RTK-M100 User's Manual

Document history

Version	Date	Updates
1.0	May 31, 2020	Creation.

Contents

1. Introduction

RTK-M100 system product is dual-frequency multi-constellation RTK devices, Embedded NXP® i.MX 6 (Automotive Grade) high-end processor and provides centimeter-accurate GNSS measurements. All of them can work in base station or rover. There are two communication interfaces, including Ethernet, 4G/LTE. Through these built-in communication functions for local or could data center communication with the external host.

RTK-M100 system have not only 64M bytes on-board flash memory for saving up to 7 days of RTK position data, but also a micro SD interface to log RTK position data and GNSS raw data for post processing. In addition, light weight and low power consumption make RTK-M100 product series easy to use.

2. Feature

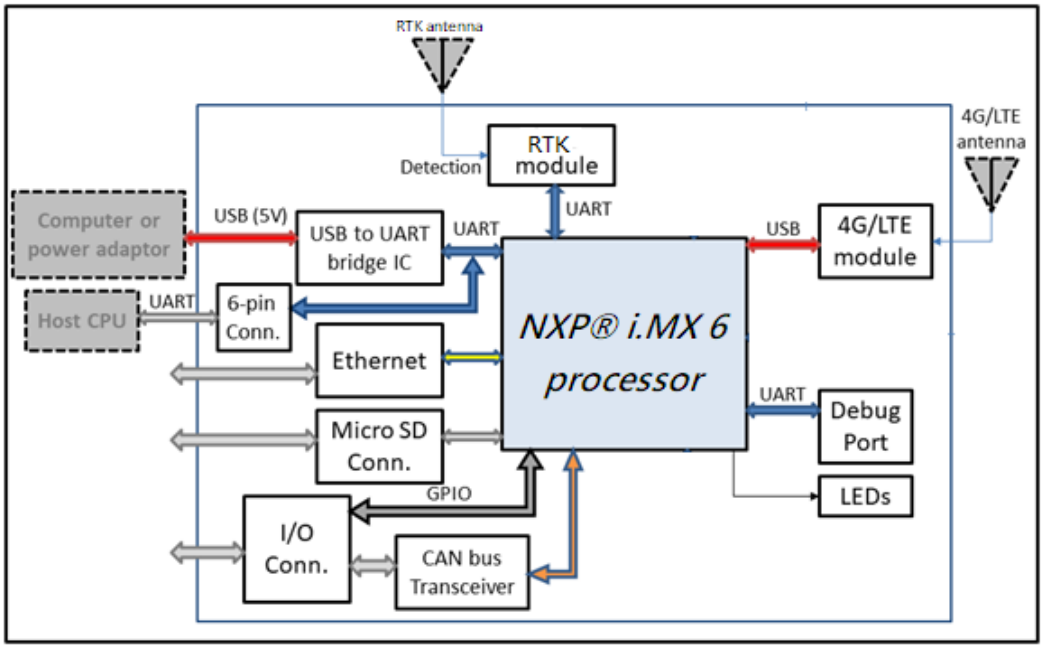
- Embedded NXP® i.MX 6 (Automotive Grade) processor.
- LOCOSYS Centimeter-accurate RTK module.
- LOCOSYS RTK algorithm.
- Support Multi-frequency and Multi-constellation.
  (GPS, BEIDOU, GLONASS, QZSS)
- Up to 5Hz RTK position.
- Up to 2Hz simultaneous RTK position.
- Built-in RJ-45 Ethernet function.
- Built-in 3G/4G-LTE modem.
- Built-in NAND flash、LPDDR2、Power management.
- Micro-SD、CAN-Bus interface、Micro-SIM holder.
- Light weight and low power consumption.
- Embedded Linux OS.

3. Application

- Precision agriculture
- Environmental and structural monitoring
- Land survey, 3D mapping and aerial photography
- Base Station or Rover use

4. Hardware description

4.1. Block diagram



4.2. Ethernet connector

The product does not support the hot plug of Ethernet. If Ethernet is going to be used, please insert Ethernet cable before turning on the power of the product.

4.3. Mini USB connector

The product is powered through Mini USB connector. PC's USB port, 5V power bank or 5V/1A adaptor can power the product. Mini USB connector is also used for communication with PC's software tool RTKFox. The optional internal battery of the product is charged through Mini USB connector, too.

4.4. Micro SD connector

The product supports hot plug of micro SD card with FAT32, ex: FAT or NTFS file system. The user can save RTK position data and GNSS raw data to micro SD card for post processing.

4.5. I/O connector

The 8-position I/O connector of the product is compatible with Hirose's DF13 series. The pin description of the connector is in the following.

Pin 1: CANL, CAN Low-Level Voltage I/O.

Pin 2: CANH, CAN High-Level Voltage I/O.

Pin 3: GND, ground.

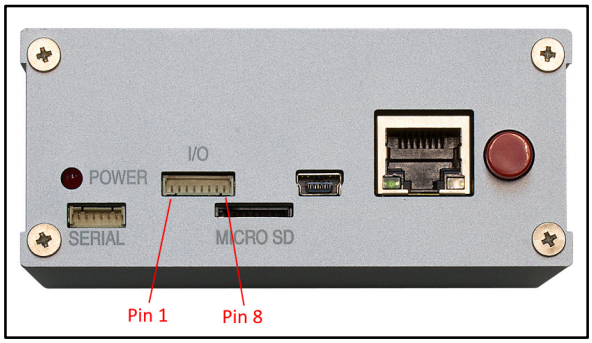
Pin 4: IO_PWR, power input for IO pin 1 ~ 4. Input voltage range is 3.3V~5.5V.

