Application of TF02 in Pixhawk

www.benewake.com Benewake (Beijing) Co., Ltd. TF02 can directly be connected with the serial port of Pixhawk. TF02 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:

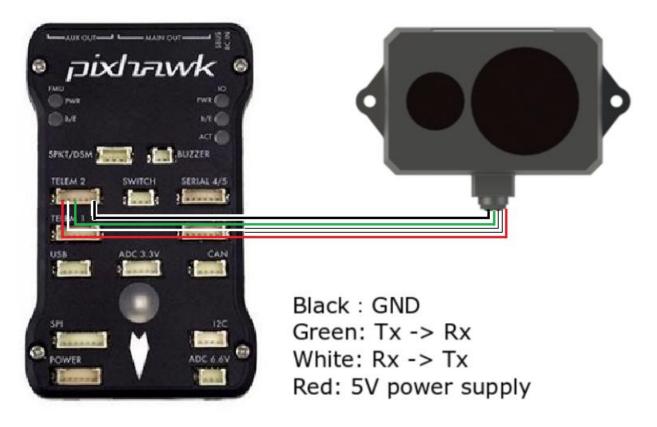


Figure 1 Schematic Diagram of Connecting TF02 with TELEM 2 Interface (Serial Port 2) of Pixhawk

a) Mission Planner configuration description of TF02 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 [TF02 option]

RNGFND_MIN_CM = 40 [It could be changed according to real demands and should be bigger LiDAR than non-detection zone,unit is cm]

RNGFND_MAX_CM = 800 [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	chllout	ch7out	gimballng	gz	my	remnoise	ter_space
accel_cal_y	AZT oMAV	ch12in	ch8in	gpsh_acc	gr2	my2	remotesmrdb	■ 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	lat2	noise	satcount	■ vibey
altasl2	battery_remaining	ch16out	DistRSSIRemain	groundcourse2	linkqualityges	opt_m_x	satcount2	vibez
altd100	battery_temp	ch1 in	DistToHome	groundspeed	lng	opt_m_y	satcountB	vlen
altd1000	battery_usedmah	chi out	distTraveled	groundspeed2	lng2	packetdropremote	servovoltage	٧x
altoffsethome	battery_usedmah2	ch2in	ekfcompv	gx	load	pidachi eved	Sonarrange	■ vy
A0A	battery_voltage	ch2out	ekfflags	gx2	localsmrdb	pi dD	sonarvoltage	■ vz
aspd_error	battery_voltage2	ch3in	ekfposhor	g:3	mag_declination	piddesired	speedup	watts
asratio	ber_error	ch3out	ekfposvert	■ gy	mag_ofs_x	pidff	SSA	wind_dir
ax	■ boardvoltage	ch3percent	ekfstatus	□ gy2	mag_ofs_y	pidI	target_bearing	wind_vel
ax2	brklevel	ch4in	ekfteralt	g y3	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	ch5out	fixedp	gyro_cal_z	magfield3	press_temp	ter_alt	yaw
ay3	ch10in	ch6in	freemem	gyrosq	mx	radius	ter_curalt	
9.Z	ch10out	ch6out	GeoFenceDist	gyrosq2	mx2	raw_press	ter_load	
az2	ch11in	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 TF02 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 = 19 [TF02 option]

RNGFND_MIN_CM = 40 [It could be changed according to real demands and should be bigger LiDAR than non-detection zone,unit is cm]

RNGFND_MAX_CM = 800 [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]

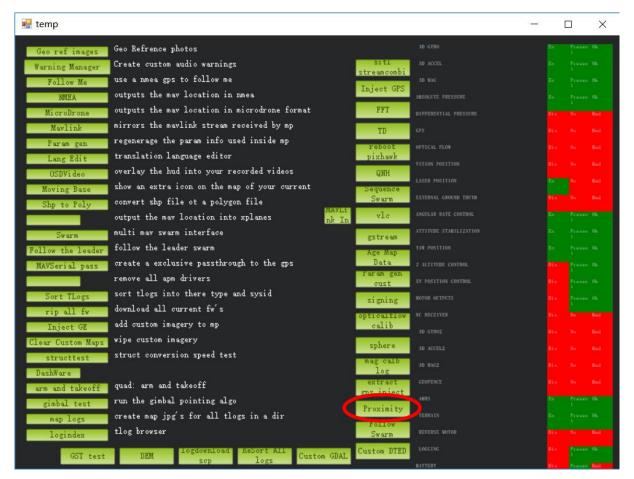
RNGFND_ORIENT=0 [It depends on the LiDAR's real installation direction,0~7 is supported up to now,see detail in MP]

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

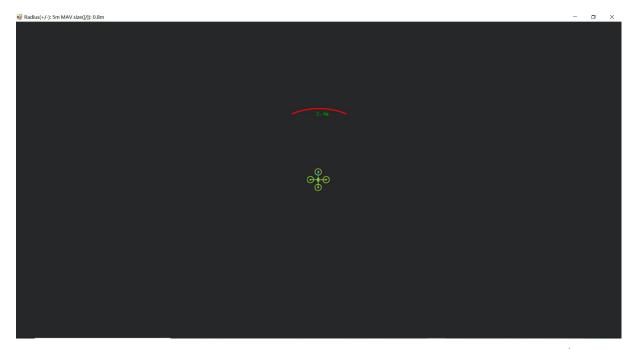
Upon setting of these parameters, click [Write Params] on the right of the software to finish.

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:



Click button *Proximity*,the following window will appear:



The number in green color means the distance from LiDAR in obstcle 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 TF02 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 TF02 for the purpose of Obstacle Avoidance or Altitude Holding, then click [Write Params] on the right of the software to finish.