

# **SUI04**

# Ultrasonic Sensor of Overall Obstacle Avoidance

Adaptable to Multirotor



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The SUI04 module can realize Alt-hold, obstacle avoidance in four directions (front, rear, left and right), and upward collision avoidance. Here is how to set CrossFlight, CrossRace, Mini Pix and PIXHAWK to work with SUI04.

# Chapter 1. Set CrossFlight/CrossRace to Work with SUI04

# 1.1 Connect SUI 04 to CrossFlight/CrossRace

# 1.1.1 Connect SUI 04 to CrossFlight/CrossRace GPS port directly

Connect to CrossFlight: SUI04 comes with a cable to connect CrossFlight/Mini Pix flight controller(4 Pin to 6 Pin). The 4 Pin end is connected to SUI04, and the 6 Pin end is connected to the GPS port of CrossFlight, as shown below:



Connect to CrossRace: Use the same cable as CrossFlight(4 Pin to 6 Pin). The 4 Pin end is connected to SUI04, and the 6 Pin end is connected to the GPS port of CrossRace, as shown below:



# 1.1.2 Connect SUI 04 to CrossFlight/CrossRace by I2C transfer board

CrossFlight comes with a I2C transfer board and its connect cable(6 Pin to 6 Pin). Connect one end to the GPS port of CrossFlight, and the other end to the I2C transfer board. Then use the 12C/PIXHAWK connect cable that comes with SUI04 (4 Pin to 4 Pin) to connect one end to the I2C transfer board, and the other end to SUI04, as shown below:



#### Note:

- (1) The I2C port of CrossFlight cannot be connected to more than 6 devices at the same time, otherwise data loss may occur.
- (2) CrossRace can connect to SUI04 with the same method, but Crossrace does not come with a I2C transfer board, and the board needs to be purchased separately.

# **1.2 Alt-Hold Function**

# 1.2.1 Button Functions of SUI04

For Alt-hold function, the direction of SUI04 downward can be setup by pressing the same button. Each time you press the button, the module direction changes once. After pressing once, you need to wait for the module light to flash. When finished, press it a second time until the light of SUI04 flashes 5 times, which means the current direction of the module is downward.

#### 1.2.2 Parameter Setup

1. Connect the flight controller to Mission Planner. Enter CONFIG--Full Parameter List. Search RNGFND1\_ and change the value of RNGFND1\_TYPE to 2. Click Write Params. Then power off the flight controller and restart it.

2. After reconnecting to Mission Planner, SUI04 can be recognized. As shown below:

Change the value of RNGFND1\_MAX\_CM to 450, RNGFND1\_MIN\_CM to 43 (cm), and RNGFND1\_ORIENT to 25. As shown below:

Name $\Delta$	Value	Default	Units	Options	Desc	Fav
RNGFND1_ADDR	0	0		0 127	This sets the bus address of the sensor, where applicable. Used for the I2C and DroneCAN sensors to allow for multiple sensors on different addresses.	
RNGFND1_FUNCTION	0	0		0:Linear 1:Inverted	Control over what function is used to calculate distance. For a linear function, the distance is (voltage-offset)"scaling. For a inverted function the distance is (offset-voltage)"scaling. For a hyperbolic function the distance is scaling/(voltage-offset). The functione of two the distance is motors.	
RNGFND1_GNDCLEAR	10	10	cm	5 127	This parameter sets the expected range measurement (in cm) that the range finder should return when the vehicle is on the ground.	
RNGFND1_MAX_CM	450	700	cm		Maximum distance in centimeters that rangefinder can reliably read	
RNGFND1_MIN_CM	43	20	cm		Minimum distance in centimeters that rangefinder can reliably read	
RNGFND1_OFFSET	0	0	v		Offset in volts for zero distance for analog rangefinders. Offset added to distance in centimeters for PWM lidars	
RNGFND1_ORIENT	25	25		0:Forward	Orientation of rangefinder	
RNGFND1_PIN	-1	-1		-1:Not Used	Analog or PWM input pin that rangefinder is connected to. Airspeed ports can be used for Analog input, AUXOUT can be used for PWM input. When using analog pin 103, the maximum value of the input in 3.3V. For PWM input, the pin must be configured as a dist1 GPU or as the MW/s/ CPUPU society for distile.	
RNGFND1_POS_X	0		m	-5 5	X position of the rangefinder in body frame. Positive X is forward of the origin. Use the zero range datum point if supplied.	
RNGFND1_POS_Y	0	0	m	-5 5	Y position of the rangefinder in body frame. Positive Y is to the right of the origin. Use the zero range datum point if supplied.	
RNGFND1_POS_Z	0		m	-5 5	Z position of the rangefinder in body frame. Positive Z is down from the origin. Use the zero range datum point if supplied.	
RNGFND1_PWRRNG	0	0	m	0 32767	This parameter sets the estimated terrain distance in meters above which the sensor will be put into a power saving mode (if available). A value of zero means power saving is not enabled	
RNGFND1_RMETRIC	1	1		0:No 1:Yes	This parameter sets whether an analog rangefinder is ratiometric. Most analog rangefinders are ratiometric, meaning that their output voltage is influenced by the supply voltage. Some analog rangefinders (such as the SF/02) have their own internal unknown and there as their an ext estimation of the superior of the set of the s	
RNGFND1_SCALING	3	3	m/V		Scaling factor between rangefinder reading and distance. For the linear and inverted functions this is in meters per volt. For the hyperbolic function the units are meterVolts. For Maxbotix serial sonar this is unit conversion to meters.	
RNGFND1_STOP_PIN	-1			-1:Not Used	Digital pin that enables/disables rangefinder measurement for the pwm rangefinder. A value of -1 means no pin. If this is set, then the pin is set to 1 to enable the rangefinder and set to 0 to disable to. This is used to enable powersaving when out of the pin is set to 1 to enable the rangefinder and set to 0 to disable to the pin to the pin more set of the pin to the	
RNGFND1_TYPE	2	0		0:None 1:Analog	Type of connected rangefinder	

RNGFND1\_MAX\_CM is the maximum distance in centimeters that rangefinder can reliably read. RNGFND1\_MIN\_CM is the minimum distance in centimeters that rangefinder can reliably read. When the distance sent by SUI04 exceeds 43~450cm, the flight control will not recognize the distance of SUI04, so it will achieve the alt-hold by the barometer.

# 1.2.3 Data View

1. View ultrasonic data in the quick interface.

Connect the flight controller to Mission Planner. Double-click in the quick interface, and a large list will appear. Select sonarrange in the list, and the ultrasonic height data will be displayed.



Mission Planner For Radiolir	💀 Display This	of Address Workshold					- 0
🖹 🍏 🌮 🔞	accelsq	battery_usednah3	🔄 clinbrate	esc6_temp	landed	satcount	5200
DATA PLAN SETUP CONF	🔲 accelsq2	📄 battery_usednah4	Connected	esc6_volt	landed_state	i satcount2	-1-GENERIC - DISCON
380 345 Ŋ	🛅 uccolag3	🔲 battery_usednah5	🔲 crit_AOA	esc7_curr	🔤 lat	🔤 satcountB	
	🔚 airspeed	📃 battery_usednab6	current	esc7_rpa	lst2	servovoltage	S I CON
11 11 48	🛅 airspeedl_temp	📄 battery_usednah7	current2	🔲 escī_temp	linkqualityges	V zonarrange	
	🥅 airspeed2_temp	📄 battery_usednah8	📑 current3	esc7_volt	lng 🔤	sonarvoitage	and the second s
	🥅 al t	📄 battery_usednah9	🔲 current4	esc8_curr	lng2	🛅 speedup	
40 8 41	🔤 alt_error	🔚 battery_voltage	🔄 currentS	esc8_rpa	losd 📃	SSA 🔤	
10	🔤 altazl	📄 battery_voltage2	🔄 current6	🔲 esc8_temp	local snr db	🔚 target_bearing	
B	🔲 altasl2	📄 battery_voltage3	📄 current7	🔲 esc8_volt	lowairspeed	🔚 targetairspeed	
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m/s	📰 sl.td1000	🔚 battery_voltage5	🔄 current9	esc9_rps	in sgfield 📃	🔚 targetaltd100	
-	📑 altoffsethome	🔤 battery_voltage6	DistFromWovingBase	esc9_temp	🔤 nagfi el d2	🛅 ter_alt	
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-10 -2	📑 sspd_error	🔚 battery_voltage9	📑 distTraveled	fenceb_count	in nx	iter_pend	
AS 0.0m/s	🔤 asratio	ber_error	efi_baro	📑 fenceb_status	mz2	🔤 ter_space	
3S 0.0m/s	🔲 ex	🔲 boardvoltage	📄 efi_exhasttemp	fenceb_type	💼 na:3	🔚 terrainactive	the second states and a
	📰 ex2	📄 brklevel	📄 efi_fuelconsumed	🔲 fixedp	🔲 ny	🔚 tineInAir	
	🔲 w:3	Campoints.	efi_fuelflow	🔚 freenen	📄 ny2	🔤 timeInAirMinSec	
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Quick Actions Messages Pr	🔲 ay2	Campointe 🔤	📄 efi_headtenp	gen_maint_time	m nz	🔚 timesincelastshot	
	🔽 ay3	Capabilities	📑 efi_health	🔲 gen_runtine	mz2	🛅 toh	and the second second second
Altitude (m)	🔲 92	in ch10in	📑 efi_intaketemp	🔲 gen_speed	<b>n</b> z3	🛅 tot	
	🔲 sz2	in chillout	🔤 efi_load	🔤 gen_status	inav_bearing	🔚 turng	
0.00	🔲 az3	Chllin 📃	efi_rpn	gen_voltage	nav_pitch	🔄 turnrate	
	AZTOWAY	📄 chilout	ekfcompv	🔚 GeoFenceDist	nav_roll	🛅 txbuffer	
Dist to WP (m)	battery_celli	ch12in	ekfflags	ginballat	noise 🔤	🥅 ui d	
	battery_cell10	in ch12out	🔤 ekfposhor	🔤 ginballng	🔤 opt_n_x	<pre>verticalspeed</pre>	
0.00	battery_cell11	ch13in	🔄 ekfposvert	🔤 glide_ratio	🔲 opt_n_y	🔤 verticalspeed_fpm	A Street
Vertical Speed (m/s)	battery_cell12	ch13out	ekfstatus	psh_acc	opt_qua	🔤 vibeclip0	
	battery_cell13	ch14in	ekfter alt	gpsh_acc2	opt_x	ibeclip1	-
-0.1/	battery_cell14	ch14out	📃 ektvelv	🔲 gpshdg_ace	opt_y	ibeclip2	
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0 00	battery_cell3	ch15out	errors_count1	📰 gpshdop	📄 pi dachi eved	🔤 vibey	A CONTRACTOR OF
	battery_cell4	ch16in	errors_count2	gpshdop2	pidaxis 📃	- viber	
0.00	battery_cell5	ch16out	errors_count3	gpsstatus	pidD 📃	vlen 🔤	and the second s
	battery_cell6	ch17out	errors_count4	gpsstatus2	piddesired	voltageflag	poller
0.00	battery_cell7	ch18out	escl_cwr	C spsv_acc	pidff	vtol_state	
0.00	battery_cell8	chi9out	esci_rpn	gpsv_acc2	pidI	T VX	

2. View ultrasonic data in the Tuning interface.

Check the Tuning option in Mission Planner. Double-click the dynamic table, and select sonarrange in the list to display the dynamic waveform of ultrasonic data. As shown below:



💀 Display This	A CONTRACTOR AND A DESCRIPTION	and the second second					8
battery_cell2	current4	esc4_volt	nav_bearing	MoneAlt	ch22out	nx	npdr_nic ^
 battery_cell3	current5	 esc5_curr	 nev_pitch	🔲 horizondist	ch23out	nx2	Vibe
battery_cell4	current6	esc5_rpn	nev_roll	lat .	ch24out	<b>n</b> x3	vibeclip0
battery_cel15	📃 current?	esc5_temp	target_bearing	1at2	🔄 ch25out	ny ny	vibeclipl
battery_cell6	current8	esc5_volt	Targetairspeed	lng	ch26out	ny2	vibeclip2
🔝 battery_cell7	🛅 current9	🔄 esc6_curr	🔚 targetalt	🔚 lng2	🔄 ch27out	🔤 ny3	wiber 📃
📑 battery_cell8	🔚 watts	🔤 esc6_rpn	🔚 targetaltd100	🔤 posd	🔄 ch28out	nz	vibey 📃
🔝 battery_cell9	Calibration	📄 esc6_tenp	🥅 toh	🔄 pose	🔄 ch29out	<u>n z</u> 2	viber 📃
📑 battery_knleft	🛅 asratio	esc6_volt	🔚 tot	🔄 posn	🔄 ch2out	nz3	
🔝 battery_nahperkn	EFI	🔄 esc7_curr	🔤 wp_dist	📺 qnh	🔄 ch30out	🔤 press_abs	
🔝 battery_renaining	🔲 efi_baro	🔤 esc7_rpn	m wpmo	🔤 radius	🛅 ch31 out	🔄 prezz_abz2	
🔝 battery_renaining2	🔟 efi_exhasttenp	🔚 esc7_tenp	🔚 xtrack_error	🔄 satcount	🔄 ch32out	🧰 press_temp	
🔝 battery_renaining3	🔤 efi_fuelconsumed	🔤 esc7_volt	Other	🔤 satcount2	🛅 ch3out	🔤 press_temp2	
🔝 battery_renaining4	🔲 efi_fuelflow	🔚 esc8_curr	🔚 al t d100	🔄 satcountB	🔄 ch3percent	🔚 rangefinderl	
🔝 battery_renaining5	🔲 efi_fuelpressure	🔤 esc8_rpn	🔤 altd1000	🔤 timeInAir	🛅 ch4out	🔚 rangefinder2	
🔝 battery_renaining6	🔟 efi_headtenp	🔚 esc8_tenp	🔚 GeoFenceDist	🔚 timeInAirMinSec	🔄 chSout	🔤 rangefinder3	
🔝 battery_renaining7	🔚 efi_health	🔤 esc8_volt	🔚 messageHighSeverity	🔤 timeSinceArmInAir	🛅 ch6out	🔚 rpnl	
🔝 battery_renaining6	🔟 efi_intaketemp	🔚 esc9_curr	🔚 tinesincelastshot	📃 turng	🔄 ch7out	rpn2	
🔝 battery_renaining9	i efi_load	🔤 esc9_rpn		🔝 turnrate	📄 ch8out	🗹 sonarrange	
🔝 battery_renainnin	🔟 efi_rpn	🔚 esc9_temp	🔲 pi dachi eved	📃 verticalspeed	🔝 ch9out	- sonarvoltage	
🔝 battery_renainnin2	EKF	🔤 esc9_volt	🔚 pidaxis	🔤 verticalspeed_fpm	Sensor	Software	
🔝 battery_renainnin3	📰 ekfconpv	Fence	🥅 pi dD	🔄 vlen	🔤 accelsq	🔤 brklevel	
🔝 battery_renainnin4	🔲 ekfflags	🔄 fenceb_count	🥅 piddesired	🗾 vx	🔤 accelsg2	🔚 capabilities	
🔝 battery_renainnin5	🔝 ekfposhor	🔚 fenceb_status	🥅 pi dff	🔲 vy	🔄 accelsg3	🛅 freenen	
🔄 battery_renainnin6	🔝 ekfposvert	🔄 fenceb_type	🥅 pi dI	🔄 vz	🛅 airspeed	🔚 landed_state	
🔝 battery_renainnin7	🔝 ekfstatus	Flow	🥅 pi dP	🔚 wind_dir	🔄 airspeed1_temp	C load	
🔝 battery_renainnin8	🔲 ekfteralt	🔤 opt_m_x	📰 pi dPDmod	🔄 wind_vel	🔝 airspeed2_temp	🔄 speedup	
🔝 battery_renainnin9	🔝 ekfvelv	🔤 opt_m_y	📑 pidSRate	RadioIn	<u> </u>	🛅 ui d	
🔝 battery_tenp	Environental	🔤 opt_qua	Position	🔤 ch10in	<u>~</u> at2	wtol_state	
🔝 battery_tenp2	🛅 KIndex	🔤 opt_x	🔲 લો ધ	🔝 chllin	<u></u> ax3	Telen	
🔝 battery_tenp3		🔤 op t_y	🔚 altazl	🔤 ch12in	🔟 ay	DistRSSIRenain	
🔝 battery_tenp4	🔤 escl_curr	Generator	📑 altazl2	🔝 ch13in	<u>n</u> ay2	🔝 fixedp	
🔝 battery_tenp5	🔤 escl_rpn	🔄 gen_current	🔚 altoffsethome	🔤 ch14in	🔟 ay3	🔚 linkquali tygcs	
🔝 battery_tenp6	🔤 escl_temp	🔤 gen_maint_tine	AZT oMAV	🔄 ch15in	🛄 az	🔤 local snrdb	
🔝 battery_temp7	escl_volt	🔤 gen_runtime	🔚 climbrate	🔤 ch16in	🛄 az2	noise 🔄	
battery_tenp8	escl0_curr	C gen_speed	DistFronHovingBase	🛄 chlin		🔝 packetdroprenote	
battery_tenp9	escl0_rpm	gen_status	DistToHone	🔤 ch2in	🔲 6x	🔤 rateattitude	
🔝 battery_usedmah	escl0_temp	gen_voltage	istTraveled	Ch3in	🛄 gr2	rateposition 🔤	
🔄 battery_usedmah2	escl0_volt	Hardware	ELT oMAV	Ch4in	🔄 gt3	raterc [	
🔝 battery_usedmah3	escl1_curr	boardvoltage	Elide_ratio	Ch5in	🔲 a7	ratesensors	
battery_usedmah4	escl1_rpm	errors_count1	m gpsh_acc	m ch6in	□ \$7 <sup>2</sup>	🔚 ratestatus	

#### **1.3 Obstacle Avoidance**

#### 1.3.1 Button Setup

The SUI04 module can realize obstacle avoidance in four directions (front, rear, left and right). The directions can be changed by pressing the button on SUI04. The default direction of the module is forward. Each time the button is pressed, the direction of the module changes clockwise, and the module LED flashes. Different flash frequencies means different directions: Once-Front, Twice-Right, 3 Times-Back, 4 Times-Left. After the direction is set, the module needs to be powered off and restarted.

#### 1.3.2 Parameter Setup

1. Connect SUI04 to the flight controller. Search PRX1\_TYPE in Full Parameter List and change the value to 4. Then search RNGFND in Full Parameter List and change the value of RNGFNDx\_TYPE to 2 (x represents the ultrasonic serial number). Finally restart the flight controller. As shown below:



						- 1152	
Name $\Delta$	Value	Default	Units	Options	Desc	Fav	Load from file
RNGFND1_MIN_CM	20	20	cm		Minimum distance in centimeters that rangefinder can reliably read		Save to file
RNGFND1_OFFSET	0	O	v		Offset in volts for zero distance for analog rangefinders. Offset added to distance in centimeters for PWM lidars		Write Parans
RNGFND1_ORIENT	25	25		0:Forward	Orientation of rangefinder		Refresh Params
RNGFND1_PIN	-1	-1		-1:Not Used	Analog or PWM input pin that rangefinder is connected to. Airspeed pots can be used for Analog input, AUXOUT can be used for PWM input, When using analog pin 100, the maximum value of the input in 3.3V. For PWM input, the pin	-	All Units are in raw
RNGFND1_POS_X					X position of the rangefinder in body frame. Positive X is forward of the origin. Use the zero range datum point if supplied		Tunat with no starm
RNGFND1_POS_Y	0	0	m	-5 5	Y position of the rangefinder in body frame. Positive Y is to the right of the origin. Use the zero range datum point if supplied.	-	Load Prenaved
RNGFND1_POS_Z	0	0	m	-5 5	Z position of the rangefinder in body frame. Positive Z is down from the origin. Use the zero range datum point if supplied		Reset to Default Search
RNGFND1_PWRRNG	0	0	m	0 32767	This parameter sets the estimated terrain distance in meters above which the sensor will be put into a power saving mod (if available). A value of zero means power saving is not enabled	•	RNGFND
RNGFND1_RMETRIC	1	1		0:No 1:Yes	This parameter sets whether an analog rangefinder is ratiometric. Most analog rangefinders are ratiometric, meaning that their output voltage is influenced by the supply voltage. Some analog rangefinders (such as the SF/02) have their own		Modified
RNGFND1_SCALING	3	3	m/V		Scaling factor between rangefinder reading and distance. For the linear and inverted functions this is in meters per volt. For the hyperbolic function the units are meter/olts. For Maxbotix serial sonar this is unit conversion to meters.		
RNGFND1_STOP_PIN	-1	-1		-1:Not Used	Digital on that enables/disables rangefinder measurement for the pwm rangefinder. A value of -1 means no pin. If this is set, then the pin is set to 1 to enable the rangefinder and set to 0 to disable it. This is used to enable powenaving when		
RNGFND1_TYPE	2	0		Maxbo 🔻	Type of connected rangefinder		
RNGFND2_TYPE	2	0		0:None 1:Analog	Type of connected rangefinder		E
RNGFND3_TYPE	2	0		0:None 1:Analog	Type of connected rangefinder		
RNGFND4_TYPE				0:None 1:Analog	Type of connected rangeInder		
RNGFND5_TYPE	2	0		0:None 1:Analog	Type of connected rangefinder		
RNGFND6_TYPE	2	0		0:None 1:Analog	Type of connected rangefinder		
RNGFND7_TYPE	0	0		0:None 1:Analog	Type of connected rangefinder		
RNGFND8_TYPE	0	0		0:None 1:Analog	Type of connected rangefinder		

2. Search RNGFND1 in Full Parameter List. Modify RNGFND1\_ADDR to 116, RNGFND1\_MAX\_CM to 450, RNGFND1\_MIN\_CM to 43, and RNGFND1\_ORIENT to 0. (0 indicates that the ultrasonic direction is forward) As shown below:

RNGFND1_ADDR		0)		0 127	This sets the bus address of the sensor, where applicable. Used for the I2C and DroneCAN sensors to allow for multiple sensors on different addresses.	
RNGFND1_FUNCTION	0	0		0:Linear 1:Inverted 2:Linoshata	Control over what function is used to calculate distance. For a linear function, the distance is (voltage-offset)'scaling. For a inverted function the distance is (offset-voltage)'scaling. For a hyperbolic function the distance is scaling/(voltage-offset). The functions return the distance in meters.	
RNGFND1_GNDCLEAR			cm	5 127	This parameter sets the expected range measurement (in cm) that the range finder should return when the vehicle is on the ground.	
RNGFND1_MAX_CM	450	700	cm		Maximum distance in centimeters that rangefinder can reliably read	
RNGFND1_MIN_CM		20			Mnimum distance in certimeters that rangefinder can reliably read	
RNGFND1_OFFSET	0	0	v		Offset in voits for zero distance for analog rangefinders. Offset added to distance in centimeters for PWM lidars	
RNGFND1_ORIENT		25		0:Forward 1:Forward-Rig	Orientation of rangefinder	

3. Search RNGFND2 in Full Parameter List. Modify RNGFND2\_ADDR to 113, RNGFND2\_MAX\_CM to 450, RNGFND2\_MIN\_CM to 43, and RNGFND2\_ORIENT to 2 (2 indicates that the ultrasonic direction is to the right) As shown below:

RNGFND2_ADDR		0		0 127	This sets the bus address of the sensor, where applicable. Used for the I2C and DroneCAN sensors to allow for multiple sensors on different addresses.	
RNGFND2_FUNCTION	0	0		0:Linear 1:Inverted	Control over what function is used to calculate distance. For a linear function, the distance is (voltage-offsed)'scaling. For a invested function the distance is (offset-voltage)'scaling. For a hyperbolic function the distance is scaling/(voltage-offsed). The function return the distance in meters.	
RNGFND2_GNDCLEAR					This parameter sets the expected range measurement(in cm) that the range finder should return when the vehicle is on the ground.	
RNGFND2_MAX_CM	450	700	cm		Maximum distance in certimeters that rangefinder can reliably read	
RNGFND2_MIN_CM		20			Minimum distance in centimeters that rangefinder can reliably read	
RNGFND2_OFFSET	0	O	v		Offset in volts for zero distance for analog rangefinders. Offset added to distance in centimeters for PWM lidars	
RNGFND2_ORIENT		25		0:Forward 1:Forward-Rig	Orientation of rangefinder	

4. Search RNGFND3 in Full Parameter List. Modify RNGFND3\_ADDR to 114, RNGFND3\_MAX\_CM to 450, RNGFND3\_MIN\_CM to 43, and RNGFND3\_ORIENT to 4 (4 indicates that the ultrasonic direction is backward) As shown below:

RNGFND3_ADDR					This sets the bus address of the sensor, where applicable. Used for the I2C and DroneCAN sensors to allow for multiple sensors on different addresses.	
RNGFND3_FUNCTION	0	0		0:Linear 1:Inverted 2:Lineatolia	Control over what function is used to calculate distance. For a linear function, the distance is (voltage-offset)"scaling. For a inverted function the distance is (offset-voltage)"scaling. For a hyperbolic function the distance is scaling/(voltage-offset). The functions return the distance in meters.	
RNGFND3_GNDCLEAR					This parameter sets the expected range measurement(in cm) that the range finder should return when the vehicle is on the ground.	
RNGFND3_MAX_CM	450	700	cm		Maximum distance in centimeters that rangefinder can reliably read	
RNGFND3_MIN_CM		20	cm		Minimum distance in certimeters that rangefinder can reliably read	
RNGFND3_OFFSET	0	0	v		Offset in voits for zero distance for analog rangefinders. Offset added to distance in centimeters for PWM lidars	
RNGFND3_ORIENT	4	25		0:Forward 1:Forward-Rij	Orientation of rangefinder	

5. Search RNGFND4 in Full Parameter List. Modify RNGFND4\_ADDR to 115, RNGFND4\_MAX\_CM to 450,

RNGFND4\_MIN\_CM to 43, and RNGFND4\_ORIENT to 6 (6 indicates that the ultrasonic direction is to the left) As shown below:

RNGFND4_ADDR				0 127	This sets the bus address of the sensor, where applicable. Used for the I2C and DroneCAN sensors to allow for multiple sensors on different addresses.	
RNGFND4_FUNCTION	0	0		0:Linear 1:Inverted 2:Umorted	Control over what function is used to calculate distance. For a linear function, the distance is (voltage-offset) 'localing, For a inverted function the distance is (offset-voltage)'scaling. For a hyperbolic function the distance is scaling/(voltage-offset). The functions return the distance in meters.	
RNGFND4_GNDCLEAR			cm		This parameter sets the expected range measurement (in cm) that the range finder should return when the vehicle is on the ground.	
RNGFND4_MAX_CM	450	700	cm		Maximum distance in certimeters that rangefinder can reliably read	
RNGFND4_MIN_CM		20	cm		Minimum distance in centimeters that rangefinder can reliably read	
RNGFND4_OFFSET	0	0	v		Offset in volts for zero distance for analog rangefinders. Offset added to distance in certimeters for PWM lidars	
RNGFND4_ORIENT	6	25		0:Forward 1:Forward-Rig	Orientation of rangefinder	

6. Click Write Params. Then power off the flight controller and restart it. After reconnecting to Mission Planner, SUI04 can be recognized.

# 1.3.3 Set the Avoidance Distance and Avoidance Enable/disable

1. The obstacle avoidance distance of SUI04 can be set by changing the value of AVOID\_MARGIN.

AVOID\_MARGIN: Vehicle will attempt to stay at least this distance (in meters) from objects while in GPS mode.

# 2. Parameter Settings

Search AVOID\_MARGIN in Full Parameter List, and modify it to 3 (That is, 3 meters. The valid value is 1~10). Then click Write Params.



# 3. Set RC7\_OPTION

Search RC7\_OPTION in Full Parameter List, and modify it to 40. Then click Write Params. As shown below:

Name	△ Value	Default	Units	Options	Desc Fav	Load from file
RC7_OPTION	40	0		Prozi 💌	Function assigned to this RC channel	Save to file Write Parans
L			<u> </u>			Refresh Params
						Compare Params
						All Units are in raw format with no scaling
						v
						Load Presaved
						Reset to Default
						Search
						RC7_OPTION
						Modified
						🛅 None Default

# 4. Transmitter Setup

This setup is optional.

The avoidance function of flight controller is always automatically enabled in Loiter Mode by default and disabled in Stabilize Mode. If users prefer enabling/disabling the avoidance function by transmitter, setup the transmitter by following the below steps:

- 1) Choose a 2-position switch to control CH7.
- 2) Connect Mission Planner. Enter SETUP-- Mandatory Hardware--FailSafe. The PWM value of CH7 is shown.
- 3) Toggle the switch of CH7. If the PWM value of CH7 is more than 1800, it means the avoidance function is enabled when the switch is at the position. If the PWM value of CH7 is less than 1800, it means the avoidance function is disabled when the switch is at the the position.

