Protocol Introduction User manual

1 Protocol Introduction

T1(001 and Plus, the following T1 system products have the same operation process) and T2 module: **Support MAVLINK V1 PX4, MAVLINK V1 APM, MSP V2, Upixels Optical flow +TOF version protocol and Upixels Optical flow +TOF version extension protocol**
302GS module: **Supports the MAVLINK V1 PX4, MSP V2 and Upixels pure optical flow version protocols**, so it also needs to be used with ranging sensors such as TOF or barometers.

2.Baud rate:
T1(001/Plus)and T2 module:**Fixed baud rate 115200**
302GS module:Fixed baud rate **460800**

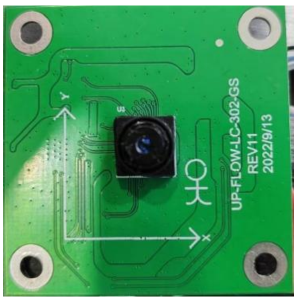
3.Frame rate:
T1(001/Plus)module:**50Hz**
302GS and T2 module:**120Hz**

4.Handoff protocol:
Switch via the host computer, or via the serial port (baud rate as shown above) by sending the following ASCII instructions to switch without manual restart:
<set protocol upixels> Switch to the upixels optical flow +TOF version protocol or upixels pure optical flow version protocol;
<set protocol upx_ext> Switch to upixels optical flow +TOF version extension protocol;
<set protocol msplink> Switch to the MSP V2 protocol;
<set protocol mav_apm> Switch to the MAVLINK V1 APM protocol;
<set protocol mav_px4> Switch to the MAVLINK V1 PX4 protocol.
T1(001/Plus) and T2 are the upixels optical flow +TOF version protocols by default, and 302GS is the upixels pure optical flow version protocol by default. You can view the version number and current protocol by the host computer, and judge the current output protocol by the received raw data frame header.

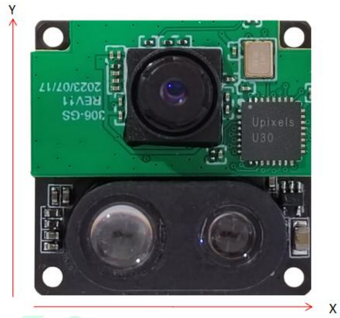
5. Optical flow coordinate system

T1-001 Optical flow coordinate system

T1-001-plus Optical flow coordinate system



302GS Optical flow coordinate system



T2 Optical flow coordinate system

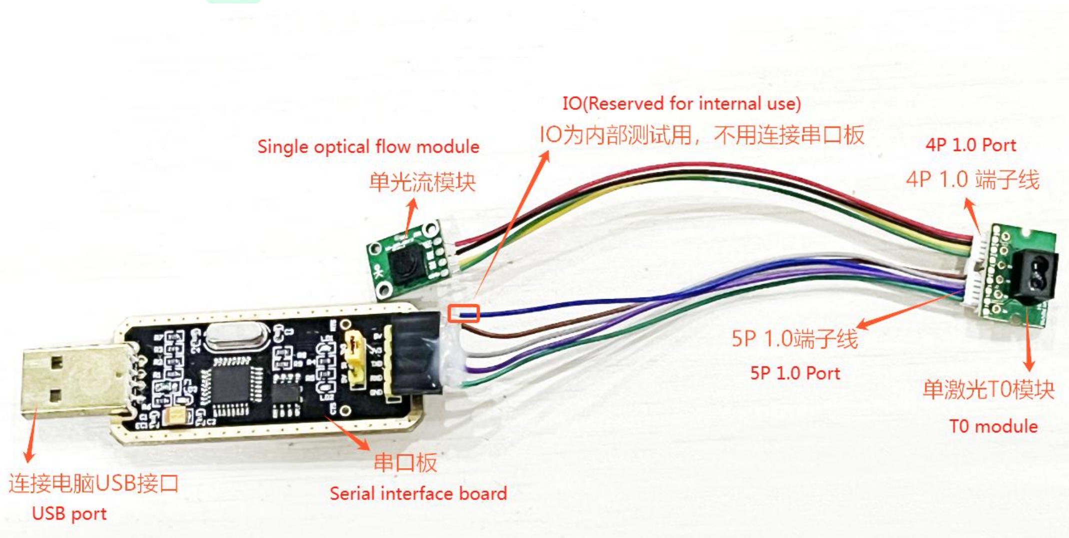
6.Module connection mode

6.1 T0 Module

The T0-001 is a single laser module that can be used alone or extended to connect optical flow modules. The connection mode is as follows:

Note: If only TOF data is used, there is no need to connect the optical flow module;

The connection method can see the screenshot below, or you can find customer service staff to ask for related videos.



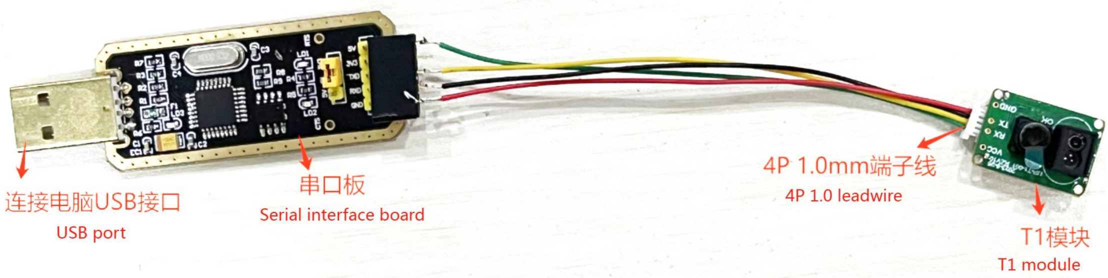
The mapping between serial port board, T0 module, and optical flow module is as follows:

Serial port board	T0 module(5P 1.0mm port)	T0 module(4P 1.0mm port)	Optical flow module
5V	5V	5V	5V
GND	GND	GND	GND
TX	RX	TX	TX
RX	TX	RX	RX
-	IO(Reserved for internal use)	-	-

6.2 T1 Module

T1-001 is a two-in-one module composed of TOF and optical flow. The connection method is as follows:

The connection method can see the screenshot below, or you can find customer service staff to ask for related videos.

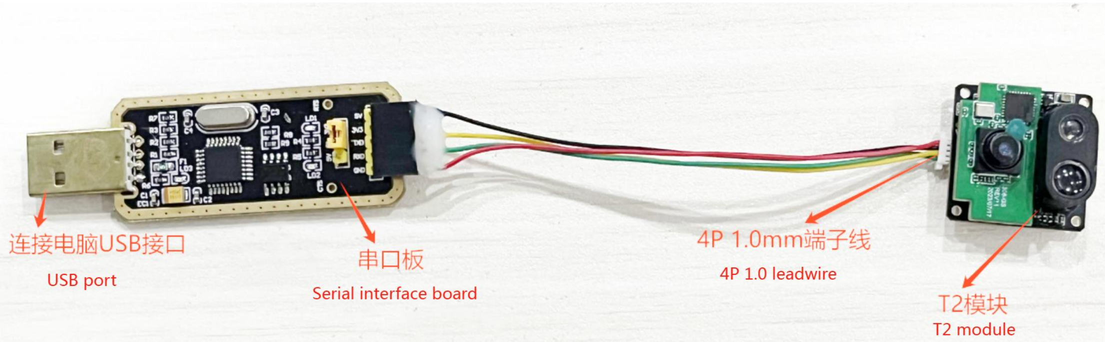


The mapping between serial port boards and T1 modules is as follows:

Serial port board	T1 module(4P 1.0mm port)
5V	5V
GND	GND
TX	RX
RX	TX

6.3 T2 Module

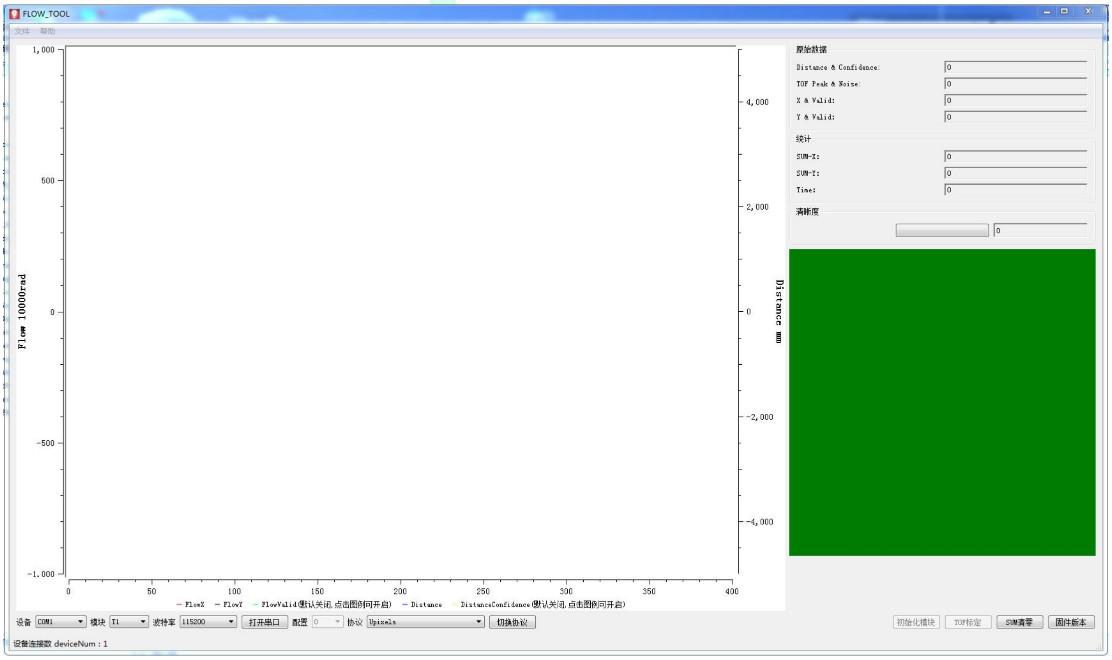
T2-001 is a two-in-one module composed of TOF and optical flow. The connection method is as follows:Note:The connection method can see the screenshot below, or you can find customer service staff to ask for related videos.



The mapping between serial port boards and T2 modules is as follows:

Serial port board	T2 module(4P 1.0mm port)
5V	5V
GND	GND
TX	RX
RX	TX

6. Use method of upper computer



(1)Select the port number, select the module, confirm the baud rate, click to open the serial port, it will prompt: open the serial port successfully! If it fails, check the connection and Settings and try again.

(2)The default UPIXELS protocol, at this time you can see the waveform output, you can select

other protocols through the drop-down list, click switch protocol to switch;
(3)Switch to PX4 protocol, click firmware version to view firmware version number;
(4)T1(001.Plus) or T2 module switches to UPIXELS_EXTENSION protocal,click file→Save the log, then you can save the Distance,Confidence,Noise and Peak value of TOF to the log file of the host computer directory.
(5)Click the legend to switch waveform display or hide.

7.TOF demarcate
To enable the calibration function and calibration process, please contact customer service.

1.1 MAVLINK V1

1.MAVLink stands for Micro Air Vehicle Link;
2.Mavlink has V1 version and V2 version,This product uses the V1 version, the message format is referred to https://mavlink.io/en/messages/common.html,The order is subject to this manual.
3.Mavlink V1 APM is used for APM flight control firmware; The Mavlink V1 PX4 is used for PX4 flight control firmware.

1.1.1 MAVLINK V1 APM

One packet with message ID 0x64 is used to send optical flow and another packet with message ID 0x84 is used to send distance data.

		Data type	Introductions
Frame header		uint8_t	0xFE
Payload Length		uint8_t	Message payload length, fixed at 0x1A
Packet sequence number		uint8_t	Packet sequence number 0x00-0xFF loop
System ID		uint8_t	Id of the device that sends this message. It is used to distinguish different devices on the same network. The value is 0x00.
Module ID		uint8_t	The number of the component that sends this message is used to distinguish different components in the same device. The value is 0x9E
Message ID		uint8_t	Different message ids correspond to different message payload formats. The fixed value is 0x64
	time_usec(us)[1]	uint64_t	Timestamp (time since system boot)
	flow_comp_x(m/s)	float	Flow in y-sensor direction, angular-speed compensated There is no gyroscope and

Protocol Message Loading			therefore no compensation is used directly (flow_x_integral(rad)/10000)*(excellent Laser ranging value in upixels protocol)/(integration_timespan(s) in upixels protocol)[2]
	flow_comp_y(m/s)	float	Flow in y-sensor direction, angular-speed compensated There is no gyroscope and therefore no compensation is used directly (flow_y_integral(rad)/10000)*(excellent Laser ranging value in upixels protocol)/(integration_timespan(s) in upixels protocol)
	ground_distance(m)	float	Ground distance. Positive value: distance known. Negative value: Unknown distance Using the laser ranging value (m) in the upixels protocol
	flow_x(dpix)	int16_t	Flow in y-sensor direction,use the flow_x_integral*10/36 in the upixels protocol[3]
	flow_y(dpix)	int16_t	Flow in y-sensor direction,use the flow_y_integral*10/36 in the upixels protocol
	sensor_id	uint8_t	The Sensor ID is fixed to 0x00
	quality	uint8_t	Optical flow quality/confidence. 0: bad, 255: maximum quality Only two valid values 0x00-invalid and 0xF5-valid are used in the upixels protocol
	flow_rate_x(rad/s)	float	Unused
	flow_rate_y(rad/s)	float	Unused
Frame rate check		uint16_t	Check from the load length to the message load, but need to add an extra MAVLINK_CRC_EXTRA value [4] after the message load, using CRC-16/MCRF4XX algorithm
Frame header		uint8_t	0xFE
Payload Length		uint8_t	Message load length 0x0E
Header serial number		uint8_t	Packet sequence number 0x00-0xFF loop
System ID		uint8_t	Ditto
Module ID		uint8_t	Ditto
Message ID		uint8_t	Different message ids correspond to different message payload formats. The fixed value is 0x84
	time_boot(ms)	uint32_t	Timestamp (time since system boot)
	min_distance(cm)	uint16_t	the Minimum distance the sensor can measure T1 is fixed to 0x0002 and T2 is fixed to 0x0005

	max_distance(cm)	uint16_t	Maximum distance the sensor can measure T1 is fixed to 0x0190 and T2 is fixed to 0x05DC
	current_distance(cm)	uint16_t	Current distance reading Using the distance value (cm) in the upixels protocol
Protocol Message Loading	Type	uint8_t	The Type of distance sensor is set to 0x00
	id	uint8_t	Onboard ID of the sensor is set to 0x00
	orientation	uint8_t	Direction the sensor faces. downward-facing:ROTATION_PITCH_270, upward-facing:ROTATION_PITCH_90, backward-facing:ROTATION_PITCH_180, forward-facing: ROTATION_NONE, left-facing: ROTATION_YAW_90, right-facing: ROTATION_YAW_270. It is fixed to 0x19
	covariance(cm^2)	uint8_t	Measurement variance. Max standard deviation is 6cm. UINT8_MAX if unknown is fixed to 0x00
	horizontal_fov(rad)[4]	float	Unused
	vertical_fov(rad)	float	Unused
	quaternion	float[4]	Unused
	signal_quality(%)	uint8_t	Unused
Frame rate check		uint16_t	Ditto

Note 1: The yellow text background indicates a non-fixed amount;

Note 2: The units need to be converted according to the units in the formula, which will not be described below;

Note 3: All data in this paper are sent in small-end mode, which will not be described below;

Note 4:static const uint8_t crc_extra_array[256]={50, 124, 137, 0, 237, 217, 104, 119, 0, 0, 0, 89, 0, 0, 0, 0, 0, 0, 0, 214, 159, 220, 168, 24, 23, 170, 144, 67, 115, 39, 246, 185, 104, 237, 244, 222, 212, 9, 254, 230, 28, 28, 132, 221, 232, 11, 153, 41, 39,78, 0, 0, 0, 15, 3, 0, 0, 0, 0,0, 153, 183, 51, 59, 118, 148, 21, 0, 243, 124, 0, 0, 38, 20, 158, 152, 143, 0, 0,0, 106, 49, 22, 143, 140, 5, 150, 0, 231, 183, 63, 54, 0, 0, 0, 0, 0, 0, 0,175, 102, 158, 208, 56, 93, 138, 108, 32, 185, 84, 34, 174, 124, 237, 4, 76, 128, 56, 116, 134, 237, 203, 250, 87, 203, 220, 25, 226, 46, 29, 223, 85, 6, 229, 203, 1, 195, 109, 168, 181, 148, 72, 0, 0, 0, 103, 154, 178, 200,0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,0, 0, 0, 0, 0, 0, 0, 0, 0, 0,0, 0, 0, 0, 0, 0, 0, 0, 0,0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,0, 0, 0, 0, 0, 0, 0, 0, 0, 0,0, 0, 0, 0, 0, 0, 0, 0, 0,0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 90, 104, 85, 95, 83, 0, 0, 8, 204, 49, 170, 44, 83, 46, 0};For example, if the message ID is 0x64, check the value of crc_extra_array[0x64] as 175 in the above table, and then verify the message load.

Note 5: Blue font indicates protocol optional, this article does not use not included firmware, not fixed 0.

1.1.2 MAVLINK V1 PX4

1.1.2.1 T1(001/Plus)and T2 module

One packet with message ID 0x6A is used to send optical flow data and another packet with message ID 0x84 is used to send distance data.

		Data type	Description
Frame header		uint8_t	0xFE
Payload Length		uint8_t	Message payload length, fixed at 0x2C
Header serial number		uint8_t	Packet sequence number 0x00-0xFF loop
System ID		uint8_t	Id of the device that sends this message. It is used to distinguish different devices on the same network. The value is 0x00
Module ID		uint8_t	The number of the component that sends this message is used to distinguish different components in the same device. The value is 0x9E
Message ID		uint8_t	Different message ids correspond to different message payload formats, which are fixed to 0x6A
Protocol Message Loading	time_usec(us)	uint64_t	Timestamp (time since system boot)
	integration_time(us)	uint32_t	Integration time. Divide integrated_x and integrated_y by the integration time to obtain average flow. The integration time also indicates the integration_timespan(us) in the upixels protocol.
	integrated_x(rad)	float	Flow around X axis (Sensor RH rotation about the X axis induces a positive flow. Sensor linear motion along the positive Y axis induces a negative flow.)flow_x_integral(rad) in the upixels protocol/10000
	integrated_y(rad)	float	Flow around Y axis (Sensor RH rotation about the Y axis induces a positive flow. Sensor linear motion along the positive X axis induces a positive flow.)flow_y_integral(rad) in the upixels protocol/10000
	integrated_xgyro(rad)	float	RH rotation around X axis is fixed to NaN
	integrated_ygyro(rad)	float	RH rotation around Y axis is fixed to NaN
	integrated_zgyro(rad)	float	RH rotation around Z axis is fixed to NaN
	time_delta_distance(us)	uint32_t	Time since the distance was sampled T1 is

			fixed to 0x00008235， T2 is fixed to 0x0000208D
	distance(m)	float	Distance to the center of the flow field. Positive value (including zero): distance known. Negative value: Unknown distance Using the laser ranging value in the upixels protocol(m)
	temperature(℃)	int16_t	Temperature is fixed to 0x0000
	sensor_id	uint8_t	Sensor ID is fixed to 0x00
	quality	uint8_t	Optical flow quality / confidence. 0: no valid flow, 255: maximum quality The valid value in the upixels protocol is only 0x00-invalid and 0xF5-valid
Frame rate check		uint16_t	Check the load length to the message load, but need to add an extra MAVLINK_CRC_EXTRA value after the message load, using the CRC-16/MCRF4XX algorithm
Frame header		uint8_t	0xFE
Payload Length		uint8_t	The payload length of the message, fixed at 0x0E
Header serial number		uint8_t	Packet sequence number 0x00-0xFF loop
System ID		uint8_t	Ditto
Module ID		uint8_t	Ditto
Message ID		uint8_t	Different message ids correspond to different message payload formats. The fixed value is 0x84
Protocol Message Loading	time_boot(ms)	uint32_t	Timestamp (time since system boot)
	min_distance(cm)	uint16_t	Minimum distance the sensor can measure is set to 0x0002
	max_distance(cm)	uint16_t	Maximum distance the sensor can measure is set to 0x0FA0
	current_distance(cm)	uint16_t	Current distance reading Using the laser ranging value (cm) in the upixels protocol
	Type	uint8_t	Type of distance sensor is ste to 0x00
	id	uint8_t	Onboard ID of the sensor is set to 0x01
	orientation	uint8_t	Direction the sensor faces. downward-facing:ROTATION_PITCH_270, upward-facing:ROTATION_PITCH_90, backward-facing:ROTATION_PITCH_180, forward-facing: ROTATION_NONE, left-facing: ROTATION_YAW_90, right-facing: ROTATION_YAW_270.

			The value is fixed to 0x19
	covariance(cm^2)	uint8_t	Measurement variance. Max standard deviation is 6cm. UINT8_MAX if unknown. The value is fixed to 0x19
	horizontal_fov(rad)	float	Unused
	vertical_fov(rad)	float	Unused
	quaternion	float[4]	Unused
	signal_quality(%)	uint8_t	Unused
Frame rate check		uint16_t	Unused

1.2 MSP V2

1, MSP full name Multiwii Serial Protocol;
2, MSP has V1, V2 orver V1 and V2 three versions, this product uses the V2 version;
3. MSP is used for flight control such as iNavflight, MultiWii, CleanFlight and BetaFlight.

1.2.1 T1(001/Plus) and T2 module

One packet with message ID 0x1F01 sends distance data and another packet with message ID 0x1F02 sends optical flow data.

		Data type	Description
Frame header		uint8_t	0x24
Frame header		uint8_t	0x58
requeset or response		uint8_t	0x3C
flag		uint8_t	The value is fixed to 0x00
Message ID		uint16_t	Different message ids correspond to different message payload formats. The fixed value is 0x1F01.
Payload Length		uint16_t	Message load length, fixed at 0x0005
Protocol Message Loading	quality	uint8_t	Using the laser ranging confidence in the image optimization protocol
	distance(mm)	uint32_t	Laser ranging values using the Image Optimization Protocol (mm)
Check		uint8_t	The crc8_dvb_s2 algorithm is used to verify the load from flag to message
Frame header		uint8_t	0x24
Frame header		uint8_t	0x58
requeset or response		uint8_t	0x3C
flag		uint8_t	The value is fixed to 0x00
Message ID		uint16_t	Different message ids correspond to different message payload formats, and the fixed value is 0x1F02
Payload Length		uint16_t	Message load length, fixed at 0x0009

Protocol Message Loading	quality	uint8_t	There are only two valid values in the upixels protocol: 0-invalid and 245-valid.
	motionX(rad/s)	int32_t	optical flow angular rate in rad/s measured about the X body axis use(flow_x_integral(rad) in the upixels protocol/10000)/(integration_timespan(s) in the upixels protocol)
	motionY(rad/s)	int32_t	optical flow angular rate in rad/s measured about the Y body axis use(flow_y_integral(rad) in the upixels protocol/10000)/(integration_timespan(s) in the upixels protocol)
Check		uint8_t	Ditto

1.2.2 302GS Module

Only one packet with message ID 0x1F02 is used to send optical stream data.

Frame header		uint8_t	0x24
Frame header		uint8_t	0x58
requeset or response		uint8_t	0x3C
flag		uint8_t	The value is fixed to 0x00
Message ID		uint16_t	Different message ids correspond to different message payload formats, and the fixed value is 0x1F02
Payload Length		uint16_t	Message load length, fixed at 0x0009
Protocol Message Loading	quality	uint8_t	There are only two valid values in the upixels protocol: 0-invalid and 245-valid.
	motionX(rad/s)	int32_t	optical flow angular rate in rad/s measured about the X body axis use(flow_x_integral(rad) in the upixels protocol/10000)/(integration_timespan(s) in the upixels protocol)
	motionY(rad/s)	int32_t	optical flow angular rate in rad/s measured about the Y body axis use(flow_y_integral(rad) in the upixels protocol/10000)/(integration_timespan(s) in the upixels protocol)
Check		uint8_t	Ditto

1.3 Upixels protocol

1.3.1 T1(001、Plus)and T2 module

1.3.1.1 Optical flow +TOF version protocol

serial number		Packet data	contents note
1	Packet header	0xFE	The start identifier of the packet
2		0x0A	Packet bytes（fixed value 0x0A）
3	Optical flow laser data structure	Low byte of flow_x_integral	X:The cumulative displacement of pixels over the cumulative time,(radians*10000) [Divided by 10,000 times the height is the actual displacement]
4		High byte of flow_x_integral	
5		Low byte of flow_y_integral	Y:The cumulative displacement of pixels over the cumulative time,(radians*10000) [Divided by 10,000 times the height is the actual displacement]
6		High byte of flow_y_integral	
7		Low byte of integration_timespan	The total time between the last optical flow data transmission and the current optical flow data transmission（us）
8		High byte of integration_timespan	
9		Laser ranging in low bytes	Laser ranging distance(mm),For example, the low byte is 0x12,High byte is 0x08,The laser ranging distance is 0x0812=2066mm
10		Laser ranging in high bytes	
11		valid	status value:0(0x00) indicates that optical flow data is unavailable, and 245(0xF5) indicates that optical flow data is available
12		Confidence of laser ranging	Laser ranging confidence,for example, 0x64 indicates that the laser ranging confidence is 100%
13	Proof test value	XOR	3-12 bytes XOR

