# Version Change History

| Date | Person in charge | Version | Content |
|---|---|---|---|
| 2025-02-07 | Makerbase | V1.00 | Document creation. |
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# MKS Express Manual

## Part1. Product Information

### 1.1 Introduction

MKS Express is a product designed based on VESC Express, featuring functional modules for data logging, GPS connectivity, and wireless communication (WiFi/Bluetooth). Equipped with a built-in micro SD card slot, it allows recording every ride to the SD card. The device supports multiple SD card types, enabling users to replace cards with larger storage capacities without worrying about space limitations.

MKS Express enables wireless debugging, firmware updates, data analysis, and log file access for your VESC motherboard via WiFi or Bluetooth through VESC Tool. Both WiFi and Bluetooth can be configured with personalized names and PIN codes for secure data transmission. The device can operate as a password-protected WiFi access point (AP mode) or connect to an existing WiFi network (station mode).

### 1.2 Features

1. **Black Box Functionality:** Logs ride data to a micro SD card.
2. **WiFi/Bluetooth Support:** Enables wireless debugging, firmware updates, data analysis, and log file access.
3. **External GPS (GNSS) Support:** Compatible with M8030 chipset modules.
4. **Customizable WiFi/Bluetooth Names and PINs.**
5. **Dual WiFi Modes:** AP mode or Station mode.
6. **CAN Interface:** Connects to VESC motherboards via CAN.
7. **Compact Size:** 30x23x10mm (excluding antenna).

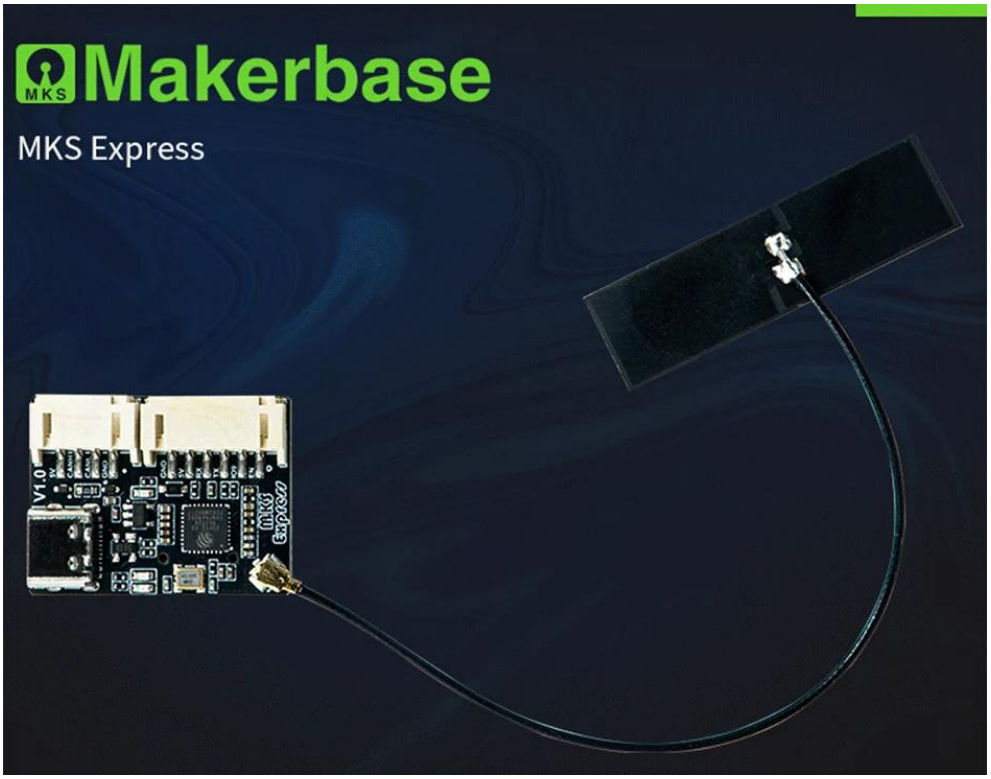
## 1.3 Specifications

| Parameter | Details |
|---|---|
| **Model** | MKS Express V1.0 |
| **Microprocessor** | ESP32 |
| **Input Voltage** | DC 5V |
| **Communication Ports** | USB/CAN/Bluetooth/WiFi/GPS/micro SD |
| **CAN Baud Rate** | 10K/20K/50K/75K/125K/250K/500K/1M |
| **GPS Compatibility** | GPS/GALILEO/GLONASS/BEIDOU/SBAS/QZSS |
| **Dimensions** | 30mm (L) x 23mm (W) x 10mm (H) (excluding antenna) |
| **Firmware Version** | V6.02 (upgradeable) |

# Part 2. Special Notes

## 2.1 Purchasing Modules & Downloading Host Software

1. **MKS Express Purchase Link:**
https://vi.aliexpress.com/item/3256808170742894.html




2. **VESC Motherboards Purchase Link:**
https://makerbase.vi.aliexpress.com/store/1100774442/pages/all-items.html

3. **VESC Tool & Resources Download:**
https://github.com/makerbase-motor

## 2.2 Micro SD Card Requirements

- The SD card **must be formatted to FAT32.**
- **Formatting Instructions:**
  1. Insert the SD card into a reader and connect it to a PC.
  2. Right-click the drive in "My Computer" > Check "Properties" to verify the file system.
  3. If not FAT32, reformat using:
     - For ≤32GB cards: Use Windows built-in formatting tool.
     - For >32GB cards: Use third-party tools like DiskGenius (Download).

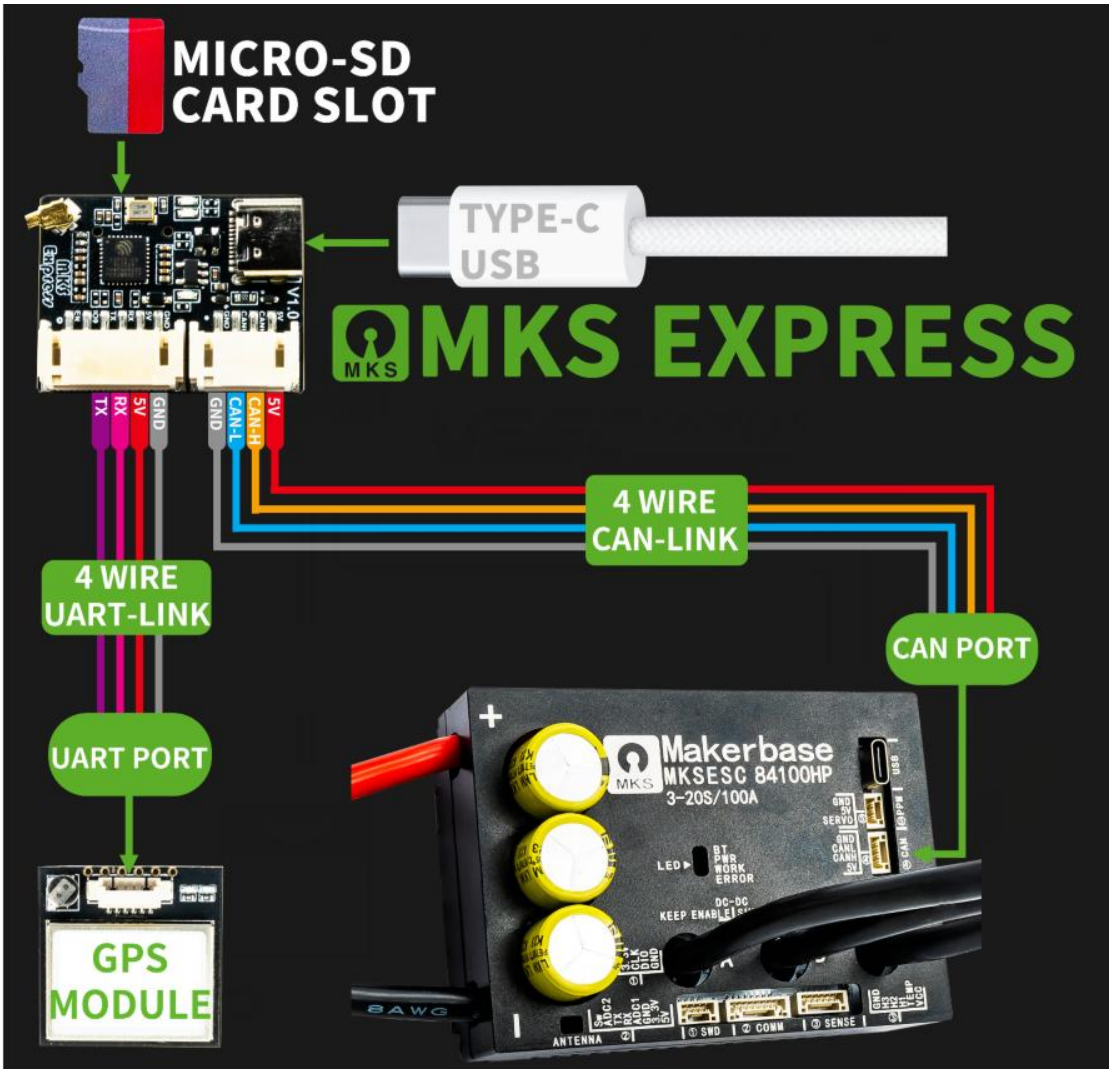
# Part 3. Functional Setup

## 3.1 Wiring & Installation

- **Before connecting the MKS Express module to the VESC, please carefully check the wiring sequence of the VESC and the Express module and choose to use the appropriate wiring!!!**

- **Pin Connections:**

| MKS Express to VESC | MKS Express to GPS Module |
|---|---|
| 5V → 5V | GND → GND |
| CANH → CANH | 5V → 5V |
| CANL → CANL | RX → TX |
| GND → GND | TX → RX |



## 3.2 Install Components

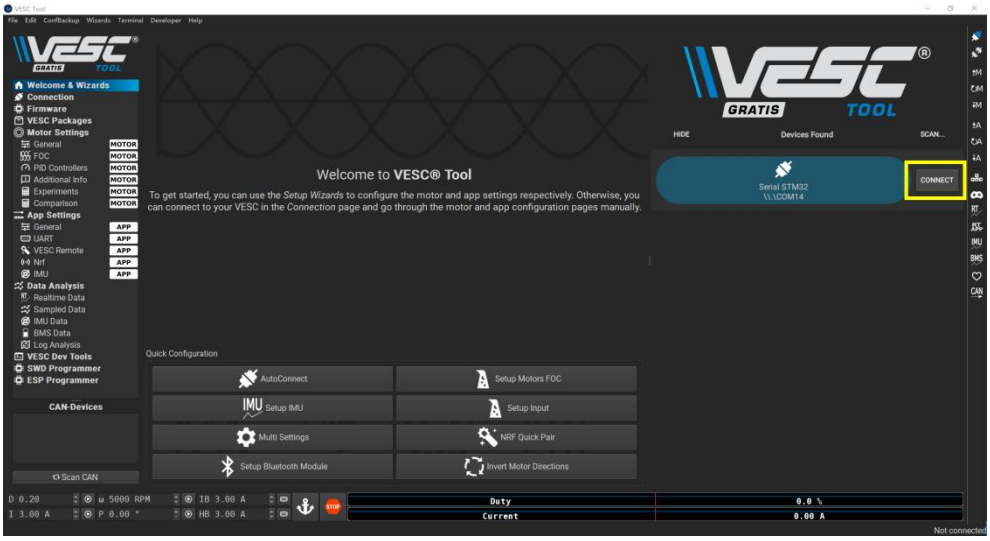
- **Note:**

**① The MKS Express module must have a micro SD card inserted;**

**② The MKS Express module should be connected to the VESC motherboard via the CAN interface;**

**③ Use a USB cable to connect the VESC motherboard to the computer to power the VESC.**

1. Open the VESC TOOL V6.02 upper computer, click "CONNECT", as shown in the following figure:




2. Successfully connected, as shown in the following figure:

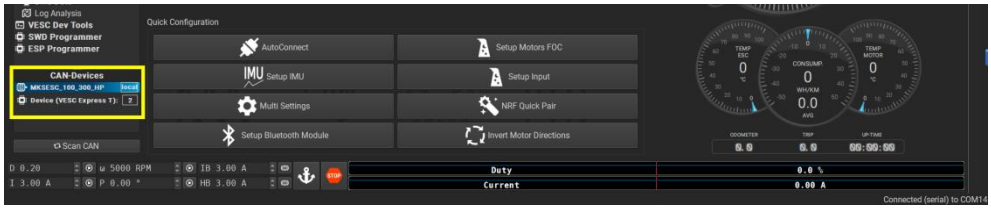
**Note:** If the "Device (VESC Express T)" device is not displayed in the lower left corner, the problem may be:

①The CAN wiring is not connected properly, the line sequence is incorrect, and the 5V power supply is not connected;

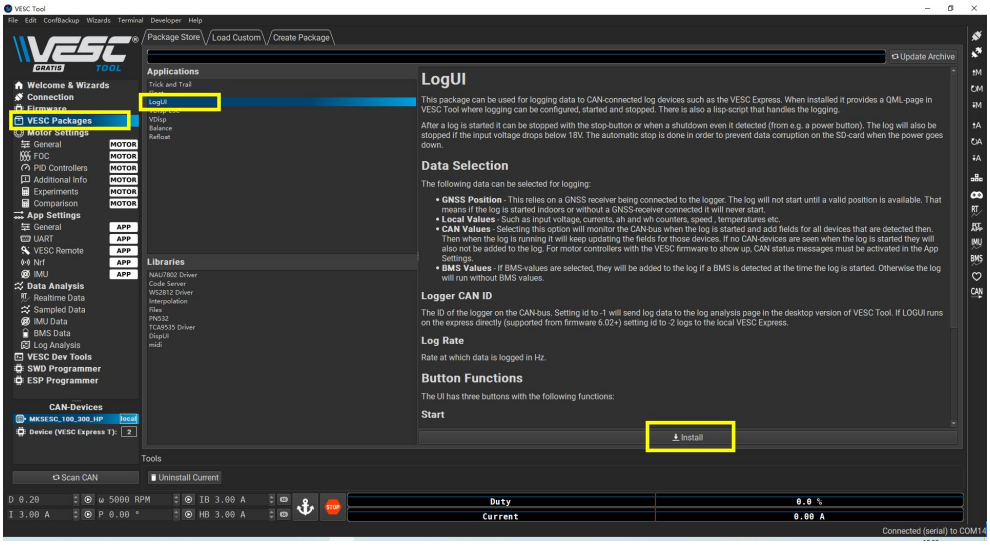
②The CAN baud rate of the VESC motherboard and the MKS Express module does not match, and the default baud rate of MKS Express is 500K;

③The MKS Express module is damaged (this situation is less likely, and the function will be tested before leaving the factory);

④The CAN communication function of the VESC motherboard is damaged (the CAN chip is damaged);

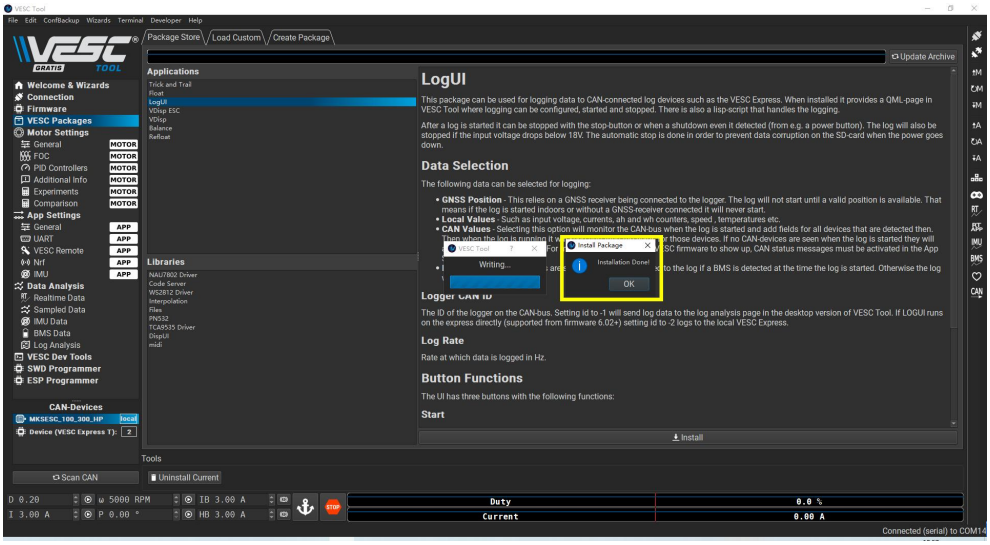


3. Click "VESC Packages" on the left side of VESC TOOL, select "LogUI", and then click "Install" to install the component, as shown in the following figure:

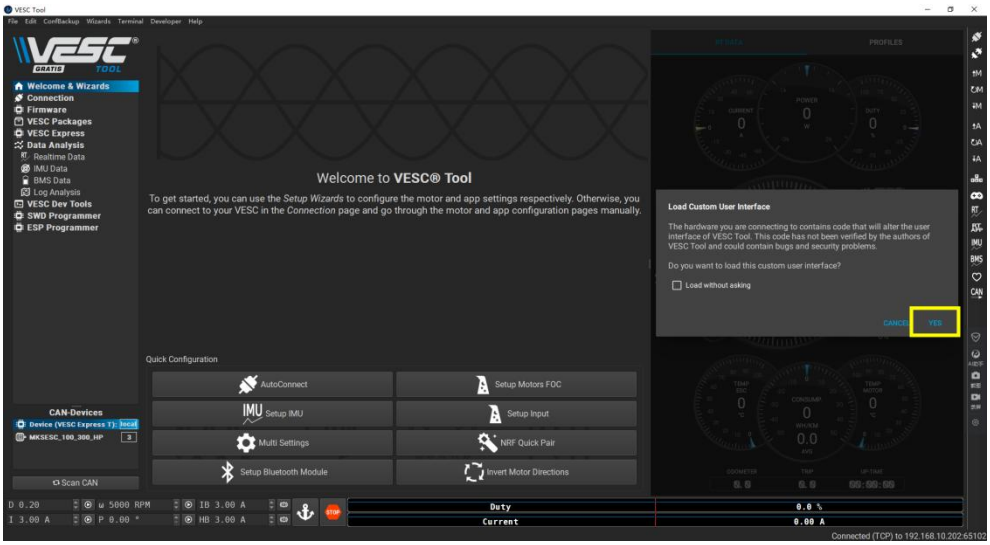



4. Wait for the installation to complete. A prompt will pop up when the installation is complete. Click "OK" to complete the installation, as shown in the following figure:

**Note:** If the installation fails, you need to repeat the installation steps and reopen VESC TOOL after multiple failed attempts.

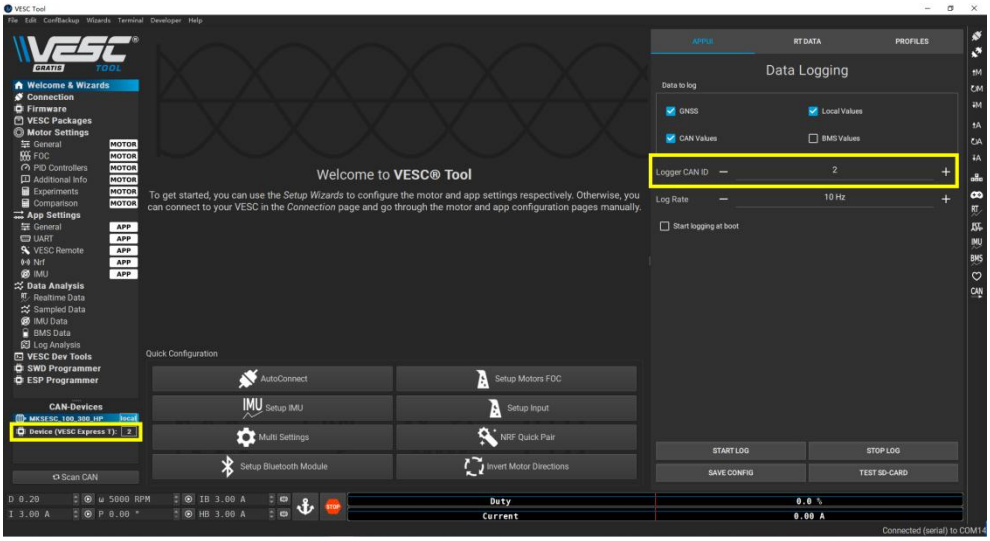


5. Click "Welcome&Wizards" to return to the initial interface. A pop-up window will pop up on the right asking you to load the "LogUI" component. Click "Yes" to load it, as shown in the following figure:

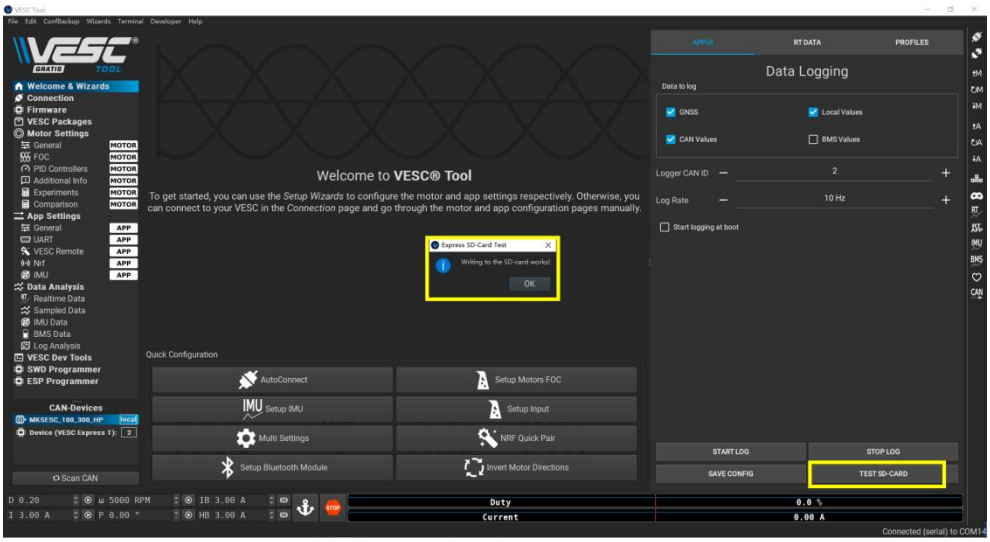


## 3.3 Testing SD Card

1. In the "Logger CAN ID" of the loaded "APPUI" interface, fill in the MKS Express module CAN ID displayed in the "CAN-Devices" in the lower left corner, as shown in the figure below:




2. Click "TEST SD-CARD" and the pop-up window shown below will be displayed (the i character in a blue circle), indicating that the micro SD is ready and data can be read normally.