DATA PLAN SETUP CON	😸 📑 🕎	
Install Firmware	Radio IN	Servo/Motor OUT Wild
<b>Frame Туре</b>	1498	
Initial Tune Par:	Radio 2 1500	GPS: No GPS
Compass	Radio 3 1144	Radio 3 1000 Low Buttery
Radio Calibratio	Radio 4 1499	Radio 4 Reserved Mill C
Servo Output ESC Calibration	Radio 5	
Flight Modes	1265	Radio
FailSafe	1066	FS Pwn 975 🚔
ADSB	Radio 7 1933	
>> Optional Hardware	Radio 8 1066	GCS FS Enable
>> Advanced		

#### 1.3.4 Data Display

Connect the flight controller to Mission Planner. Press CTRL+F on the keyboard, and click Proximity in the pop-up window. As shown below:

- - X-

and temp							
Geo ref images	moved to dataflash tab	hex Mavlink decode		30 GYR0	Za.	Proxest Gk	
Warning Manager	Create custom audio warnings	driver clean	remove installed drivers	3DACCEL	In		
Follow Me	use a nmea gps to follow me	Toggle Saftey Switch	virtual press the satey button	30 846	In	Frezent Bad	
NMEA	outputs the may location in nmea	Message Interval	set custom message interval's for	ARCOLUTE DESCORE			
MicroDrone	outputs the mav location in microdrone	MAVLink Inspector	Inspect all mavlink packets being			Freedom Ca.	
Mavlink	mirrors the mavlink stream received by mp	Bootloader Upgrade	update the bootloader	DIFFERENTIAL PRESSURE	Dis	No Dad	
Param gen	regenerate the param info used inside mp	3D Map	3d map testing	CPS	Dis		
Lang Edit	translation language editor	decode HWID's	display info about a hardware id typed	OPTECAL FLOW	Dis		
OSDVideo	overlay the hud into your recorded videos	parse packet bytes	debug a hex string mavlink packet	WISLON POSITION	Dix		
Moving Base	show an extra icon on the map of your	adjust aircraft baro he	modify baro alt reference alt				
Shp to Poly	convert shp file ot a polygon file	Lockup MAV	cause the autopilot to lockup	LASERPOSITION	DT.	80 068	
Anon Log		DEM	display information about the	EXTERNAL GROUND TRUTH	Dix	No Bad	
Swarm	multi mav swarm interface	logdownload scp	logdownload via scp - ssh (apsync)	ANGULAMMATE CONTROL	26		
Follow the leader	follow the leader swarm	ReSort All logs	resort all the logs in the MP logging	ATTETUDE STABILIZATION	In		-
MAVSerial pass	create a exclusive passthrough to the gps	Custom GDAL	load a custom map tile source via GDAL	TAWPOSITOR	Za	Present Ck	
Start Remote df log		sitl streamcombiner					
Sort TLogs	sort tlogs into there type and sysid	Param Restore		TACITIOUE CUMINE	011	PTCICK USS	
rip all fw	download all current fw's	FFT		IT POSITION CONTROL	Dis	Present Bad	
Inject GE	add custom imagery to mp	grab threads. txt		MOTOR OUTPUTS	Za,		
Clear Custom Maps	wipe custom imagery	reboot pixhawk	reboot the autopilot	NC NECK LYER	Dis		
structtest	struct conversion speed test	QNH	adjust the qnh	30 61802	Dis	No. Dad	
Dashijare	Create dashware date input file	Sequence Swarm	label49				
arm and takeoff	quad: arm and takeoff	vlc	display video stream via vlc - USE	JUALLELA	DIE		
gimbal test	run the gimbal pointing algo	Age Map Data	remove image tiles older than 30 days	30 MAC2	Dis	No Bad	
map logs	create map jpg's for all tlogs in a dir	Param gen cust	generate aged param data	CZOFEKZ	Die		
logindex	tlog browser	signing	mavlink2 signing configuration	AHRS	24		
opticalflow calib	display the image data from the px4	extract gps_inject	extract rtcm data from tlog	TERMAN	Za	Frezent Ok	
APJ Tool		Proximity	display the proximity ui				
mag calb log	get mag offsets from a log	Follow Swarm	swarm style		J.L		
CoT	Outputs Cursor-on-Target	Manage Command List	Manage Planner's Command List	TOCCIDIC	Dis		
Force Accel Cal	Mark accel as cal'd after param restore	DFU Mode	DFV Mode	DATIEN	Dis		
Rce Compass Cal	Mark mag as cal'd after param restore			PROXIMITY	Dix		-

Ultrasound data can be displayed in a pop-up window, as shown below:



#### **1.4 Collision Avoidance Upward**

#### 1.4.1 Button Setup

The collision avoidance upward function is the same as the obstacle avoidance function, the direction of SUI04 upward can be setup by pressing the same button. Press the button 6 times and the LED flashes 6 times, and the direction of SUI04 is set upward. The corresponding collision avoidance distance can be set by the value of AVOID\_MARGIN as the previous steps instructed.

#### 1.4.2 Parameter Setup

1. Connect SUI04 to the flight controller. Search PRX1\_TYPE in Full Parameter List and change the value to 4. Then search RNGFND in Full Parameter List and change the value of RNGFNDx\_TYPE to 2 (x represents the ultrasonic serial number). Finally restart the flight controller. As shown below:



								- 11	5200	·	-
			1	lu -	10		Stats	COM18	1-GE	NERIC - DISCON	EC
	Name $\Delta$	Value	Default	Units	Options	Desc		Fav		Load from file	-
	RNGFND1_MIN_CM	20	20	cm		Minimum distance in centimeters that ra	angefinder can reliably read			Save to file	
	RNGFND1_OFFSET	0				Offset in volts for zero distance for anal	log rangefinders. Offset added to distance in centimeters for PWM lidars			Write Parans	
	RNGFND1_ORIENT	25	25		0:Forward	Orientation of rangefinder				Refresh Params	
	RNGFND1_PIN	-1	-1		-1:Not Used	Analog or PWM input pin that rangefing be used for PWM input. When using an	g or PWM input pin that rangefinder is connected to. Anspeed ports can be used for Analog input, AUXOUT can ed for PWM input. When using analog pin 103, the maximum value of the input in 3.3V. For PWM input, the pin to configure to data (2004) results MHX of 2004/2004 reduce for datable				
	RNGFND1_POS_X	0				X position of the rangefinder in body fra	ame. Positive X is forward of the origin. Use the zero range datum point if supplied.		h		
	RNGFND1_POS_Y	0	0	m	-5 5	Y position of the rangefinder in body fra supplied.	ame. Positive Y is to the right of the origin. Use the zero range datum point ∉			Load Presaved	
	RNGFND1_POS_Z	0				Z position of the rangefinder in body fra	ame. Positive Z is down from the origin. Use the zero range datum point if supplied.			Reset to Default Search	
	RNGFND1_PWRRNG	0	0	m	0 32767	This parameter sets the estimated terrai (If available). A value of zero means po	parameter sets the estimated terrain distance in meters above which the sensor will be put into a power saving mode vallable). A value of zero means power saving is not enabled				
	RNGFND1_RMETRIC				0:No 1:Yes	is parameter sets whether an analog rangefinder is ratiometric. Most analog rangefinders are ratiometric, meaning that pir output voltage is influenced by the supply voltage. Some analog rangefinders (such as the SF/02) have their own and when experiment and estimated as the set of t				Modified	
	RNGFND1_SCALING	3	3	m/V		Scaling factor between rangefinder rea For the hyperbolic function the units are	iding and distance. For the linear and inverted functions this is in meters per volt. e meterVolts. For Maxbotix serial sonar this is unit conversion to meters.				
	RNGFND1_STOP_PIN	-1	-1		-1:Not Used	Digital pin that enables/disables rangef set, then the pin is set to 1 to enable th	finder measurement for the pwm rangefinder. A value of -1 means no pin. If this is is an angefinder and set to 0 to disable it. This is used to enable powersaving when a whore her denotes MM/dr // CRUN // second for houries distancing the distance of the provider of the mean of the distance of the mean second sec				
	RNGFND1_TYPE		0		Maxbo 🔻	Type of connected rangefinder					
	RNGFND2_TYPE	2	0		0:None 1:Analog	Type of connected rangefinder					
	RNGFND3_TYPE		0		0:None 1:Analog	Type of connected rangefinder					
	RNGFND4_TYPE	2			0:None 1:Analog	Type of connected rangefinder					
	RNGFND5_TYPE		0		0:None 1:Analog	Type of connected rangefinder					
l	RNGFND6_TYPE	2	o		0:None 1:Analog	Type of connected rangefinder					
	RNGFND7_TYPE	0	0		0:None 1:Analog	Type of connected rangefinder					
	RNGFND8_TYPE	0			0:None 1:Analog	Type of connected rangefinder					

2. Search RNGFND in Full Parameter List. Modify RNGFNDx\_ADDR (x represents the ultrasonic serial number) to 117, RNGFNDx\_MAX\_CM to 450, RNGFNDx\_MIN\_CM to 43, and RNGFNDx\_ORIENT to 24. (24 indicates that the ultrasonic direction is forward) As shown below:

Name $\Delta$	Value	Default	Units	Options	Desc	Fav
RNGFND6_ADDR	117	0		0 127	This sets the bus address of the sensor, where applicable. Used for the I2C and DroneCAN sensors to allow for multiple sensors on different addresses.	
RNGFND6_FUNCTION	0	0		0:Linear 1:Inverted	Control over what function is used to calculate distance. For a linear function, the distance is (voltage offset)'scaling, For a inverted function the distance is (offset-voltage)'scaling. For a hyperbolic function the distance is scaling/(voltage offset). The functioner that the distance is include:	
RNGFND6_GNDCLEAR	10	10	cm	5 127	This parameter sets the expected range measurement (in cm) that the range finder should return when the vehicle is on the ground.	
RNGFND6_MAX_CM	450	700	cm		Maximum distance in centimeters that rangefinder can reliably read	
RNGFND6_MIN_CM		20	cm		Minimum distance in centimeters that rangefinder can reliably read	
RNGFND6_OFFSET	0	0	v		Offset in volts for zero distance for analog rangefinders. Offset added to distance in centimeters for PWM lidars	
RNGFND6_ORIENT		25		0:Forward	Orientation of rangefinder	
RNGFND6_PIN	-1	-1		-1:Not Used	Analog or PWM input pin that rangefinder is connected to. Airspeed ports can be used for Analog input, AUXOUT can be used for PWM input. When using analog pin 103, the maximum value of the input in 3.3V. For PWM input, the pin must be used for even as distIC BUC as the MMM in PUDPOP is distingt and the second state.	

# 1.4.3 Data Display

As only the horizontal distances are available on the data check interface, upward data can only be checked on DataFlash Logs. The steps are as follows:

1. DataFlash Logs Download

Connect the flight controller to Mission Planner and follow the below steps to download DataFlash Logs.



Click the logs you want to view, and click Download these logs to download the selected logs.

🔕 Log Downloader			×
Log files:		Output:	
		Getting list of log files No logs to download	*
Download All Logs	First Person KML		
Download Selected Logs	Create KML		
Clear Logs	.bin to .log		*
		NOTE: When posting support querys, please send the bin file	547 - 148 1

# 2. Log Check

Click Review a Log and open the log.



Follow steps 1 and 2 in the picture below.



The data shown in the chart is the distance of objects detected by SUI04.

# Chapter 2. Set Mini Pix/PIXHAWK to Work with SUI04

#### 2.1 Obstacle Avoidance

#### 2.1.1 Firmware Support

The firmware of the obstacle avoidance function needs to be downloaded from the link below, and then uploaded to the flight controller on Mission Planner. Other versions of firmware cannot be used! !! (The following firmware is modified from Firmware Copter V3.5.7. After installing the firmware, the previous functions and parameters will remain unchanged, and there is no need to re-calibrate.) SUI04 Firmware for Obstacle Avoidance Function: https://www.radiolink.com/sui04\_firmware

# 2.1.2 How to Connect With PIXHAWK

Individually with PIXHAWK: Connecting the module (eg. SUI 04) and the I2C port of PIXHAWK with a 4 pin to 4 pin wire.



Connecting with PIXHAWK by I2C wiring board: 2 wires of 4 pin to 4 pin are needed: one for connecting I2C port of PIXHAWK and I2C wiring board; one for connecting I2C wiring board and SUI04.



# With Mini Pix

**WARNING**: NO memory card inside When connection.

Individually connect with Mini Pix: one 4 pin to 6 pin wire is needed: the 4 pin end to SUI04 and the 6 pin end to the GPS port of Mini Pix.



Connecting with Mini Pix by I2C wiring board:

- (1) Take a 6 pin to 6 pin wire with one end to the GPS port of Mini Pix and one end to the I2C expansion board.
- (2) Take a 4 pin to 4 pin wire with one end to the I2C expansion board and one end to the I2C wiring board.
- (3) Take another 4 pin to 4 pin wire with one end to the I2C wiring board and one end to the SUI04.



#### 2.1.3 Parameters Setup

#### Module type setup

PIXHAWK support four kinds of obstacle avoidance modules. SUI04 can be chosen by setting the value of PRX\_TYPE in Mission Planner(MP).

#### Setting steps:

- (1) Choose CONFIG/TUNING on the top of the interface.
- (2) Click "Full Parameter List" on the left.
- (3) Input "PRX\_TYPE" (obstacle avoidance module type) in search column at the lower right corner and press "Enter".
- (4) As the searched proximity sensor type shown in the Mission Planner, change the proximity sensor type value to 4 ( that is , the chosen module type is Range Finder, which is SUI04 ).
- (5) Click "Write Params" on the right to save the parameters when the setting is complete.

Mission Planner For Radi	olink 1.3.49.6 APM:Cop	ter V3.5.5 (27229c83)				- 🗆 X
			DONATE		COM3 - 11520 維接統	
Flight Modes	Command Step1	Value	Units	Options	Desc	Load from file
GeoFence	PRX_TYPE	<sup>2</sup> Step4		0:None 1:LightWareSF40C 2:MAVLink 3:TeraRangerTower 4:RangeFinder	What type of proximity sensor is connected	Save to file
Basic Tuning		Sector Sector	h.		Step5	Write Params
Extended Tuning						Refresh Farams
Standard Params						Compare Farams
Advanced Params						411 Maite and in wa
Full Parameter List	e2					format with no scali
Full Parameter Tree						Racing210(穿起 -
Planner						Load Presaved
						Reset to Default
						Search PRX_TYPE
						Step3

# Setup the avoidance distance and the avoidance enable/disable

The avoidance distance of ultrasonic sensor SUI04 can be hanged by setting the value of AVOID\_MARGIN. AVOID\_MARGIN: the max avoidance distance at LoiterMode, the unit is meter.

The avoidance enable/disable of ultrasonic sensor SUI04 can be set by changing the value of AVOID\_ENABLE.

AVOID\_ENABLE: the value of AVOID\_ENABLE 0 (options is None) means the avoidance function is off and the value 2(options is Use Proximity Sensor) means the avoidance function is on.

#### Parameters Setting Steps on Mission Planner:

- (1) Choose CONFIG/TUNING on the top of the interface.
- (2) Click "Full Parameter Tree".
- (3) Click the "AVOID", the parameters of "AVOID\_ENABLE" and "AVOID\_MARGIN" are shown.
- (4) Set the value of the AVOID\_ENABLE 2(use proximity sensor) means make avoidance sensor enable.
- (5) Set the value of AVOID\_MARGIN 3(3 meters, the effective value is from 1 to 10) means vehicle will attempt to stay at least in 1 to 10 meters from objects while in GPS modes.
- (6) Click "Write Params" on the right to save the parameters when the setting is complete.

Mission Planner For Rad	liolink 1.3.49.6 APM:Copter	V3.5.7 (ccc782	32)				>	×
			<mark>؟</mark> ک	() NE	Coms ÷ 94 维接统计	600	DISCON	NECT
Flight Modes	Command Step 1	Value	Unit	Range	Description	^	Load from file	
GeoFence	ACCEL						Save to file	
Basic Tuning	E ACRO			0.01 11 1	Step	6	Write Params	
Extended Tuning	ADSB_ENABLE			0:Disabled 1:Enabled	Enable ADS-B		Refresh Params	T
Standard Params	II AHRS						Compare Params	
Advanced Params	ANGLE_MAX	4500	cdeg	1000 8000	Maximum lean angle in all flight modes		177 Y '	
Full Parameter List	ARMING						format with no :	n ra scali
Full Parameter Tree	E AIC						Racing210(穿起,	-
Planner Step 2	AVD_ENABLE			O:Disabled 1:Enabled	Enable Avoidance using ADSB		Load Presaved Reset to Defaul	ŧ
	avoid Step 3				Wen loss and a moder and detailer while		Search	
	AVOID_ANGLE_MAX	1000	cdeg	0 4500	in non-GPS modes Nictance from object at which obstacle			
	AVOID_DIST_MAX	<sup>10</sup> Step 4	<b>4</b> m	3 30 0 None	avoidance will begin in non-GPS modes			
	AVOID_ENABLE			1 StopAtFence…	Enabled/disable stopping at fence Vehicle will attempt to stav at least this			
	AVOID_MARGIN	3 Stop	m	1 10	distance (in meters) from objects while in…			
	BATT	step :						
	BATT2					~		

#### How to Enable/Disable the avoidance function by transmitter(Optional)

This setup depends on users' habit and is optional.

The avoidance function of flight controller is always automatically enabled a Loiter Mode by default and disabled if change to Stabilize Mode.

If users prefer enabling/disabling the avoidance function by transmitter, setup in the Mission Planner as Below steps is necessary.

#### Flight Controller Setting steps (CH7\_OPT Parameters):

- (1) Choose CONFIG/TUNING on the top of the interface.
- (2) Click "Full Parameter List" on the left.
- (3) Input "CH7\_OPT" (choose the CH7 to make the avoidance function enable or disable) in search column at the lower right corner and press "Enter".

- (4) As the searched CH7\_OPT shown in the Mission Planner, change the value to 40 (Object Avoidance). It means switchon/off CH7 enable/disable the avoidance function.
- (5) Click "Write Params" on the right to save the parameters when the setting is complete.

UGHT DATA FUGHT PLAN INITIAL SETUR					COM3 + 115200 結務統	
light Modes	Command Step1	Value	Units	Options	Desc	Load from file
GeoFence Basic Tuning Extended Tuning Standard Params Advanced Params Full Parameter List Full Parameter Tree Planner	сн7_орт = 1 <mark>2</mark>	40 Step4		0 Do Nothing 2-Filp 3-Simple Mode 4:RTL 5:Save Tim 7:Save WP 9:Camera Trigger 10: RangeFinder 11:Fence 13:Super Simple Mode 14:Acro Trainer 15:Sprayer 16:Auto 17:Auto Tune 18:Land 19:Gripper 21:Parachute Release 23:Parachute Release 24:Parachute Release 23:Parachute Release 24:Para	Step5 Select which function is performed when CH7 is above 1800 pwm	Save to file Write Params Refresh Params Compare Params All Units are in format with no so Racing210(穿起。 Load Presaved Reset to Default

#### Transmitter setting steps

- (1) Choose a 2-position switch(the SWA of AT9S for example) to control CH7.
- (2) Choose INITIAL SETUP on the top of the interface.
- (3) Click "FailSafe" in the pull-down menu of "Madatory Harware" on the left and the PWM value interface of CH7 is shown.
- (4) Toggle the switch. If the PWM value of CH7 is more than 1800, it means the avoidance function is enabled when the switch is at the bottom position. If the PWM value of CH7 is less than 1800, it means the avoidance function is disabled when the switch is at the top position.



#### 2.1.4 Button Functions of SUI04

Flight controller PIX can simultaneously support 6 modules (eg. SUI04) including front/back/left/ right/upward/downward. So the direction of each module should be set. Every press on the button, the module direction changes once accordingly clockwise and the module LED flashes. Different flash frequencies means different directions. Once-Front, Twice-Right, 3 Times-Back, 4 Times-Left, 5 Times-Downward, 6 Times- Upwards.



(Press this button to change the direction of obstacle avoidance, it will rotate 90 degree clockwise when press the button once.)

NOTICE: Every direction changed, the flight controller and the module need to be restarted.

#### 2.1.5 Data Check

As the data of the latest official Mission Planner is not well shown, it's suggested to download the Mission Planner specially.

for Mini Pix to check data.

https://www.radiolink.com/minipix\_firmware

After the above setups are complete, the SUI04 data can be checked on Mission Planner. Disconnect the PIXHAWK and restart the Mission Planner. When the Mission Planner is connecting, a new interface (as shown below) will come out automatically and the working condition of SUI04 can be checked . If it doesn't come out, please click the icon at the task bar on the desktop.



(Current direction: Forward)

(Current direction: Right

# 2.1.6 Flight Modes

Flight modes need to setup after the parameters of PIXHAWK have been set and the Ultrasonic Sensor SUI04 works, the basic flight modes include 1: Stabilize, 2: Loiter.

			DONATE
Install Firmware		Current Mode: Stabilize(自稳	9
Wizard		Current PWM: 5: 1065	
	Flight Mode 1	Stabilize(自稳)	🗾 🧅 🗌 Simple Mode
>> Mandatory Hardware	Flight Mode 2		🔍 🗌 Simple Mode
Frame Type	Flight Mode 3	Stabilize(自稳)	Simple Mode
Accel Calibration	Flight Mode 4		📕 🗌 Simple Mode
Compass	Flight Mode 5	Stabilize(自稳)	📃 🔤 Simple Mode
Radio Calibration	Flight Mode 6	PosHold(定点)	Simple Mode
ESC Calibration		Save Modes	
Flight Modes			
FailSafe			
>> Optional Hardware			

Mission Planner For Radiolink 1.3.49.6 APM:Copter V3.5.7 (ccc78232)

# 2.1.7 Working Condition

**WARNING**: Reconnect the PIXHAWK and restart the Mission Planner after following all the above steps to ensure the successful parameters setup for failsafe.

After verifying all the parameters setup, it's strongly suggested to find a large place with walls or other obstacles to have a test when ready for the first flight.

#### Flight testing steps:

- (1) Power on the drone and wait till the blue LED of PIXHAWK blinks,meaning the initialization of PIXHAWK is complete.
- (2) Press the safety switch about 1 to 2 seconds till the red LED of PIXHAWK is on when the blue LED of PIXHAWK is blinking.
- (3) Unlock the drone and the motors will begin to move if armed successfully. Push the throttle stick slowly, change the flight mode to Loiter when the drone takes off.
- (4) Toggle the CH7-SWA(or any other 2 position switch, it depends on which you setup at the very beginning) to turn on the avoidance function.
- (5) Push the throttle and aileron sticks to make the drone close to the wall/obstacle, the drone will control the racing speed and stopped at the 3 meters far from the wall/obstacle automatically. If the flight speed is too high and the distance to the wall/obstacle is less than 3meter because of the inertia, the drone will stay at 3 meters away from the wall or obstacle automatically.

**Notice**: To unlock a drone, put the throttle stick to the bottom right corner if the transmitter is Mode2. Or put the throttle stick to the bottom left corner and the aileron stick to the bottom right if your transmitter is Mode1.

# 2.1.8 Notices

- (1) No memory card allowed when connecting Mini Pix.
- (2) Avoidance function is automatically enabled when at Alt-Hold Mode. If needs to be disabled, please follow the above steps and change the value of AVOID\_DIST\_MAX to 0 in Param Setup in Mission Planner.
- (3) Never enable the avoidance function of SUI04 at Alt-Hold Mode but Loiter Mold. (At Alt-hold mode, when the drone encounter obstacles, its slant angle will combine pitch with roll then response. It may be too late to stop if the drone is at full speed. But at Loiter Mode, the drone will stop immediately when encounter an obstacle no matter how big both the pitch and roll are. So, it's suggested use the horizontal obstacle avoidance function at the Loiter Mode.)
- (4) When obstacles detected, the LED of SUI04 is always on; When no obstacle detected, the LED of SUI04 keeps flashing.
- (5) If connection is successfully done, the LED of SUI04 will flash 4 to 6 times and be off when power on.Then always on after the initialization.
- (6) Be sure to avoid the interference from propellers and frame to signals when connecting the flight controller.
- (7) As SUI04 is a transceiver, there is a blind area of 40cm, including the area less than 40cm.
- (8) Only the distance of horizontal directions can be checked on the data check interface. When there's no distance shown, the current direction of SUI04 may be upward, which can be checked on DataFlash Logs.

# 2.1.9 Errors Report on Mission Planner

1) Mission Planner note: Bad LiDAR Health, as shown below.



The ultrasonic shown in the above pic is under unusual working condition. The possible reasons are:

- a. PRX\_TYPE value is set wrong.
- b. PRX\_TYPE value is set 4, but SUI04 is not connected. If SUI04 need to be turned off, PRX\_TYPE value should be set 0.
- c. SUI04 connect incorrectly.
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- 2) Mission Planner note: PreArm: Proximity X deg,0.40m, as shown below

The above screenshot shows SUI04 detects the distance less then 60cm and is locked by the flight controller. To armed SUI04, the distance between the drone and obstacles should be more than 60cm.

# 2.2 Collision Avoidance Upward

The collision avoidance upward function is same as the obstacle avoidance function, the direction of SUI04 upward can be setup by pressing the same button.

Press the button 6 times and the LED flashes 6 times, and the direction of SUI04 is set upward.

The corresponding distance of collision avoidance can be set by the value of AVOID\_MARGIN as the previous steps instructed.

As only the horizontal distances are available on the data check interface, upward data can be checked on DataFlash Logs.

# 1) DataFlash Logs Download

Connect the flight controller with Mission Planner and follow the below steps to download DataFlash Logs.



Click the logs and download.

	😣 Log Downloader			×
S	Log files:	Output:		
		Getting list of log files No logs to download		¢
9				
h				
	Download All Logs First Person KML			
	Download Delected Logs Recreate KML			
	Clear Logs , bin to , log			~
		NOTE: When posting support querys, please send the .	oin file	

# 2) Log check

Open the log files. Click the log review and open the log.



#### Follow the Step 1 and Step 2 shown in below pic:

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(The data that arrow points to means the distance that SUI04 detects.)

# 2.3 Alt-Hold Function Downward

#### 2.3.1 How to Connect

The Alt-Hold downward function is same as the obstacle avoidance function, the direction of SUI04 downward can be setup by pressing the same button.

Press the button 5 times and the LED flashes 5 times, and the direction of SUI04 is set downward.

# 2.3.2 Parameters Setup

#### Module type setup:

- (1) Click "INITIAL SETUP" on the top.
- (2) Click "Optional Hardware" on the left.
- (3) Click "Range Finder" and the Range Finder interface is on the right.
- (4) Click the pull-down menu and choose "MaxbotixI2C" or "LightWareI2C".



After the Range Finder setup, restart the flight controller and back to this Range Finder setup menu, the shown detection distance details means the parameters setup is complete.

#### Setting steps:

- (1) Choose CONFIG/TUNING on the top of the interface.
- (2) Click "Full Parameter List" on the left.
- (3) Input "RNGFND\_MAX\_CM" and "RNGFND\_MIN\_CM" in search column at the lower right corner and press "Enter".
- (4) As the searched the two items shown in the Mission Planner, change RNGFND\_MAX\_CM value to 450cm and RNGFND\_MIN\_CM value to 43 cm.
- (5) Click "Write Params" on the right to save the parameters when the setting is complete.

RNGFND\_MAX\_CM is the detectable max distance of flight controller at Alt-Hold Mode RNGFND\_MIN\_CM is the detectable min distance of flight controller at Alt-Hold Mode.

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			DONATE		COM3 - 115200 附近现场社	DISCONNECT
Flight Modes	Command	Value	Units	Options	Desc	Load from file
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Basic Tuning	Internet and the second				the RNGFND_MAX_CM parameter. Set to -1 to prevent range finder use.	Write Parans
Extended Tuning	RNGFND_MAX_CM	450	cm		Maximum distance in centimeters that rangefinder can reliably read	Refresh Parans
Standard Params	Step3-02		e a a co		Step5	Compare Parans
Advanced Params		alue of RNGFNI	XAM C	CM is 450		All Units are in ra
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	Command	Value	Units	Options	Desc	
	RNGFND_MIN_CM	40	cm		Minimum distance in centimeters that rangefinder can reliably read	1
			4			

# 2.3.2 How to Enable/Disable the Alt-Hold function by transmitter(Optional)

This setup depends on users' habit and is optional.

The Alt-Hold function of SUI04 is always automatically enabled at Alt-Hold Mode and Post-Hold Mode by default and disabled if change to Stabilize Mode.

If users preferenabling/disabling the Alt-Hold function by transmitter, setup in the Mission Planner is necessary.

#### Flight Controller Setting steps (CH8\_OPT Parameters):

- (1) Choose CONFIG/TUNING on the top of the interface.
- (2) Click "Full Parameter List" on the left.
- (3) Input "CH8\_OPT" (choose the CH8to make the Alt-Hold function enable or disable) in search column at the lower right corner and press "Enter".
- (4) As the searched CH8\_OPT shown in the Mission Planner, change the value to10 (Object Alt-Hold).It means switchon/off CH7 enable/disable the avoidance function.
- (5) Click "Write Params" on the right to save the parameters when the setting is complete.

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					21:Parachute Enable 22:Parachute Release			Compare 1	Farams
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								St	tep 3

#### **Transmitter settings**

- (1) Choose a 2-position switch to control CH8.
- (2) Choose INITIAL SETUP on the top of the interface of Mission Planner.
- (3) Click "FailSafe" in the pull-down menu of "Madatory Harware" on the left and the interface of CH8 PWM value is shown.
- (4) Toggle the switch. If the PWM value of CH8 is more than 1800, it means the Alt-Hold function is enabled when the switch is at the bottom position. If the PWM value of CH8 is less than 1800, it means the Alt-Hold function is disabled when the switch is at the top position.

