

T series product commissioning manual

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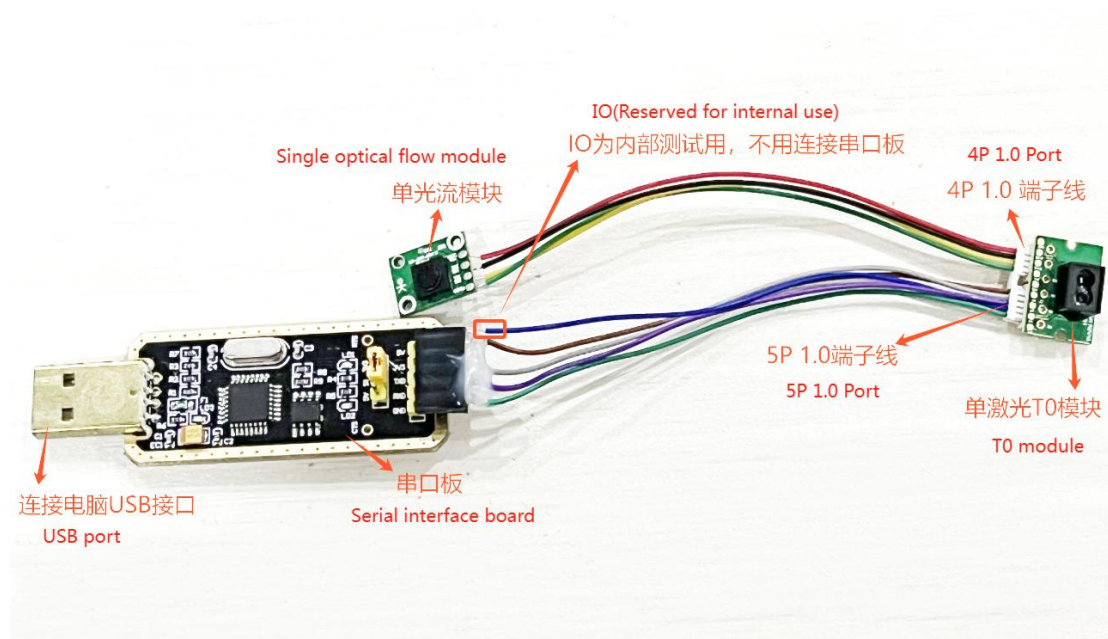
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1.Module connection mode

1.1 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.

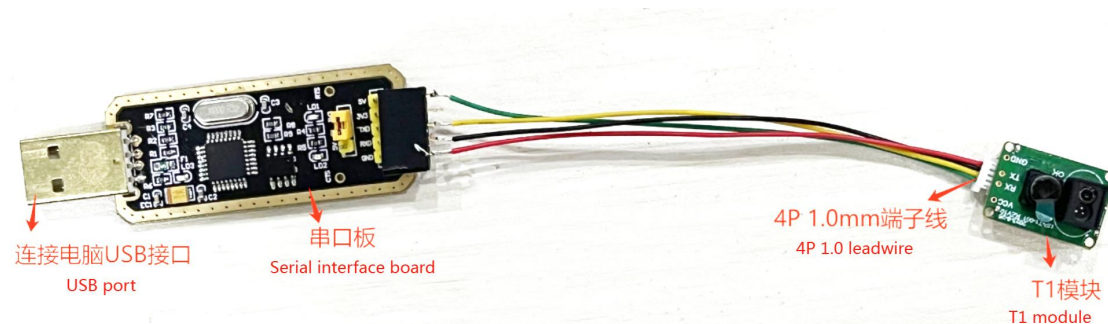


The mapping between serial port board, T0 module, and optical flow module is as follows:

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)	-	-

1.2 T1 Module

T1-001 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.

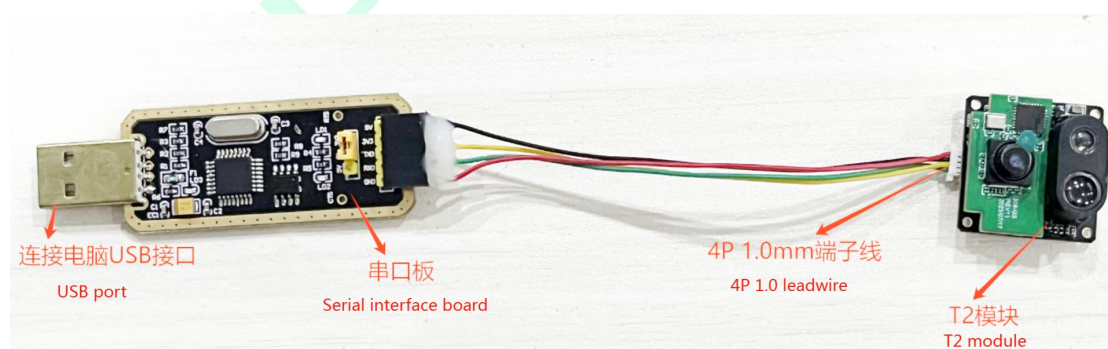


The mapping between serial port boards and T1 modules is as follows:

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

1.3 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:

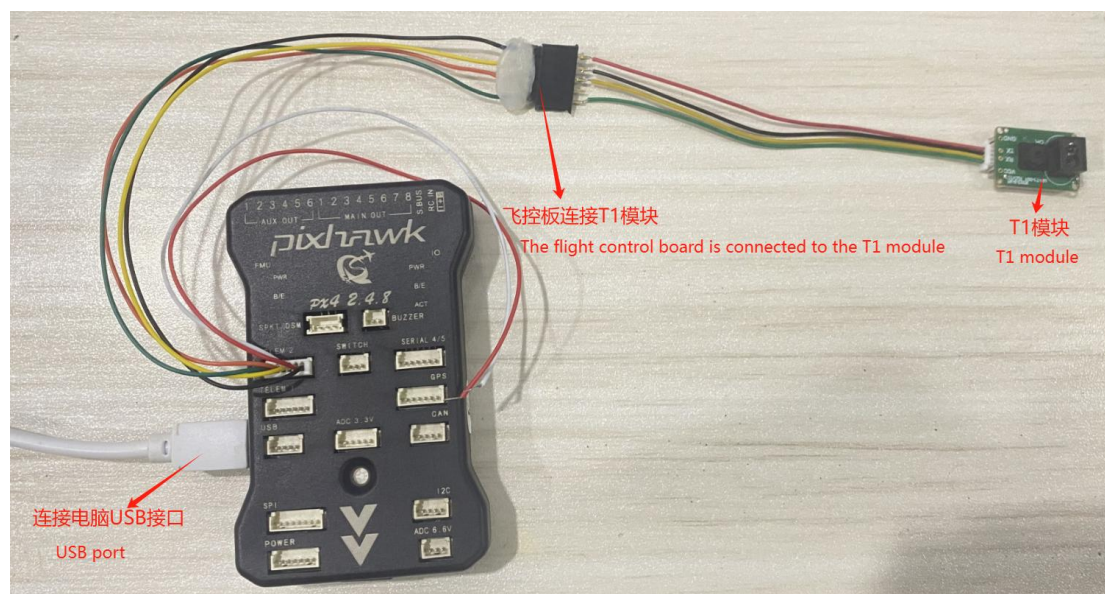
Serial port board	T2 module(4P 1.0mm port)
5V	5V
GND	GND

TX	RX
RX	TX

1.4 T1 Connect to “pixhawk 2.4.8 Flight Control”

It can be applied to T1 module +APM protocol +QGroundControl, T1 module + PX4 protocol +QGroundControl, T1+APM protocol +MissionPlanner, and the connection mode is as follows:

Note: T2 connection method is the same, the connection method can see the screenshot below, you can also find customer service staff to ask for related videos.



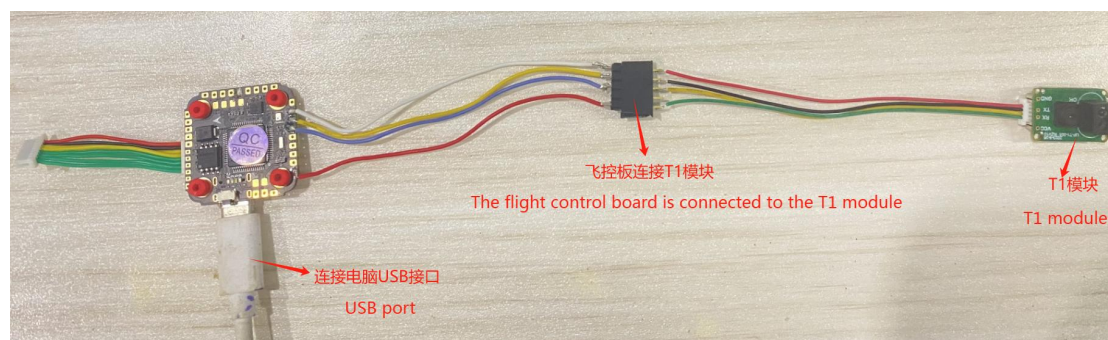
The linear relationship between the flight control board and T1 module is as follows:

The flight control board(6P port)	T1 module(4P 1.0mm port)
5V	5V
GND	GND
TX	RX
RX	TX

1.5 T1 Connect to “Aocoda-RC F722MINI.V1.0”

It can be applied to T1 module + MSP protocol +INAV Configurator,and the connection mode is as follows:

Note: T2 connection method is the same, the connection method can see the screenshot below, you can also ask the customer service staff for related videos.



The linear relationship between the flight control board and T1 module is as follows:

The flight control board	T1 module(4P 1.0mm port)
5V	5V
GND	GND
TX	RX
RX	TX

2.Module installation direction

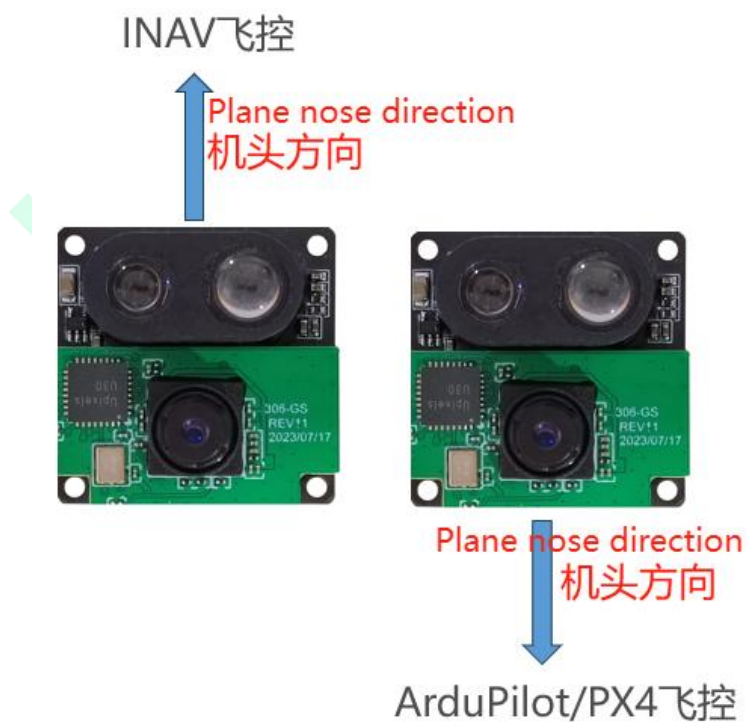
2.1 How do you tell which axis is aligned with the nose of the plane?

The module is installed vertically,the xy axis can be on the nose of the aircraft,do not align the x axis with the nose, then use the y axis data.After installation, hold the aircraft forward and backward translation, which axis data is large, which is the corresponding nose direction.

2.2 T1 module default aircraft nose orientation



2.3 T2 module default aircraft nose orientation



3.The upper computer common problems and solutions

Q1:The serial port on the upper computer fails to open

Solutions:

- 1.Please check the upper computer operation document or operation video of the corresponding product, the document or video can ask for customer service staff;
- 2.Please check whether the selected device number is correct, or you can unplug other devices and keep only the device of this module.
- 3.Whether the line sequence between the module and the serial port board is correct;
- 4.Re-insert the module;
- 5.Replace the serial port board and terminal cable;
- 6.The serial port board is directly connected to the USB port of the computer;
- 7.Change to a different USB port;
- 8.Get a different computer.

Q2:The upper computer has no waveform output

Solutions:

- 1.Please check the upper computer operation document or operation video of the corresponding product, the document or video can ask for customer service staff;
- 2.Check whether the pin of the connector on the module is inserted crooked;
- 3.Please check whether the protocol of the module is consistent with that of the host computer; You can check by selecting the protocol content one by one, for example, if you choose APM, no waveform output means that it is not APM protocol, and if you choose PX4, waveform output means that the module is PX4 protocol;
- 4.If you do not need to know what protocol the module is, as long as it can be used, you can directly select the required protocol, click the "switch protocol" button to switch to the required protocol.

Q3:How to judge the feasibility of laser data

Solutions:

- 1.Please check the upper computer operation document or operation video of the corresponding product, the document or video can ask for customer service staff;
- 2.The blue waveform is TOF, measuring objects at different distances, and the blue waveform will change according to the actual distance.

Q4:How to judge the feasibility of optical flow data

Solutions:

- 1.Please check the upper computer operation document or operation video of the corresponding product, the document or video can ask for customer service staff;
- 2.You can use books with characters to slide uniformly around 10cm away from the module, and there will be regular fluctuations in the red X axis and black Y axis, which means that the optical flow data is OK.

Q5:How to switch protocols

Solutions:

- 1.Please check the upper computer operation document or operation video of the corresponding product, the document or video can ask for customer service staff;
- 2.Select the required protocol and click "switch protocol" button. If we want to switch MSP protocol, select MSP and click "switch protocol". If there is waveform output, it means that the switch is successful.

Q6:When the waveform disappears, how do I display it again

Solutions:

- 1.Please check the upper computer operation document or operation video of the corresponding product, the document or video can ask for customer service staff;
- 2.You can click the legend to open or hide it again;
- 3.The upper computer program can be closed and reopened.

Q7:How to turn on optical flow confidence and TOF confidence

Solutions:

- 1.Please check the upper computer operation document or operation video of the corresponding product, the document or video can ask for customer service staff;
- 2.Click on the FlowValid and DistanceConfidence of legend.

Q8:How do I check if there is a median when switching between high and low distance of TOF?

Solutions:

- 1.Please check the upper computer operation document or operation video of the corresponding

product, the document or video can ask for customer service staff;

2. When photographing objects of high and low distance (for example, moving left and right to photograph the high and low distance between the desktop and the ground), view the distance change value by saving the log. For details about how to save logs, see the instructions on the upper computer.

Dist.	Conf.	Noise	Peak
147	100	95	4924079
147	100	95	4924079
144	100	137	4924079
144	100	137	4924079
897	100	124	460345
897	100	129	460345
895	100	129	460345
895	100	129	460345
895	100	129	460345
892	100	129	452269
889	100	126	453625

There is no intermediate value when switching between high and low distances
高低距离切换时不存在中间值

Dist.	Conf.	Noise	Peak
118	100	69	480021
118	100	69	480021
117	100	68	475952
120	100	68	475952
137	100	73	471575
287	100	73	471575
653	100	73	471575
813	100	70	475324
838	100	70	475324
856	100	78	470538
843	100	78	470538

There are two intermediate values for the high-low distance switch: 287, 653
高低距离切换时存在2个中间值: 287, 653

Q9: The PX4 protocol waveform output is particularly slow

Solutions:

1. Use SScom to print logs to view the output speed.

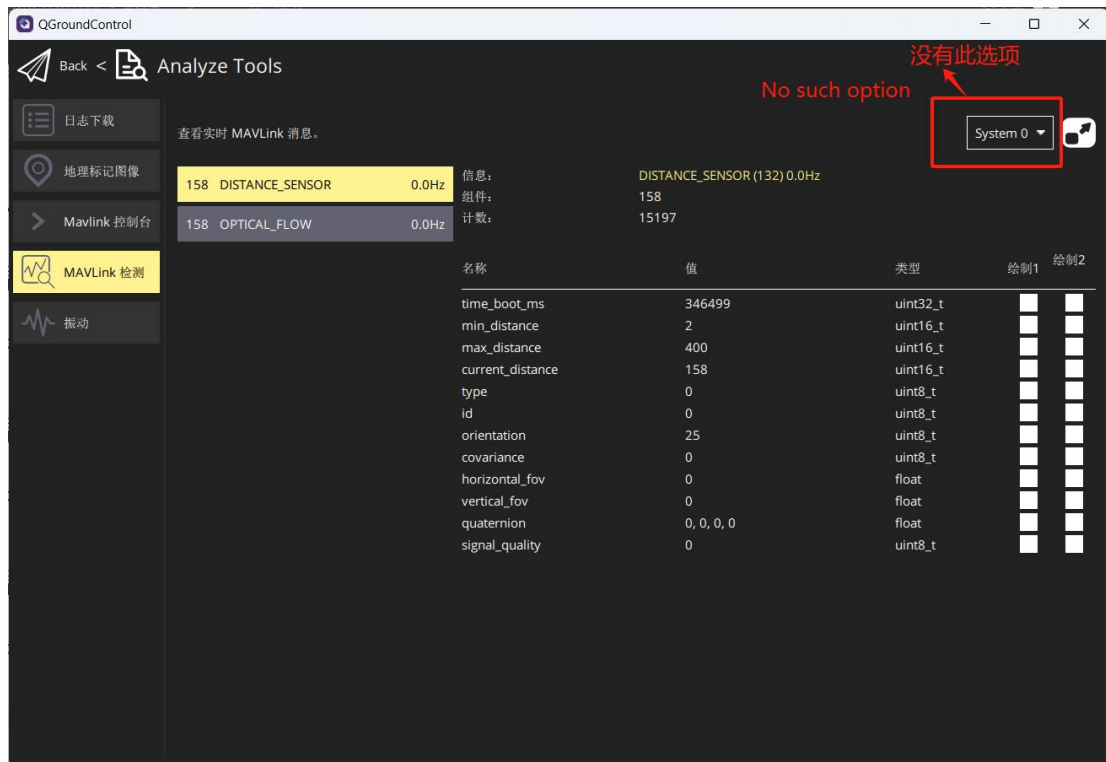
4. Flight control common problems and solutions

