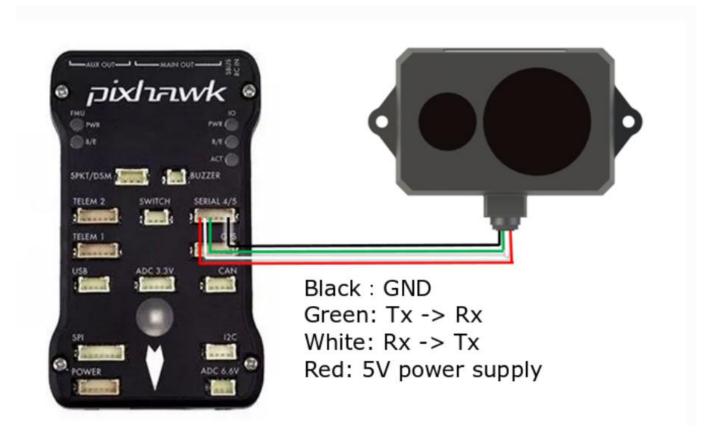


Application of TF02 in PX4

www.benewake.com Benewake (Beijing) Co., Ltd. PX4 is popular and used by a lot of customers. TF02 is popular in the LiDAR market. This article introduce the detail application of TF02 in PX4. This article is based on QGroundControl v3.4.4 and PX4 v1.8.2, any incomplete function at customer side should be upgraded in Ground Control Station and firmware.

I Hardware connection

We take Pixhawk as an example for connection, see following picture:



Please install TF02 on the aircraft and make sure it's firm,lens should face downward and there is no obstacle before that, it should be at least 40cm between TF02 lens and ground!

II Software setting

1.Choose *Setting--Parameters--EKF2_-EKF2_RNG_AID*, select *Range aid enabled*, see the following picture:



QGroundControl v	3.4.4			- o	×
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Vehicle Setup	Search:	Clear			Too
Summary	Standard	ERITE I VALUE AN			- posi
	Battery Calibration	EKF2_PCOEF_Y	0.00	Pressure position error coefficient for the Y axis. This is the ratio of static pressure error to dynamic pressure generated by a wind relative	
Firmare	Comera trigger	EKF2_PCOEF_Z	0.00	Static pressure position error coefficient for the Z axis. This is the ratio of static pressure error to dynamic pressure generated by a wind i	
		EKF2_REQ_EPH	5.0 m	Required EPH to use GPS	
	Commander	EKF2_REQ_EPV	8.0 =	Required EPV to use GPS	
	Data Link Loss	EKF2_REQ_GDOP		Required GDoP to use GPS	
	EKF2	EKF2_REQ_HDR1FT	0.30 m/s	Maximum horizontal drift speed to use GPS	
	FW Attitude Control	EKF2_REQ_NSATS			
Flight Modes	Follow target	EKF2_REQ_SACC	1.00 m/s	Required speed accuracy to use GPS	
D Power	GPS	EKF2_REQ_VDR1FT	0.50 m/s	Maximum vertical drift speed to use GPS	
		EKF2_RNG_AID		Range sensor aid	
Safety	GPS Failure Navigation	EKF2_RNG_A_HMAX	5.000	Maximum absolute altitude (height above ground level) allowed for range aid mode	
	Geotence	EKF2_RNG_A_IGATE	1.000 SD	Gate size used for innovation consistency checks for range aid fusion	
	MAVLink	EKF2_RNG_A_VMAX	1.000	Maximum horizontal velocity allowed for range aid mode	
Camera	Mission	EKF2_RNG_DELAY	5.0 ms	Range finder measurement delay relative to 1MU measurements	
Parameters	Mount.	EKF2_RNG_GATE	5.0 SD	Gate size for range finder fusion	
-	ulticopter Attitude Contr	EKF2_RNG_N01SE		Measurement noise for range finder fusion	
	lticopter Position Contr	EKF2_RNG_PITCH	0.000 rad	Range sensor pitch offset	
	PWN Outputs	EKF2_RNG_POS_X	0.000 m		
		EKF2_RNG_POS_Y	0.000 m	Y position of range finder origin in body frame	
	Precision Land	EKF2_RNG_POS_Z	0.000 =		
	Rodio Calibration	EKF2_RNG_SFE	0.050 m/m	Range finder range dependant noise scaler	
	Radio Switches	EKF2_TAS_GATE	3.0 SD	Gate size for TAS fusion	
	Return Mode	EKF2_TAU_POS		Time constant of the position output prediction and amoothing filter. Controls how tightly the output track the EKF states	
	Return To Land	EKF2_TAU_VEL	0.25 s	Time constant of the velocity output prediction and smoothing filter	
	SD Logging	EKF2_TERR_GRAD	0.50 m/m	Magnitude of terrain gradient	
	Sensor Calibration	EKF2_TERR_N0ISE	5.0 m/s	Terrain altitude process noise - accounts for instability in vehicle height estimate	
	Collect Collector 100	EKF2_WIND_NOISE	0.100 m/s/s		

Customer setting:

(1) EKF2_RNG_A_VMAX

(2) EKF2_RNG_A_HMAX

Detail description could be found at the parameters place.

2.Select *Setting--Sensors--SENS_EN_TFMINI*, select *Enabled*, see the following picture:

QGroundControl v	3.4.4				
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Vehicle Setup	Search:	Clear			
	DAL 2	CAL_MAG_SIDES		n Bitfield selecting mag sides for calibration	
	FW Attitude Control	IMU_ACCEL_CUTOFF	30.000 Hz		
· · · · ·	Follow target	IMU_GYRO_CUTOFF	80.000 Hz	Driver level cutoff frequency for gyro	
	GPS	SENS_BARO_QNH	1013.250 hPa	QNH for barometer	
		SENS_BOARD_ROT		Board rotation	
		SENS_BOARD_X_OFF	0.000 deg		
	MAVLink	SENS_BOARD_Y_OFF	0.000 deg		
	Mission	SENS_BOARD_Z_OFF	0.000 deg		
	Mount	SENS_EN_LL40LS		Lidar-Lite (LL40LS)	
	ulticopter Attitude Contro	SENS_EN_SF0X		Lightware laser rangefinder (serial)	
Safety	ulticopter Position Contro	SENS_EN_SF1XX	Disabled	Lightware SF1xx/SF20/LW20 laser rangefinder (i2c)	
		SENS_EN_TFMINI		Benewake TFmini laser rangefinder	
	PWM Outputs	SENS_EN_THERMAL		w Thermal control of sensor temperature	
💽 Camera	Precision Land	SENS_EN_TRANGER		TeraRanger Rangefinder (i2c)	
	Radio Calibration				
Parameters					
	Return Mode				
	Return To Land				
	SD Logging				
	Sensor Calibration				
	Sensors				
	System				
	Thermal Compensation				
	VTOL Attitude Control				
	Developer -				
	System -				

2. TF02 measurement result will be displayed on the panel, see the following picture:

