



# SparkNavi

## SparkNavi TinyPOS900

### User Manual

<b>Product Number</b>	<b>SparkNavi TinyPOS900</b>
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<b>Version</b>	<b>V1.0</b>
<b>Update Date</b>	<b>2024-10-14</b>

# Revision Record

Date	Version	Description	Arthor
2024-10-14	V1.0	First Release Version	Ethan
2024-11-07	V1.1	Modify the GPS output baud rate	Ethan

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**This technical document supports the following TinyPOS models.**

**TinyPOS 900**



# SparkNavi TinyPOS900 Specifications

## Appearance



## Specification

### Features

The TinyPOS is a compact, lightweight GNSS/INS (Global Navigation Satellite System/Inertial Navigation System) navigator specifically designed for drones, fully compatible with Pixhawk and Ardupilot platforms. By combining the strengths of GNSS and Inertial Measurement Unit (IMU), this all-attitude navigator delivers exceptional positioning accuracy and stability, offering continuous position and orientation data even in challenging signal environments or GNSS outages. The system features a built-in high-speed storage device, ensuring self-contained operation for precision applications.

### Built-In SparkNavi IMU600



- Gyroscope In-Run Bias Stability 0.9 °/h
- Triple Gyroscopes  $\pm 125$  °/s /
- Tri-Axis Accelerometer  $\pm 6$  G

### Gyro Analysis:

gyro\_x:

Bias Instability: 0.538979 deg/hour

Noise (Std Dev): 0.008192962 deg/s

ARW (Angle Random Walk): 0.764686 deg/√hr

gyro\_y:

Bias Instability: 0.549252 deg/hour

Noise (Std Dev): 0.009673080 deg/s

ARW (Angle Random Walk): 0.741116 deg/√hr

gyro\_z:

Bias Instability: 0.568994 deg/hour

Noise (Std Dev): 0.006763415 deg/s

ARW (Angle Random Walk): 0.754317 deg/√hr

#### Accel Analysis:

accel\_x:

Bias Instability: 2.477705 m/s/hour

Noise (Std Dev): 0.027623636 m/s<sup>2</sup>

VRW (Velocity Random Walk): 41.2951 mm/s/√hr

accel\_y:

Bias Instability: 2.086176 m/s/hour

Noise (Std Dev): 0.023265226 m/s<sup>2</sup>

VRW (Velocity Random Walk): 34.7696 mm/s/√hr

accel\_z:

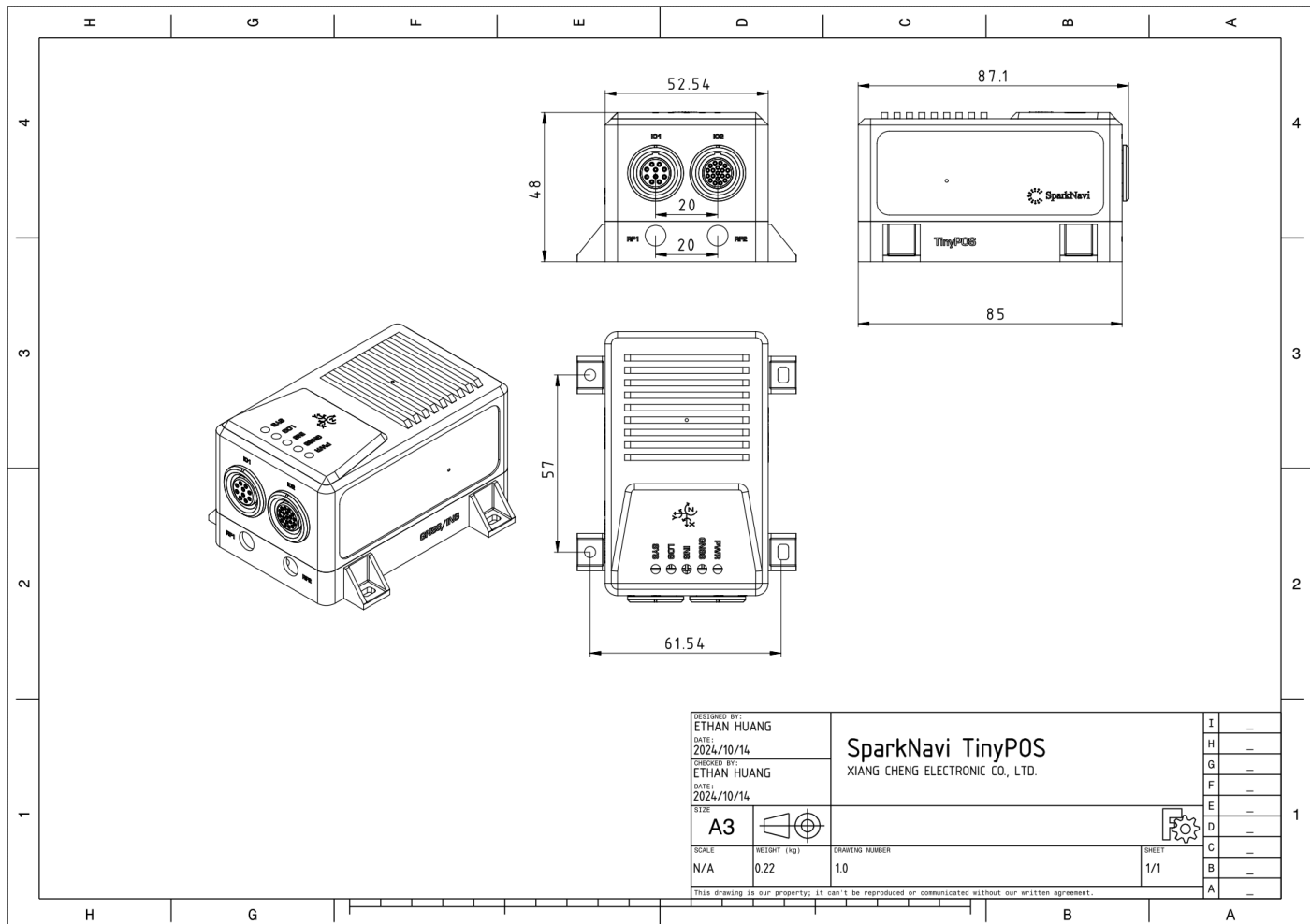
Bias Instability: 5.738274 m/s/hour

Noise (Std Dev): 0.063863667 m/s<sup>2</sup>

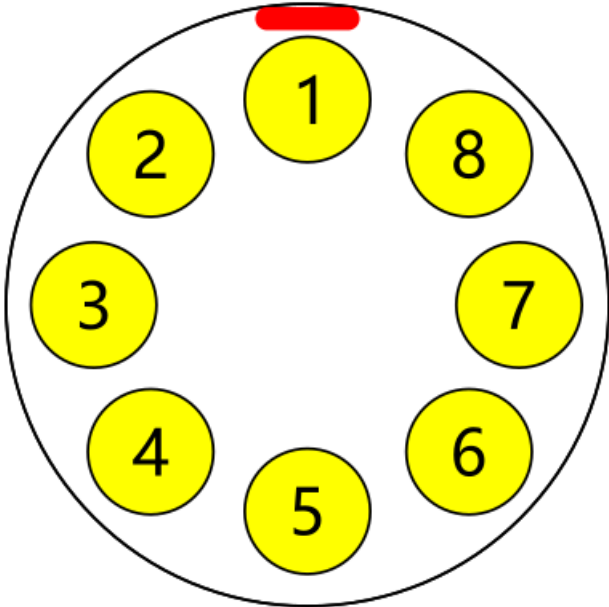
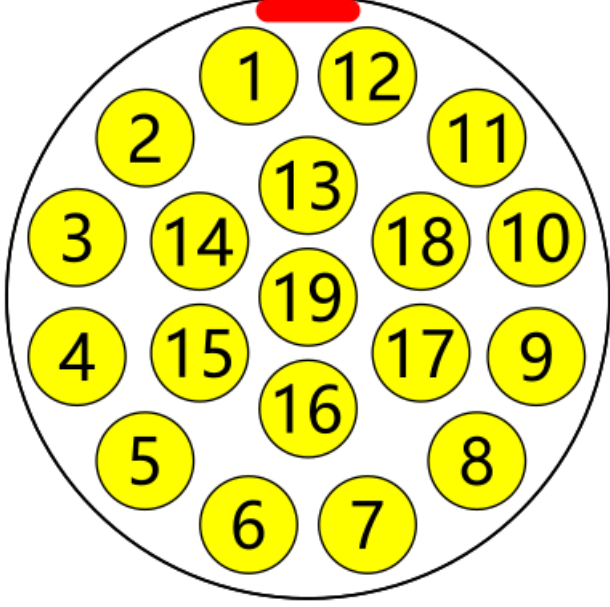
VRW (Velocity Random Walk): 95.6379 mm/s/√hr

