

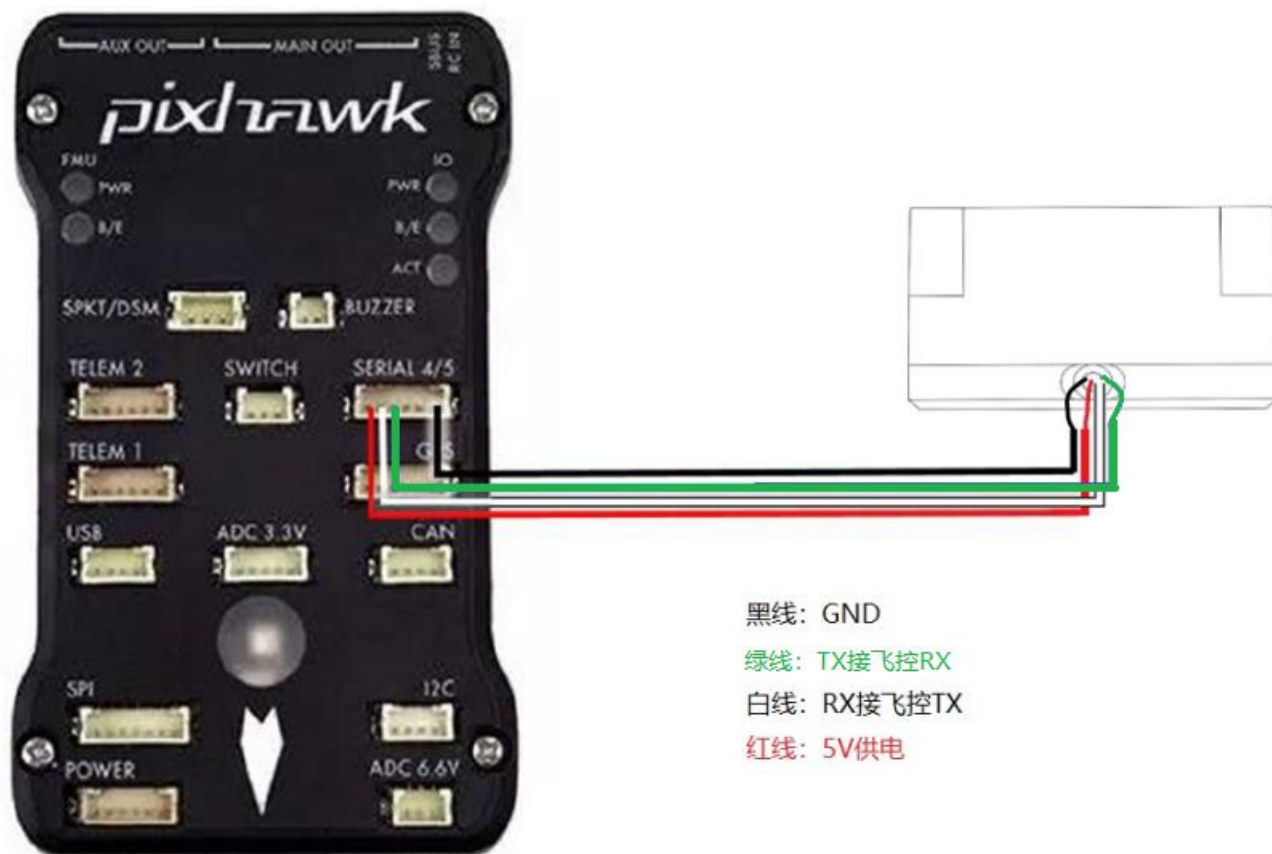
# TFmini Plus 在 PX4 上的应用

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PX4 有着自己独特的优势，受到广大爱好者的喜爱。TFmini Plus 是北醒公司推出的性价比极高的激光雷达，受到广大爱好者的追捧。本文介绍 TFmini Plus 和 PX4 的连接方法。本文档基于 QGroundControl v3.4.4 和固件 PX4 v1.8.2 编写，如因地面站或固件功能不全，请升级。

