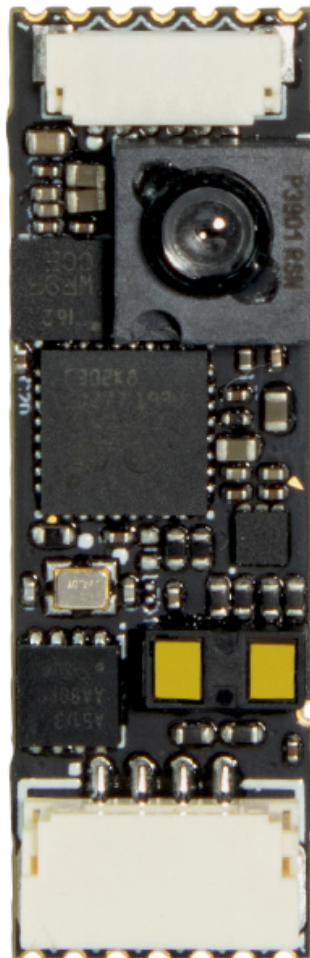


Here Flow



Overview

Here Flow is a finger size optical flow sensor. Compared with other optical flow sensors, it is even smaller. It can be installed easily at any position without taking much space.

A LiDAR component, an optical flow camera and a 6D IMU (ICM20602) are integrated in the Here FLOW.

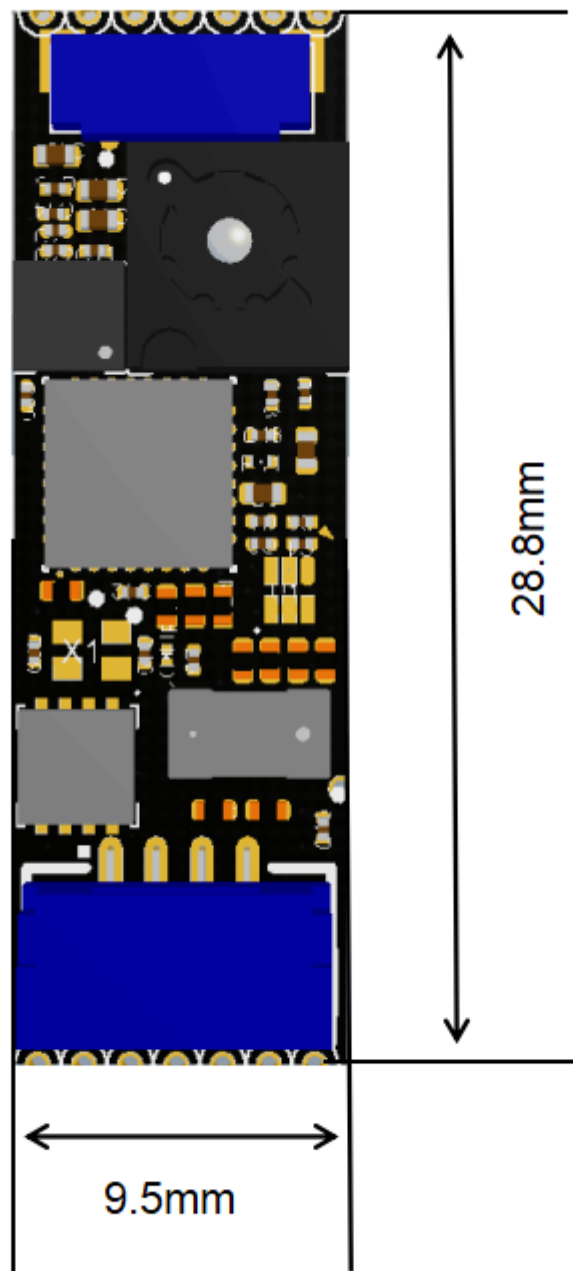


The LiDAR component is a power efficient high speed TOF range finder, which embeds the latest ST FlightSense™ technology. In range of 2 m, it can acquire the distance within 5 ms. The accuracy is not affected by colour or reflection rate of the target surface.

The Here Flow can be setup at any node in the CAN bus without noise problem.

Specification

Size: 28.8mm*9.5mm



Performance



Hardware Specification

1. Built-in ultra small lidar module
2. CAN Protocol, which provide more reliable communication
3. Built-in IMU Module
4. PMW3901 Optical Flow Sensor. Effective ranges from 80 mm to infinity.