<b>GNSS Signals</b>	GPS L1C/A, L2C GLONASS L1OF, L2OF, Galileo E1-B/C, E5b, BeiDou B1I, B2I
<b>INS System Time to Position Fix</b>	60 seconds
<b>RF</b>	Default 4G LTE Cat.4 (Order placement options: 4G / 433MHz / 915MHz / 2.4GHz)
<b>Temperature Operating</b>	Temperature Operating -40°C to +85°C
<b>Interfaces</b>	<ul style="list-style-type: none"> <li>● INS Position UBX Protocol Output x 1</li> <li>● GNSS UBX Protocol Output x 1</li> <li>● INS Position Raw Data Output x 1</li> <li>● 1PPS out</li> <li>● 1Hz Trigger out</li> <li>● 5Hz Trigger out</li> </ul>
<b>Dimensions</b>	- Length: 85mm - Width: 70.5 mm - Height: 48.5 mm
<b>Weight</b>	<ul style="list-style-type: none"> <li>● Net weight of the machine : 218g</li> <li>● Connector: 55g</li> </ul>
<b>Place of origin</b>	Design and made in Taiwan
<b>Power Input</b>	DC +12V ~ +55V

# Engineering Dimension Diagram



# IO1/IO2 Interface Description

Pin Configuration and Color Correspondence	
 <p>IO1 Front View</p>	 <p>IO2 Front View</p>

# SparkNavi- Aviation Connector IO Definition

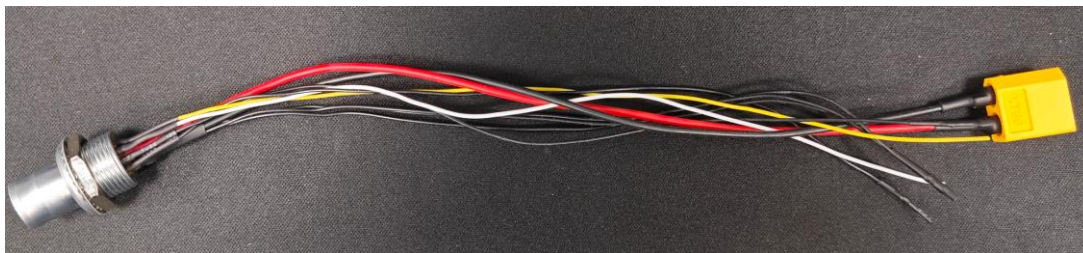
IO1		
8 Pin		
No.	8 Pin	Description
1	VIN	DC +12V ~ +55V
2	VIN	
3	TriggerIO1	1Hz Trigger Out
4	TriggerIO2	5Hz Trigger Out
5	Reversed	
6	Reversed	
7	GND	Ground
8	GND	

IO2		
19 Pin		
No.	19 Pin	Description
1	VDD_3V3	
2	IPPS	IPPS Output
3	GPS_RX2	GNSS UBX Protocol Output
4	GPS_TX2	
5	GND	Ground
6	USART1_RX	INS Position UBX Protocol Output
7	USART1_TX	
8	GND	Ground
9	USB_DP	Upgrade Firmware and AT Command
10	USB_DM	
11	GND	Ground
12	Reversed	
13	Reversed	
14	GND	Ground
15	USART2_RX	INS Position Raw Data Output
16	USART2_TX	
17	USART2_RTS	
18	USART2_CTS	
19	GND	Ground

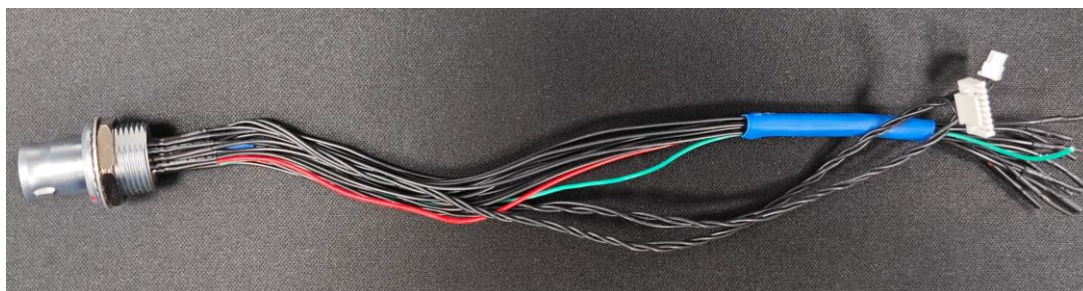


## IO1/IO2 Aviation Connector Appearance

IO1 Connector

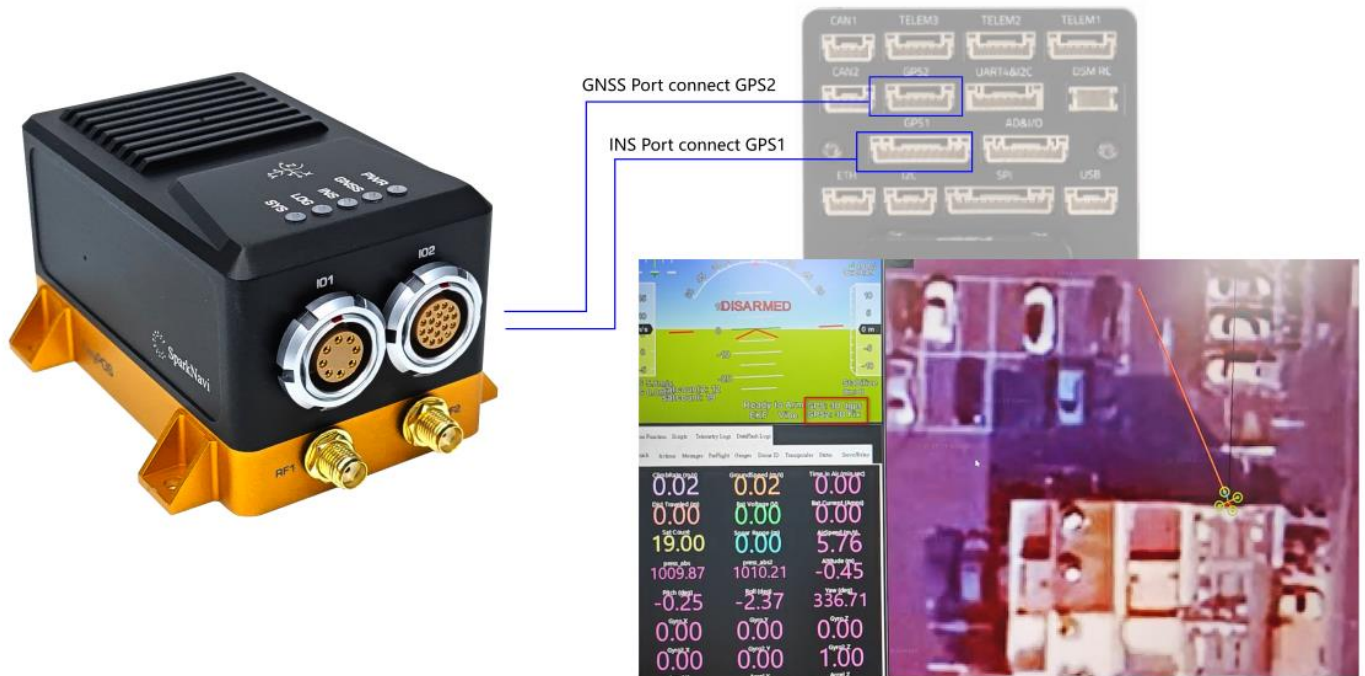


IO2 Connector

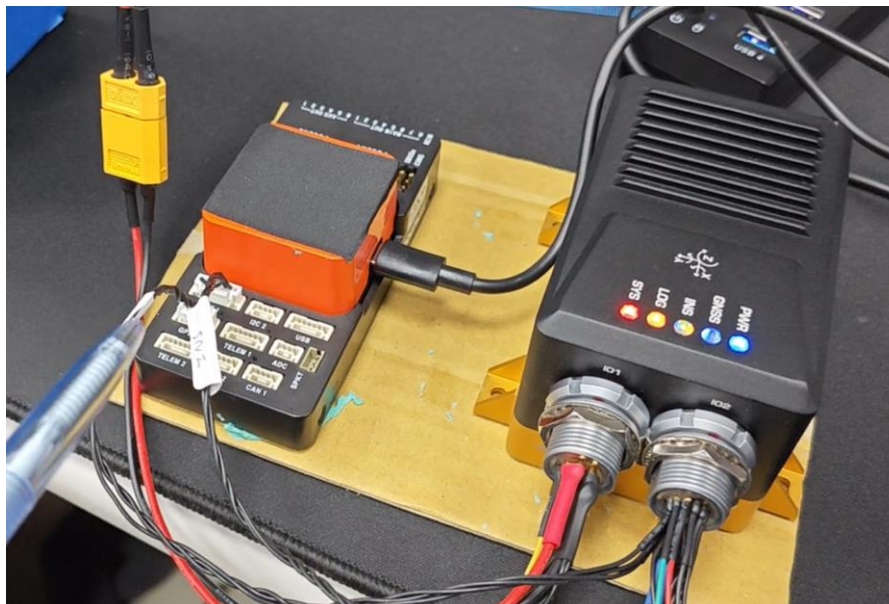


# Installation Steps

1. Connect the INS data to the GPS1 port of the flight controller computer
2. Connect the GNSS data to the GPS2 port of the flight controller computer



For actual wiring with the flight controller computer, please refer to the diagram below:



Flight controller parameters are set as follows:

### GPS1 for GNSS, GPS2 for INS

AHRS\_GPS\_USE = 0

GPS\_TYPE = 5

GPS\_TYPE2 = 1

SERIAL3\_BAUD = 57

SERIAL3\_PROTOCOL = 5

SERIAL4\_BAUD = 230

SERIAL4\_PROTOCOL = 5

The SERIAL3\_BAUD is 57600 and SERIAL4\_BAUD is modified to 230400, which is a good baud rate choice, because sometimes we will use this baud rate to receive GPS data from the Telemetry module or from TinyPOS.