3. Click "TEST SD-CARD" and a pop-up window (yellow triangle exclamation mark) will appear as shown below, indicating that the micro SD card cannot read information normally. The problem may be:

①The micro SD is not connected properly;

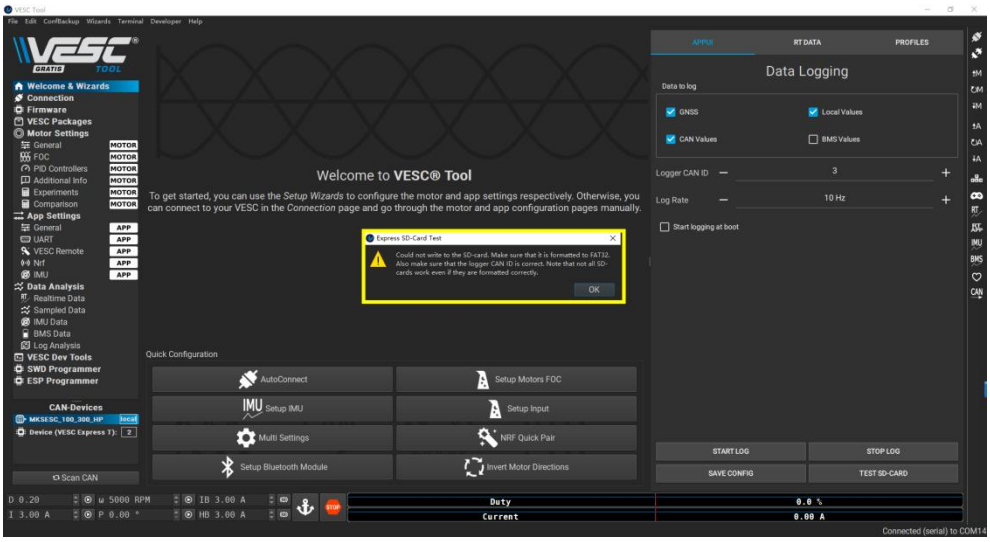
②The micro SD is damaged;

③The micro SD is not compatible with MKS Express (SanDisk white card, red black card, and red gold card have been tested, and 8G-128G are all compatible);

④The module used is not Makerbase's MKS Express;

⑤The "Logger CAN ID" setting is incorrect;

⑥The CAN heartbeat data packet (CAN Messages) of the VESC motherboard is not turned on or sent normally;



## 3.4 Configure and enable logging function

- **Note: GPS module is required.**

### 1) Enable the function

1. In the Welcome "APPUI" interface of the VESC motherboard device, perform the following operations to enable the log recording function:

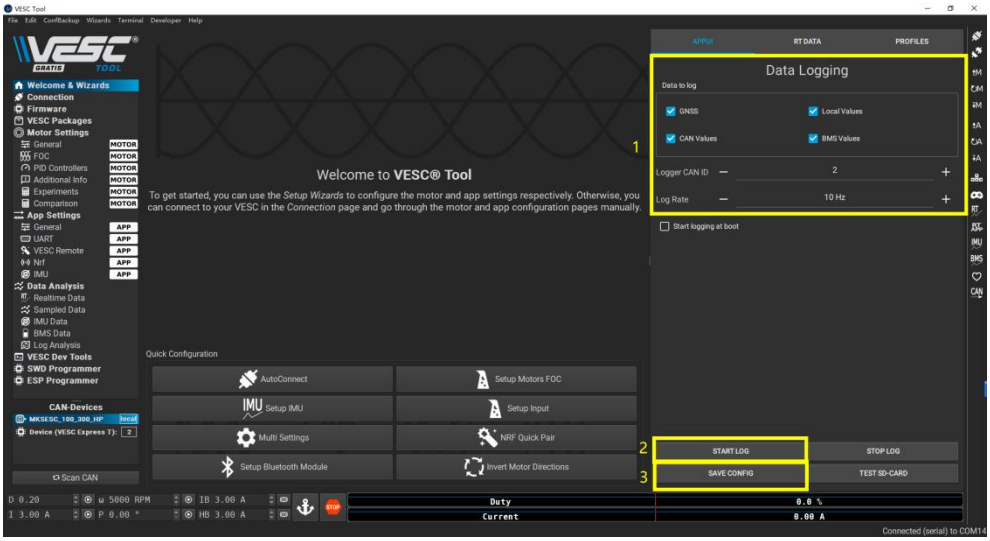
① Check the data you need to record to the micro SD;

② Configure the CAN ID of MKS Express in "Logger CAN ID";

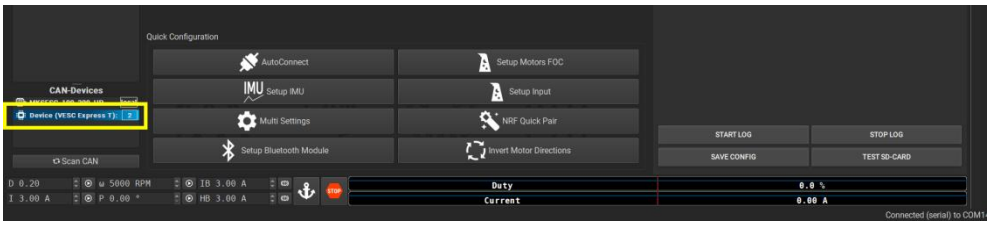
③ Set the frequency of recording data in "Log Rate" (it must not exceed the frequency of CAN messages supported by the VESC motherboard);

④ Click "START LOG" to start recording;

⑤ Click "SAVE CONFIG" to save the configuration, as shown below:




2. In the "CAN-Devices" interface in the lower left corner, click the MKS Express (Device VESC Express T) device, as shown below:

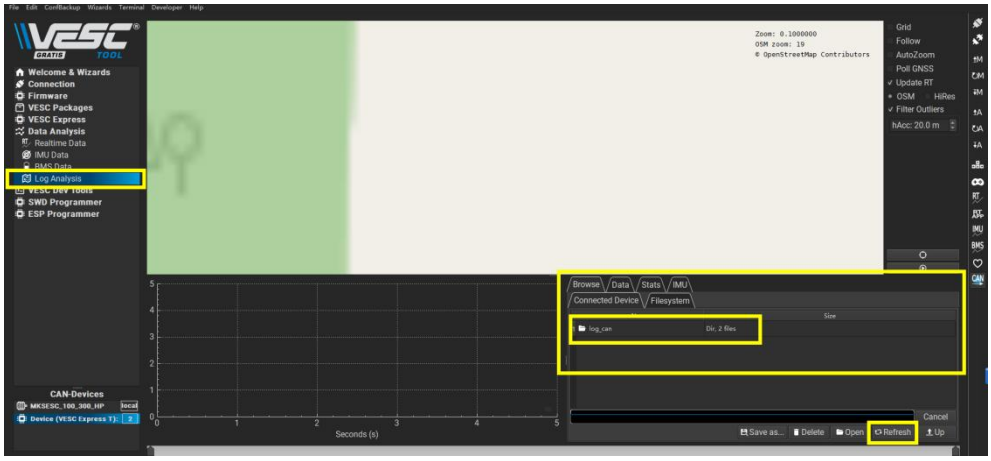


3. Click "Log Analysis" on the left interface, and then click "Refresh" on the right interface. In Browse -> Connected Device, you can see the newly created log file storage folder "Log_can", as shown below:

**Note:** If the newly created folder "Log_can" does not appear on this interface, the problem may be:

① Step (III) SD card test failed;

② The MKS Express module does not have the steps to enable log recording.




4. Double-click the "Log_can" folder and click "date" to see the recorded log files, as shown in the figure below:

**Note:** If there is no log file in date, the problem may be:

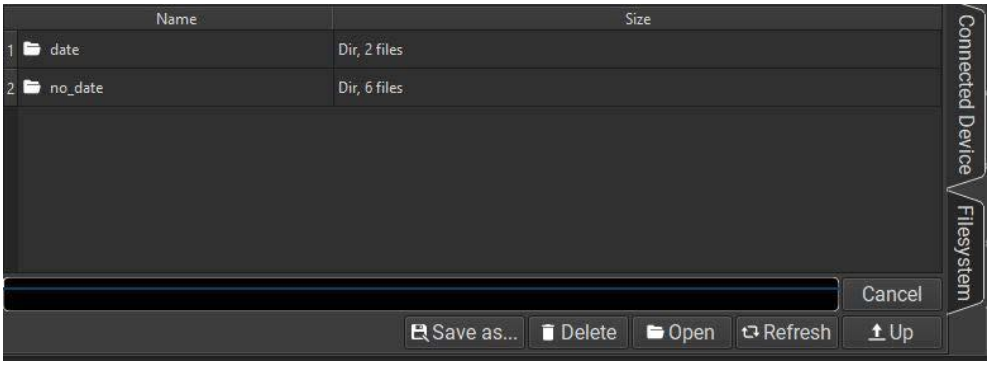
① GPS module is not connected properly;

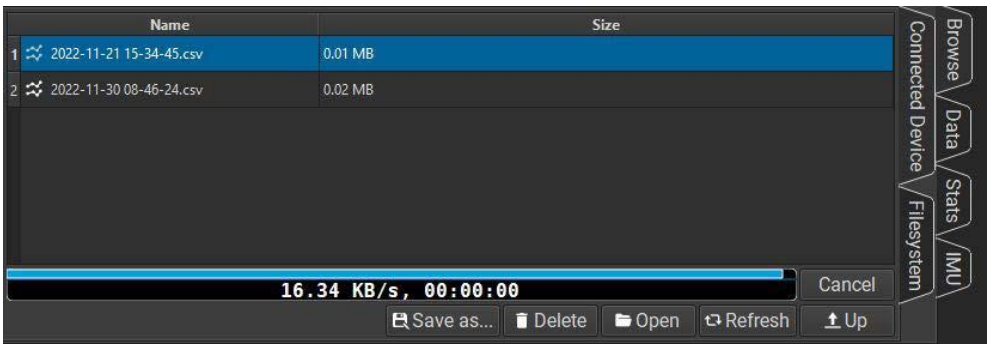
② GPS module is incompatible;

③ GPS module has no data and no travel records;