Optical Flow Sensor Specification

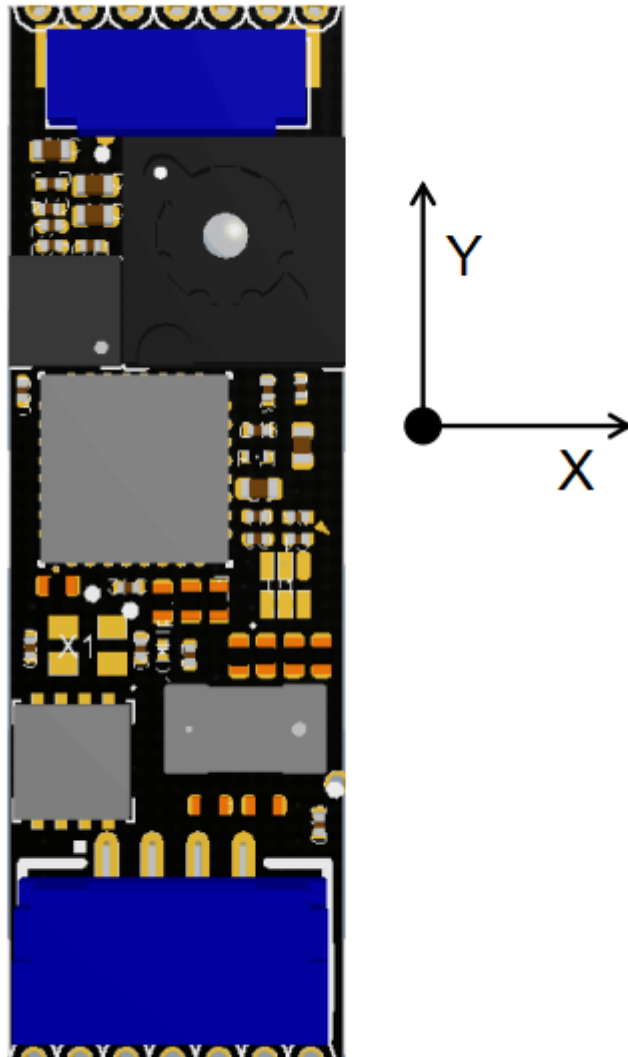
Type	Parameter
Range	80 mm to infinity
Field of view	42 degree
Maximum movement speed	7.4 rad/s
Minimum illumination	> 60 lux
Infrared emitter	940 nm invisible light emission (Class1)
Operating temperature	-20 to +70 °C
Interface	CAN
Power supply	5 V

Lidar Specification

Type	Parameter
Measuring frequency	Up to 50 Hz
Field of view	27 degree
Longest distance	2m
Accuracy	±3 %
Infrared emitter	940 nm invisible light emission (Class1)
Operating temperature	-20 to +70 °C
Interface	CAN
Power supply	5 V

Installation





Connect the CAN port on module and flight controller with the 4 Pin CAN cable. Point the Y axis of Here Flow to the nose of the aircraft. Face the camera to ground and stick the module to the bottom of aircraft by 3M sticker or soft sticker (with slightly vibration isolation).

DO NOT touch the electronic components on the PCB. Touch the edge of the PCB if possible during the installation.

The bottom of module must be clear, otherwise the measured data will be affected.

Settings

Remark: Here Flow has not been ready on the APM firmware stable version. Master firmware is needed before the release of copter3.7

Firmware update instructions: <https://discuss.cubepilot.org/t/can-flow-setup-instructions-alpha-batch/341>

1. Connect the flight controller to computer via USB cable. Open Mission Planner. Install the master firmware by "Load custom firmware". Go to "Full Parameter List" and find "CAN_P1_DRIVER". Change it to "1" to enable CAN.

Mission Planner 1.3.63.1 build 1.3.7030.13952 ArduPlane V3.10.0-dev (9e2ba9b0)

FLIGHT DATA FLIGHT PLAN INITIAL SETUP CONFIG TUNING SIMULATION TERMINAL HELP DONATE

Flight Modes
Basic Tuning
Standard Params
Advanced Params
Full Parameter List
Full Parameter Tree
Planner

Command	Δ	Value	Units	Options
CAN_D1_PROTOCOL		1		0:Disabled 1:UAVCAN 2:KDECAN 3:ToshibaCAN
CAN_D1_UC_ESC_BM		0		
CAN_D1_UC_NODE		10		1 250
CAN_D1_UC_SRV_BM		0		
CAN_D1_UC_SRV_RT		50	Hz	1 200
CAN_D2_PROTOCOL		1		0:Disabled 1:UAVCAN 2:KDECAN 3:ToshibaCAN
CAN_P1_BITRATE		1000000		10000 1000000
CAN_P1_DRIVER		1		0:Disabled 1:First driver 2:Second driver
CAN_P2_BITRATE		1000000		10000 1000000
CAN_P2_DRIVER		1		0:Disabled 1:First driver 2:Second driver
CAN_SLCAN_CPORT		1		0:Disabled 1:First driver 2:Second driver
CAN_SLCAN_SERNUM		-1		-1:Disabled 0:Serial0 1:Serial1 2:Serial2 3:Serial3 4:Serial4 5:Serial5 6:Serial6
CAN_SLCAN_TIMEOUT		0		0 32767
COMPASS_EXTERN2		0		0:Internal 1:External 2:ForcedExternal
COMPASS_EXTERN3		0		0:Internal 1:External 2:ForcedExternal
COMPASS_EXTERNAL		0		0:Internal 1:External 2:ForcedExternal
COMPASS_FLTR_RNG		0	%	0 100
COMPASS_LEARN		1		0:Disabled 1:Internal-Learning 2:EKF-Learning 3:InFlight-Learning

2. Find "RNGFND_TYPE" and set it to "24" to enable range finder. Set "RNGFND_MAX_CM" (maximum distance) to 200 cm; "RNGFND_MIN_CM" (minimum distance) to 5 cm.

Please note: We have integrated the TOF sensor in this component due to it being VERY useful for precision landing detection. However, it is NOT suitable for height detection in outdoor conditions above 0.5 m, nor is it suitable for indoor height estimations higher than 2 m.

For accurate flow navigation, we still recommend installing the SF11B lidar from Lightware, or a similar Lidar that you trust.

Users may also opt to use Arducopter Mode FLOWHOLD for optical flow based position hold without rangefinder.



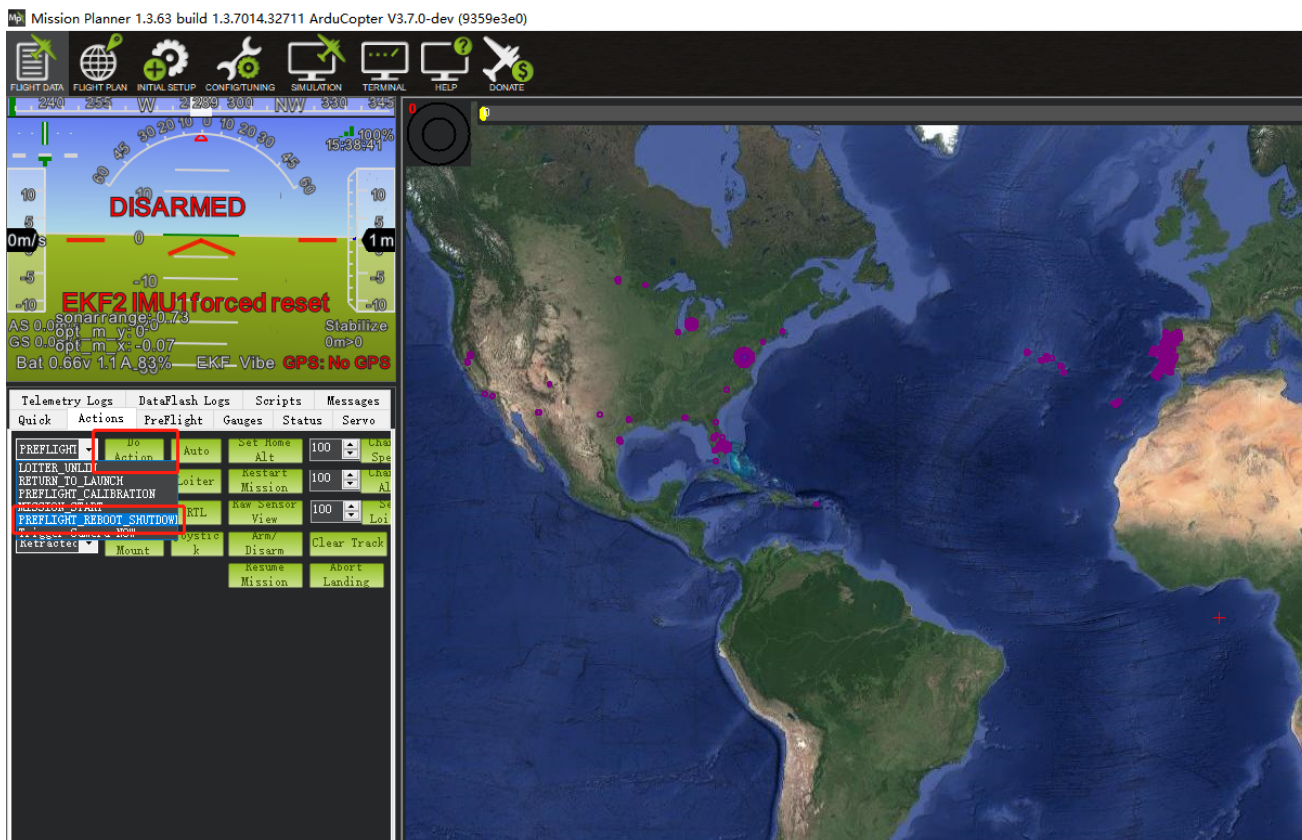
Flight Modes	Command	Δ	Value	Units	Options
Basic Tuning	RNGFND1_MAX_CM		200	cm	
Standard Params	RNGFND1_MIN_CM		5	cm	
Advanced Params	RNGFND1_OFFSET		0	v	
Full Parameter List	RNGFND1_ORIENT		25		0:Forward 1:Forward-Right 2:Right 3:Back-Right 4:Back 5:Back-Left 6:Left 7:Forward-Left 24:Up 25:Down
Full Parameter Tree	RNGFND1_PIN		-1		-1:Not Used 11:PX4-airspeed port 15:Pixhawk-airspeed port
Planner	RNGFND1_POS_X		0	m	
	RNGFND1_POS_Y		0	m	
	RNGFND1_POS_Z		0	m	
	RNGFND1_PWRRNG		0	m	0 32767
	RNGFND1_RMTRIC		1		0:No 1:Yes
	RNGFND1_SCALING		3	m/V	
	RNGFND1_SETTLE		0	ms	
	RNGFND1_STOP_PIN		-1		-1:Not Used 50:Pixhawk AUXOUT1 51:Pixhawk AUXOUT2 52:Pixhawk AUXOUT3 53:Pixhawk AUXOUT4 54:Pixhawk AUXOUT5 55:Pixhawk AUXOUT6 111:PX4 FMU Relay1 112:PX4 FMU Relay2 113:PX4IO Relay1 114:PX4IO Relay2 115:PX4IO ACC1 116:PX4IO ACC2
	RNGFND1_TYPE		24		0:None 1:Analog 2:MaxbotixI2C 3:LidarLiteV2-I2C 5:PX4-PWM 6:BBB-PRU 7:LightWareI2C 8:LightWareSerial 9:BeboP 10:MAVLink 11:uLanding 12:LeddarOne 13:MaxbotixSerial 14:TeraRangerI2C 15:LidarLiteV3-I2C 16:VL53L0X 17:NMEA 18:WASP-LRF 19:Benewake TF02 20:Denonwale TFmini

3.To turn on optical flow function: Set "FLOW_TYPE" to "6" in order to enable optical flow camera.