## 一、硬件连接

本文以 Pixhawk 为例示意连接，如下图：



请将 TFmini Plus 安装在飞行器上，固定牢固，垂直向下，并保证镜头前方没有障碍物，TFmini 镜头距离地面需大于 10cm。

## 二、软件设置

1.在 设置--Parameters--EKF2--EKF2\_RNG\_AID 选项下，选择 *Range aid enabled*,如下图：

QGroundControl v3.4.4

File Widgets

Vehicle Setup Search:  Clear

| Category   | Parameter        | Value             | Description  |
|------------|------------------|-------------------|--|
| Sensors    | EKF2_PCOEF_X     | 0.00              | Static pressure position error coefficient for the positive X axis. This is the ratio of static pressure error to dynamic pressure generated by a positive velocity. |
|            | EKF2_PCOEF_Y     | 0.00              | Static pressure position error coefficient for the positive Y axis. This is the ratio of static pressure error to dynamic pressure generated by a positive velocity. |
|            | 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 relative velocity.     |
|            | EKF2_REQ_EPH     | 5.0 m             | Required EPH to use GPS  |
|            | EKF2_REQ_EPV     | 8.0 m             | Required EPV to use GPS  |
|            | EKF2_REQ_GDOF    | 2.5               | Required GDoF to use GPS   |
|            | EKF2_REQ_HDRIFT  | 0.30 m/s          | Maximum horizontal drift speed to use GPS  |
|            | EKF2_REQ_NSATS   | 6                 | Required satellite count to use GPS  |
|            | EKF2_REQ_SACC    | 1.00 m/s          | Required speed accuracy to use GPS   |
|            | EKF2_REQ_VDRIFT  | 0.50 m/s          | Maximum vertical drift speed to use GPS  |
| Parameters | EKF2_RNG_AID     | Range aid enabled | Range sensor aid   |
|            | EKF2_RNG_A_HMAX  | 5.000             | Maximum absolute altitude (height above ground level) allowed for range aid mode   |
|            | EKF2_RNG_A_IGATE | 1.000 SD          | Gate size used for innovation consistency checks for range aid fusion  |
|            | EKF2_RNG_A_VMAX  | 1.000             | Maximum horizontal velocity allowed for range aid mode   |
|            | EKF2_RNG_DELAY   | 5.0 ms            | Range finder measurement delay relative to IMU measurements  |
|            | EKF2_RNG_GATE    | 5.0 SD            | Gate size for range finder fusion  |
|            | EKF2_RNG_NOISE   | 0.10 m            | Measurement noise for range finder fusion  |
|            | EKF2_RNG_PITCH   | 0.000 rad         | Range sensor pitch offset  |
|            | EKF2_RNG_POS_X   | 0.000 m           | X position of range finder origin in body frame  |
|            | EKF2_RNG_POS_Y   | 0.000 m           | Y position of range finder origin in body frame  |

用户自定义设置：

(1) EKF2\_RNG\_A\_VMAX: TFmini Plus 飞行器最大水平速度触发值，即：仅当飞行速度小于此值时，TFmini Plus 生效。默认值 1m/s，最小值 0.1m/s，最大值 2m/s。

(2) EKF2\_RNG\_A\_HMAX: TFmini Plus 飞行器最大高度触发值，即：仅当飞行高度小于此值时，TFmini Plus 生效。默认值 5m，最小值 1m，最大值 10m。

2.开启 TFmini Plus 选项: *Setting--Sensors--SENS\_EN\_TFMINI*，选择 *Enabled*，如下图：

QGroundControl v3.4.4

File Widgets

Vehicle Setup Search:  Clear

| Category   | Parameter        | Value                | Description                                       |
|------------|------------------|----------------------|---|
| Sensors    | CAL_MAG_SIDES    | Six side calibration | Bitfield selecting mag sides for calibration      |
|            | IMU_ACCEL_CUTOFF | 30.000 Hz            | Driver level cutoff frequency for accel           |
|            | IMU_GYRO_CUTOFF  | 80.000 Hz            | Driver level cutoff frequency for gyro            |
|            | SENS_BARO_QNH    | 1013.250 hPa         | QNH for barometer                                 |
|            | SENS_BOARD_ROT   | No rotation          | Board rotation                                    |
|            | SENS_BOARD_X_OFF | 0.000 deg            | Board rotation X (Roll) offset                    |
|            | SENS_BOARD_Y_OFF | 0.000 deg            | Board rotation Y (Pitch) offset                   |
|            | SENS_BOARD_Z_OFF | 0.000 deg            | Board rotation Z (Yaw) offset                     |
|            | SENS_EN_LL40LS   | Disabled             | Lidar-Lite (LL40LS)                               |
|            | SENS_EN_SF0X     | Disabled             | Lightware laser rangefinder (serial)              |
| Parameters | SENS_EN_SF1XX    | Disabled             | Lightware SF1xx/SF20/LW20 laser rangefinder (i2c) |
|            | SENS_EN_TFMINI   | Enabled              | Benewake TFmini laser rangefinder                 |
|            | SENS_EN_THERMAL  | Thermal control unav | Thermal control of sensor temperature             |
|            | SENS_EN_TRANGER  | Disabled             | TeraRanger Rangefinder (i2c)                      |
|            | SENS_EN_TFMINI   | Enabled              | Benewake TFmini laser rangefinder                 |
|            | SENS_EN_TFMINI   | Enabled              | Benewake TFmini laser rangefinder                 |
|            | SENS_EN_TFMINI   | Enabled              | Benewake TFmini laser rangefinder                 |
|            | SENS_EN_TFMINI   | Enabled              | Benewake TFmini laser rangefinder                 |
|            | SENS_EN_TFMINI   | Enabled              | Benewake TFmini laser rangefinder                 |
|            | SENS_EN_TFMINI   | Enabled              | Benewake TFmini laser rangefinder                 |



以上步骤设置完成后，请重启飞控和 QGroundControl。在主界面有 TFmini Plus 数值显示，如下图：

