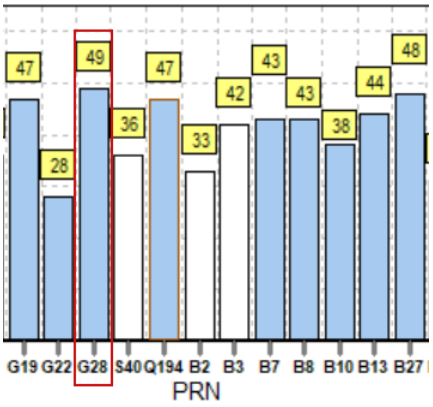
Figure 7: PowerGPS Interface (Connected)

5.1.1. Interface Explained

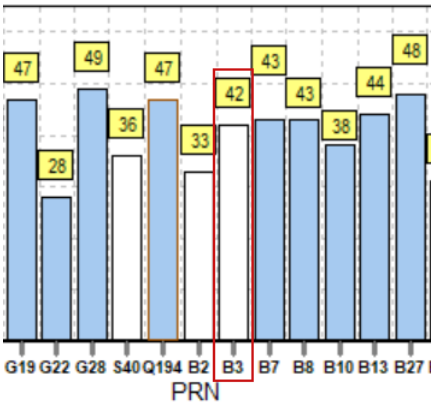
You can view GNSS information, such as CNR message, time, position, speed and precision in the PowerGPS interface. To find out more about these parameters, see the following table.

Table 4: PowerGPS Interface Explained

Icon	Explanation
	• A satellite vehicle (SV) with PRN 65. If the SV is positioned near the center of the Sky View, the SV elevation angle is close to 90°. • Dark Blue means that this satellite is being tracked.
	• Light blue means that this satellite is not being tracked.



- PRN G28 carrier-to-noise ratio (CNR) is 49 dB/Hz.
- G stands for a GPS satellite, B for a BeiDou satellite, and S for an SBAS satellite.
- Light blue column means that the navigation data of the satellite is in use.



- PRN B3 CNR is 42 dB/Hz.
- White column indicates that the navigation data of this satellite is not in use.

UTC Time	08:57:29.000
Latitude	31.84628000 N
Longitude	117.19882833 E
Pos Fix	Valid DGPS
Num of SV Used	13
HDOP	0.810
Altitude (m)	58.500
UTC Date	2017-10-26

- UTC time
- Latitude degree
- Longitude degree
- Position fix
- The number of satellites being used
- Horizontal dilution of precision
- Altitude based on WGS84 datum
- UTC date

Fixing Mode	3D
SV in Used	G24 Q193 G18 G20
PDOP	0.810
VDOP	2.000
Speed (m/s)	0.000

- Fixing mode: No-fix, 3D or 2D SPS
- Satellite being used
- Position dilution of precision
- Vertical dilution of precision
- Receiver speed

5.2. PMTK Command Sending

The PowerGPS supports sending PMTK commands to control the module as shown in the figure below, The PMTK command format includes only characters between '$' and '*', for example: **PMTK869,0**. The checksum will be calculated and added automatically to complete the full NMEA format message.

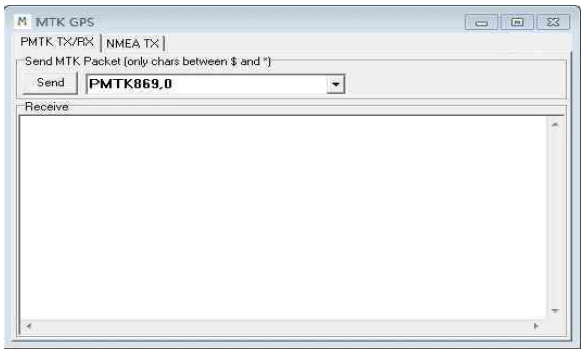


Figure 8: PMTK Command Sending via PowerGPS

5.3. Automatic TTFF Testing

The PowerGPS tool allows users to measure TTFF (Time to First Fix) under the following testing conditions:

- Full cold start,
- Cold start,
- Warm start, or
- Hot start.

Select the number of tests from 1, 10, 20, 100, 1000 and 10000. Click the "**Run**" button to start the test. Click the "**Stop**" button to stop the test.

PowerGPS configuration steps for TTFF testing:

Step 1: When running a TTFF test, these options need to be unchecked else it will affect the TTFF results. These options include "System time aiding", "Reference location aiding", "EPO aiding", "Q BD EPO aiding".

Click "**Setting**" menu to open the "**Options**" window and select "**AGPS Agent**". Then you need to disable these options as shown in the figure below. Finally click "**OK**".

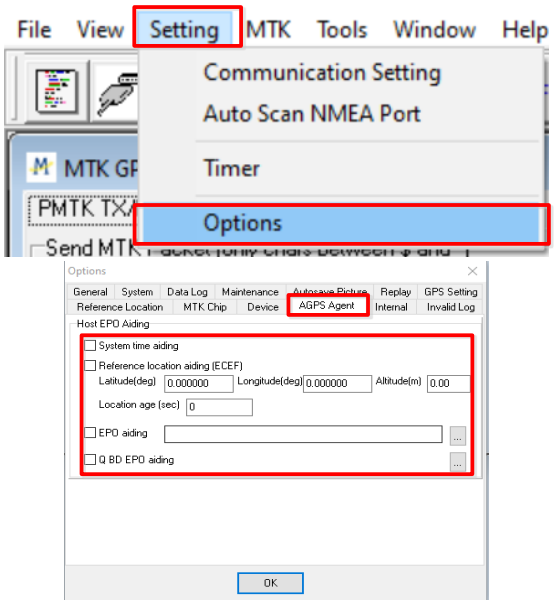


Figure 9: Disable These Options

Step 2: Click "**MTK**" menu and click "**Static TTFF Testing**" to enter "**Automatic TTFF Testing**" as shown in the figure below.

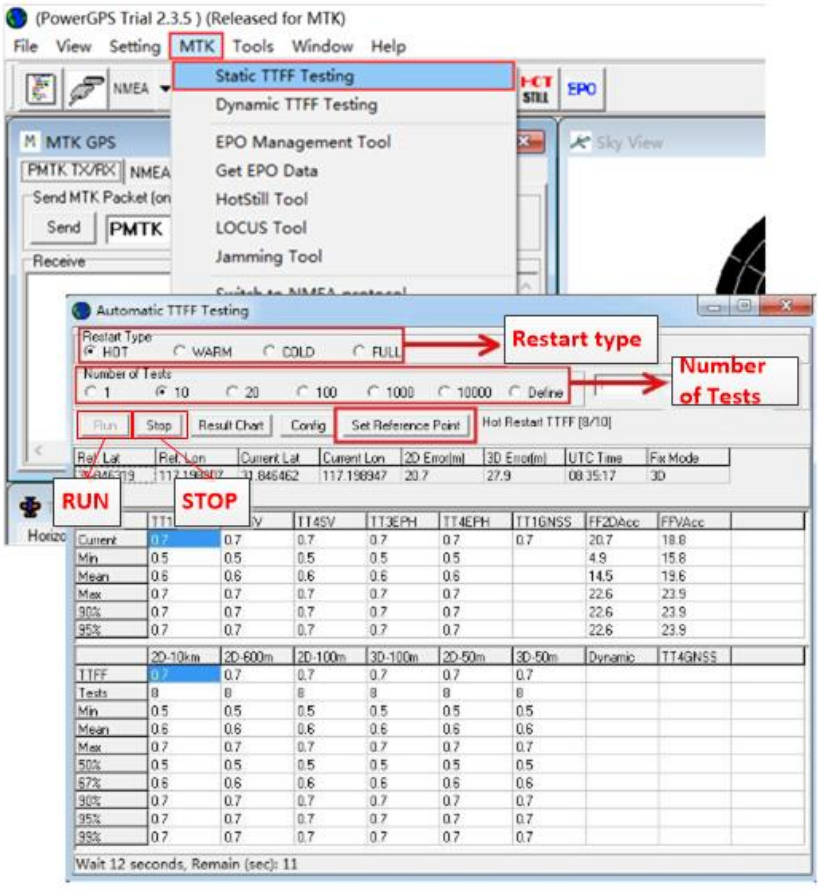


Figure 10: Static TTFF Testing via PowerGPS

Step 3: Click "**Set Reference Point**" to open the "**Options**" window as shown in the figure below and select "**Reference Location**" tab.

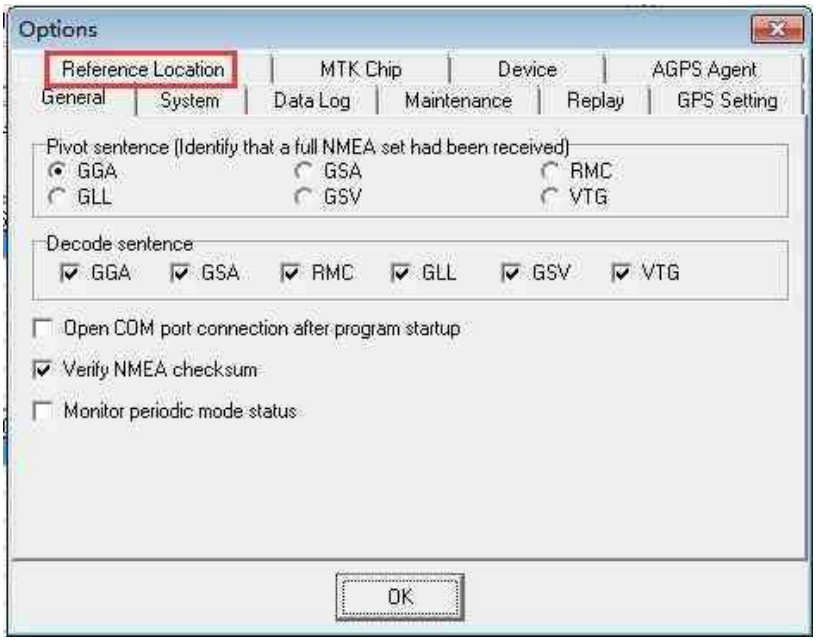


Figure 11: Select Reference Location

Step 4: Click on the "**Use Mean Position**" button as shown in the figure below, and click "**OK**".

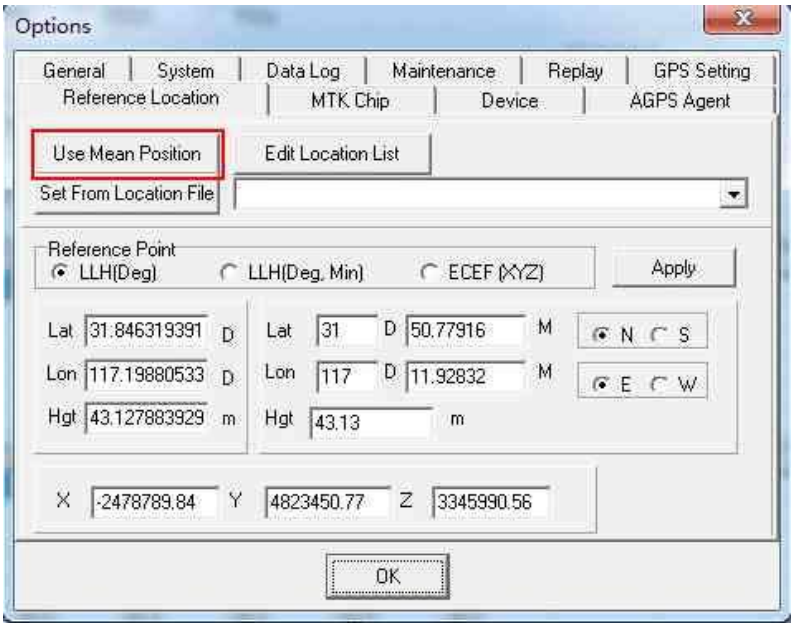


Figure 12: Click Use Mean Position

Step 5: Return to the "**Automatic TTFF Testing**" interface shown in the figure below and click "**Config**" to get to TTFF configuration interface.

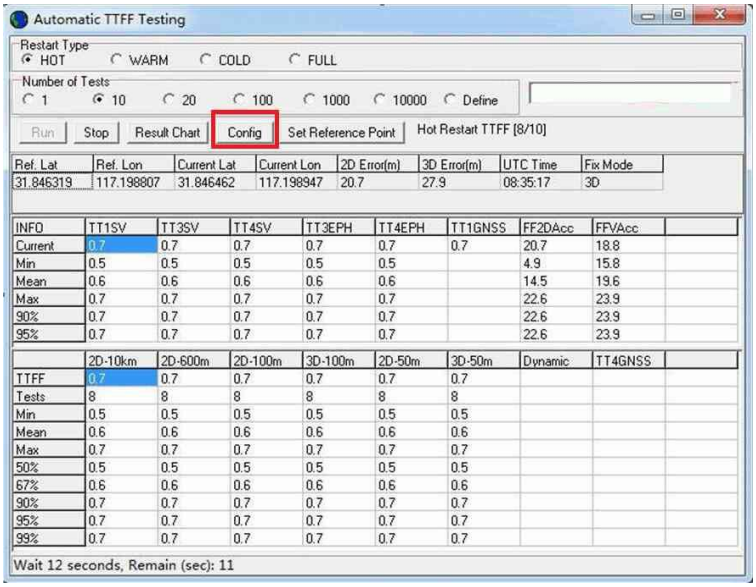


Figure 13: Click Configuration

Step 6: Set the "**TTFF Time- out (sec)**" as shown in the figure below and click "**OK**". If you select hot start, it is recommended to set the "**TTFF Time-out (sec)**" to 10 s. If you select warm start, you can set the "**TTFF Time-out (sec)**" to 50 s. Lastly, if you select cold start, you can set the "**TTFF Time-out (sec)**" to 100 s. "**TTFF Time-out (sec)**" can help you to assess TTFF and save time.

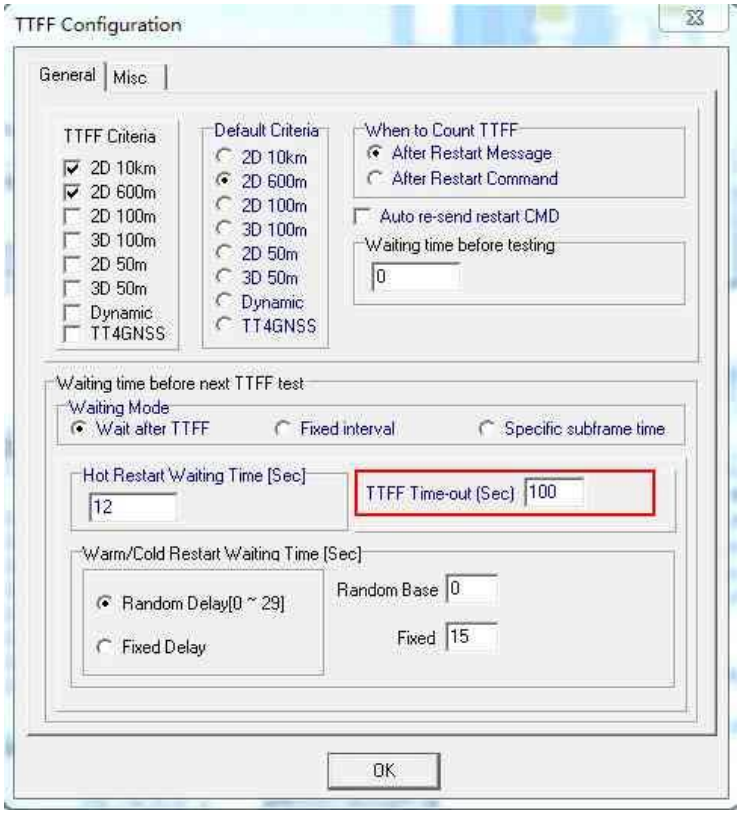


Figure 14: Set TTFF Time-out (Sec)

Step 7: Click on the "**Run**" button to start the test. **OR**
Click on the "**Stop**" button to stop the test.