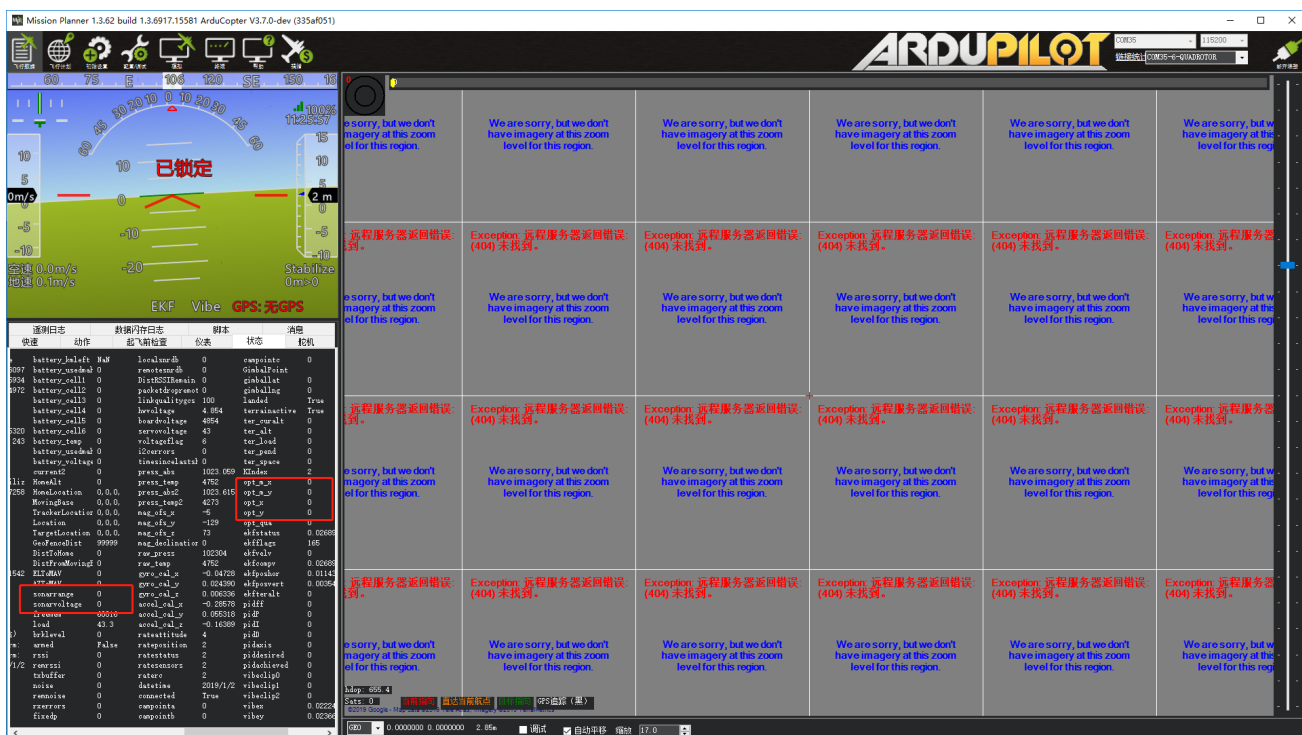
Flight Modes	Command	Δ	Value	Units	Options
Basic Tuning	EK2_FLOW_I_GATE		500		100 1000
Standard Params	EK2_FLOW_M_NSE		0.15	rad/s	0.05 1.0
Advanced Params	EK2_FLOW_USE		2		
Full Parameter List	EK2_GPS_TYPE		0		0:GPS 3D Vel and 2D Pos 1:GPS 2D vel and 2D pos 2:GPS 2D pos 3:No GPS
Full Parameter Tree	EK2_MAX_FLOW		2.5	rad/s	1.0 4.0
Planner	EK2_NOAID_M_NSE		10	m	0.5 50.0
	FLOW_ADDR		0		0 127
	FLOW_FXSCALER		0		-200 +200
	FLOW_FYSCALER		0		-200 +200
	FLOW_ORIENT_YAW		0		-18000 +18000
	FLOW_POS_X		0	m	-10 10
	FLOW_POS_Y		0	m	-10 10
	FLOW_POS_Z		0	m	-10 10
	FLOW_TYPE		6		-1:None 1:MAVLink1 2:MAVLink2 3:Frsky D 4:Frsky SPort 5:GPS 7:Alexmos Gimbal Serial 8:STORM32 Gimbal Serial 9:RangeFinder 10:Frsky SPort Passthrough (OpenTX) 11:Lidar360 13:Beacon 14:Volz servo out 15:SBUS servo out 16:ESC Telemetry 17:Devo Telemetry 18:OpticalFlow 19:RobotisServo
	SERIAL1_PROTOCOL		1		

4. After setting the parameters, click "Write Params". Go to the "Actions" tag in "flight Data" page. Select "PREFLIGHT_REBOOT_SHUTDOWN" then click "Do Action" to reboot the flight controller.





5. After rebooting the flight controller, reconnect to Mission Planner and go to "status" tag. Change the altitude of the aircraft to see whether "sonarrange" is changing correspondingly. If the value does not change, please check if the parameters are properly set or reboot the flight controller. Change the position of the aircraft and see whether the data of "opt_m_x", "opt_m_y", "opt_x", "opt_y" are changing. If the value do not change, please check if the parameters are properly set or reboot the flight controller.



6. After confirming the data are normal, go to "Full parameter list" and change "EKF2_GPS_TYPE" to "3" to disable GPS. This is for testing if the optical flow is working normally. Change ARMING_CHECK" to 15838 to cancel the pre-arm check of optical flow (Otherwise, you will need to rise the aircraft to at least 50 cm and then put it back to the ground to disarm. After take off, the aircraft can loiter normally in LOITER mode.

For more optical flow settings, you may check in Ardupilot Wiki:

<https://discuss.cubepilot.org/c/flow-sensor>

Last modify: 9th April 2019