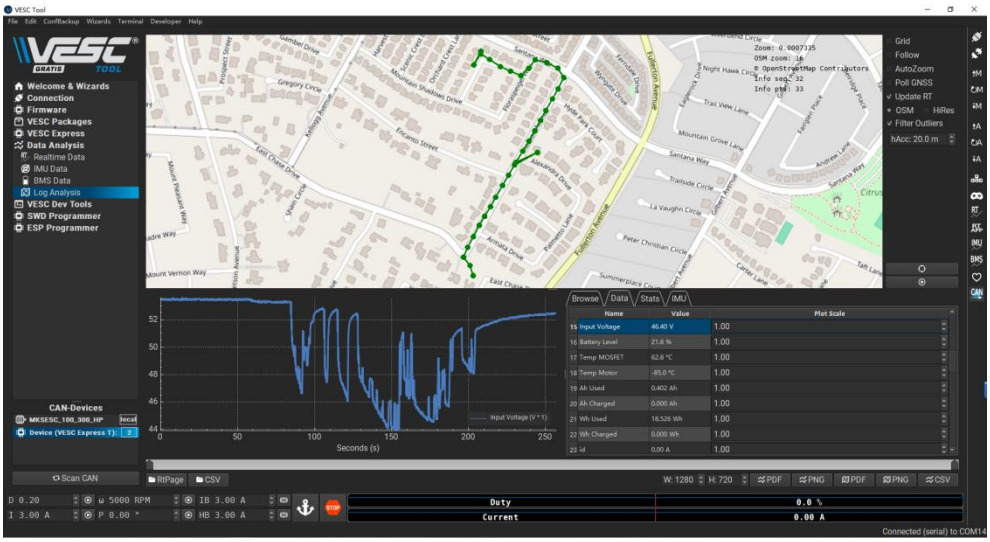
④ Log recording function is not turned on;

⑤ Data to be recorded is not checked;

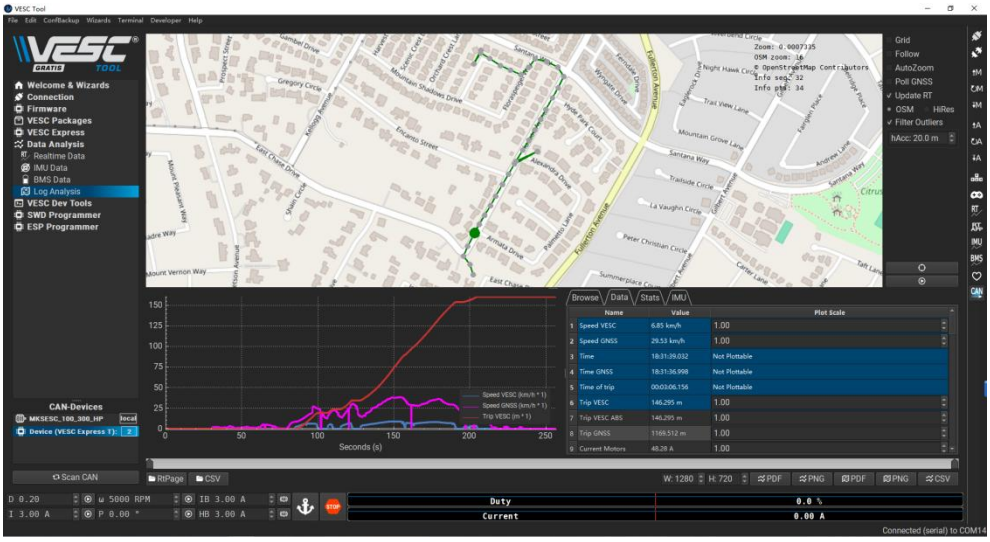


5. After opening the log file, in the "Data" interface, you can click on any recorded data to display it, as shown in the following figure:



6. Click an item, then hold down the "Shift" key and click other data options to select multiple values to display.

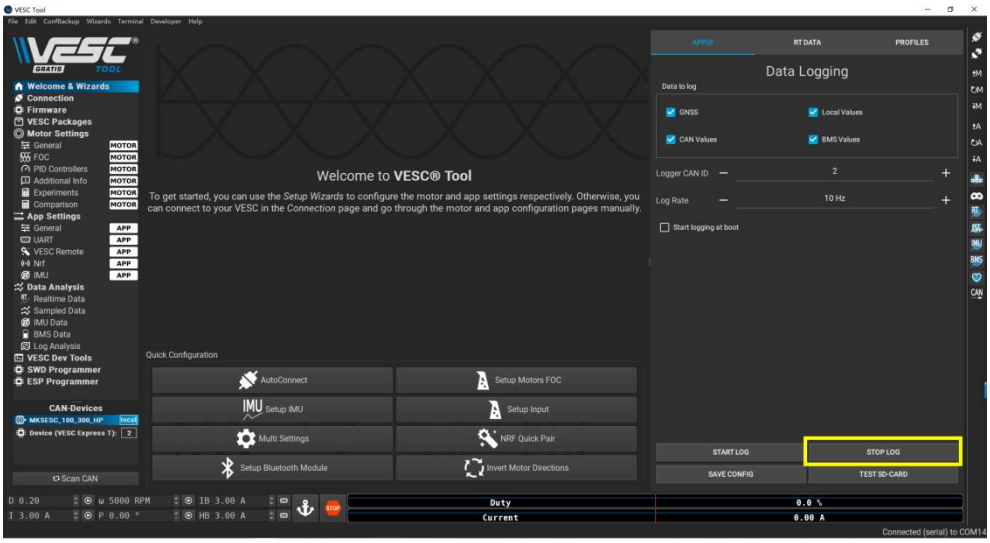


7. The mouse can be clicked or swiped in the chart to accurately read the data of each plot point. If GNSS is recorded, the map trip record will also follow the movement to accurately show the location of the data block being viewed.



## 2) Turn off the function

In the Welcome "APPUI" interface of the VESC motherboard device, click "STOP LOG" to stop the log recording function, as shown in the following figure:



## 3.5 Configuring CAN Functions of MKS Express

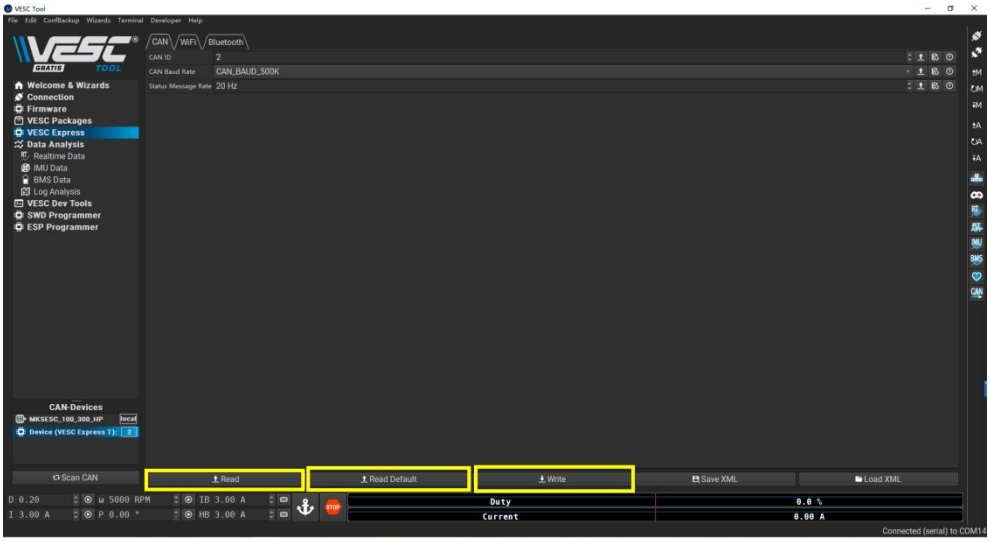
1. In the interface of the MKS Express device, click "VESC Express", as shown below:

**Notes:**

① Click "Read" to read all configurations in the MKS Express module (including CAN, WIFI, Bluetooth);

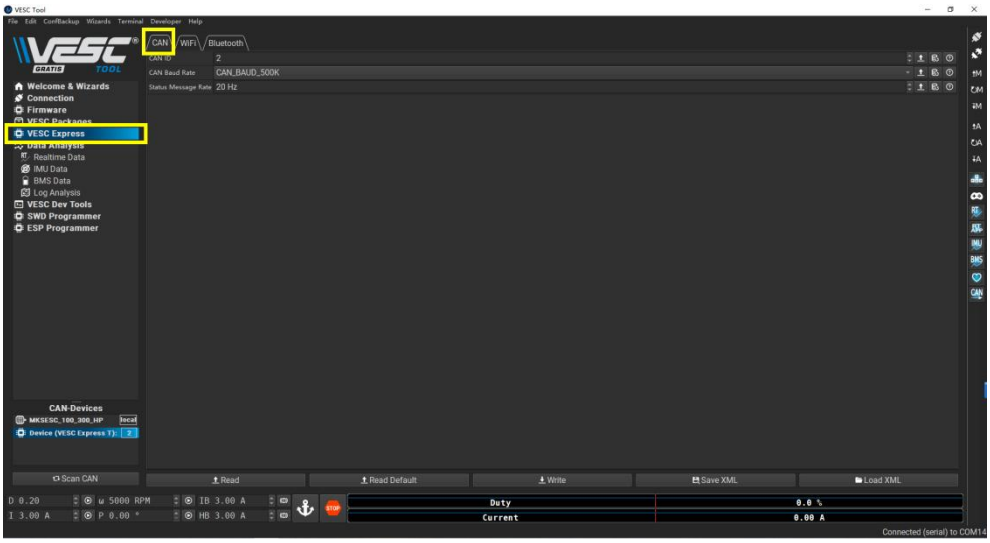
② Click "Read Default" to read all default configurations of the firmware (including CAN, WIFI, Bluetooth);

③ Click "Write" to write all configurations to the MKS Express module (including CAN, WIFI, Bluetooth), as shown below:

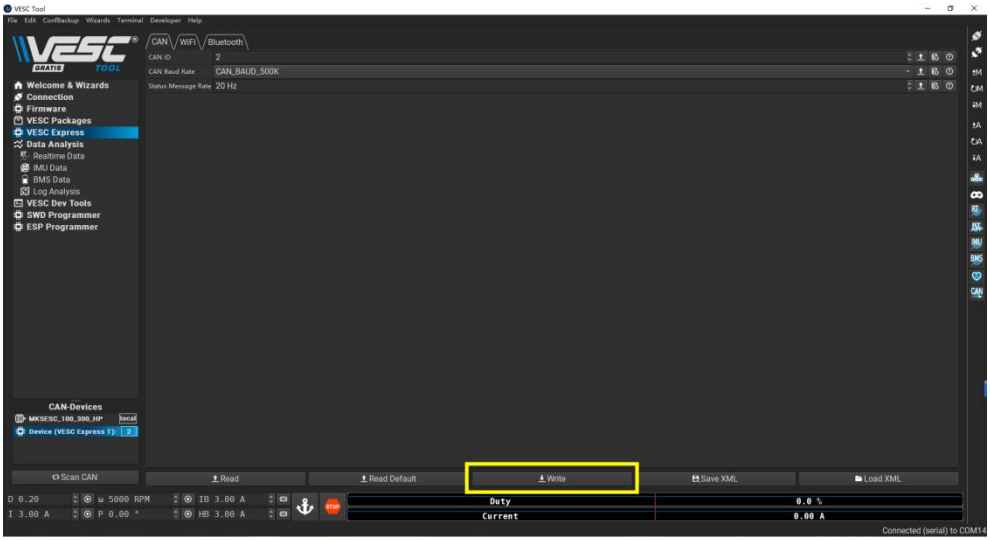



2. In the "CAN" interface, you can set the CAN ID, baud rate, and status message rate, as shown in the figure below:

**Note:** Once the baud rate is changed, the MKS Express will be disconnected from the VESC motherboard!

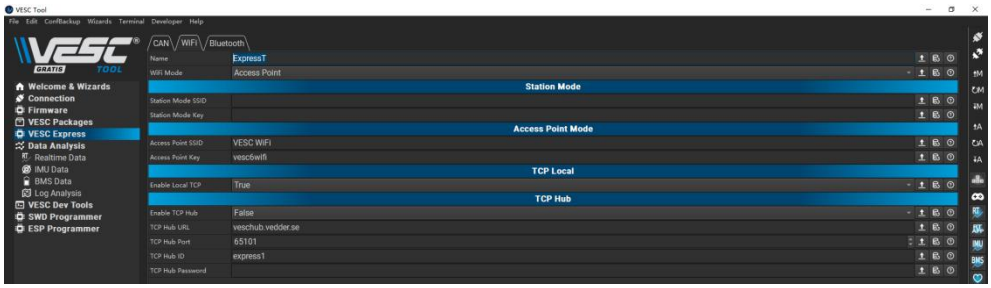


3. After the settings are completed, you can write the configuration to the MKS Express motherboard through the "Write" button below, as shown in the figure below:



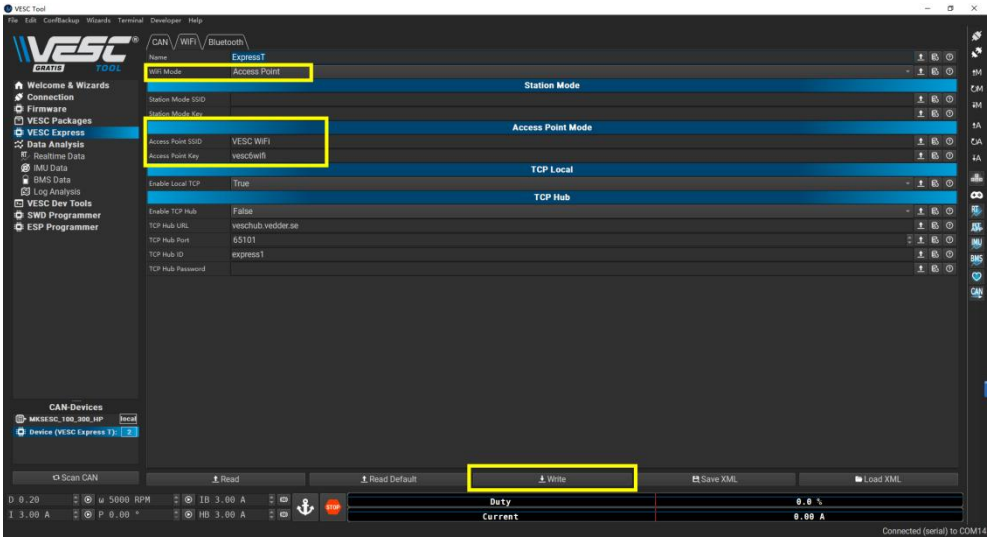
## 3.6 Configuring the Wi-Fi Function

In the WIFI interface, click "Name" to modify the device name, as shown below:



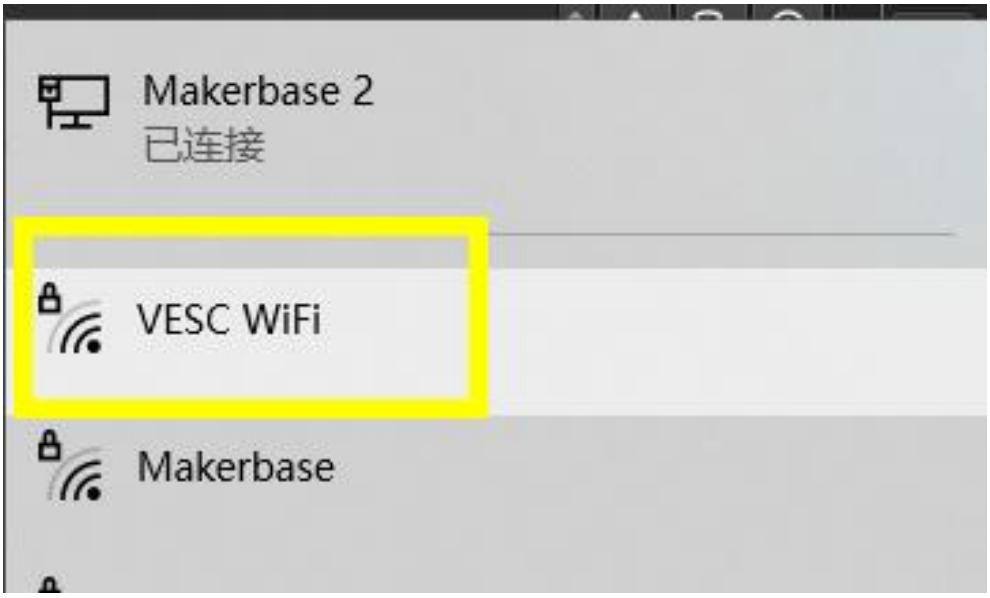

### 1) Access Point Mode

1. Select "Access Point" mode in "Wifi Mode";
2. Set the WIFI device name of the MKS Express module in "Access Point SSID";
3. Set the WIFI device password of the MKS Express module in "Access Point Key";
4. Click "Write" to write the configuration to the MKS Express module, as shown below:




5. Disconnect the power supply of the MKS Express module and then reconnect it to restart.

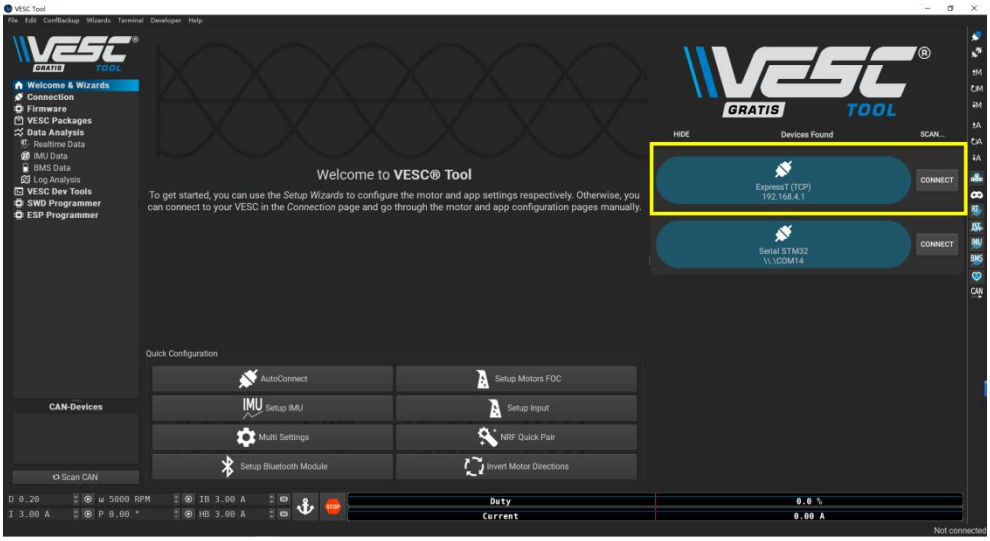
6. Open the WIFI management interface on your phone or PC, search for WIFI devices, find and select the "VESC Wifi" device, as shown below:

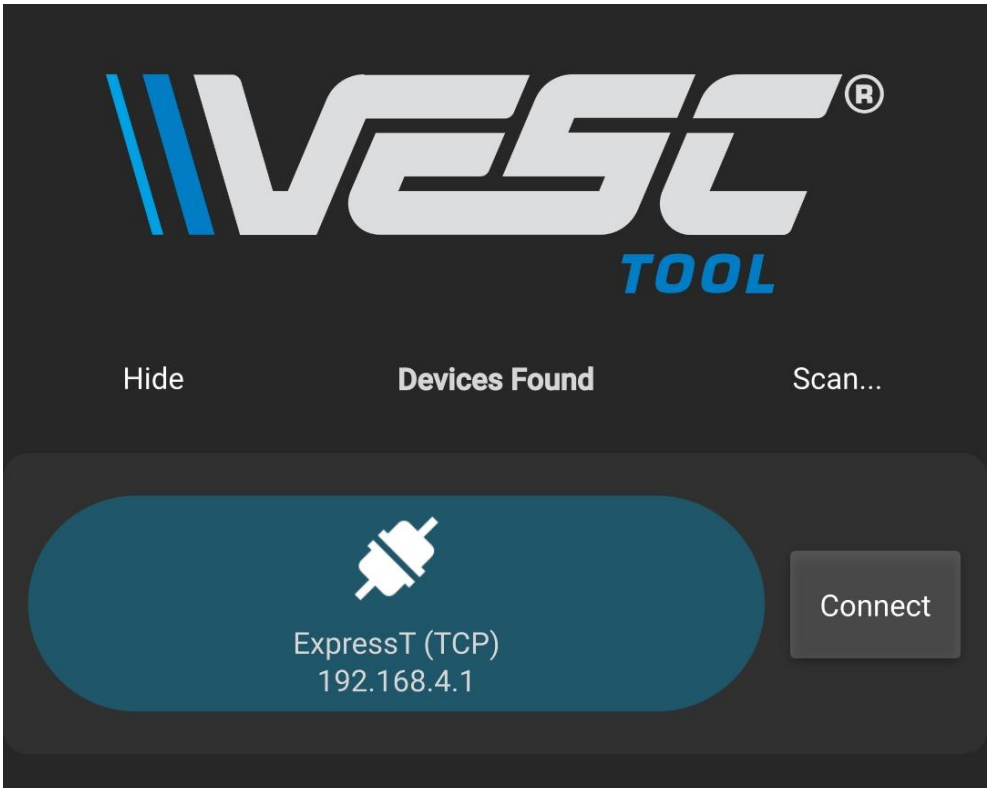



7. In the password input interface, enter the password set in step "3", such as "vesc6wifi" in this tutorial, as shown below:



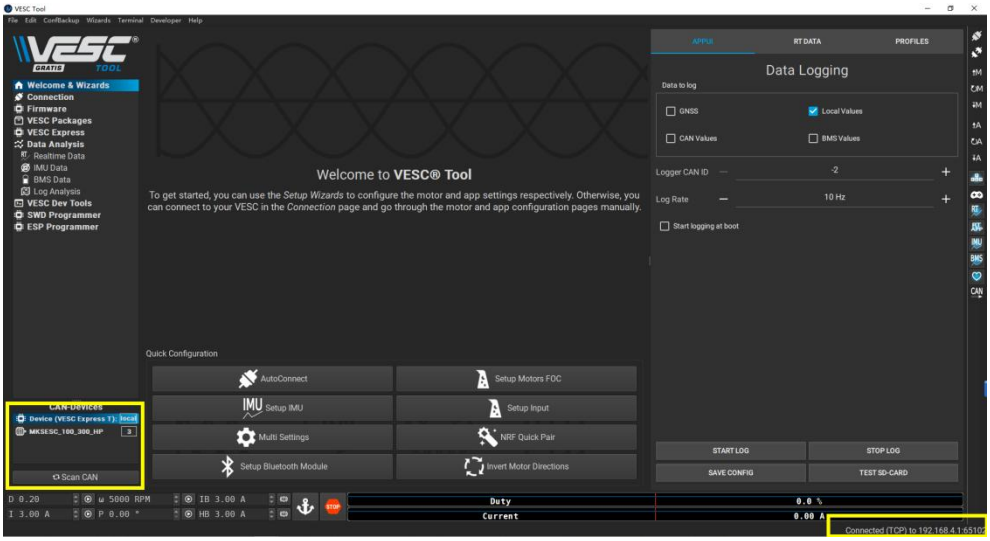
8. Open VESC TOOL on your computer or mobile phone, and you will find that the connected MKS Express device has been detected, as shown in the following figure:

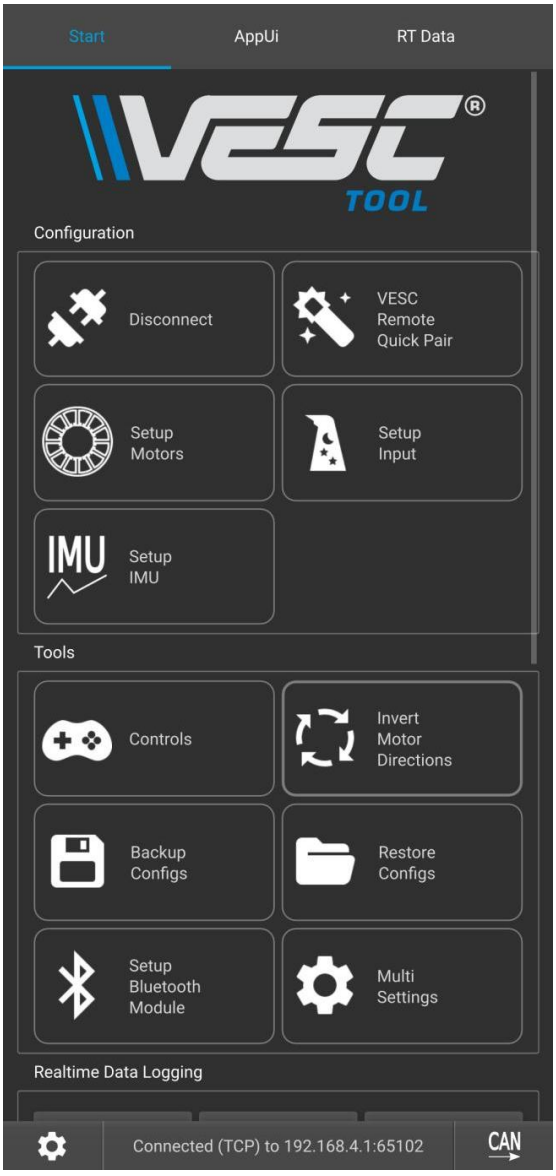


9. Click "CONNECT" to successfully connect and display the interface shown below:

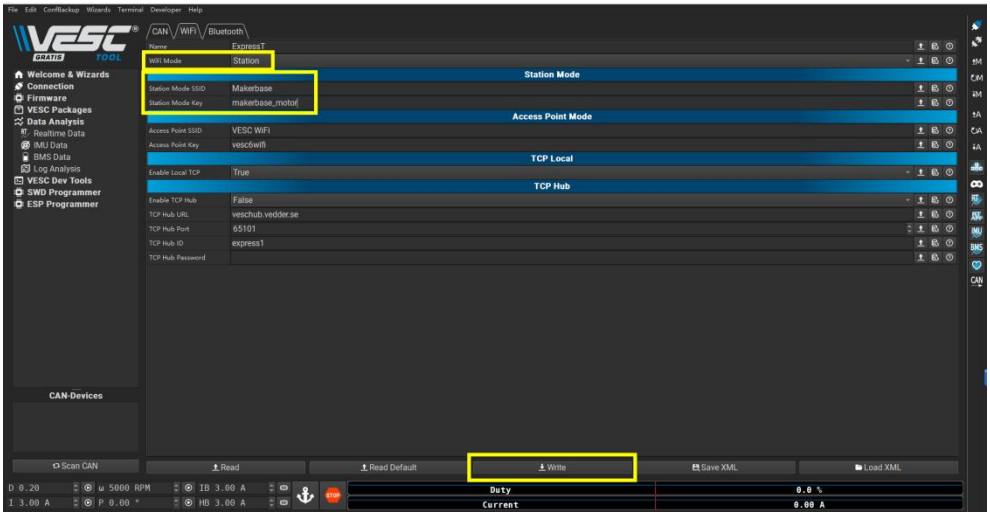
**Note:** In Access Point mode, there is no indicator light on the mainboard.



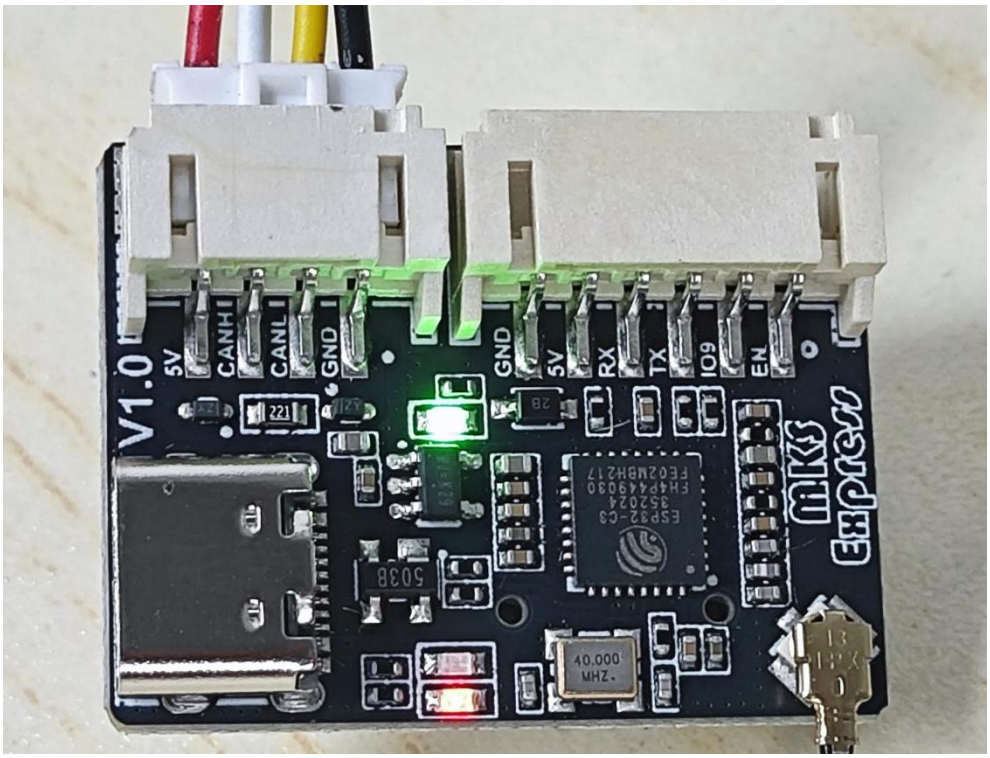



## 2) Station mode

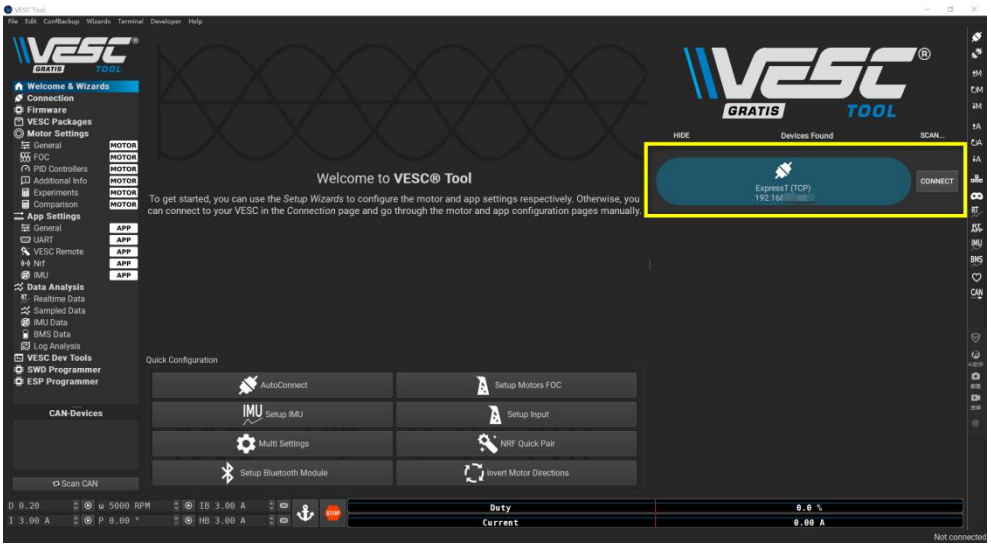
1. Select "Station" mode in "Wifi Mode";
2. Set the name of the WIFI device (router) that MKS Express is going to connect to in "Station Mode SSID";
3. Set the password of the WIFI device (router) that MKS Express is going to connect to in "Station Mode Key";
4. Click "Write" to write the configuration to the MKS Express module, as shown below:

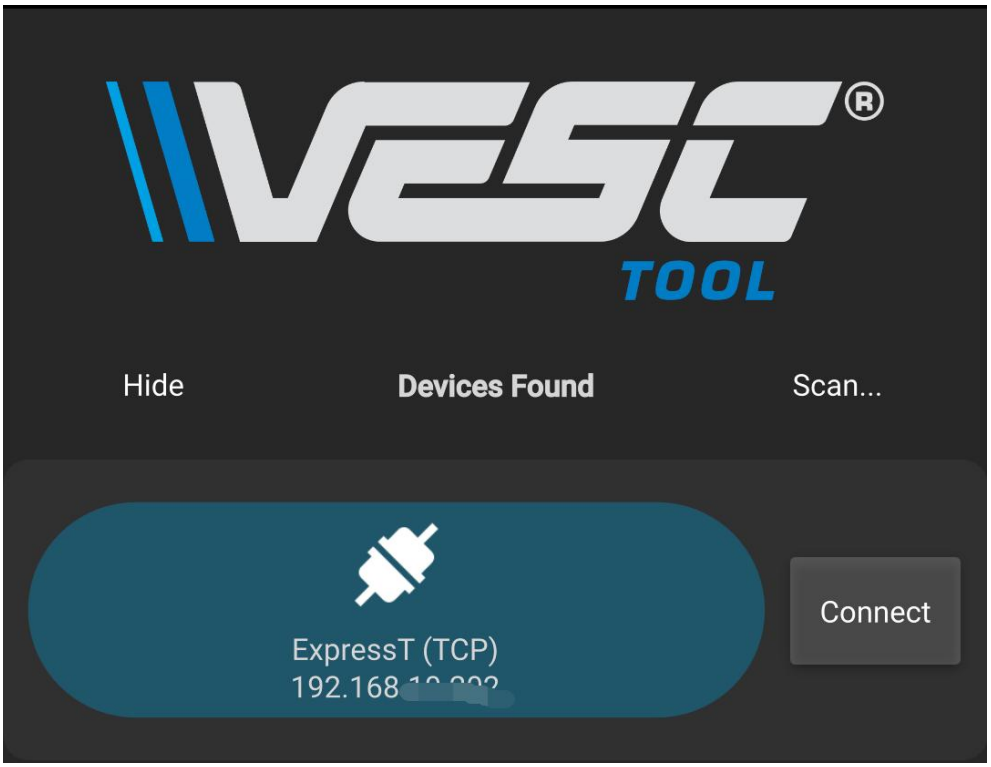



5. Observe the MKS Express module and you will find that the red light on the module is on, indicating that it has successfully connected to the set Wifi device, as shown in the following figure:

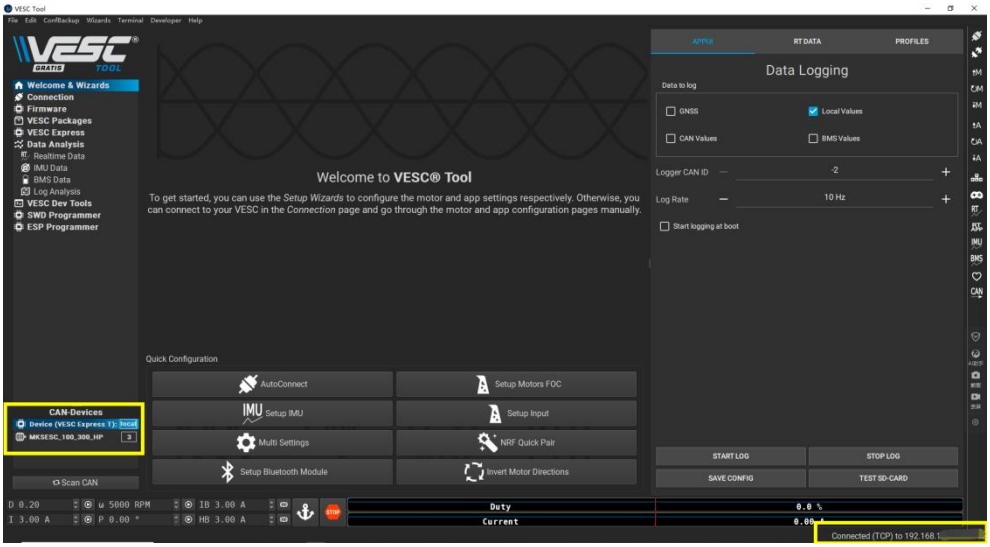


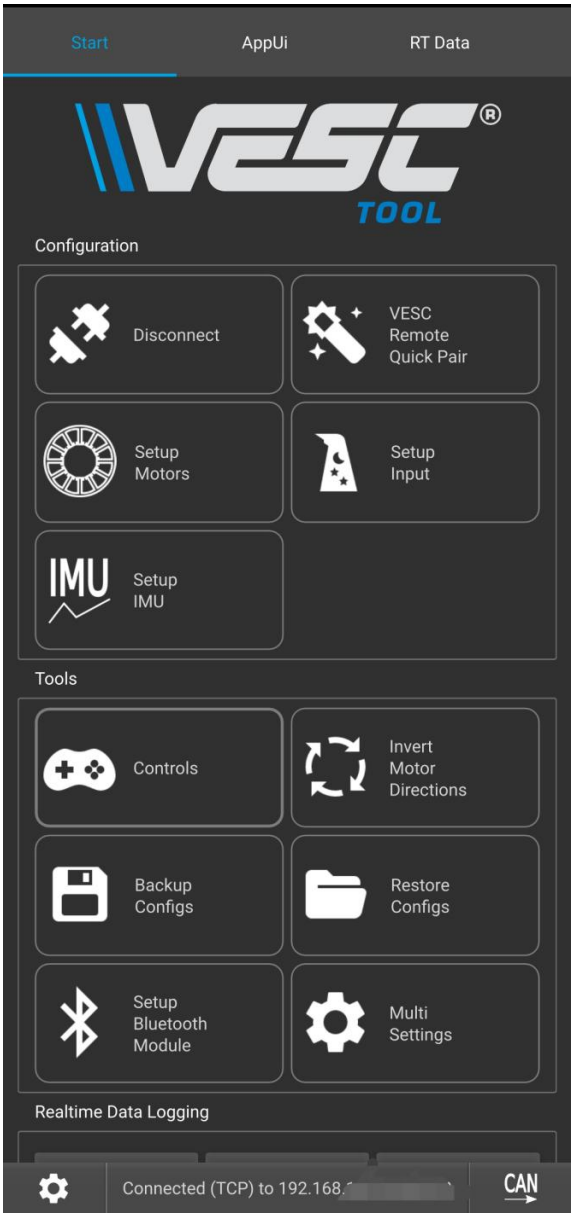
6. Open VESC TOOL on your computer or mobile phone, and you will find that the connected MKS Express device has been detected, as shown in the following figure:



7. Click "CONNECT" to successfully connect and display the interface shown below:

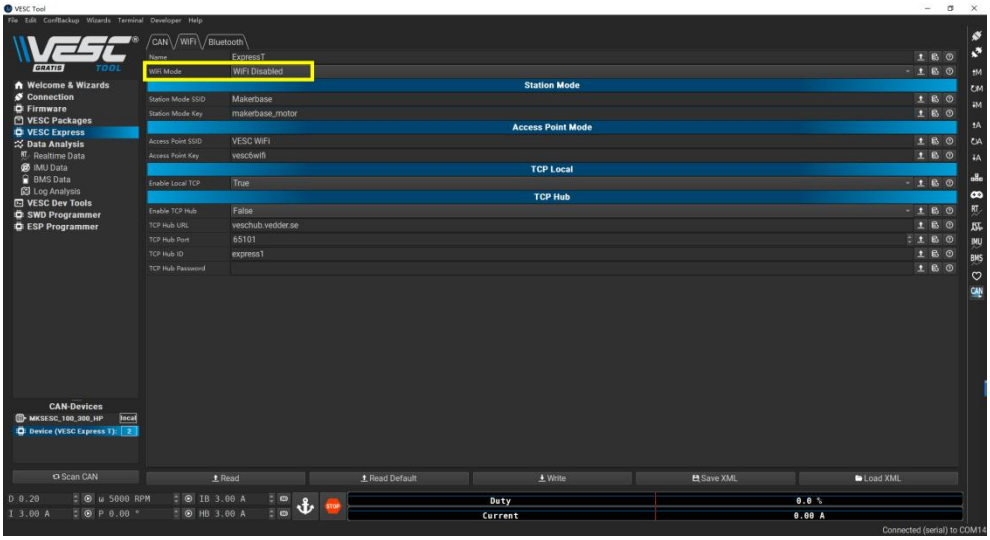


## 3) Turn off the WiFi function

1. To turn off the WIFI function, select "WiFi Disabled" in "WiFi Mode" and then click "Write" to write the setting to the module, as shown in the figure below:

2. Re-power the MKS Express module to complete the WIFI shutdown.



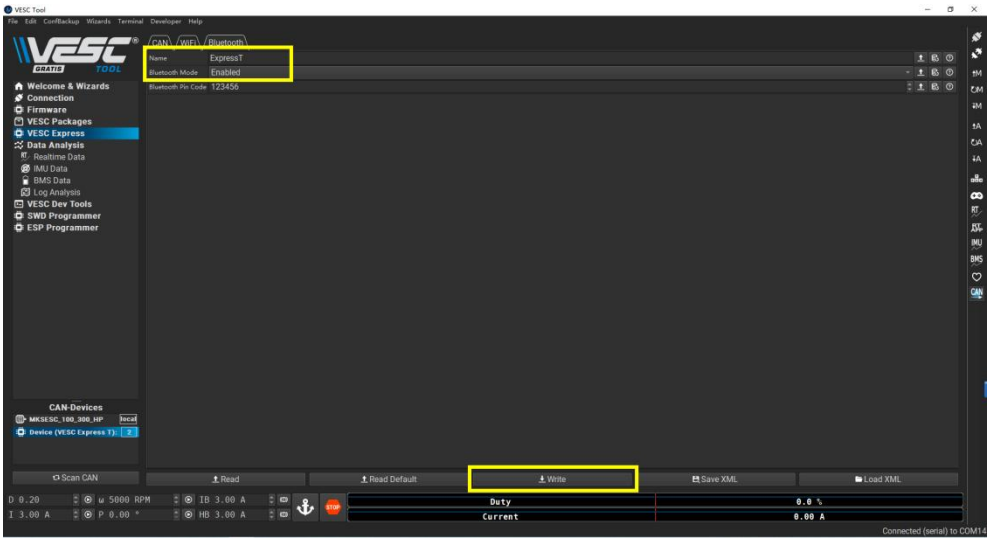
## 3.7 Configure Bluetooth function

## (recommend using mobile phone to connect)

### 1) No password mode

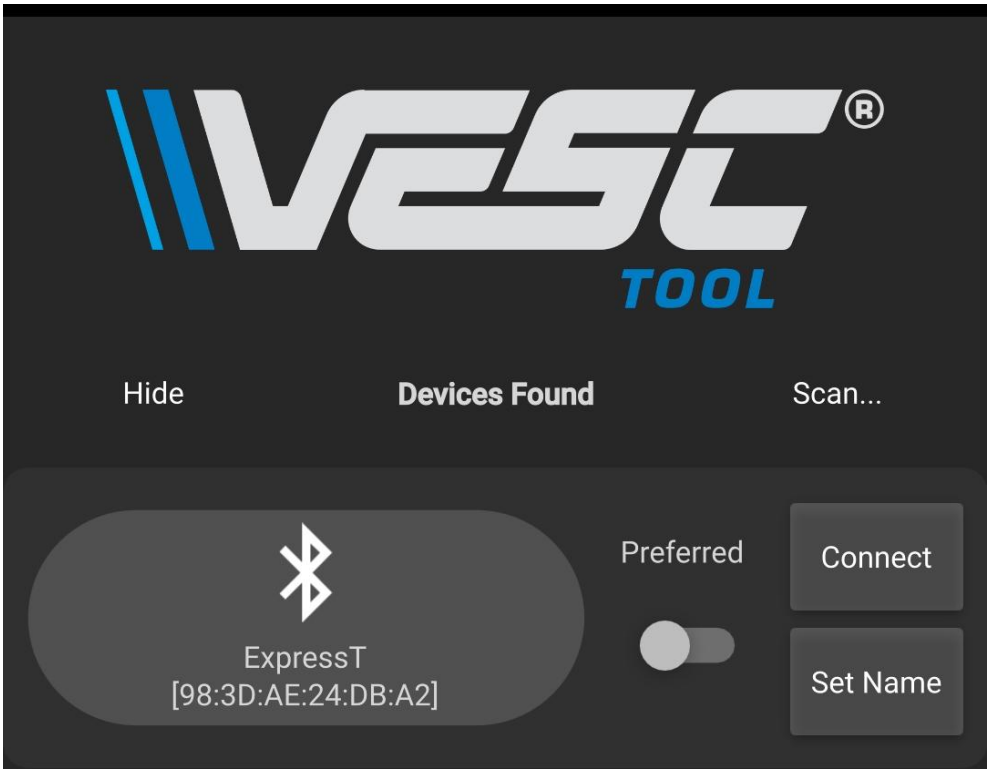
1. Open the Bluetooth interface and modify the device's Bluetooth name in "Name";

2. Select "Enabled" in "Bluetooth Mode" and click "Write" to write the configuration to the MKS Express module, as shown below:

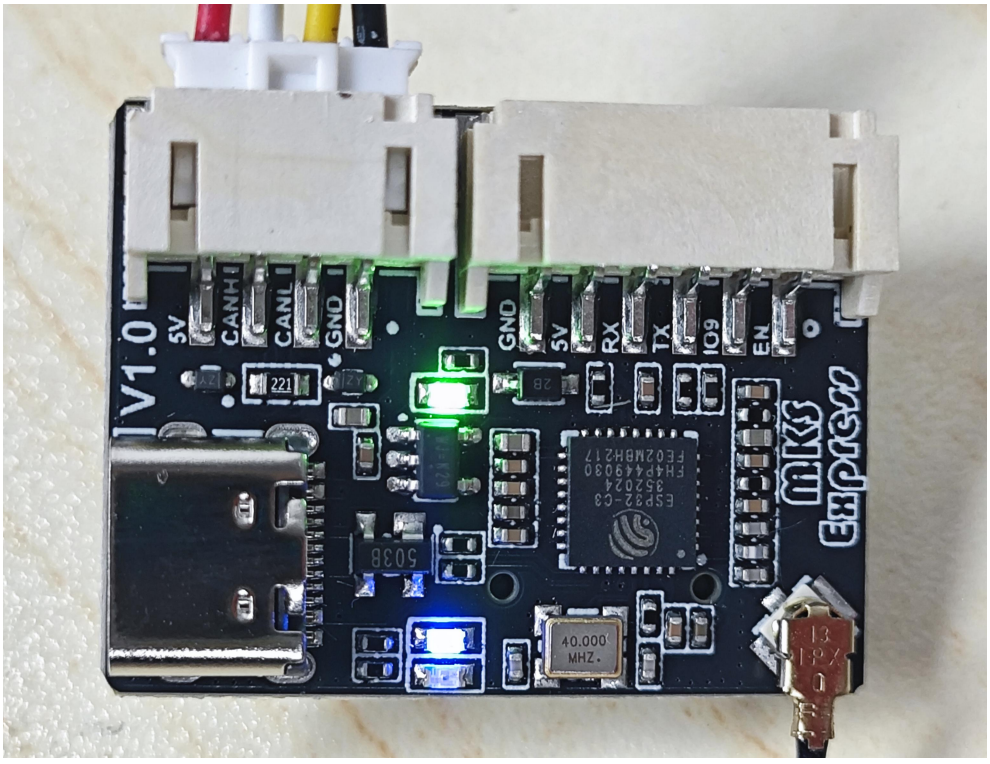



3. Re-power the MKS Express module. In the Bluetooth manager on the computer or in the VESC TOOL app on the phone, you can search for the "ExpressT" device, as shown in the following figure:

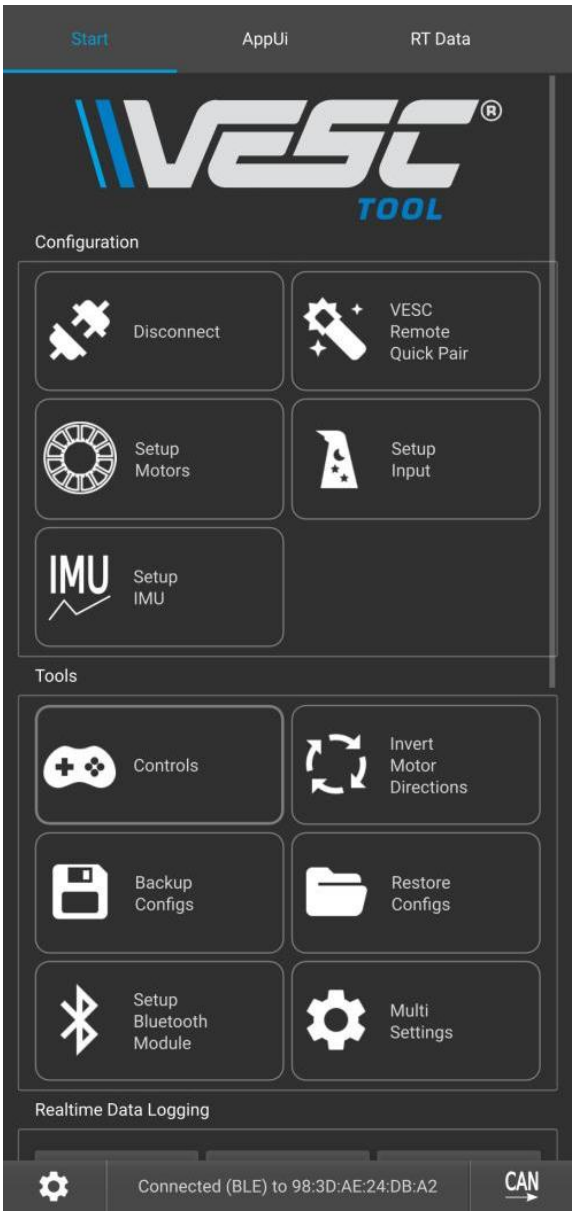





4. Click "Connect" to connect. After successful connection, the blue light of the MKS Express module will light up, as shown below:



5. After successful connection, the VESC TOOL interface will be as shown below:



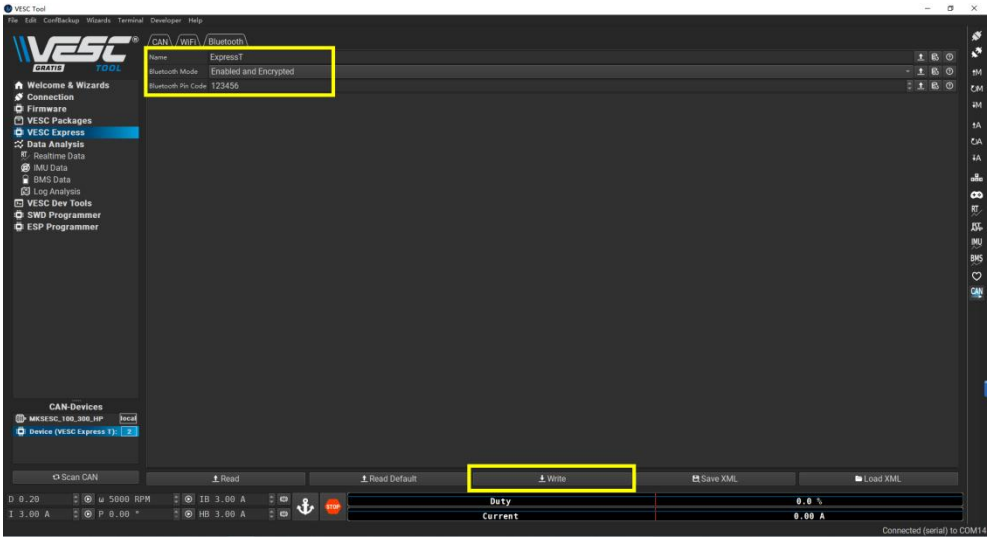
## 2) Password mode

1. Open the Bluetooth interface and modify the device's Bluetooth name in "Name";

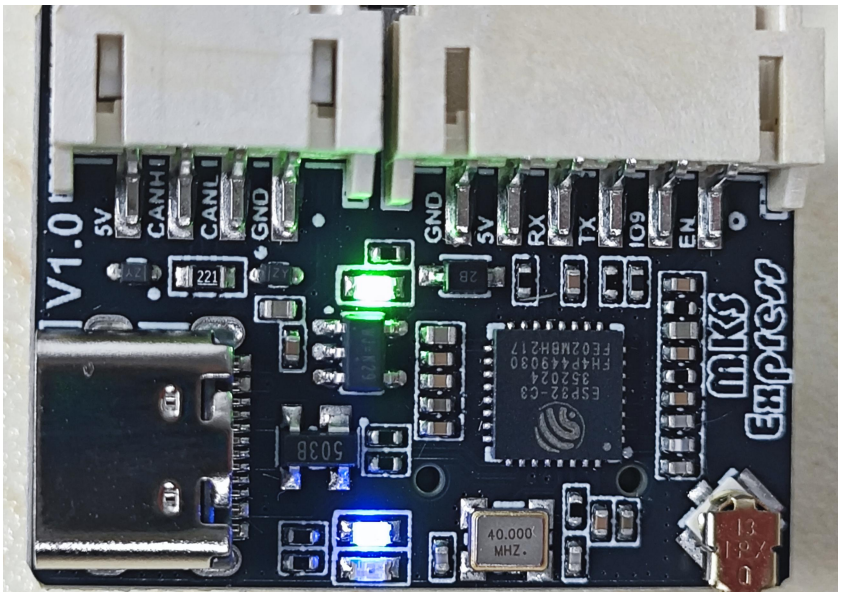
2. Select "Enabled and Encrypted" mode in "Bluetooth Mode";

3. Set the password of the MKS Express Bluetooth device in "Bluetooth Pin Code";

4. Click "Write" to write the configuration to the MKS Express module, as shown below:

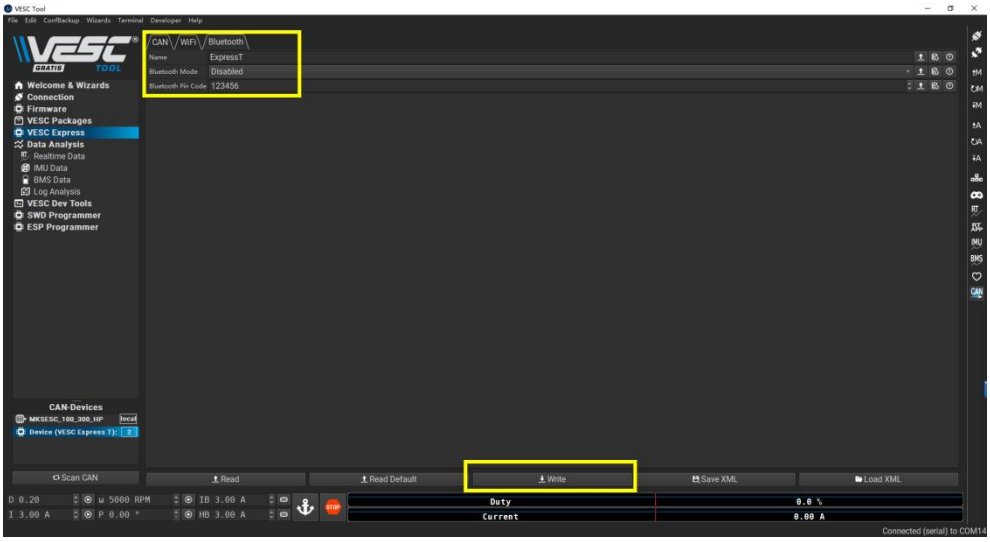



5. When connecting the computer to the VESC TOOL mobile phone, fill in the set device password to complete the connection. After successful connection, the blue light of the MKS Express module will light up, as shown in the figure below:



## 3) Turn off Bluetooth

1. To turn off the Bluetooth function, select "Disabled" in "Bluetooth Mode", and then click "Write" to write the settings to the module, as shown in the figure below:




2. Re-power the MKS Express module to turn off the Bluetooth function.

## 3.8 WIFI and Bluetooth dual mode

1. WIFI and Bluetooth are independent functions. There is no conflict when both are turned on at the same time. You only need to operate (VI) to configure the WIFI function and (VII) to configure the Bluetooth function respectively.
2. When WIFI is set to station mode (Station) and Bluetooth is connected, you can see that the red and Bluetooth indicators of MKS Express are on, as shown in the figure below:

