

Application of TFmini Plus in Pixhawk

www.benewake.com Benewake (Beijing) Co., Ltd. TFmini Plus can directly be connected with the serial port of Pixhawk. TFmini Plus can be used in flight device for the purpose of altitude holding or obstacle avoidance. This document is suitable to Pixhawk adopts ArduCopter V3.6.2 or higher firmware(Note:Standard output mode should be used instead of PIX mode by Benewake GUI in firmware V3.6.2 or above).

Example for connecting Pixhawk:



Figure 1 Schematic Diagram of Connecting TFmini Plus with TELEM 2 Interface (Serial Port 2) of Pixhawk

a) Mission Planner configuration description of TFmini Plus for the purpose of altitude hold

Connect the flight control board to MP.Attention:the installation height should be bigger than non-detection zone.Select [Full Parameter List] in the left from the below bar- [CONFIG/TUNING]. Find and modify the following parameters:

SERIAL2_PROTOCOL = 9 [Rangefinder option]

SERIAL2_BAUD = 115 [Choose the current LiDAR baud rate, if haven't been changed, the default baud rate 115200 should be selected, that is 115]

RNGFND_TYPE = 20 [Same option with TFmini]

RNGFND_MIN_CM = 30 [It could be changed according to real demands and should be bigger LiDAR than non-detection zone, unit is cm]

RNGFND_MAX_CM = 400 [It could be changed according to real demands but should be smaller than effective measure range of LiDAR, unit is cm]

RNGFND_GNDCLEAR = 15 [expressed in cm, depending upon mounting height of the module and should be bigger LiDAR than non-detection zone]

RNGFND_ORIENT=25 [face down]

PRX_TYPE=0

Upon setting of these parameters, click [Write Params] on the right of the software to finish.

If the error message "**Bad Lidar Health**" appears, please check if the connection is correct and the power supply is normal.

How to see the altitude value from LiDAR sensor:double click the area of the Mission Planner,see the following picture:



Select option *sonarrange*, see following picture:

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accel_cal_z	battery_cell1	ch12out	ch8out	gpshdg_acc	gz3	my3	remrssi	timeInAirMinSec
accelsq	battery_cell2	ch13in	ch9in	gpshdop	HomeAlt	mz	roll	🔲 timesincelastshot
accelsq2	battery_cell3	ch13out	ch9out	gpshdop2	horizondist	mz2	rpm1	toh
accelsq3	battery_cell4	ch14in	climbrate	gpsstatus	hwvoltage	mz3	rpm2	tot
airspeed	battery_cell5	ch14out	crit_ADA	gpsstatus2	i2cerrors	nav_bearing	🗌 rssi	turnrate
🔲 alt	battery_cell6	ch15in	current	gpsv_acc	KIndex	nav_pitch	rxerrors	<pre>verticalspeed</pre>
alt_error	battery_kmleft	ch15out	current2	gpsvel_acc	lat	nav_roll	🗌 rxrssi	🔲 vibex
🔲 altasl	📕 battery_mahperkm	ch16in	DistFromMovingBas	groundcourse	lat2	🔤 noise	satcount	🔲 vibey
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altd100	<pre>battery_temp</pre>	chlin	DistToHome	groundspeed	lng	opt_m_y	satcountB	vlen
altd1000	📃 battery_usedmah	ch1 out	distTraveled	groundspeed2	lng2	packetdropremote	servovoltage	a vx
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asratio	ber_error	ch3out	🔲 ekfposvert	🗖 67	mag_ofs_x	🔤 pidff	SSA SSA	🔲 wind_dir
a x	🔲 boardvoltage	ch3percent	ekfstatus	■ tb/2	mag_ofs_y	🔤 pidI	target_bearing	wind_vel
a x2	brklevel	ch4in	ekfteralt	□ gv3	mag_ofs_z	🔲 pidP	🔲 targetairspeed	wp_dist
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az az	ch10out	ch6out	GeoFenceDist	gyrosq2	mx2	raw_press	ter_load	
az2	dh11in	ch7in	🔲 gimballat	gyrosq3	mx 3	raw_temp	ter_pend	

The altitude distance from the LiDAR will be displayed in Sonar Range(meters),see the following picture:



b) Mission Planner configuration description of TFmini Plus for the purpose of Obstacle Avoidance

It's only recommended to be used in Loiter mode, the detail setting is as followings:

Connect the flight control board to MP.Attention:distance between UAV margin and LiDAR should be bigger than LiDAR non-detection zone.Select [Full Parameter List] in the left from the below bar-[CONFIG/TUNING]. Find and modify the following parameters:

AVOID_MARGIN=3 [Unit: m, set obstacle avoidance distance as required]

SERIAL2_PROTOCOL = 9 [Rangefinder option]

SERIAL2_BAUD = 115 [Choose the current LiDAR baud rate, if haven't been changed, the default baud rate 115200 should be selected, that is 115]

RNGFND_TYPE = 20 [Same option with TFmini]

RNGFND_MIN_CM = 30 [It could be changed according to real demands and should be bigger LiDAR than non-detection zone, unit is cm]

RNGFND_MAX_CM = 400 [It could be changed according to real demands but should be smaller than effective measure range of LiDAR, unit is cm]

RNGFND_GNDCLEAR = 15 [Unit: cm, depending upon mounting height of the module and should be bigger LiDAR than non-detection zone]

RNGFND_ORIENT=0 [It depends on the LiDAR's real installation direction,0~7 is supported up to

now, see detail in MP]

PRX_TYPE=4 [RangeFinder should be selected for proximity sensor in obstacle avoidance mode]

Upon setting of these parameters, click [Write Params] on the right of the software to finish.

If the error message "**Bad Lidar Health**" appears, please check if the connection is correct and the power supply is normal.

How to see the target distance from the LiDAR: (distance from LiDAR in obstacle avoidance can't be displayed in *sonarrange* option) press Ctrl+F button in keyboard, the following window will pop out:

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Warning Manager	Create custom audio warnings		sitl				
Follow Me	use a nmea gps to follow me		streamcombi	30 WAG			
NMEA	outputs the may location in nmea		Inject GPS				
MicroDrone	outputs the may location in microdrone format		FFT	DIFFEBENTIAL PRESSURE	010		
Mavlink	mirrors the mavlink stream received by mp		TD		Dia		
Param gen	regenerage the param info used inside mp		TD				
Lang Edit	translation language editor		pixhawk	OPTICAL PLOY	81.4		
OSDVi deo	overlay the hud into your recorded videos		QNH	VISION POSITION	01.		
Moving Base	show an extra icon on the map of your current		Sequence				
Shp to Poly	convert shp file ot a polygon file		Swarm				
	output the may location into xplanes	nk In	vlo				
Swarm	multi mav swarm interface	Contraction Address	zstream				
Follow the leader	follow the leader swarm		Aze Man				
MAVSerial pass	create a exclusive passthrough to the gps		Data				
	remove all apm drivers		faram gen		Dis		
Sort TLogs	sort tlogs into there type and sysid			NOTOR OUTPETS	01.0		
rip all fw	download all current fw's		signing				
Inject GE	add custom imagery to mp		calib	at seteries	U.S.		
Clear Custon Maps	wipe custom imagery			8D GY802	Dis		
structtest	struct conversion speed test		sphere				
DashWare			log		Dis		
arm and takeoff	quad: arm and takeoff		extract		Dis		
zimbal test	run the gimbal pointing algo		gns intect	AHRS			
map logs	create map jpg's for all tlogs in a dir		Proximity	TERRAIN			
logindex	tlog browser		Follow Swarm				
	logdownLoad ReSort All		Custom DTED		Dis		
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Click button *Proximity*, the following window will appear:





The number in green color means the distance from LiDAR in obstele avoidance mode (the number only refresh when this window open, close, zoom in or zoom out, it doesn't mean the real time distance from LiDAR and will not be influenced in Mission Planner version under v1.3.48, the problem could be solved by updating Mission Planner)



♦ Attach:If TELEM 2 port has been used ,SERIAL4/5 interface could be used,the other setting are same



Figure 2 Schematic Diagram of Connecting TFmini Plus with SERIAL4/5 Interface (Serial Port 4/5) of Pixhawk

Configuration Descriptions of Mission Planner

Connect flight control board to MP, Select [Full Parameter List] in the left from the below bar [CONFIG/TUNING]. Find and modify following parameters:

SERIAL4_PROTOCOL = 9 (LiDAR)

SERIAL4_BAUD = 115

Upon setting of these parameters, the other parameters should be same as Mission Planner configuration description of TFmini Plus for the purpose of Obstacle Avoidance or Altitude Holding, then click [Write Params] on the right of the software to finish.