14	Data packet end	0x55	The end identifier of the packet(fixed value 0x55)

1.3.1.2 Optical Flow +TOF version extension protocol

serial number		Packet data	contents note
1	Packet header	0xFE	The start identifier of the packet
2		0x0A	Packet bytes（fixed value 0x0A）
3	Optical flow laser data structure	Low byte of flow_x_integral	X:The cumulative displacement of pixels over the cumulative time,(radians*10000) [Divided by 10,000 times the height is the actual displacement]
4		High byte of flow_x_integral	
5		Low byte of flow_y_integral	Y:The cumulative displacement of pixels over the cumulative time,(radians*10000) [Divided by 10,000 times the height is the actual displacement]
6		High byte of flow_y_integral	
7		Low byte of integration_timespan	The total time between the last optical flow data transmission and the current optical flow data transmission（us）
8		High byte of integration_timespan	
9		Laser ranging in low bytes	Laser ranging distance(mm),For example, the low byte is 0x12,High byte is 0x08,The laser ranging distance is 0x0812=2066mm
10		Laser ranging in high bytes	
11		valid	status value:0(0x00) indicates that optical flow data is unavailable, and 245(0xF5) indicates that optical flow data is available
12		Confidence of laser ranging	Laser ranging confidence,for example, 0x64 indicates that the laser ranging confidence is 100%

13		Laser ranging of peak 0 byte	The peak value of laser ranging, for example, the 0 byte is 0x78, the 1 byte is 0x56, the 2 byte is 0x34, and the 0 byte is 0x12, then 0x12345678 means that the peak of laser ranging is 305419896
14		Laser ranging of peak 1 byte	
15		Laser ranging of peak 2 byte	
16		Laser ranging of peak 3 byte	
17		The noise of laser ranging is low byte	The noise value of laser ranging, for example, the low byte is 0x32, the high byte is 0x00, then 0x0032 indicates that the noise of laser ranging is 50
18		The noise of laser ranging is low byte	
19	Proof test value	XOR	3-18 bytes XOR
20	Data packet end	0x55	The end identifier of the packet(fixed value 0x55)

1.3.2 302GS module

Use pure optical flow version protocol

serial number		**Packet data**	**contents note**
1	Packet header	0xFE	Start identifier of the packet (fixed value)
2		0x0A	Optical flow data structure bytes (fixed value)
3	Optical flow laser data structure	Low byte of flow_x_integral	X:The cumulative displacement of pixels over the cumulative time,(radians*10000) [Divided by 10,000 times the height is the actual displacement]
4		High byte of flow_x_integral	
5		Low byte of flow_y_integral	Y:The cumulative displacement of pixels over the cumulative time,(radians*10000) [Divided by 10,000 times the height is the actual displacement]
6		High byte of flow_y_integral	

7		Low byte of integration_timespan	The total time between the last optical flow data transmission and the current optical flow data transmission（us）
8		High byte of integration_timespan	
9		High byte of ground_distance	Reserve. The default is 999 (0x03E7)
10		High byte of ground_distance	
11		valid	Status Value: 0(0x00) indicates that optical flow data is unavailable and 245(0xF5) indicates that optical flow data is available
12		version	The version number of the optical flow module is 0x00
13	Proof test value	Xor	Optical flow data structure (Byte 3 to Byte 12) 10 bytes of XOR value
14	Data packet end	0x55	End of packet identifier (fixed 0x55)

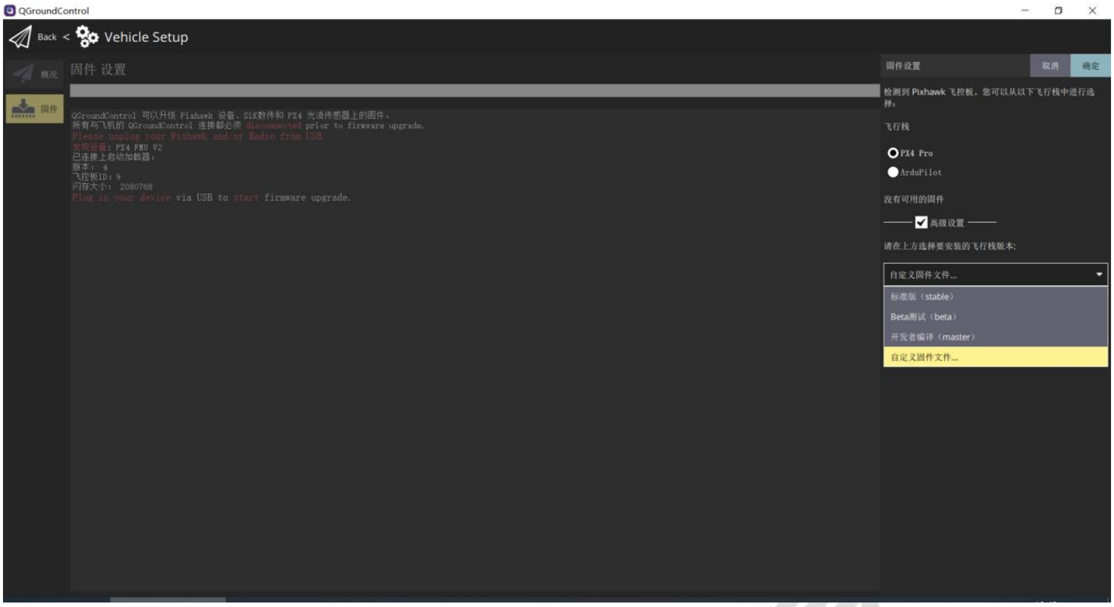
2 Instructions

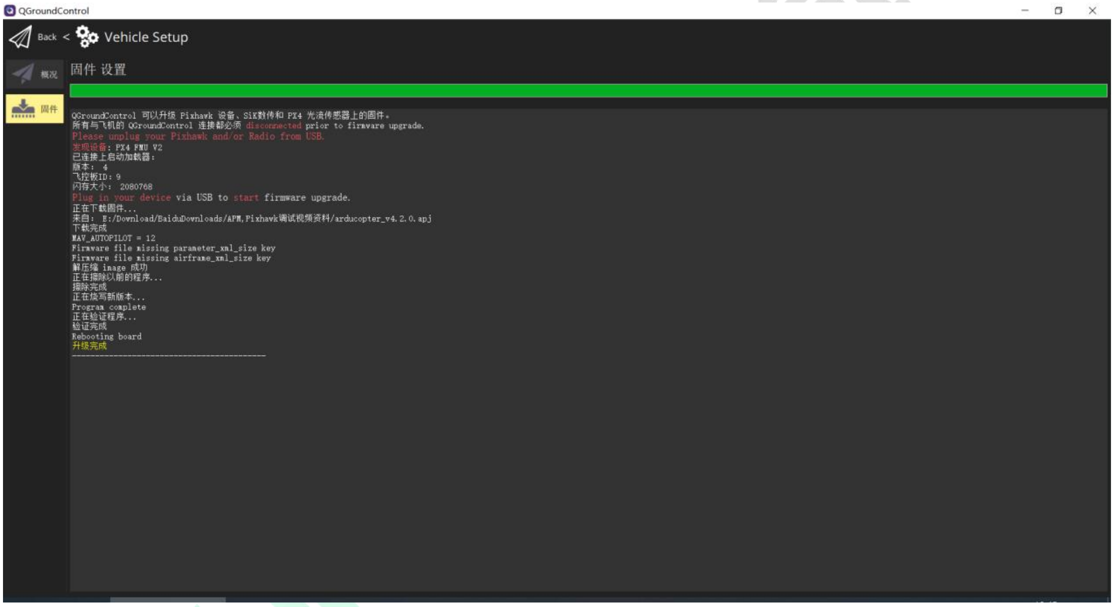
2.1 Burning method

2.1.1 QGroundControl

https://github.com/mavlink/qgroundcontrol/releases QGroundControl ground station
https://firmware.ardupilot.org/Copter/ APM firmware
https://github.com/PX4/PX4-Autopilot/tags PX4 firmware

First,Flight control via USB connection PC,PC opens QGroundControl ground station,Second,wait for the connection to succeed and click the icon in the upper left corner→choose Vehicle Setup→choose firmware,At this time, re-plug the USB, and select Advanced Settings, then select the custom firmware file in the list and click OK or select version online upgrade, finally select firmware in the pop-up file selection box to start the upgrade:

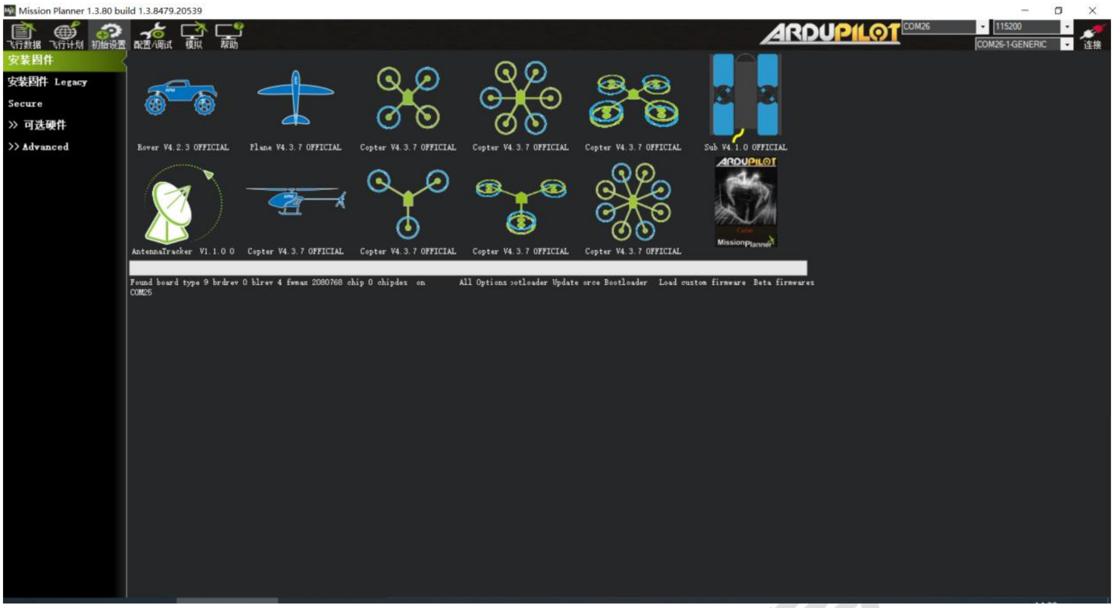


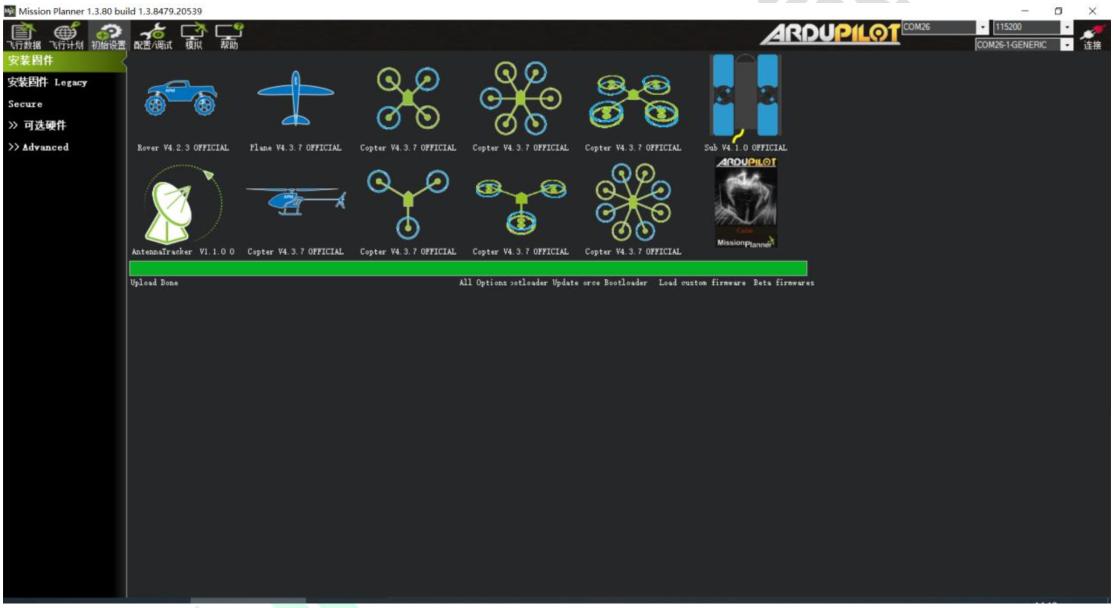


2.1.2 MissionPlanner

https://firmware.ardupilot.org/Tools/MissionPlanner/ MissionPlanner ground station
https://firmware.ardupilot.org/Copter/ APM firmware

First,Flight control via USB connection PC,In the case that the ground station is not connected to the flight control, select the initial setup page → Install firmware → click Load custom firmware to select the firmware to automatically upgrade:

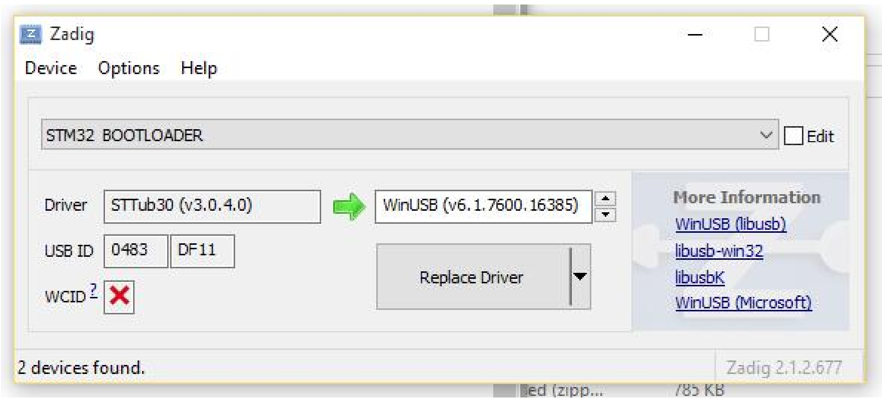




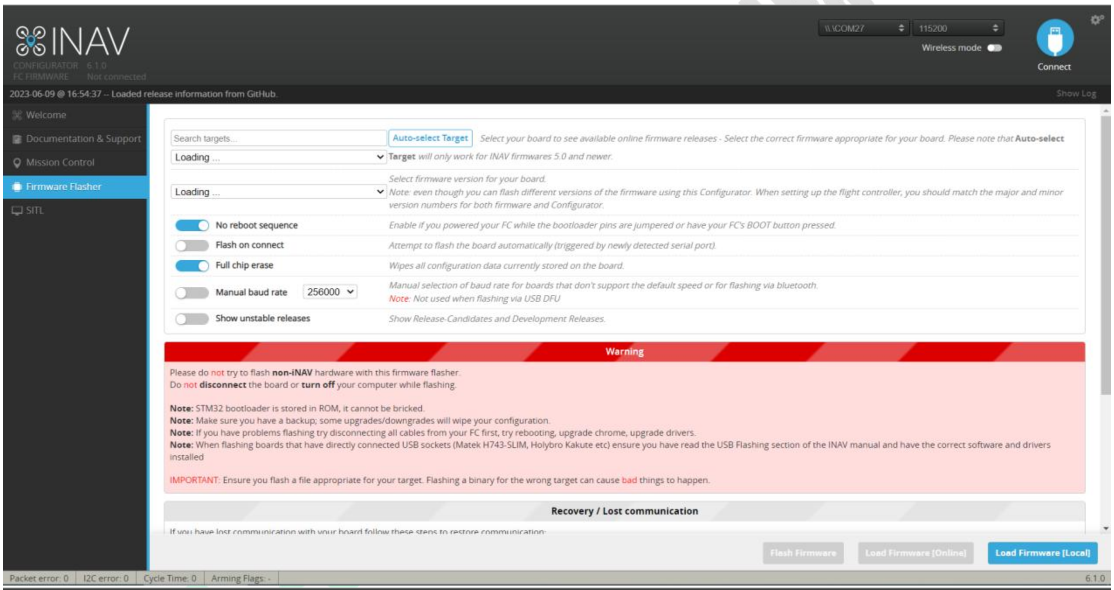
2.1.3 INAV Configurator

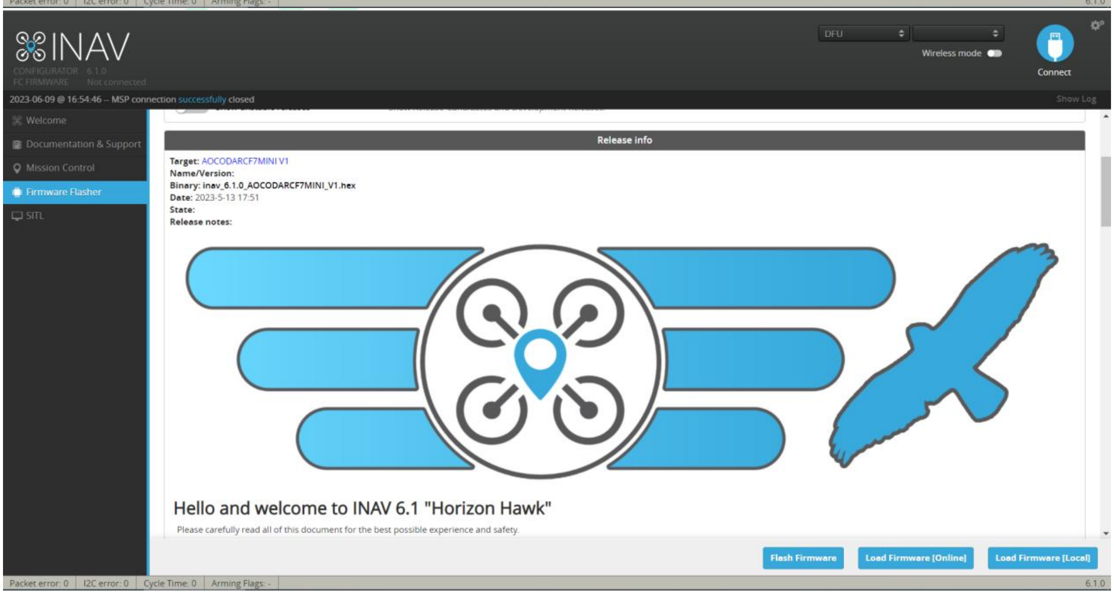
https://github.com/iNavFlight/inav-configurator/releases INAV Configurator ground station
https://github.com/iNavFlight/inav/tags iNavflight firmware
https://zadig.akeo.ie/ Zagid drive

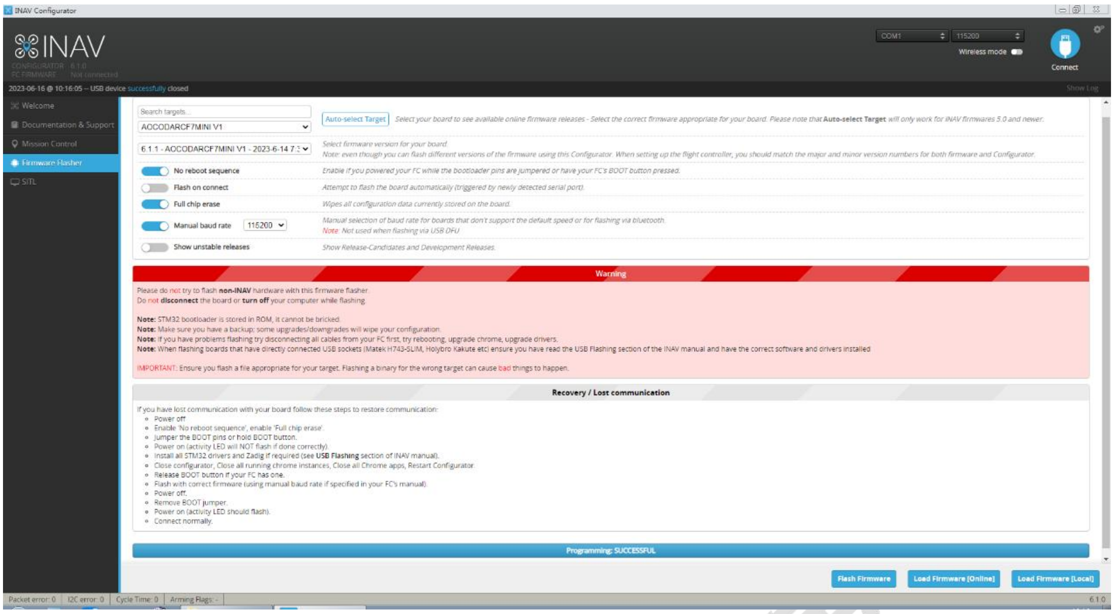
1. First, hold down the key on the board and then connect the PC through USB. At this time, enter the DFU mode, open the Zadig software, select STM32 BOOTLOADER, select WinUSB, and click Replace Driver to install the driver.



2.INavConfigurator Burning firmware method: Press and hold down the key on the board and then connect the PC via USB. At this time, enter the DFU mode. On the main screen, click the Firmware Flasher page, select the board and firmware model, and select No reboot sequence and Full chip erase. Select Load Firmware[Online] or Load Firmware[Local] to load the required Firmware. Finally, click Flash Firmware. Programming: SUCCESSFUL is displayed.







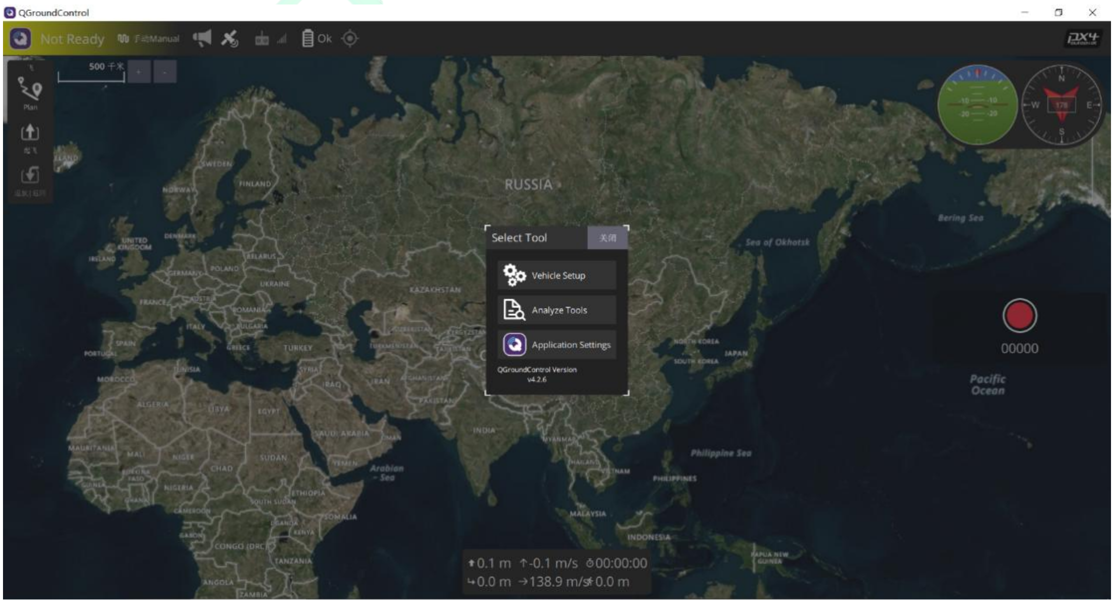
2.2 Application method

2.2.1 QGroundControl+APM

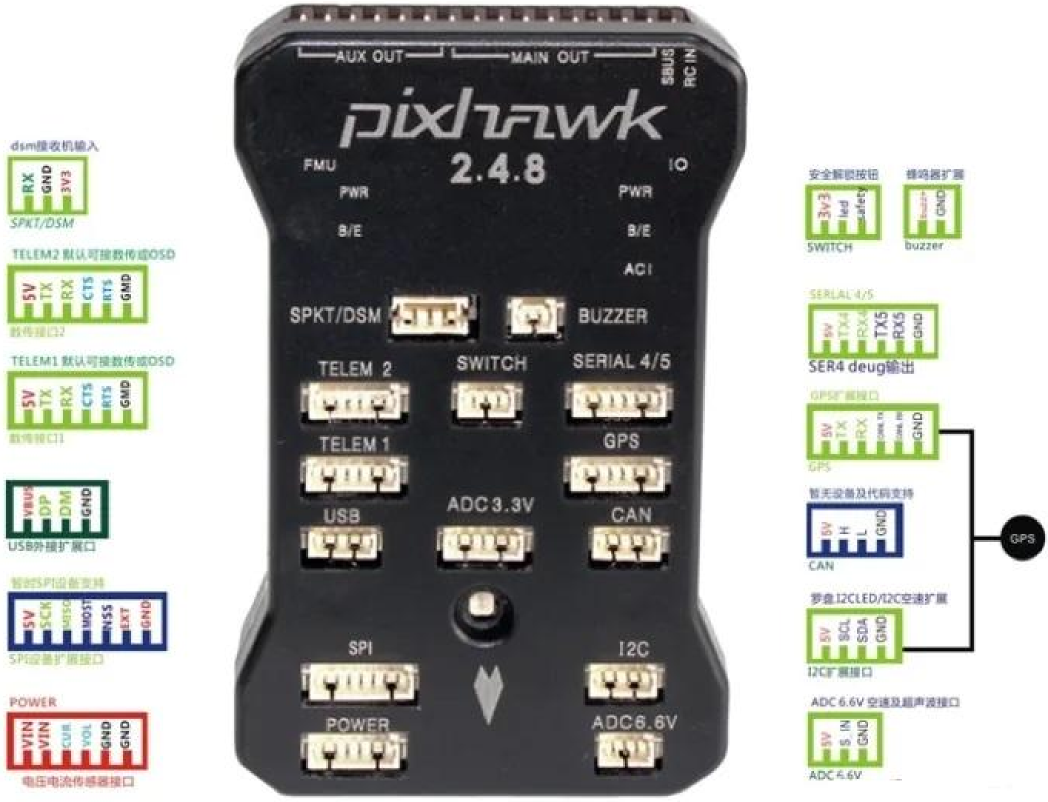
https://ardupilot.org/copter/docs/parameters-Copter-stable-V4.2.0.htmlAPM **parameter specification**