Pin 5: IO_01, general purpose IO pin 1. Logic level is based on the voltage of IO_PWR.

Pin 6: IO_02, general purpose IO pin 2. Logic level is based on the voltage of IO_PWR.

Pin 7: IO_03, general purpose IO pin 3. Logic level is based on the voltage of IO_PWR.

Pin 8: IO_PWM, general purpose IO pin 4.Logic level is based on the voltage of IO_PWR.



4.6. Serial port connector

The external host CPU can communicate with the product through the serial port. The protocol is 115200-8-N-1 (115200 baud, 8 data bits, no parity, 1 stop bit). The 6-position connector of the serial port is compatible with Hirose's DF13 series. The pin description of the connector is in the following.

Pin 1: NC, not connected.

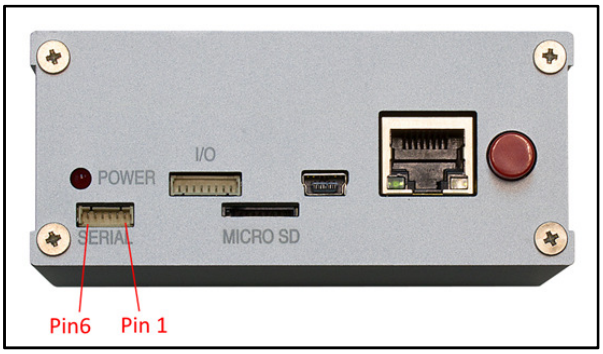
Pin 2: TX, transmit data to the external device. (3.3V)

Pin 3: RX, receive data from the external device. (3.3V)

Pin 4: NC, not connected.

Pin 5: PPS, pulse per second.

Pin 6: GND, ground.



TX and RX signals of the serial port and USB-UART bridge IC connect to the same UART port of the product's internal CPU module. If both serial port and Mini USB connector are connected, the serial port will dominate the communication with the internal CPU module.

4.7. RF connectors of RTK antenna

The product supplies the dedicated 3.3V power to the external GNSS antennas through RF connectors of RTK module. It has built-in antenna short circuit protection. The product can detect RTK antenna connection status. If RTK antenna is not properly connected, green LED will be always on.

4.8. RF connector of 4G/LTE

Connect 4G/LTE antenna before turning on the power of the product. If the product successfully registers to the network of the telecom provider, the yellow LED will blink once every second.

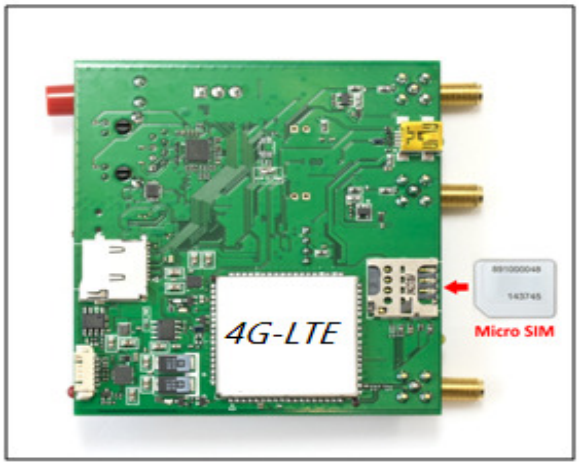
4.9. LED

The product has three LEDs. The colors are red, yellow and green. Detail description is in the following table.

LED	State	Description
Red	Blink (on/off: 500ms)	The product is working.
Yellow	Blink (on/off: 500ms)	Successfully register to the network of the telecom provider through 4G/LTE.
	Blink (on/off:250ms)	Not register to the network of the telecom provider through 4G/LTE
Green	Always on	RTK antenna is not properly connected.
	Blink (on/off:100ms)	Data log function has been enabled, but fails to detect the micro SD card or internal flash memory is full.
	Blink (on/off:300ms)	• Rover mode: RTK fix is not available. • Base station mode: Survey-In is not complete.
	Blink (on/off:500ms)	• Rover mode: RTK fix. • Base station mode: Survey-In is complete.

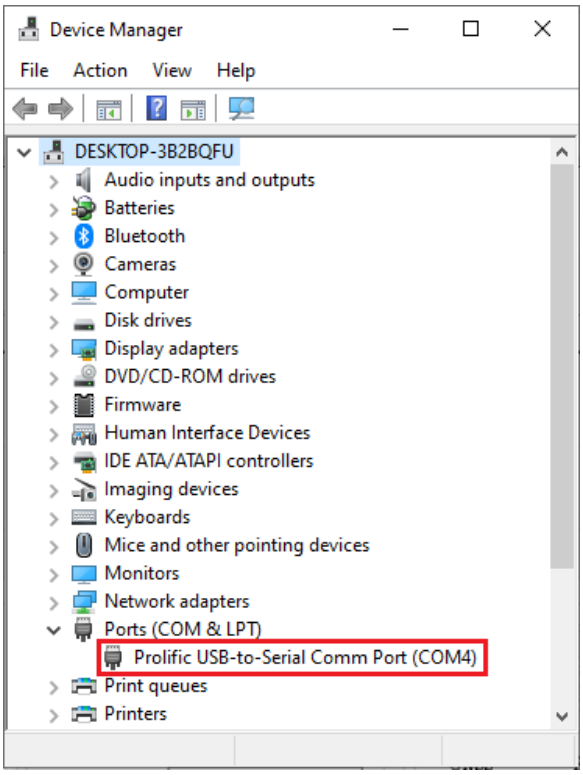
5. Installation of SIM card

First, power off the product and confirm the red LED is off. Then remove 8 screws of the product and pull out the PCB board. The SIM card holder is on the bottom side of the PCB board shown as below picture. Prepare a micro SIM card with no PIN lock, and insert into SIM card holder. Then put PCB board back into the metal box of the product and tighten the screws. Now SIM card is installed.



6. Getting started

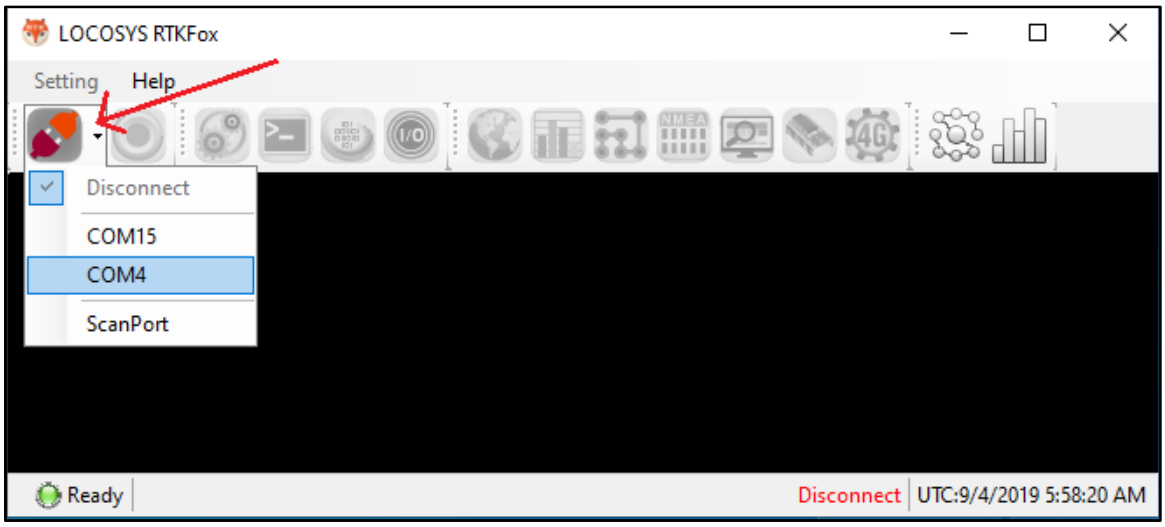
1. Install USB driver for MS Windows. It can be downloaded at http://www.prolific.com.tw/UserFiles/files/PL2303_Prolific_DriverInstaller_v1200.zip.
2. If Ethernet is going to be used, plug in Ethernet cable before power on the product.
3. If 4G/LTE is going to be used, insert a micro SIM card with no PIN lock as described in the section 5. Attach 4G/LTE antenna.
4. Connect Mini USB cable to the product and the computer. A COM port will be enumerated in the Device Manager of MS Windows.



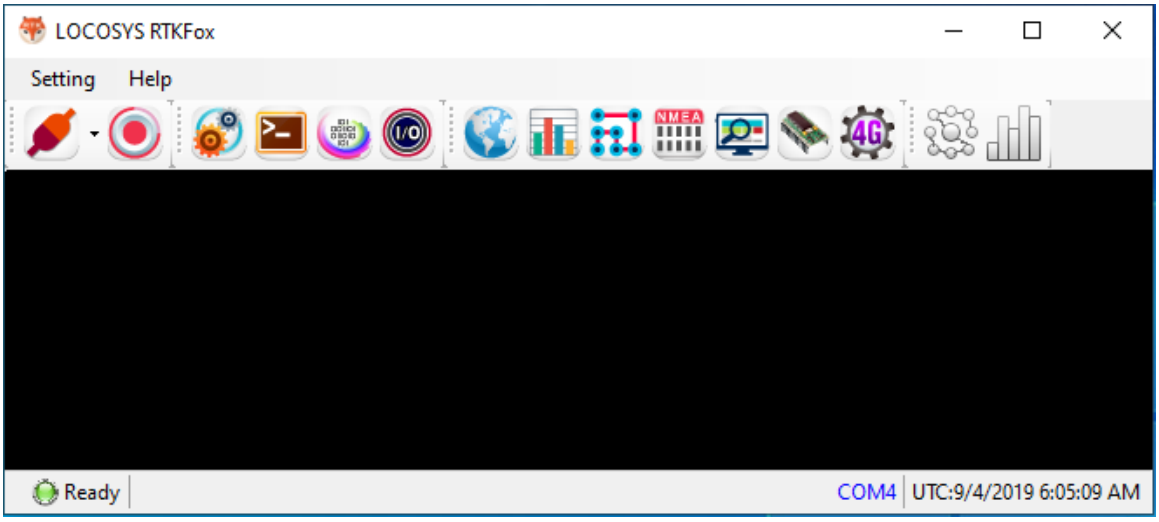
5. Press the red button to power on the product. The red LED of the product will be on immediately. Wait for up to 1 minute until the red LED blinks. The product starts and ready for control.
6. Now you can run PC software tool RTKFox to evaluate the product.