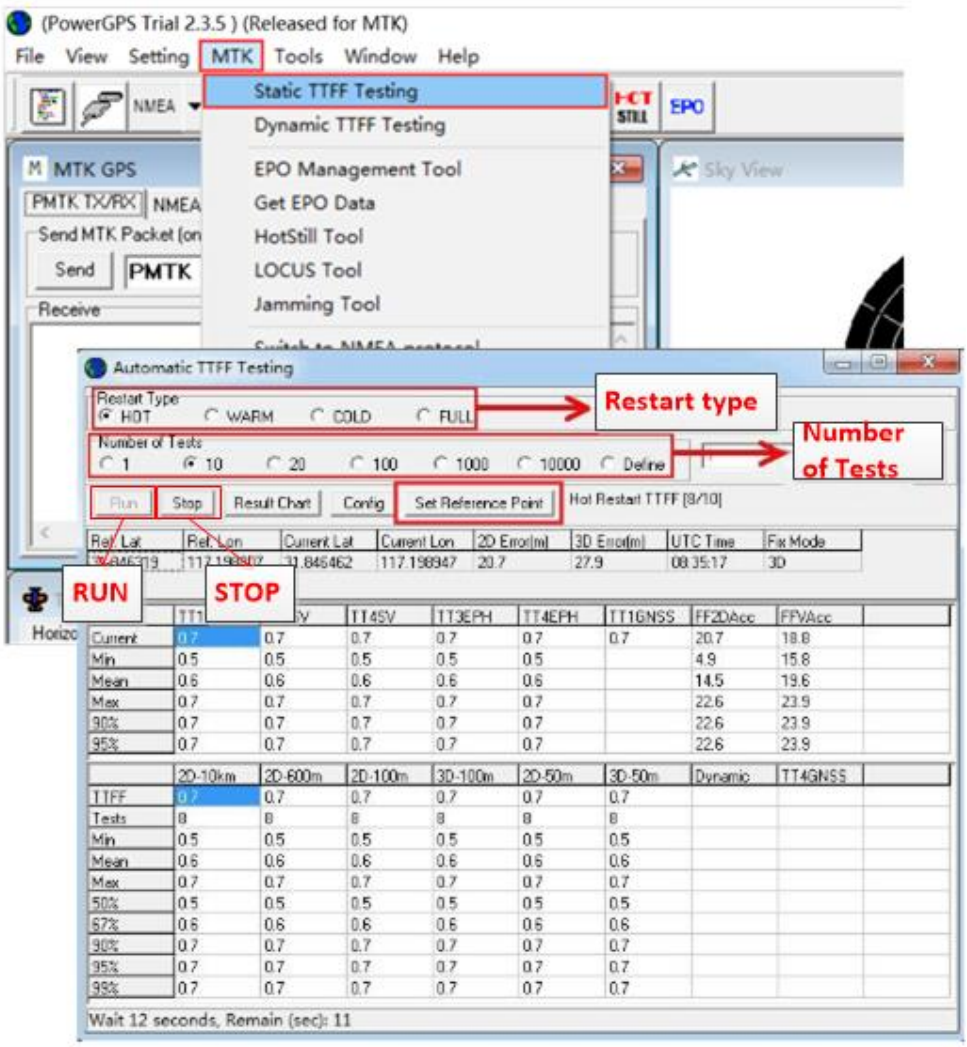


Figure 15: Click Run/Stop Button

Step 8: View the test results displayed visually in charts. The test results are stored in the directory where the tool is installed.

6 Firmware upgrade

Quectel LG77L module upgrades firmware via UART interface.

Find the MTK Flash Tool in the USB flash drive in the EVB Kit, or request it from your local FAE.

Before you start the upgrade process:

First: Connect the EVB to a PC with a Micro-USB cable.

Second: Flip the power switch (S201) to ON position to power on the EVB.

Firmware upgrade steps:

Step 1: Select the "**Settings**", click "**COM port**", and select the port of LG77L EVB USB as shown in the figure below.

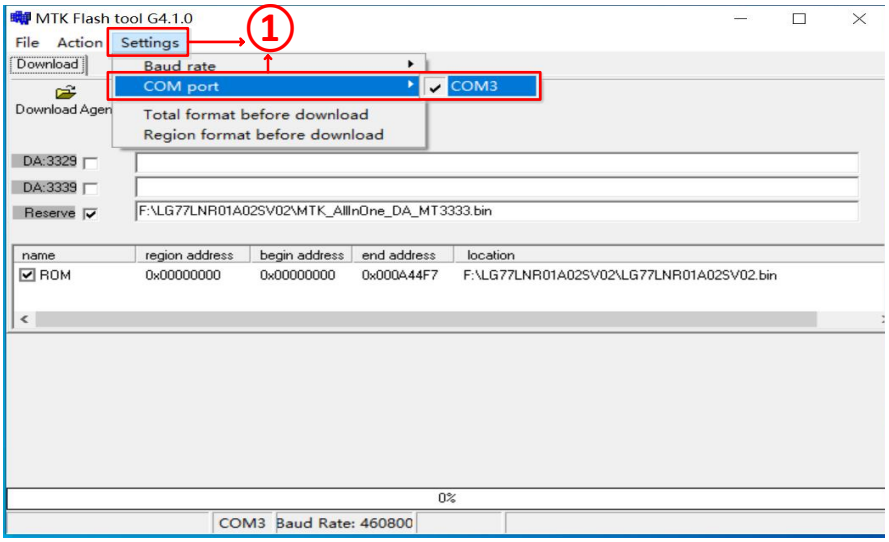


Figure 16: Firmware Upgrade – Step 1

Step 2: Select the "**Settings**", click "**Baud rate**" and select "**460800**" as shown in the figure below.

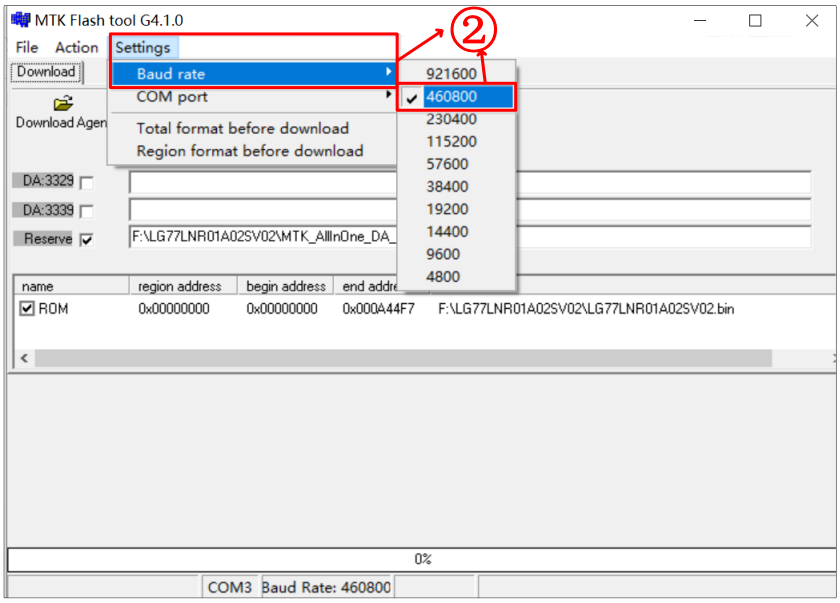


Figure 17: Firmware Upgrade – Step 2

Step 3: Left double-click "**ROM**" and select firmware, e.g. "**LG77LNR01A02SV02.bin**" as shown in the figure below.

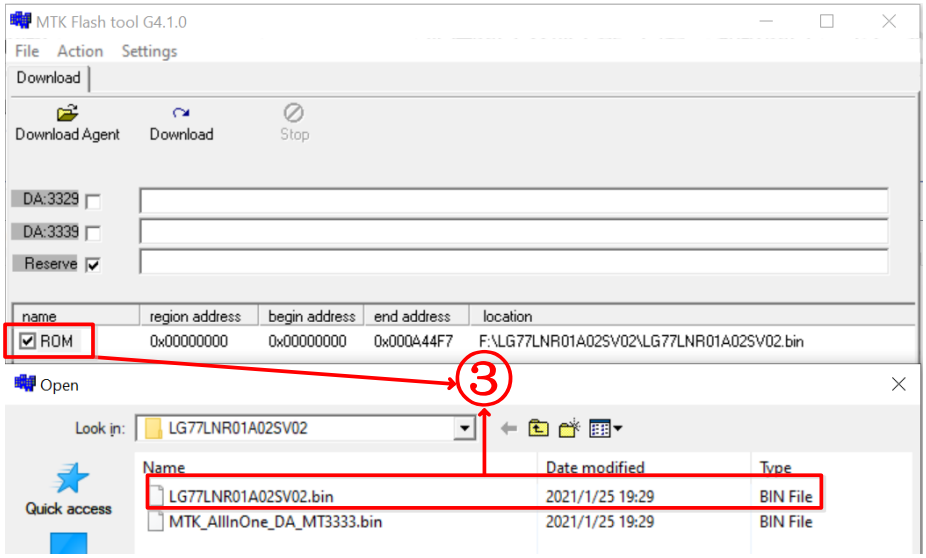


Figure 18: Firmware Upgrade – Step 3

Step 4: Click on the "**Download Agent**" button and select "**MTK_AllInOne_DA_MT3333.bin**" as shown in the figure below.

Step 5: Click the "**Download**" button to upgrade the firmware.

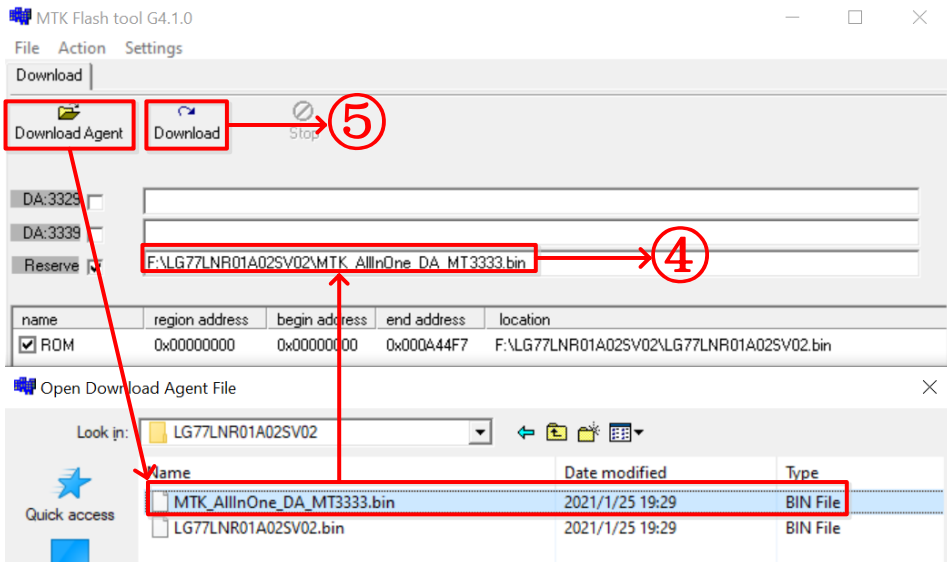


Figure 19: Firmware Upgrade – Step 4 and 5

Step 6: Click the "**Go!**" button to confirm as shown in the figure below.

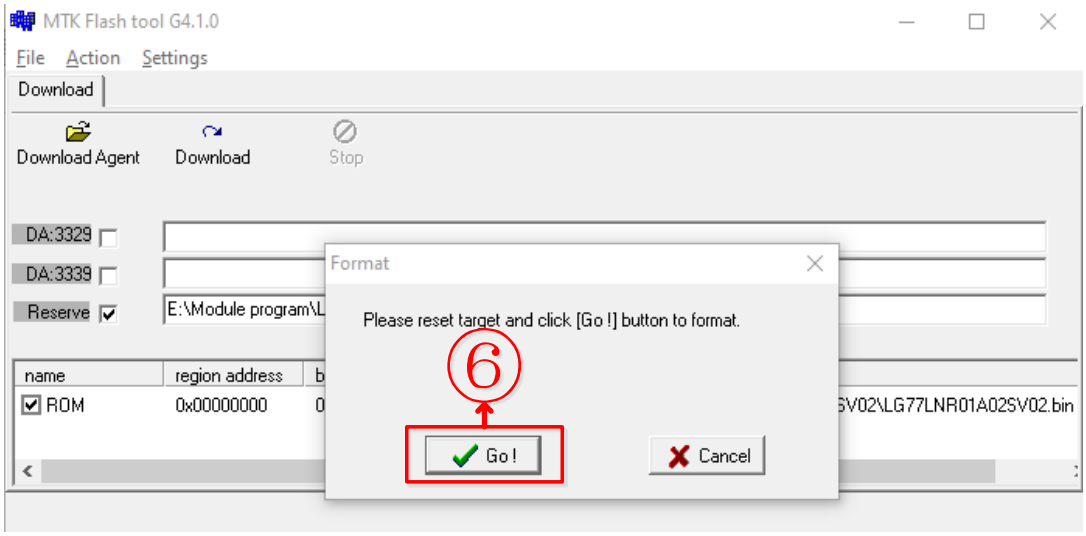


Figure 20: Firmware Upgrade – Step 6

Step 7: When the firmware upgrade is successful, the progress bar will indicate 100% and there will be a green circle on the screen. MTK Flash Tool appears as in the figure below.

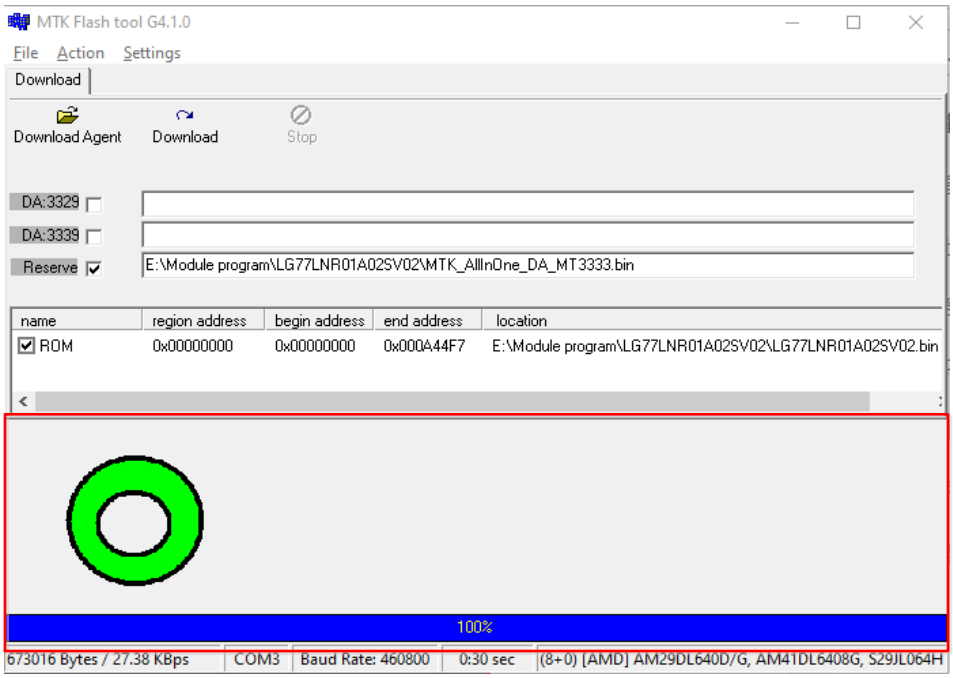


Figure 21: Successful Firmware Upgrade

7 Appendix A Reference

Table 5: Related Document

SN	Document Name	Description
[1]	Quectel_QCOM_User_Guide	QCOM User Guide

Table 6: Terms and Abbreviations

Abbreviation	Description
2D	2 Dimension
3D	3 Dimension
BeiDou	BeiDou Navigation Satellite System
COM Port	Communication Port
CNR	Carrier-to-Noise Ratio
DI	Digital Input
DO	Digital Output
ESD	Electrostatic Discharge
EVB	Evaluation Board
GND	Ground
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
I/O	Input/Output
LED	Light Emitting Diode

LNA	Low-Noise Amplifier
Micro-USB	Micro Universal Serial Bus
NMEA	NMEA (National Marine Electronics Association) 0183 Interface Standard
PC	Personal Computer
PI	Power Input
PMTK	MTK Proprietary Protocol
PO	Power Output
PPS	Pulse Per Second
PRN	Pseudorandom Noise
RXD	Receive Data (Pin)
SBAS	Satellite-Based Augmentation System
SPS	Standard Positioning Service
SV	Satellite Vehicle
TTFF	Time to First Fix
TXD	Transmit Data (Pin)
USB	Universal Serial Bus
UTC	Coordinated Universal Time
WGS84	World Geodetic System 1984