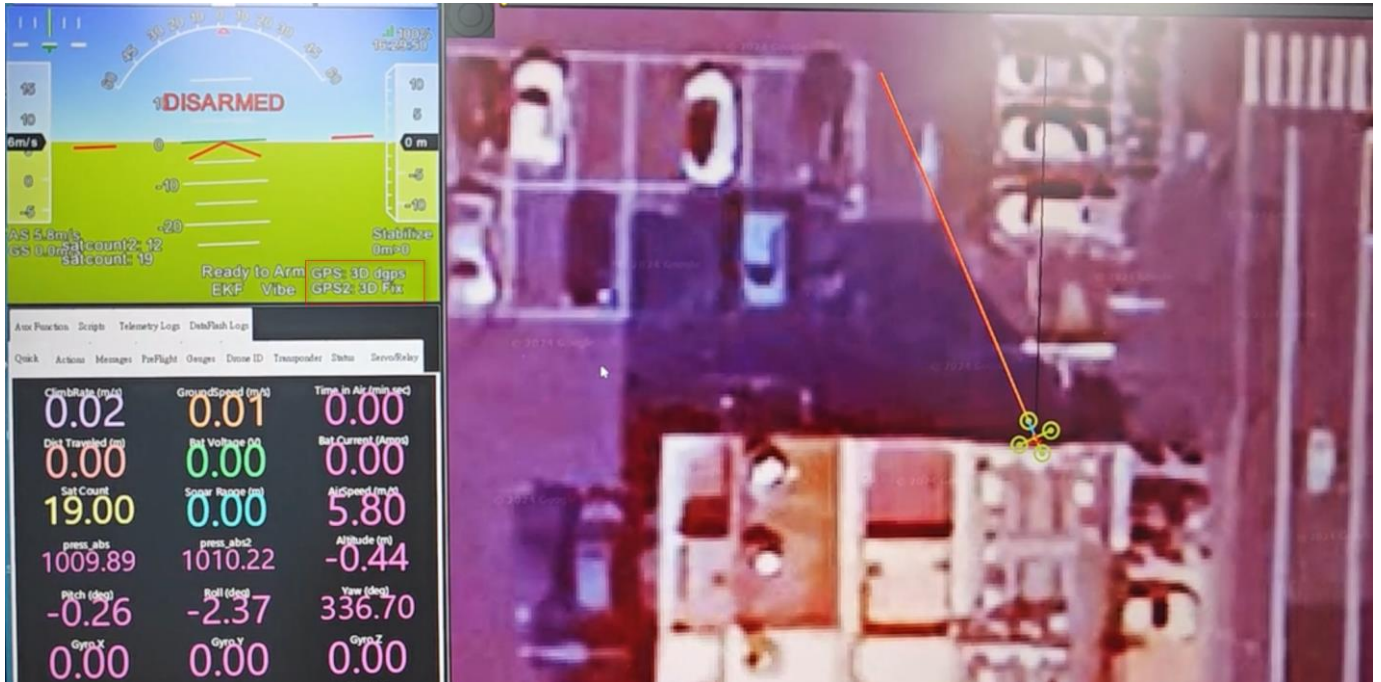
AHRS_GPS_USE	0	0:Disabled 1:Use GPS for DCM position 2:Use GPS for DCM position and height
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Name	Value	Units	Options
GPS_TYPE	1		0:None 1:AUTO 2:uBlox 5:NMEA 6:SRF 7:HIL 8:SwiftNav 9:DroneCAN 10:SBF 11:GSOF 13:ERB 14:MAV 15:NOVA 16:HemisphereNMEA 17:uBlox-MovingBaseline-Base 18:uBlox-MovingBaseline-Rover 19:MSP 20:AlyStar 21:ExternalAHRS 22:DroneCAN-MovingBaseline-Base 23:DroneCAN-MovingBaseline-Rover 24:UnicoreNMEA 25:UnicoreMovingBaselineNMEA 26:SBF-DualAntenna
GPS_TYPE2	5		0:None 1:AUTO 2:uBlox 5:NMEA 6:SRF 7:HIL 8:SwiftNav 9:DroneCAN 10:SBF 11:GSOF 13:ERB 14:MAV 15:NOVA 16:HemisphereNMEA 17:uBlox-MovingBaseline-Base 18:uBlox-MovingBaseline-Rover 19:MSP 20:AlyStar 21:ExternalAHRS 22:DroneCAN-MovingBaseline-Base 23:DroneCAN-MovingBaseline-Rover 24:UnicoreNMEA 25:UnicoreMovingBaselineNMEA 26:SBF-DualAntenna