7. Configuration examples

RTK-M100 product series can work in three different modes, including rover, base station and sensor mode. The user can use PC software tool RTKFox to configure. After finishing the steps in section 6, RTKFox starts as below. Select COM port that the product is connected.

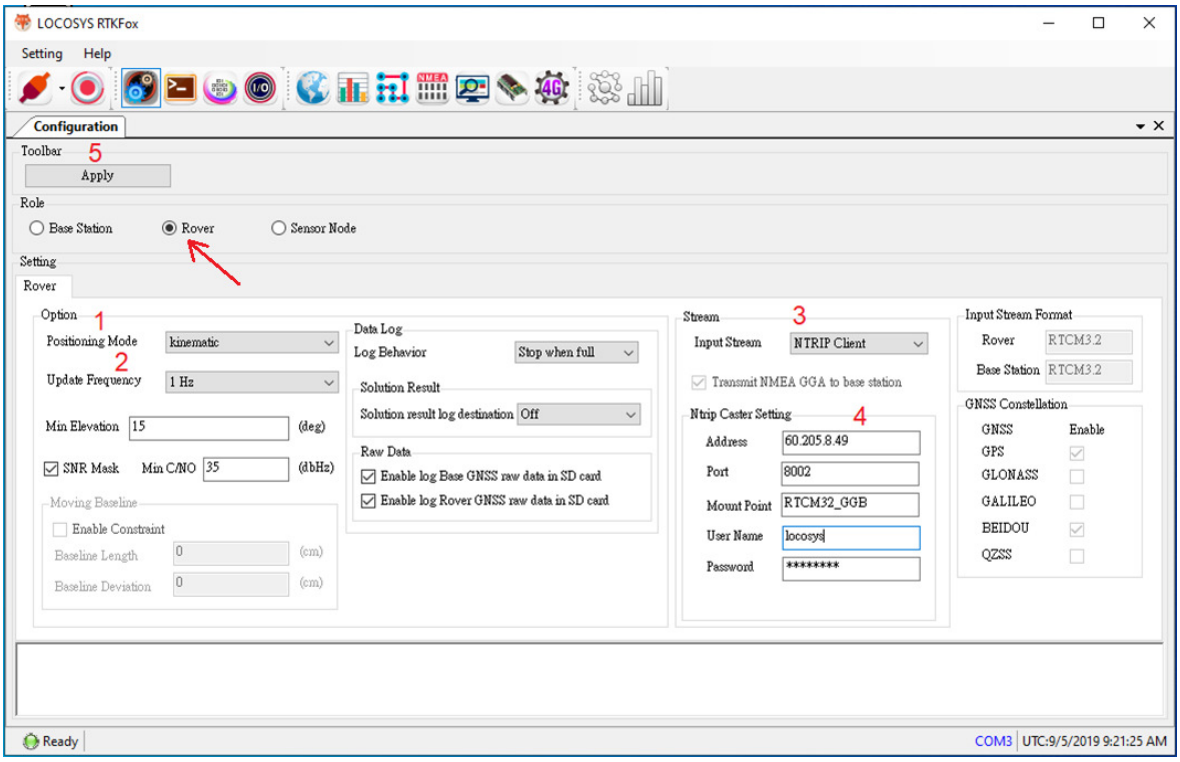


If RTKFox connects to the product successfully, all buttons are enabled as below.

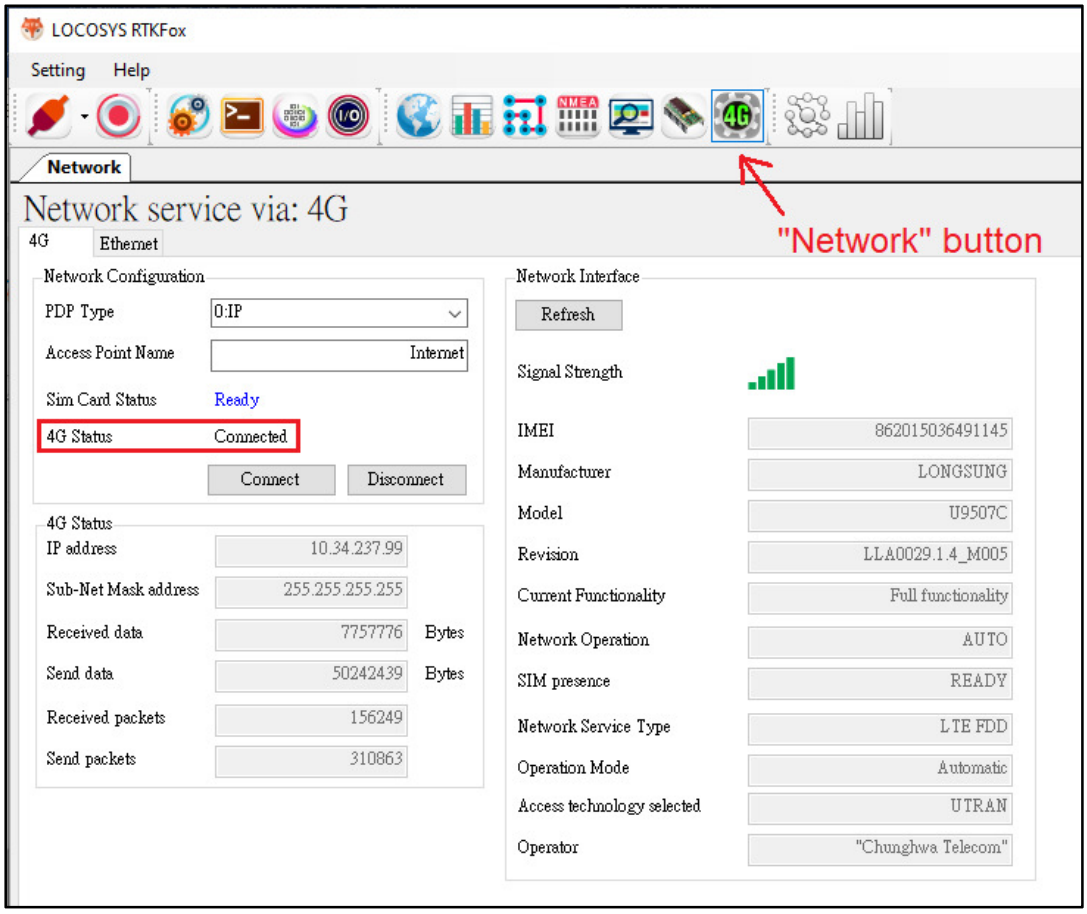


7.1. Configuration example of the rover

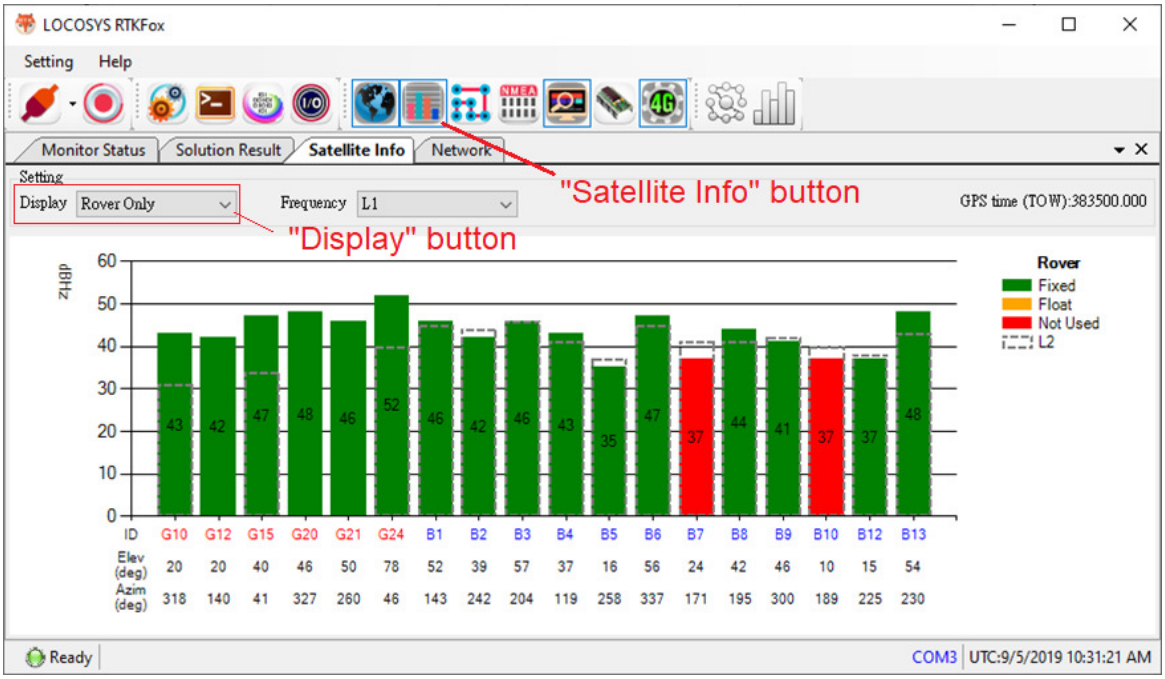
Click the radio button of "Rover" to show the setting page as below picture.



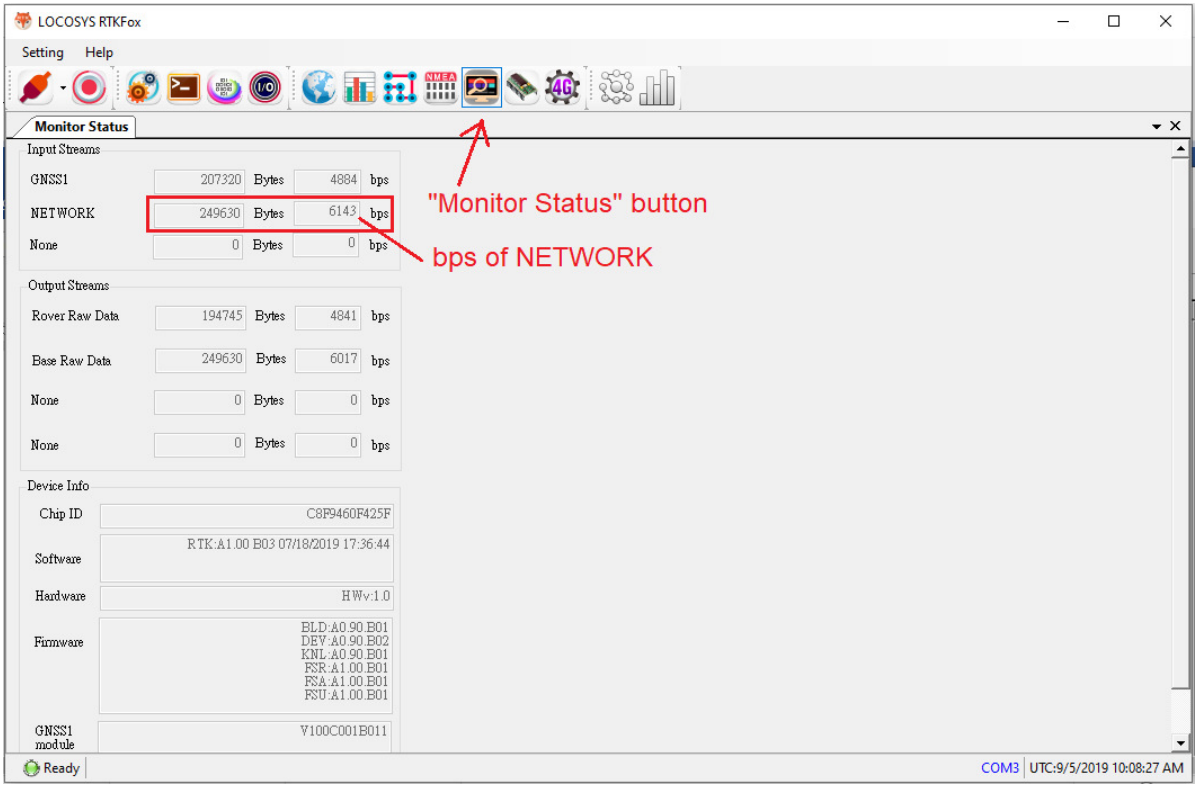
1. Click the selection "Position Mode". There are three options. The option "kinematic" is for RTK position. The option "Moving baseline" is for RTK heading. The option "kinematic + moving baseline" is for simultaneous RTK position and RTK heading.
2. Click the selection of "Update Frequency" to set the update rate of RTK.
3. Input the settings of NTRIP Caster.
4. Click the button "Apply" to take effect. The settings will be saved in the internal flash memory.
5. Check 4G/LTE connection by clicking "Network" button. If the product registers to the network of the telecom provider, it will show "Connected" as below picture.



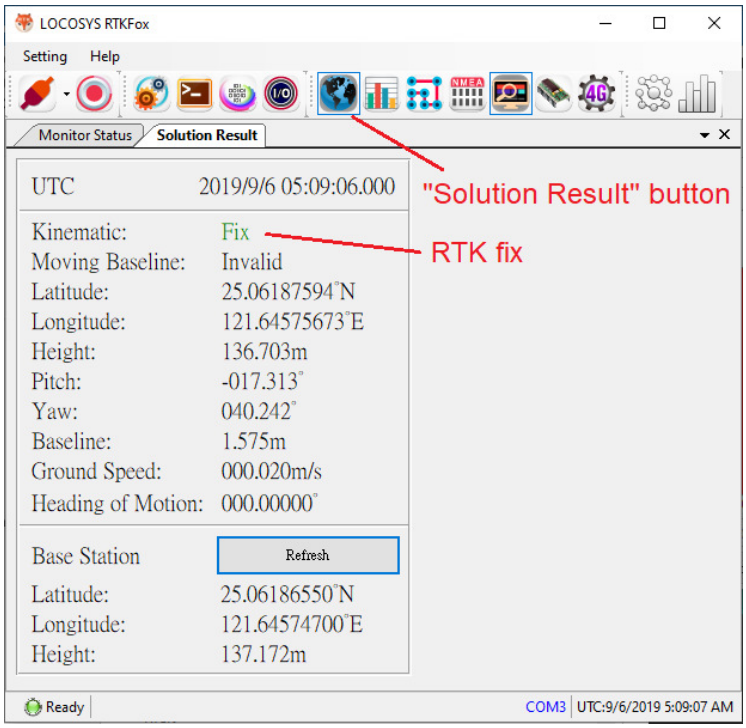
6. Click "Satellite Info" button to check the received GNSS signal strength. Most signals should be higher than 40. If you want to see satellite information from the reference/base station, you can click "Display" button and select "Rover & Base".



7. Click "Monitor Status" button. If "bps of NETWORK" varies, the connection to NTRIP Caster is established and the correction data for RTK is received.

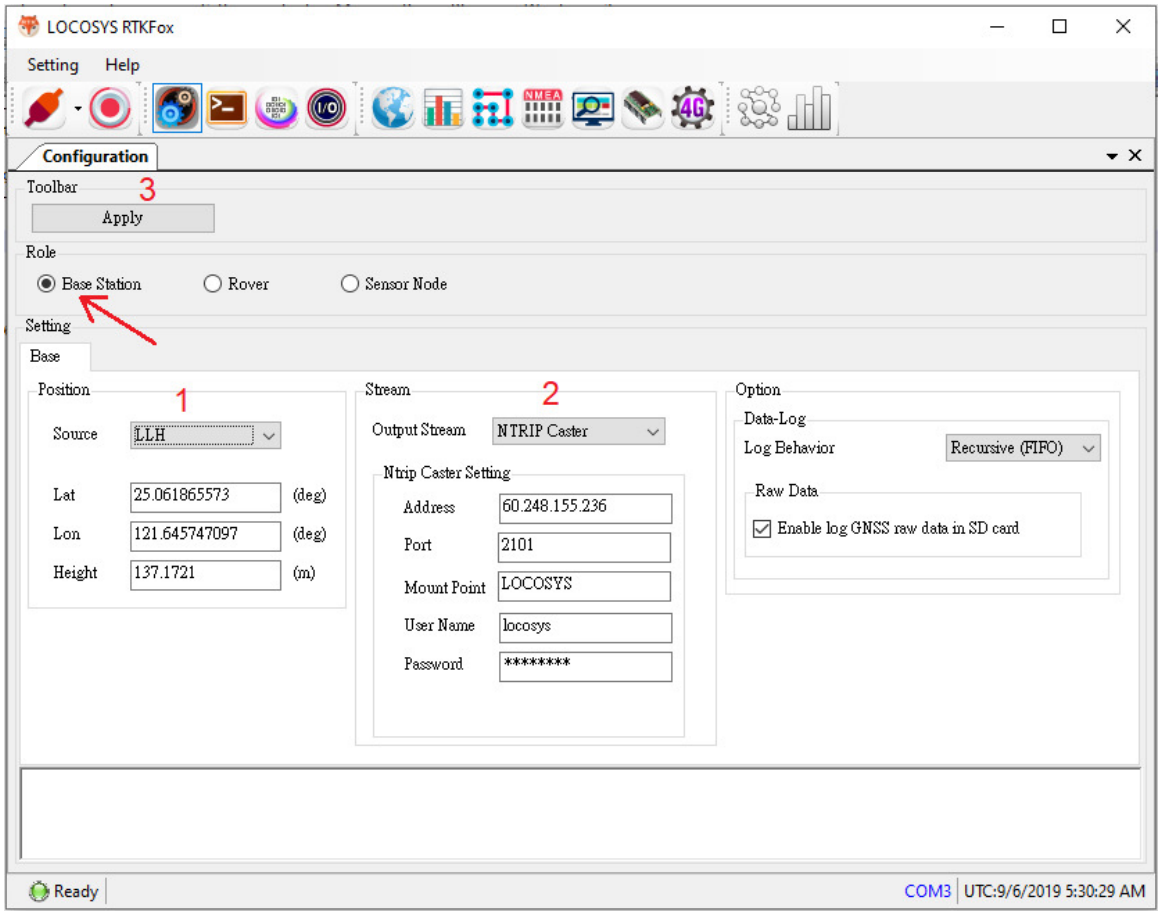


8. Click "Solution Result" button. You can see RTK fix or not and the other information of RTK position.



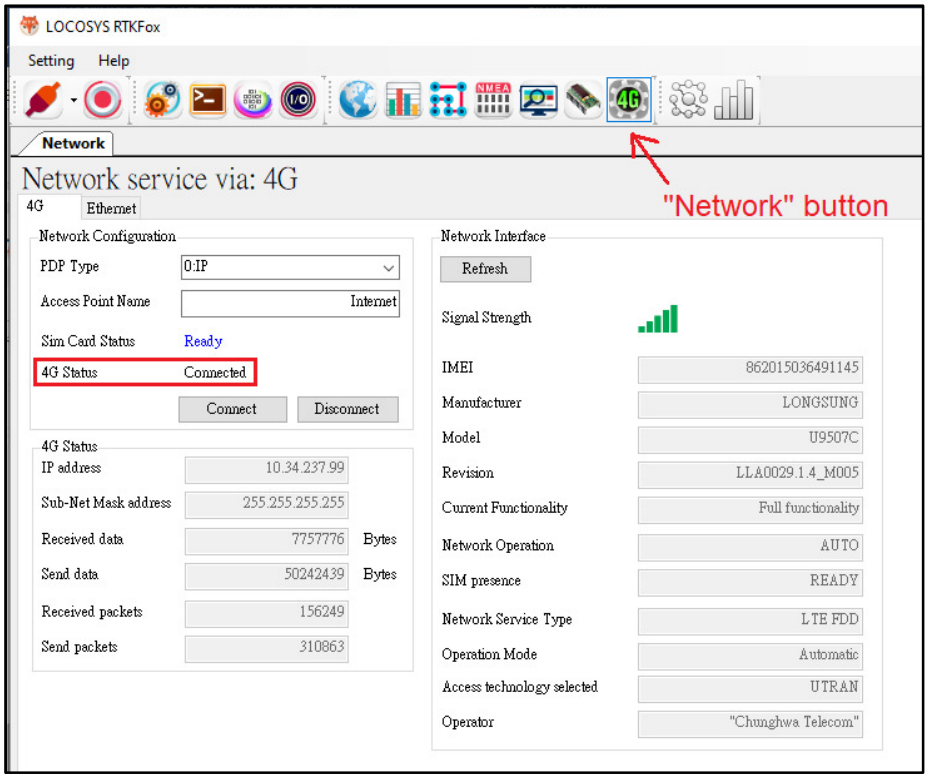
7.2. Configuration example of the base station

Click the radio button of "Base Station" to show the setting page as below picture.

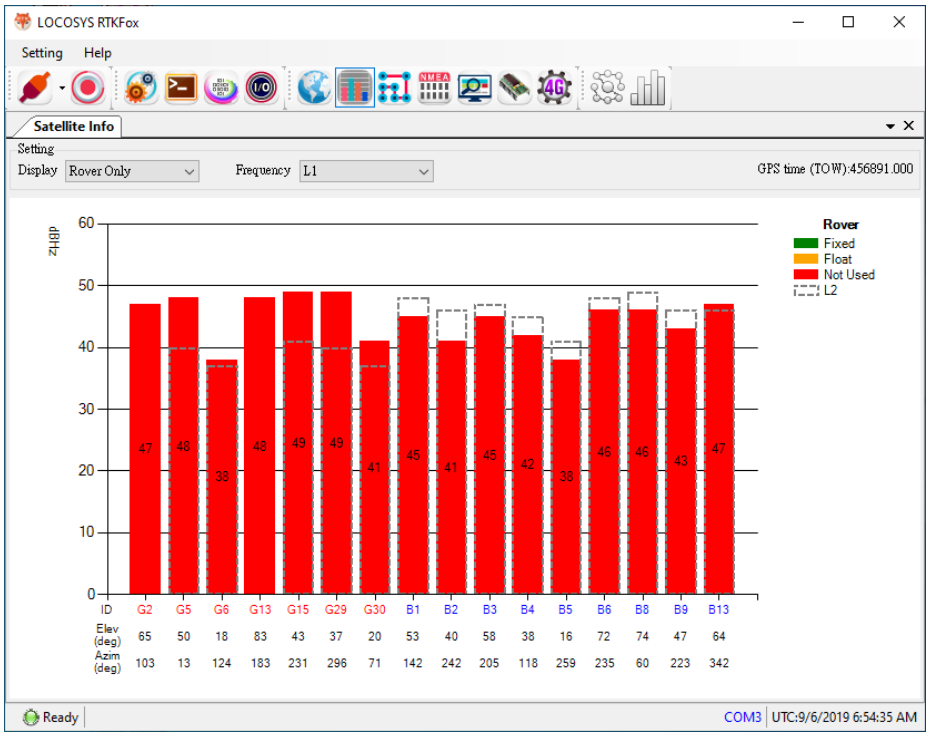


1. If the position of the product is known, select "LLH" and input its latitude, longitude and height. If the position is unknown, select "Survey In" to let the product get its own position that accuracy is 2~5 meters depending on the received GNSS satellite signals.
2. Click the button "Apply" to take effect. The settings will be saved in the internal flash memory.

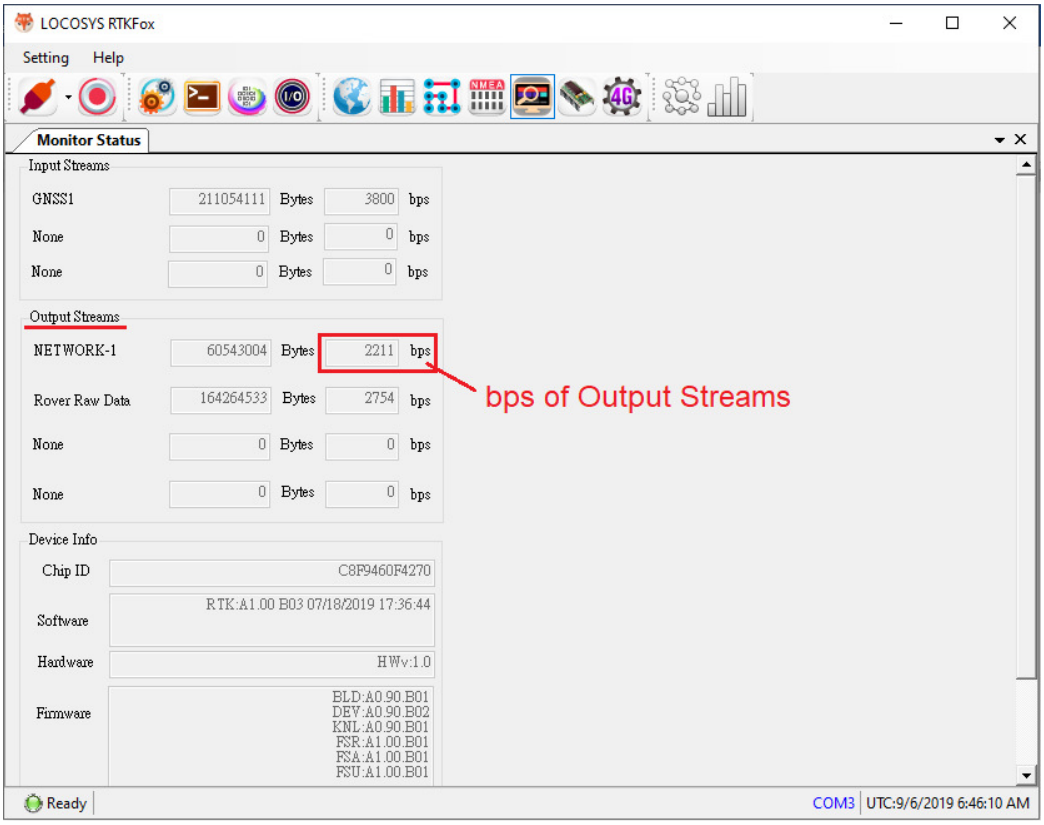
3. Check 4G/LTE connection by clicking "Network" button. If the product registers to the network of the telecom provider, it will show "Connected" as below picture.



4. Click "Satellite Info" button to check the received GNSS signal strength. Most signals should be higher than 40.



5. Click "Monitor Status" button. If "bps of Output Streams" varies, the data is successfully transmitting to NTRIP Caster.



6. The configuration of the base station is done.

8. RTK network

Most countries have Continuously Operating Reference Stations (CORS) operated by the government or enterprises. The standard protocol called NTRIP is adopted to access these RTK differential corrections. RTK-M100 product have 4G/LTE modem and support NTRIP that can access these corrections to achieve centimeter RTK accuracy.