1.Set the optical flow module to APM protocol through serial port command or upixels host computer;

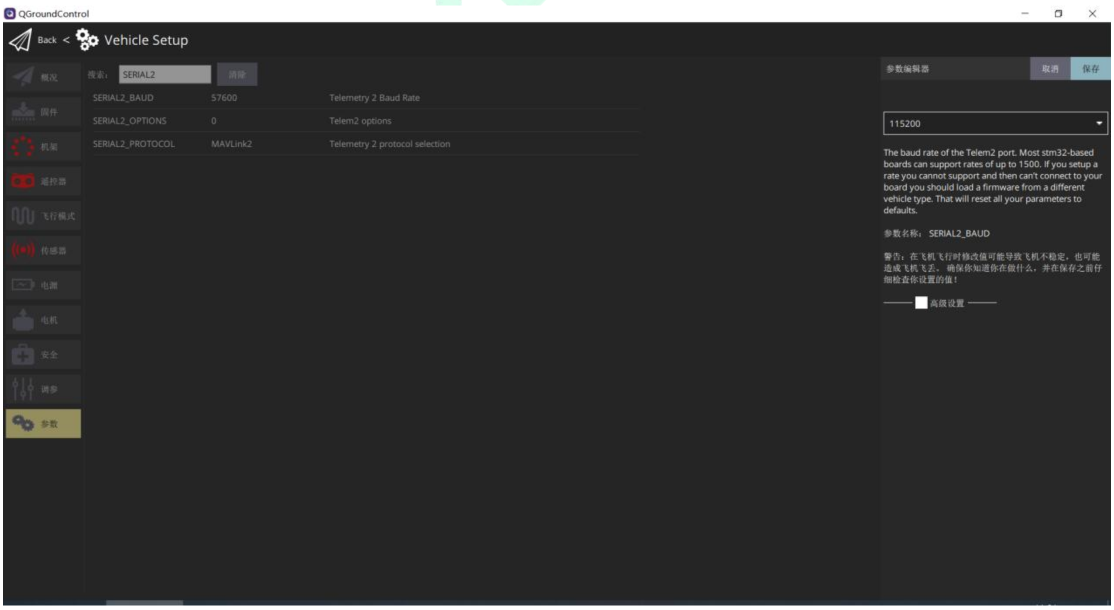
2.Flight control connects to PC via USB, PC opens QGroundControl ground station, click the icon in the upper left corner after successful connection → Select Vehicle Setup→ select parameters:



3.Take TELEM2 port inserted into pixhawk 2.4.8 (connect 5V/RX/GND of TELEM2 port to V/TX/G of optical flow module respectively) as an example:

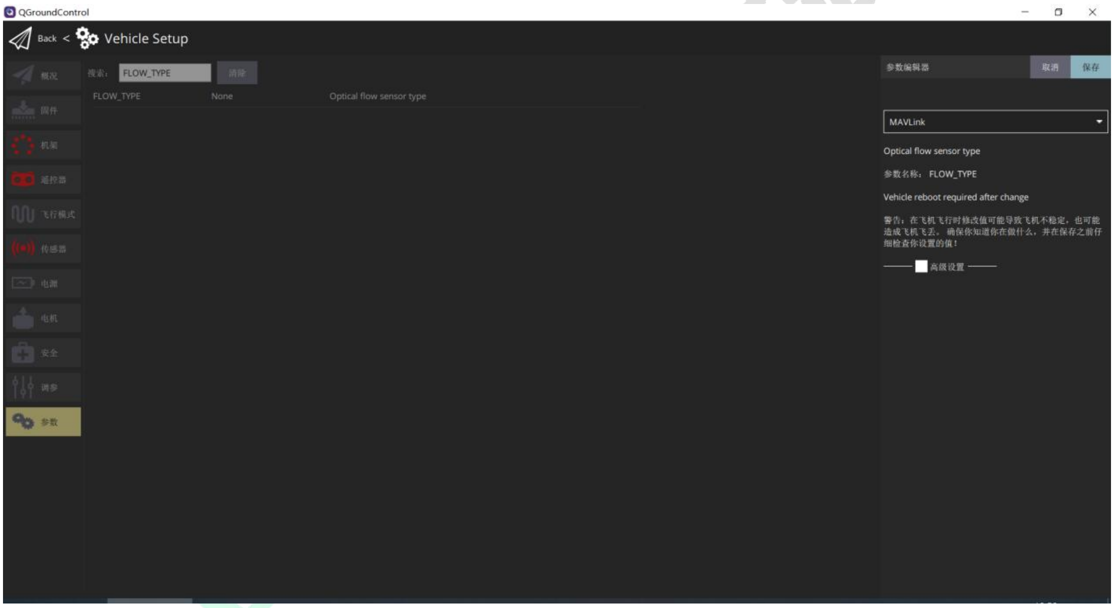


(1)Search SERIAL2_BAUD, T1(001, Plus) and T2) modules set to 115200

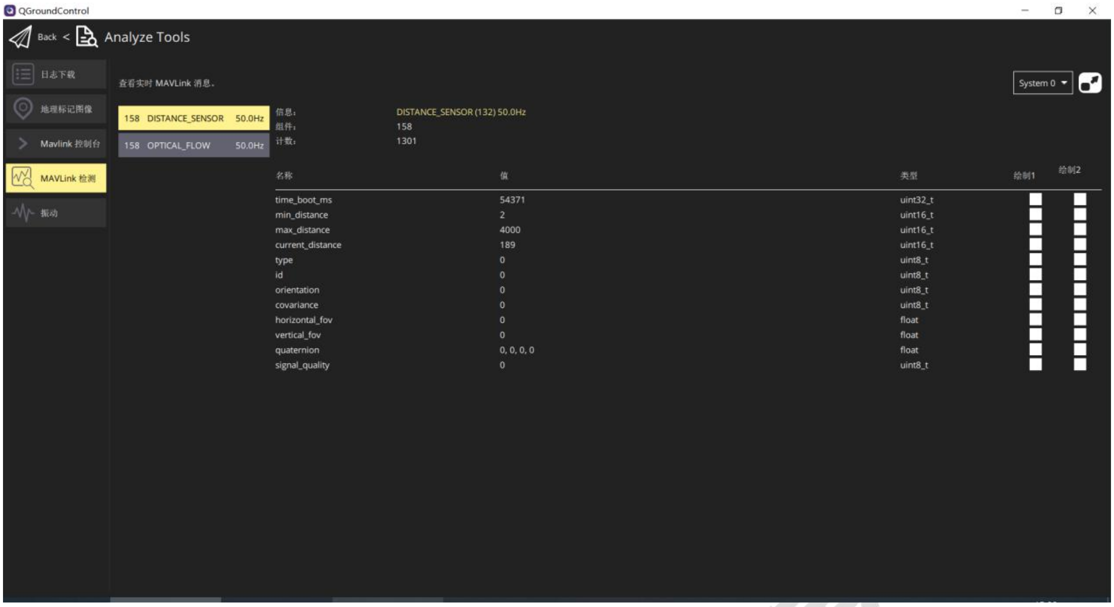


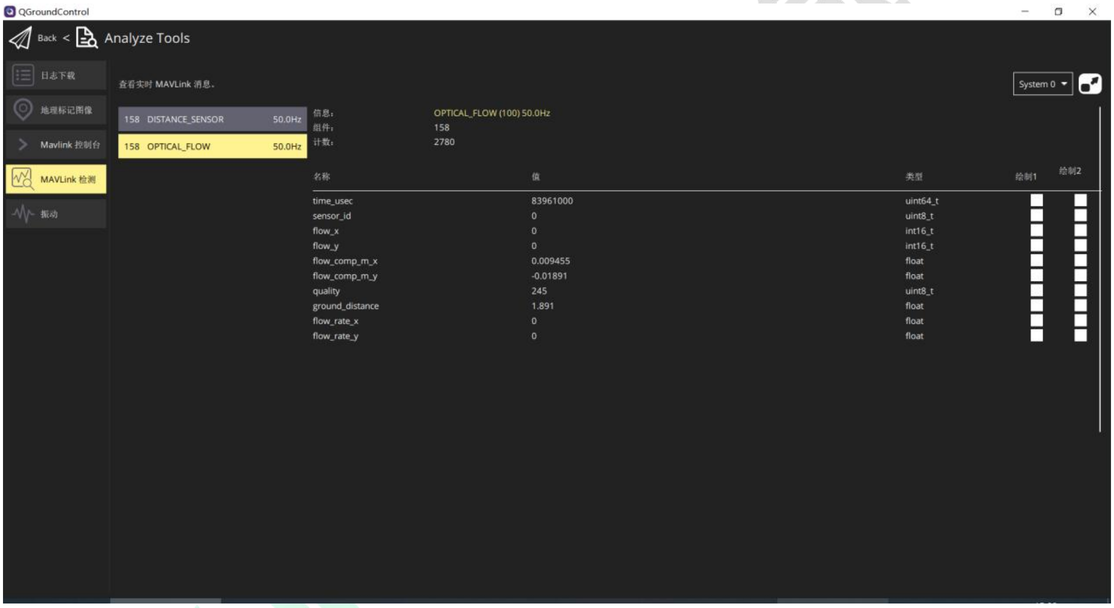
(2)Search **SERIAL2_PROTOCOL,**set to MAVLink1

(3)Search FLOW_TYPE,set to MAVLink or 5



(4) Reinsert the USB and click Disconnect on the main interface. After the automatic reconnection succeeds, go back to the main interface and click the icon in the upper left corner → select Analyze Tools→ select MAVLink detection. You can see the new DISTANCE_SENSOR and OPTICAL_FLOW_RAD data:

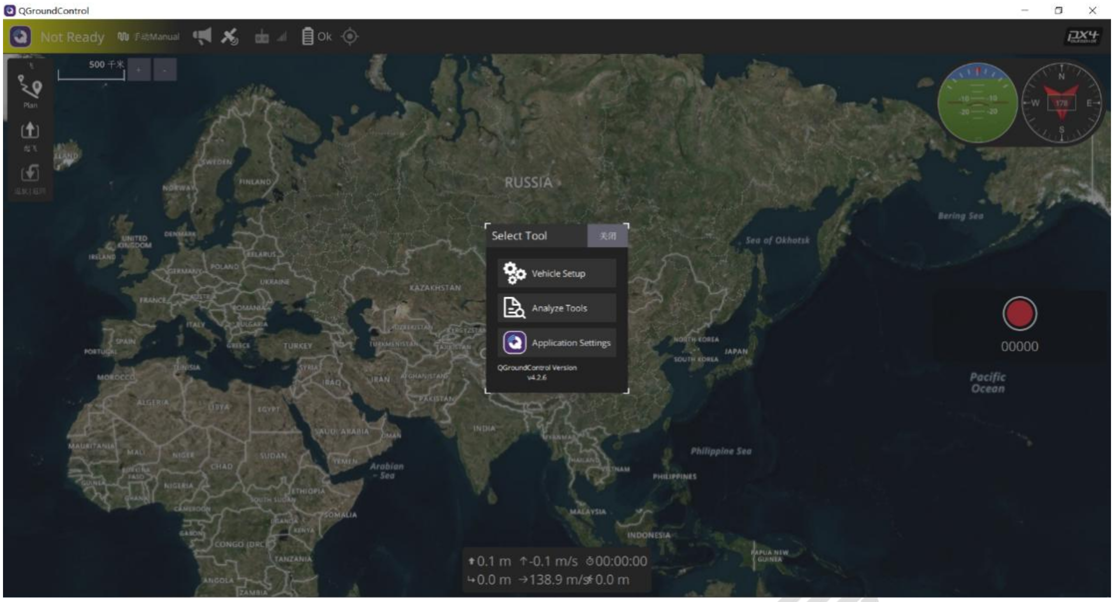




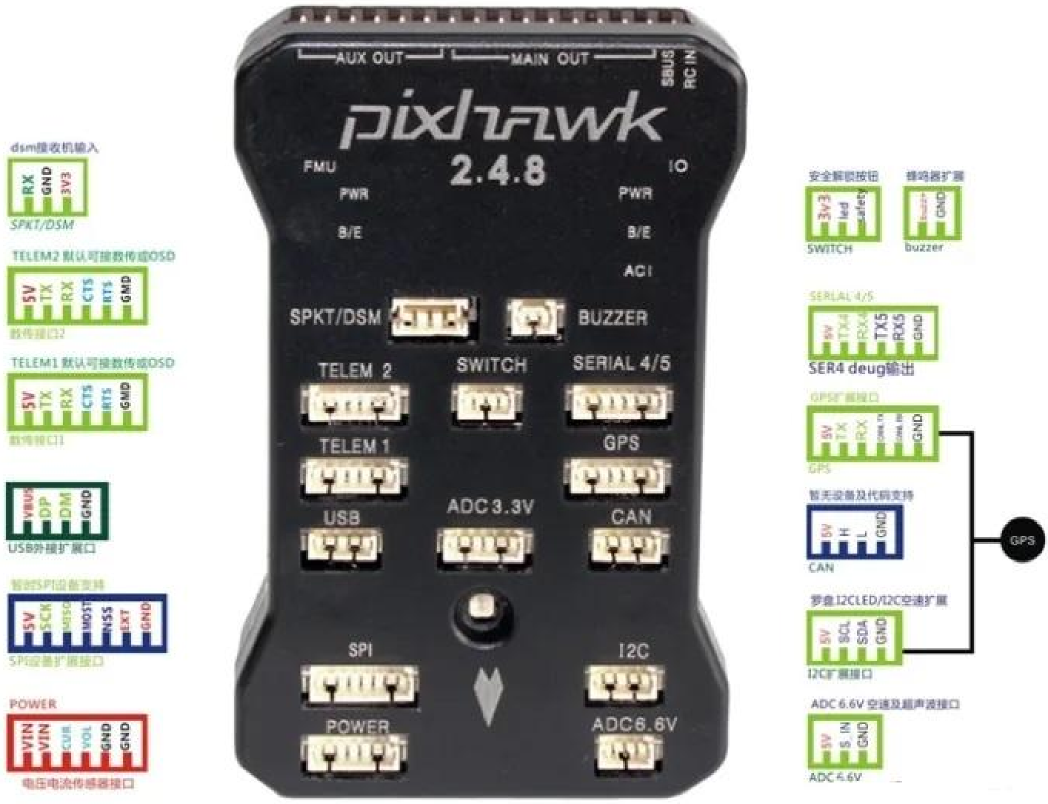
2.2.2 QGroundControl+PX4

http://docs.px4.io/main/zh/advanced_config/parameter_reference.html PX4 Autonomous Driving User Guide

1. Set the optical flow module to PX4 protocol through serial port command or upixels host computer;
2. Flight control connects to PC via USB, PC opens QgroundControl ground station, wait for successful connection, click the icon in the upper left corner → Select Vehicle Setup→ select parameters:



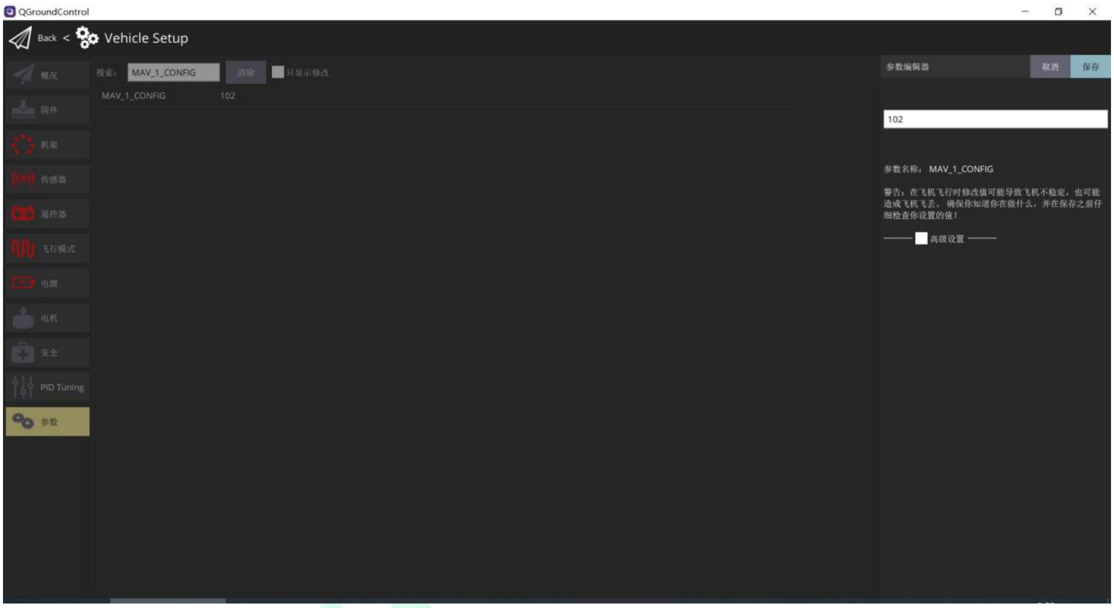
3. Take TELEM2 port inserted into pixhawk 2.4.8 (connect 5V/RX/GND of TELEM2 port to V/TX/G of optical flow module respectively) as an example:



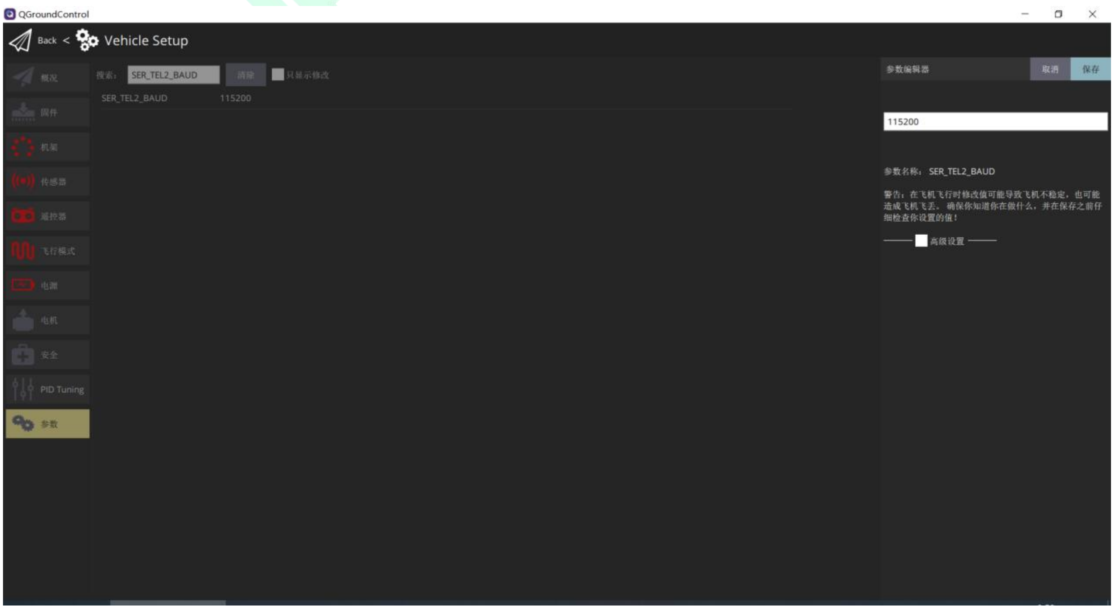
(1) Search for MAV_1_CONFIG, insert TELEM2 port, and set it to 102 according to the following table

参数对照:

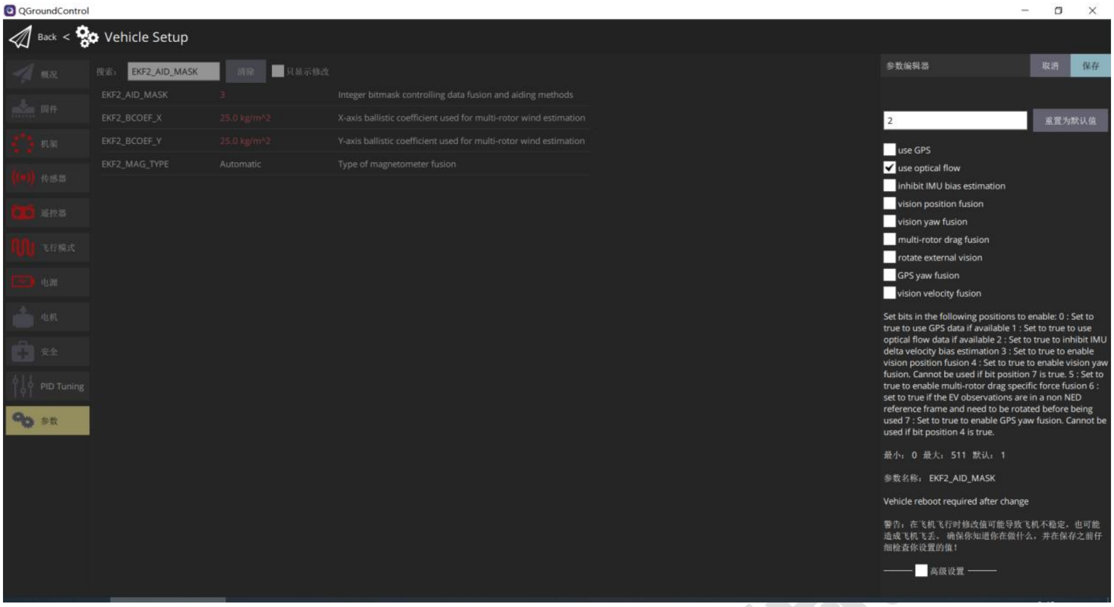
- 0: Disabled
- 6: UART 6
- 101: TELEM 1
- 102: TELEM 2
- 103: TELEM 3
- 104: TELEM/SERIAL 4
- 201: GPS 1
- 202: GPS 2
- 203: GPS 3
- 300: Radio Controller
- 301: Wifi Port
- 401: Pixhawk Payload Bus



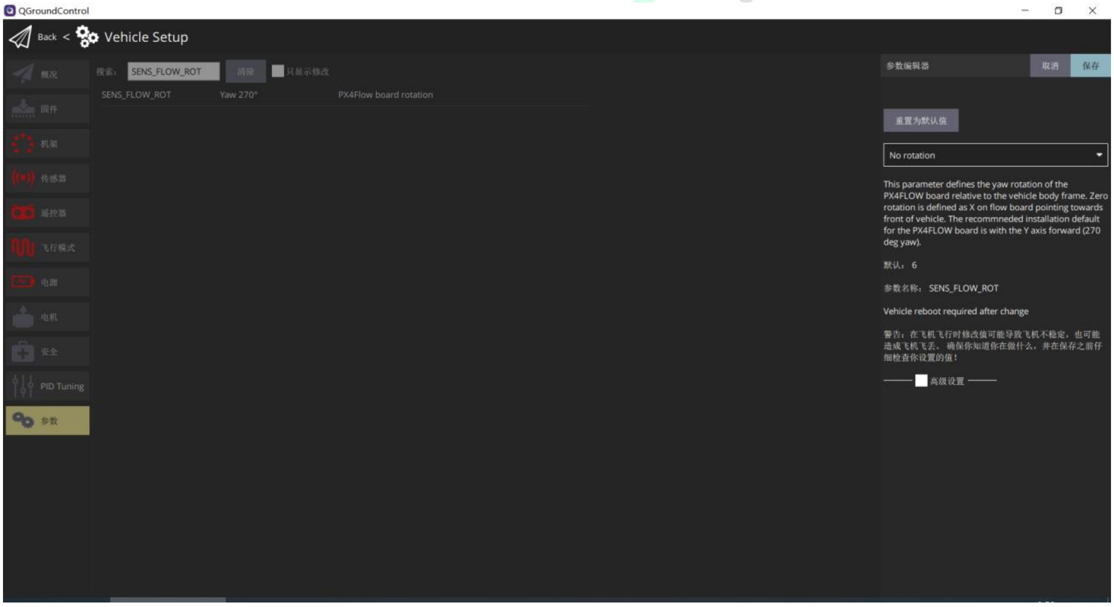
(2)Restart QGC and search for SER_TEL2_BAUD. Set the value to 115200 for T1(001, Plus) and T2 modules and 460800 for 302GS module



(3) Search for EKF2_AID_MASK and select at least use optical flow



(4) Search for EKF2_RNG_AID and set it to Range aid enabled(After setting it to Range aid enabled, the fixed altitude will be provided by LiDAR. If the aircraft encounters obstacles, it will climb. If you do not want this, set it to Range aid disabled)

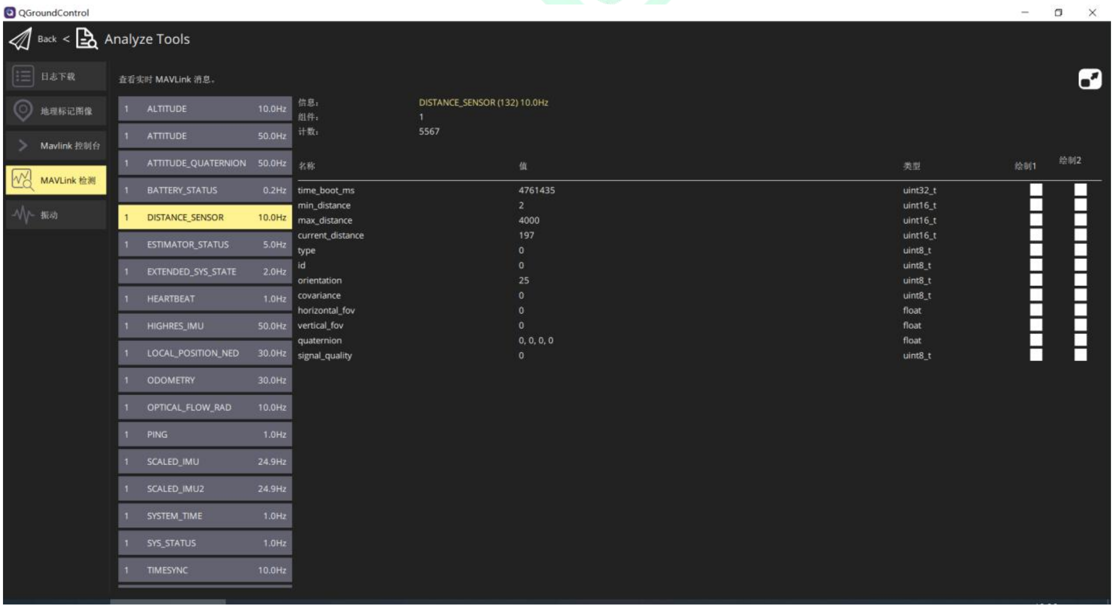


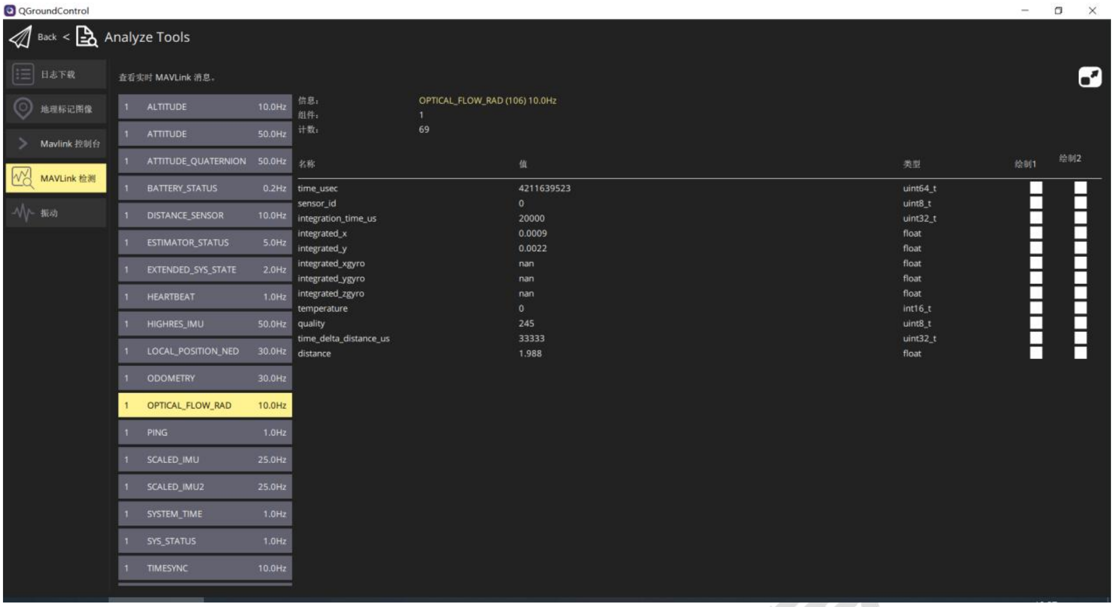
(5) Search SENS_FLOW_ROT (The optical flow installation direction can be set to 0-7 depending on your installation situation)

SENS_FLOW_ROT (INT32)	Optical flow rotation **Comment:** This parameter defines the yaw rotation of the optical flow relative to the vehicle body frame. Zero rotation is defined as X on flow board pointing towards front of vehicle. **参数对照:** • **0:** No rotation • **1:** Yaw 45° • **2:** Yaw 90° • **3:** Yaw 135° • **4:** Yaw 180° • **5:** Yaw 225° • **6:** Yaw 270° • **7:** Yaw 315°

Set EKF2_OF_POS_X, EKF2_OF_POS_Y, EKF2_OF_POS_Z according to the installation position of the optical flow module (these parameters are in the NED coordinate system of the body). Set the parameters EKF2_RNG_POS_X, EKF2_RNG_POS_Y, and EKF2_RNG_POS_Z based on the installation position of the optical flow module.

4. Re-plug the USB and click Disconnect on the main interface. After the automatic reconnection succeeds, go back to the main interface and click the icon in the upper left corner → select Analyze Tools→ select MAVLink detection.



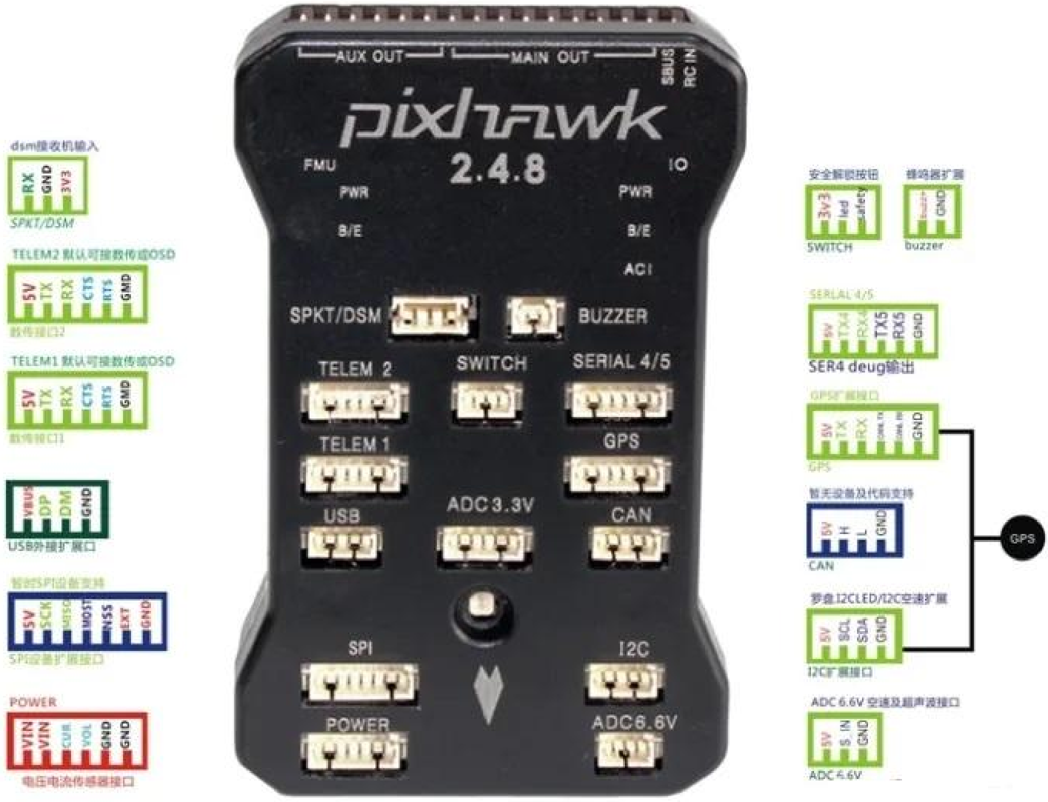


2.2.3 MissionPlanner+APM

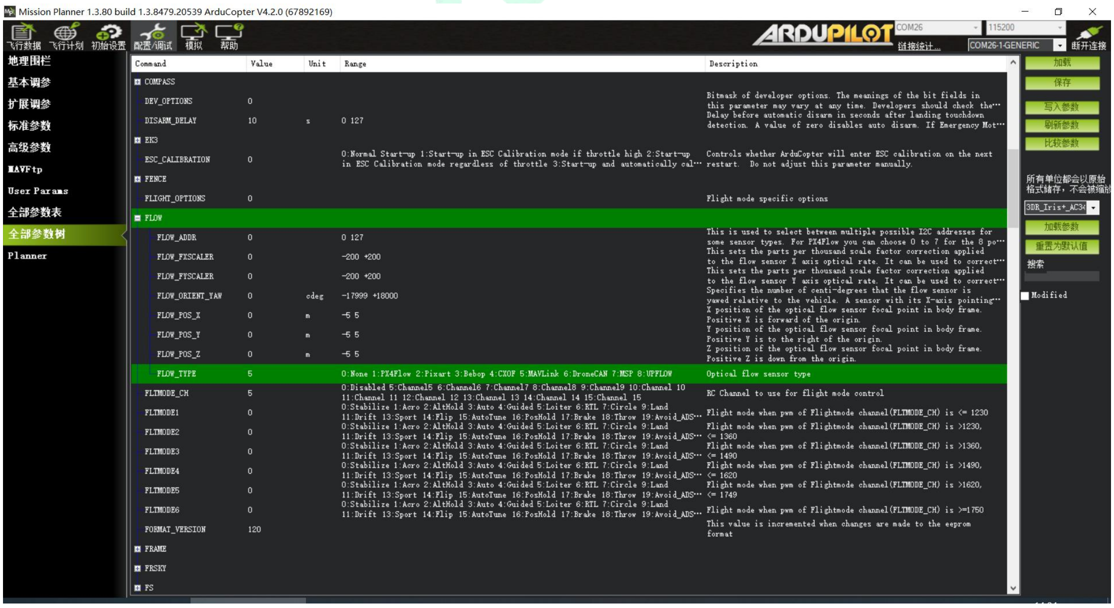
1.Set the optical flow module to APM protocol through serial port command or upixels host computer;

2.Flight control connects to the PC via USB. Open the MissionPlanner ground station on the PC, select the correct port number and baud rate in the upper right corner, wait for the connection to succeed, and click the Configuration/debugging page → Select All Parameter tree

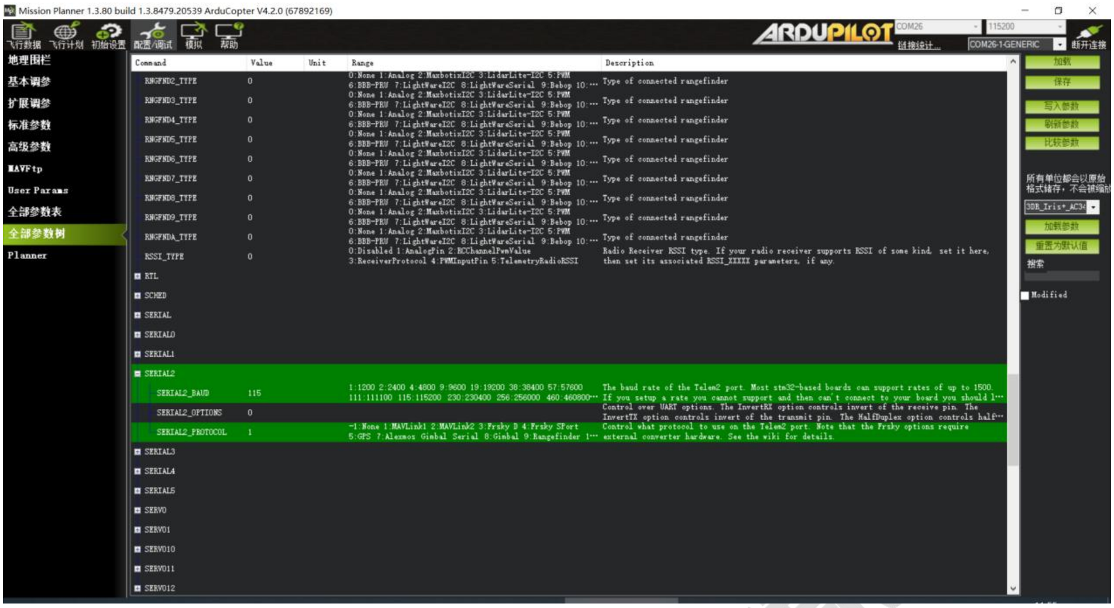
3. Take TELEM2 port inserted into pixhawk 2.4.8 (connect 5V/RX/GND of TELEM2 port to V/TX/G of optical flow module respectively) as an example:



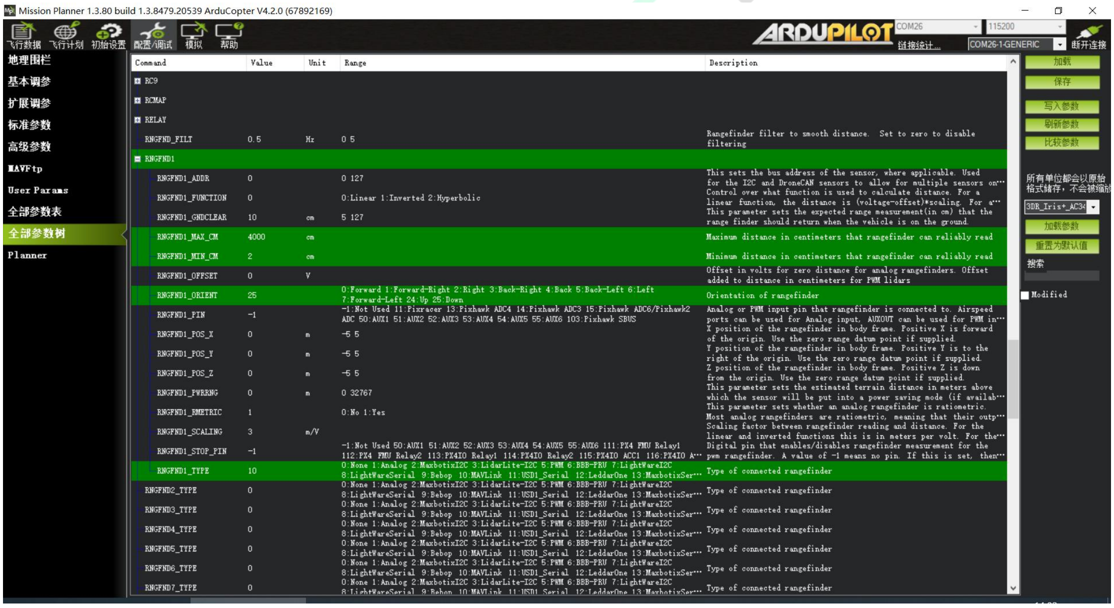
(1)Set FLOW_TYPE to 5.



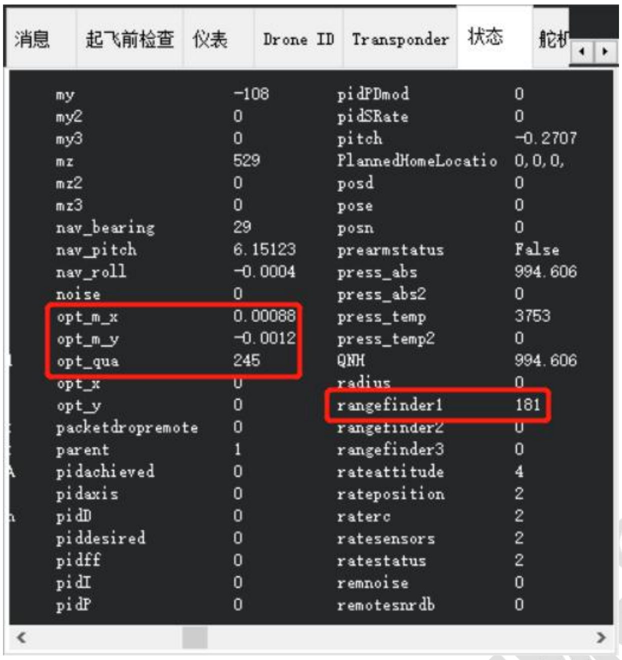
(2)Set SERIAL2_BAUD to 115 and set SERIAL2_PROTCOL to 1;



(3)Set RNGFND1_TYPE to 10,RNGFND1_MAX_CM of T1 sets to 400,RNGFND1_MAX_CM of T2 sets to 1500,RNGFND1_MIN_CM of T1 sets to 2,RNGFND1_MIN_CM of T2 sets to 5,RNGFND1_ORIENT sets to 25;



4. Click Write parameters on the right, then restart flight control, and reconnect the ground station to flight control, you can see the updates of opt_m_x, opt_m_y, opt_qua and rangefinder1 data on the status page of the main interface:

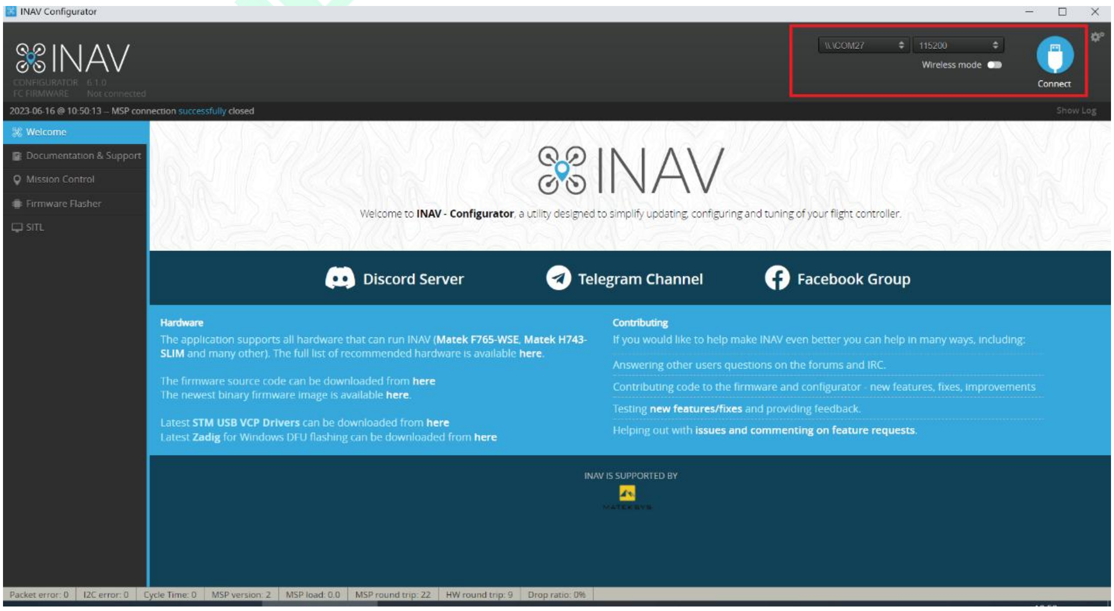


2.2.4 INAV Configurator+iNavflight

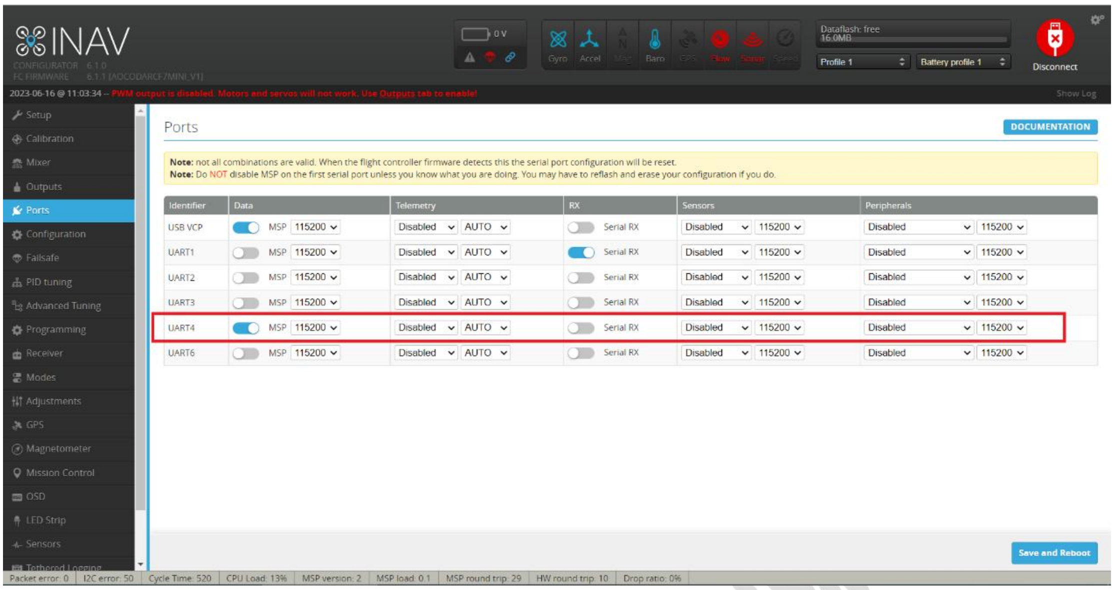
https://github.com/iNavFlight/inav/tree/master/docs iNavflight Docs

1. Set the optical flow module to MSP protocol through serial port command or upixels host computer;

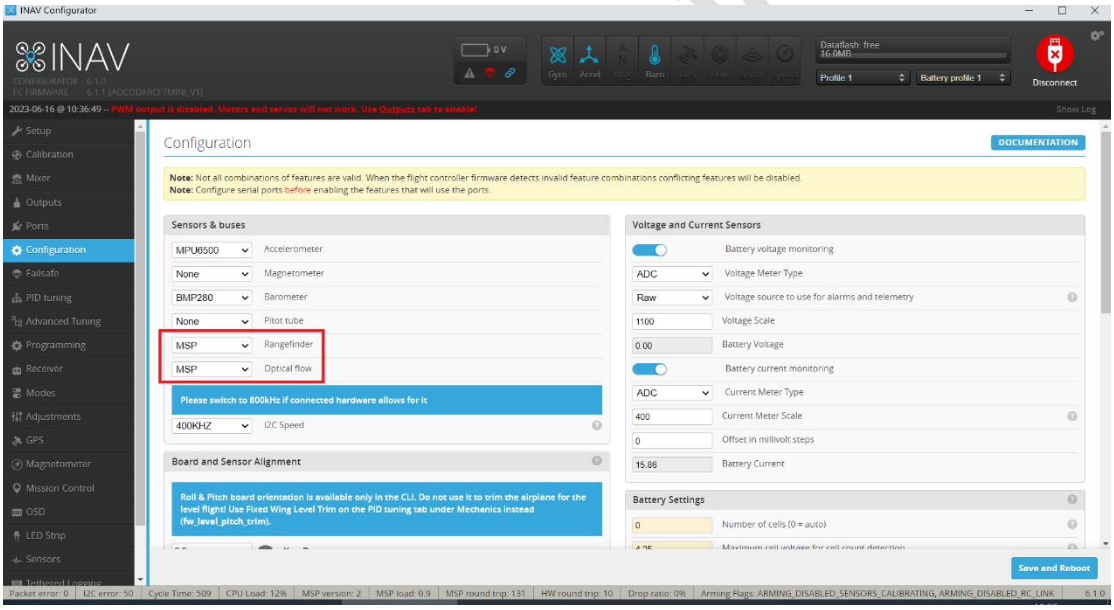
2. Do not hold down the button at the end of the board to Connect the PC directly through USB, select the correct USB port number and the default baud rate 115200 in the upper right corner, and click Connect;



(1) Connect the module to the flight control serial port such as UART4, set the baud rate for T1(001, Plus) and T2 modules to 115200 on the Ports page, start MSP, and click Save and Reboot;



(2)On the Configuration page, set Rangefinder and Optical flow to MSP and click Save and Reboot.



(3) When the light stream and sonar icon is lit, the optical flow data needs to be opened by command on the CLI page:

set debug_mode = FLOW_RAW

save

Finally, click on the Sensors page to observe the data.


INAV Configurator
INAV
CONFIGURATOR 6.0.0-FP2
FC FIRMWARE 6.0.0
0.15 V
Gyro
Accel
Mag
Baro
GPS
Flow
Sonar
No dataflash chip found
Profile 1
Battery profile 1
Disconnect
2022-12-10 @ 22:38:58 -- Unique device ID received - 0x47004a484850142031374 3
Show Log
Setup
Calibration
Mixer
Outputs
Ports
Configuration
Failsafe
PID tuning
Advanced Tuning
Programming
Receiver
Sonar - cm
Refresh: 30 ms
X: 203.00
Debug 0
Refresh: 20 ms
X: -9