

# **Application of TF03 in Pixhawk**

www.benewake.com Benewake (Beijing) Co., Ltd. TF03 can directly be connected with the serial port of Pixhawk. TF03 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:

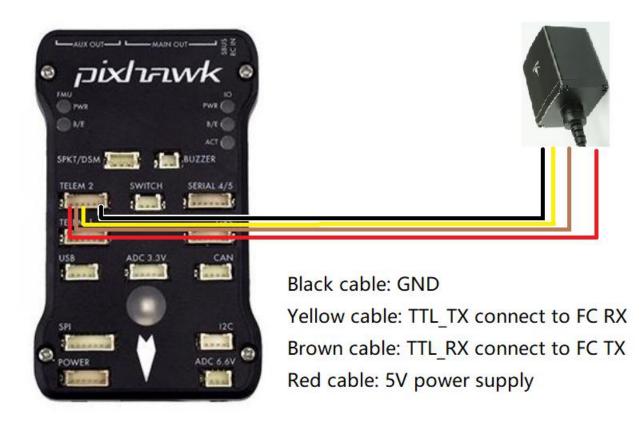


Figure 1 Schematic Diagram of Connecting TF03 with TELEM 2 Interface (Serial Port 2) of Pixhawk

## a) Mission Planner configuration description of TF03 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 = 19 [Same option with TF02]

RNGFND\_MIN\_CM = 20 [It could be changed according to real demands and should be bigger LiDAR than non-detection zone, unit is cm]

RNGFND\_MAX\_CM = 5000 [It could be changed according to real demands but should be smaller

than effective measure range of LiDAR, unit is cm]

RNGFND\_GNDCLEAR = 20 [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:

🖳 Display This								×
accel_cal_x	🖌 az3	ch11out	ch7out	🔲 gimballng	gz	my	remnoise	ter_space
accel_cal_y	AZTOMAV	🗖 ch12in	🗖 ch8in	gpsh_acc	gr2	my2	remotesnrdb	🔤 timeInAir
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_AOA	gpsstatus2	i2cerrors	nav_bearing	rssi	turnrate
alt	battery_cell6	ch15in	current	gpsv_acc	KIndex	nav_pitch	rxerrors	verticalspeed
alt_error	battery_kmleft	ch15out	current2	gpsvel_acc	lat	nav_roll	rxrssi	🗖 vibex
🗌 altasl	📕 battery_mahperkm	ch16in	DistFromMovingBas	🔤 groundcourse	1at2	noise	satcount	🗖 vibey
altasl2	battery_remaining	ch16out	DistRSSIRemain	📕 groundcourse2	🗖 linkqualitygcs	opt_m_x	satcount2	🗖 vibez
altd100	battery_temp	ch1 in	DistToHome	🔤 groundspeed	lng	opt_m_y	satcountB	🗖 vlen
altd1000	🔄 battery_usedmah	ch1 out	distTraveled	🔤 groundspeed2	lng2	🔤 packetdropremote	servovoltage	vx
altoffsethome	📕 battery_usedmah2	ch2in	ekfcompv	g:	load	pi dachi eved	🔲 sonarrange	иу
AOA	battery_voltage	ch2out	ekfflags	gx2	local snr db	🗖 pi dD	sonarvoltage	٧z
aspd_error	battery_voltage2	ch3in	ekfposhor	🔤 gx3	mag_declination	piddesired	speedup	watts
asratio	ber_error	ch3out	ekfposvert	<b>a</b>	mag_ofs_x	pidff	SSA	wind_dir
ax	boardvoltage	ch3percent	ekfstatus	g/2	mag_ofs_y	🗌 pidI	target_bearing	wind_vel
ax2	brklevel	ch4in	ekfteralt	g√3	mag_ofs_z	pidP	targetairspeed	wp_dist
ax3	campointa	ch4out	ekfvelv	gyro_cal_x	magfield	pitch	targetalt	wpno
ay	campointb	ch5in	ELT oMAV	gyro_cal_y	magfield2	press_abs	targetaltd100	xtrack_error
ay2	campointe		 fixedp	gyro_cal_z	magfield3	press_temp	ter_alt	yaw -
ay3	ch10in	ch6in	freemem	gyrosq	mx	radius	ter_curalt	
az	ch10out	ch6out		gyrosq2	 mx2		ter_load	
		ch7in	gimballat	gyrosq3	 mx3	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 TF03 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=5 [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 = 19 [Same option with TF02]

RNGFND\_MIN\_CM = 20 [It could be changed according to real demands and should be bigger LiDAR than non-detection zone, unit is cm]

RNGFND\_MAX\_CM = 5000 [It could be changed according to real demands but should be smaller than effective measure range of LiDAR,unit is cm]

RNGFND\_GNDCLEAR = 20 [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.

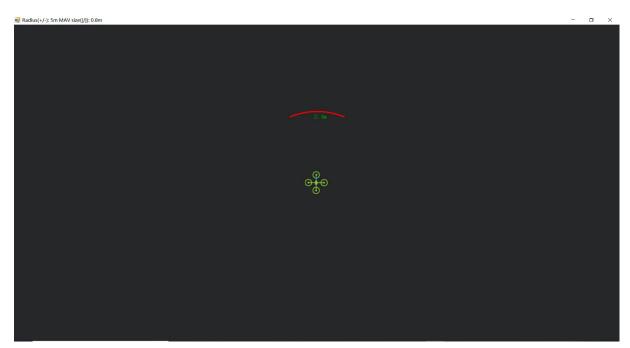
If the error message "**Bad Lidar Health**" appears, please check if the connection is correct and the power supply is normal.

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:

🖳 temp					_		×
Geo ref images	Geo Refrence photos						06
Warning Manager	Create custom audio warnings		siti				
Follow Me	use a nmea gps to follow me		streamcombi	3D WAG			
NMEA	outputs the may location in nmea		Inject GPS				
MicroDrone	outputs the may location in microdrone format		FFT				
Mavlink	mirrors the mavlink stream received by mp		TD		Dis		
Param gen	regenerage the param info used inside mp		reboot	OFTICAL FLOW	01.		
Lang Edit	translation language editor		pixhawk	VISION POSITION			
OSBVi deo	overlay the hud into your recorded videos		QNH				
Moving Base	show an extra icon on the map of your current		Sequence		E4		
Shp to Poly	convert shp file ot a polygon file		Swarm				
	output the may location into xplanes	nk In	vlc				
Swarm	multi mav swarm interface		gstream				
Follow the leader	follow the leader swarm		Age Map				
MAVSerial pass	create a exclusive passthrough to the gps		Data				
	remove all apm drivers		faram gen cust				
Sort TLogs	sort tlogs into there type and sysid		signing				
rip all fw	download all current fw's		opticalitiow				
Inject GE	add custom imagery to mp		calib	30 67902	014		
Clear Custom Maps	wipe custom imagery		sphere	3D ACCEL2	Dis		
structtest	struct conversion speed test		mag calb				
DashWare			log		Dis		
arm and takeoff	quad: arm and takeoff		extract		Dis		
gimbal test	run the gimbal pointing algo		Proximity	AHRS			
map logs	create map jpg's for all tlogs in a dir		Follow	TEBSAIN			
logindex	tlog browser		Swarm				
GST test	DEM logdownload ReSort All Cust	om GDAL	Custom DTED		Dia		
ODI LEST	scp logs Cust	on obres		BATTERY	Dis	Presen	Bad

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



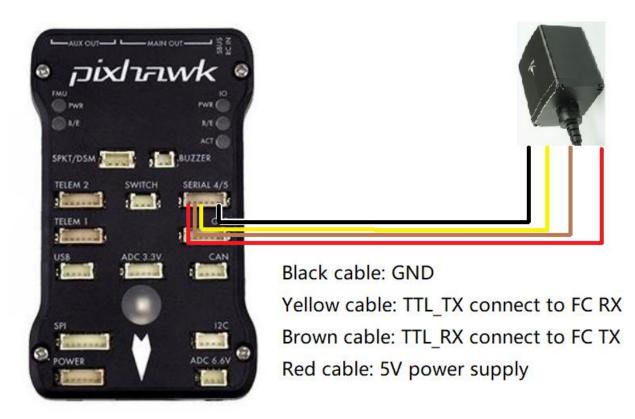


Figure 2 Schematic Diagram of Connecting TF03 with SERIAL4/5 Interface (Serial Port 4/5) of Pixhawk

## **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

### SERIAL4\_BAUD = 115

Upon setting of these parameters, the other parameters should be same as Mission Planner configuration description of TF03 for the purpose of Obstacle Avoidance or Altitude Holding, then click [Write Params] on the right of the software to finish.