Q1: No data output

Solution: Ask customer service for documentation and videos.

Q2: QGroundControl → Analyze Tools → MAVLink, Detect no "System0" option

Solution: Check whether the module is switched to the corresponding protocol. For example, if the flight control firmware is APM, the module must be switched to the APM protocol.



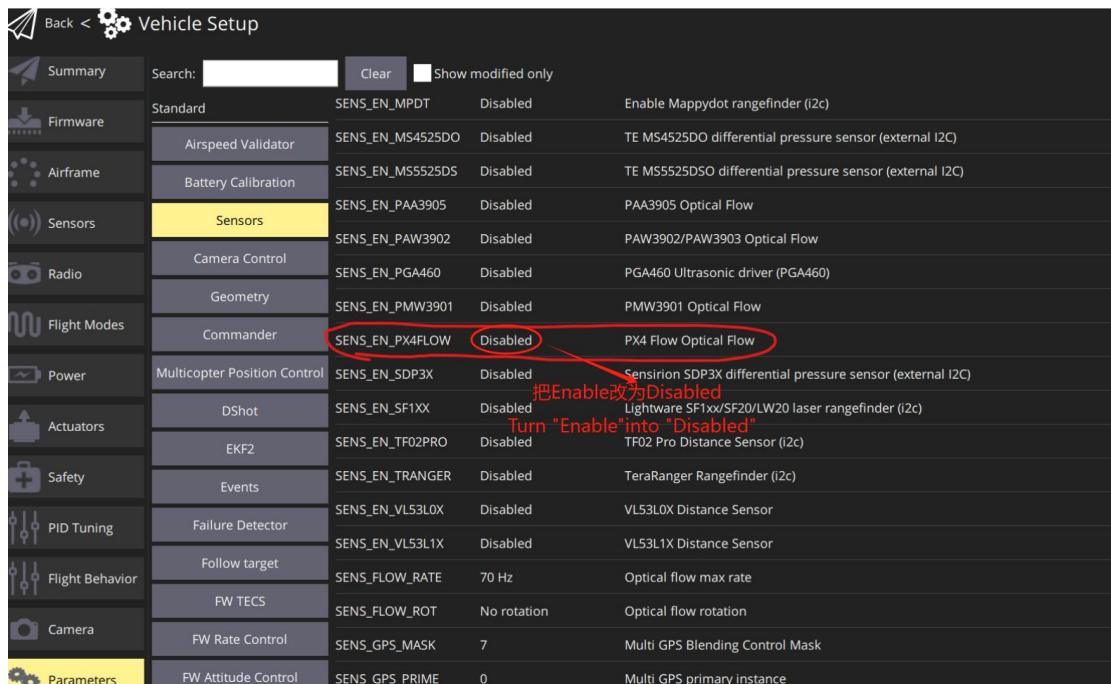
Q3:After a period of flight, the fixed point mode automatically switches to fixed altitude mode

Solution:connect by using USB

Q4:PX4 Protocal-QGC can not find“OPTICAL_FLOW_RAD”

Solutions:

- 1.Ensure that the module has been cut into the PX4 protocol.
- 2.Change PX4 FLOW from Enable to Disabled.



Category	Sub-category	Parameter	Status	Description
Summary	Standard	SENS_EN_MPDPT	Disabled	Enable Mappydot rangefinder (i2c)
	Airspeed Validator	SENS_EN_MS4525DO	Disabled	TE MS4525DO differential pressure sensor (external I2C)
Airframe	Battery Calibration	SENS_EN_MS5525DS	Disabled	TE MS5525DSO differential pressure sensor (external I2C)
	Sensors	SENS_EN_PAA3905	Disabled	PAA3905 Optical Flow
Radio	Camera Control	SENS_EN_PAW3902	Disabled	PAW3902/PAW3903 Optical Flow
	Geometry	SENS_EN_PGA460	Disabled	PGA460 Ultrasonic driver (PGA460)
Flight Modes	Commander	SENS_EN_PMW3901	Disabled	PMW3901 Optical Flow
		SENS_EN_PX4FLOW	Disabled	PX4 Flow Optical Flow
Power	Multicopter Position Control	SENS_EN_SDP3X	Disabled	Sensorion SDP3X differential pressure sensor (external I2C)
	DShot	SENS_EN_SF1XX	Disabled	Lightware SF1xx/SF20/LW20 laser rangefinder (i2c)
Actuators	EKF2	SENS_EN_TF02PRO	Disabled	TF02 Pro Distance Sensor (i2c)
	Events	SENS_EN_TRANGER	Disabled	TeraRanger Rangefinder (i2c)
PID Tuning	Failure Detector	SENS_EN_VL53L0X	Disabled	VL53L0X Distance Sensor
	Follow target	SENS_EN_VL53L1X	Disabled	VL53L1X Distance Sensor
Flight Behavior	FW TECS	SENS_FLOW_RATE	70 Hz	Optical flow max rate
	FW Rate Control	SENS_FLOW_ROT	No rotation	Optical flow rotation
Camera	FW Rate Control	SENS_GPS_MASK	7	Multi GPS Blending Control Mask
	FW Attitude Control	SENS_GPS_PRIME	0	Multi GPS primary instance

Q5: Which versions of the APM firmware have we tested?

Solutions:

1. arducopter_V4.2.0.apj and arducopter_V4.3.7.apj test can see the relevant data in the ground station.

5. Optical flow common problems and solutions

The quality of hover often directly determines the coordination quality of optical flow and flight control. Debugging hover common problems and solutions are as follows:

Q1: The aircraft has no hovering effect at all, and the phenomenon is the same as without optical flow.

Solutions:

- 1, First check whether the board is powered on normally, whether the hardware cable is connected, and whether the lens is blocked;
- 2, Then check whether there is data output on the upper computer.

Q2: The direction of the plane is slowly drifting randomly, but it is better than when there is no light flow, and when the performance is no operation, it will float back after floating in one direction.

Solutions:

1. May be the ground environment texture is too smooth, such as pure wood floors, cement floors, reflective marble floors and so on.
2. Or the ambient light is too low.

Q3: The plane is flying in a certain direction, drifting faster, like the feeling of losing control, but the drift is slower when there is no light flow

Solutions:

- 1, the lens installation direction is not consistent with the direction written in the program;
- 2, Ambient light varies greatly, such as a flash;
- 3, there are large moving objects on the ground under the optical flow lens, such as on the water surface when there is wind;
- 4, some data in the optical flow control part of the program is not cleared.

Q4: The aircraft can hover normally at first, but after hovering for a period of time it begins to shake

Solutions:

1. The barometer data drift is large, the height is seriously distorted, resulting in the output value of the optical flow data multiplied with the height becomes larger, control overshoot;
2. It may be that the temperature change is relatively large or the aircraft vibration is large, resulting in serious accelerometer drift.

Q5: The plane was able to hover normally at first, but after hovering for a while it began to drift in one direction

Solutions:

1. The weight of the upper optical flow is dynamic in the program algorithm. Some reasons cause the weight of the optical flow to weaken after the hover time is long, and the drift cannot be suppressed.
2. the Euler Angle of attitude solution due to vibration or temperature and other large errors, after a long time the aircraft itself attitude tilt, the maximum output of optical flow can not compensate for the error.

Q6:The plane shook from the start**Solutions:**

- 1, PID control parameters are too large;
- 2,The filter is more powerful, making the output data delayed, resulting in low frequency oscillation;
- 3,The input data is not smooth, and there are D items in PID control, which makes the aircraft high-frequency vibration;
- 4,Aircraft performance deteriorates, such as motor, blade wear, vibration, so that the input data noise becomes larger;
- 5,Optical flow rotation compensation is not good, especially data synchronization and limiting.

6.How to effectively feedback questions**6.1 Solve it by yourself**

Self-check and solve problems according to documents and videos;If the upper computer has waveform data and the flight control has data output, it means that the module is OK.

6.2 Provide video, technicians to help solve problems

If the upper computer has waveform data and the flight control has data output, it means that the module is OK.

6.3 exchange goods

If point 6.2 cannot be solved, the module in question will be sent back to the company, and the technician will analyze and solve the problem.