SERIAL3_BAUD	57	1:1200 2:2400 4:4800 9:9600 19:19200 38:38400 57:57600 111:111100 115:115200 230:230400 256:256000 460:460800 500:500000 921:921600 1500:1500000 2000:2000000
SERIAL3_OPTIONS	0	
SERIAL3_PROTOCOL	5	-1:None 1:MAVLink1 2:MAVLink2 3:Frsky D 4:Frsky SPort 5:GPS 7:Alexmos Gmbal Serial 8:Gmbal 9:RangeFinder 10:FrSky SPort Passthrough (OpenTX) 11:Lidar360 13:Beacon 14:Volz servo out 15:SBUS servo out 16:ESC Telemetry 17:Devo Telemetry 18:OpticalFlow 19:RobotixServo 20:NMEA Output 21:WindVane 22:SLCAN 23:RCIN 24:EFI Serial 25:LTM 26:RunCam 27:Hott Telem 28:Scripting 29:Crossfire VTX 30:Generator 31:Winch 32:MSP 33:DJI FPV 34:AirSpeed 35:ADSB 36:AHRS 37:SmartAudio 38:FETecOneWire 39:Torqeedo 40:AIS 41:CoDevESC 42:DisplayPort 43:MAVLink High Latency 44:IRC Tramp 45:DDS XRC 46:IMUDATA 48:PPP

SERIAL4_BAUD	230	1:1200 2:2400 4:4800 9:9600 19:19200 38:38400 57:57600 111:111100 115:115200 230:230400 256:256000 460:460800 500:500000 921:921600 1500:1500000 2000:2000000
SERIAL4_OPTIONS	0	
SERIAL4_PROTOCOL	5	-1:None 1:MAVLink1 2:MAVLink2 3:Frsky D 4:Frsky SPort 5:GPS 7:Alexmos Gmbal Serial 8:Gmbal 9:RangeFinder 10:FrSky SPort Passthrough (OpenTX) 11:Lidar360 13:Beacon 14:Volz servo out 15:SBUS servo out 16:ESC Telemetry 17:Devo Telemetry 18:OpticalFlow 19:RobotixServo 20:NMEA Output 21:WindVane 22:SLCAN 23:RCIN 24:EFI Serial 25:LTM 26:RunCam 27:Hott Telem 28:Scripting 29:Crossfire VTX 30:Generator 31:Winch 32:MSP 33:DJI FPV 34:AirSpeed 35:ADSB 36:AHRS 37:SmartAudio 38:FETecOneWire 39:Torqeedo 40:AIS 41:CoDevESC 42:DisplayPort 43:MAVLink High Latency 44:IRC Tramp 45:DDS XRC 46:IMUDATA 48:PPP

Start up TinyPOS and flight controller, then open Mission Planner to view the status of GPS1 and GPS2



When using the NTRIP client function or local RTK mode, we can see the 'RTK Fixed' status message on the Mission Planner screen.

