User Manual

Version V1.1-20181108

User Manual For UAV PPK Solution

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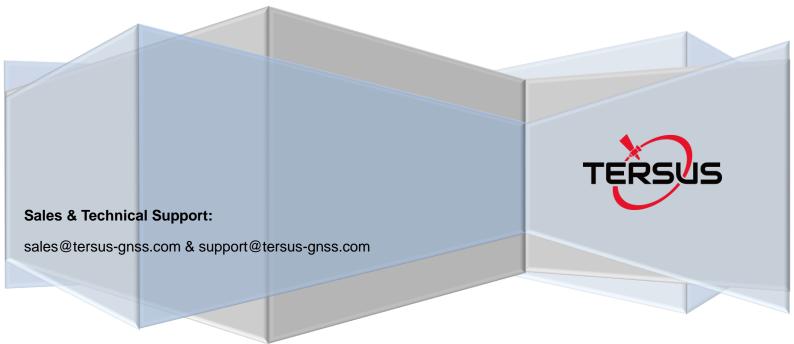




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Revision History

Version	Revision Date	Change summary
1.0	20180928	Initial Release
1.1	20181108	Add position status in processed result



1. Introduction

Tersus UAV PPK solution includes BX316R PPK Receiver, AX3705 Helix Antenna and Tersus GeoPix Software. BX316R PPK Receiver supports multi-constellations and dual-frequencies. It has in-built 4GB memory (eMMC) for GNSS observation data recoding. Very small and light AX3705 Helix Antenna is designed for UAV applications.

Tersus GeoPix integrates the functions of GNSS observation post processing, Event Mark interpolation and geotagging in EXIF. By clicking one button after input all necessary data, the software provides the result directly as input for image processing software. Tersus GeoPix is part of Tersus Tool Suite which can be downloaded from the official website: https://www.tersus-gnss.com/software.

The general process of this solution is as follows:

First, mount AX3705 helix antenna and BX316R PPK board on the drone, connect camera hot shoe to Event Mark port of BX316R for camera shutter synchronization. Then set BX316R on UAV to record GNSS raw observation, ephemeris and event mark time. Next, fly the UAV, make base and rover record data at the same time. After flight, download data from the base and the rover and conduct post processing using our Tersus GeoPix software.



2. Hardware Connection

2.1 Power Supply

BX316R PPK Receiver is powered by 5V ~ 12V DC. (A power bank with 5V output or 12V power supply comes with UAV). The antenna is fed through the BX316 receiver and no external power is required.

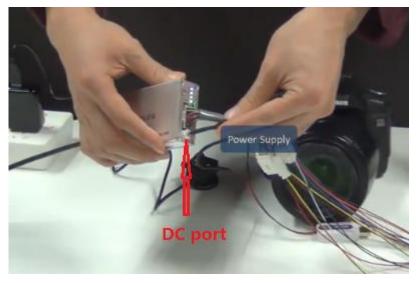


Figure 2.1 Connect power cable to the DC port of BX316R

2.2 EVENT Connection

Connect hot shoe adapter to the camera using the hot shoe cable (Figure 2.2 and 2.3), then connect the hot shoe connector to the EVENT connector of the 40-pin cable (Figure 2.4 and 2.5).



Figure 2.2 Hot shoe adapter and hot shoe cable





Figure 2.3 Connect hot shoe adapter to the camera

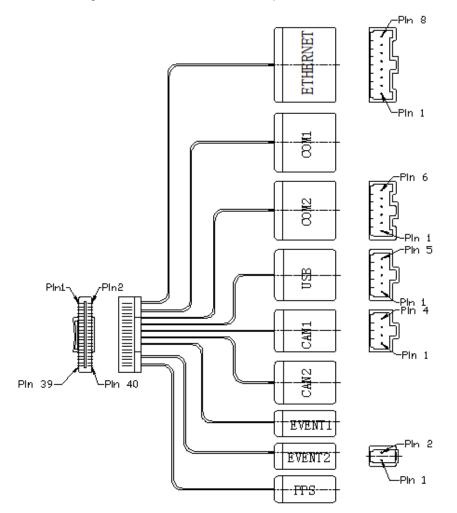


Figure 2.4 Outline of the 40-pin cable





Figure 2.5 Connect hot shoe connector to the EVENT connector

2.3 Connection Diagram

The connection diagram of Tersus UAV PPK Solution is as follows:

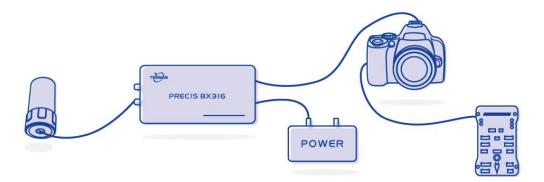


Figure 2.6 Connection diagram of Tersus UAV PPK Solution

In the above connection diagram, the AX3705 helix antenna is recommended to be installed as shown in below Figure 2.7. Ensure the AX3705 helix antenna is installed vertically and the bottom of the antenna is above the UAV.

Note: It is suggested to keep the antenna away from metal devices to avoid signal interference.





Figure 2.7 Recommended installation of AX3705 helix antenna on the UAV



3. Software Configuration

3.1 Base Station

The base station is installed in a high-lying, open environment and close to the area to be surveyed. The command configuration in Tersus GNSS Center is as follows:

LOG FILE RANGEB ONTIME 1	//output 1Hz observation data to the
	storage device
LOG FILE GPSEPHEMB ONTIME 30	//output 30s interval of GPS ephemeris to
	the storage device
LOG FILE GLOEPHEMERISB ONTIME 30	//output 30s interval of GLONASS
	ephemeris to the storage device
LOG FILE BDSEPHEMERISB ONTIME 30	//output 30s interval of BDS ephemeris to
	the storage device
LOG FILE BESTXYZB ONTIME 30	//output 30s interval of optimal position to
	the storage device
STORETYPE EMMC	//set the storage device as eMMC
LOGFILE AUTO	//storage mode is automatic storage
SAVECONFIG	//save the configuration

If the base station is set up at a known point, the configuration of the base station antenna coordinates can be added to fix the position of the base station. If the fix position is not configured currently, it can be input using GeoPix software which details in section 6.2.2. If there is no known point or no need of precise absolute coordinates, this step is ignored and the single point solution of base station will be used.

FIX POSITION xx.xxxxxx xxx.xxxxx xx.xxxx (latitude degree, longitude degree, MSL height meter)



Note: DO NOT directly copy the above FIX POSITION xx.xxxxx xxx.xxxxx xx.xxxxx commands, where latitude, longitude, and antenna height require entering by the customer based on the actual known point coordinates.

3.2 Rover on UAV

3.2.1 EVENT Configuration

Open Tersus GNSS Center software, type below command in the Text Console to configure BX316R receiver.

MARKCONTROL MARK1 ENABLE POSITIVE 0 800

SAVECONFIG

This command is used to control the mark inputs. Using this command, the event mark inputs can be enabled or disabled, polarity can be positive or negative, and a time offset and guard against extraneous pulses are optional.

Name		Value					
Command		MARKCONTROL signal [switch[polarity[timebias					
Commanu		[timeguard]]]]					
Example		MARKCONTROL MARK1 ENABLE POSITIVE 500 100					
Signal	MARK1	This command is applied to Mark1.					
	ENABLE	Enables processing of the mark input signal (default).					
Switch	DISABLE	The mark input signal is ignored.					
	NEGATIVE	The polarity of the pulse is negative (default).					
Polarity	POSITIVE	The polarity of the pulse is positive.					
		An offset, unit is ns, to be applied to the time the mark pulse					
TIMEBIAS		is input.					
		A time period, unit is ms, during which no response to the					
TIMEGUARD		input pulses.					

Table 1 MARKCONTROL



Currently only MARK1 is supported in this PPK solution. The other commands refer to details in Log & Command document.

3.2.2 Rover Configuration

When the receiver is configured as a rover on UAV, the command configuration in Tersus GNSS Center is as follows:

LOG FILE MARKTIMEB ONMARK	//output MARK time information
LOG FILE RANGEB ONTIME 0.2	//output 5Hz observation data to the storage
	device, 0.2 means 5Hz, 0.05 means 20Hz
LOG FILE BESTXYZB ONTIME 0.2 //ou	tput 5Hz optimal position to the storage device
LOG FILE GPSEPHEMB ONTIME 30	// output 30s interval of GPS ephemeris to
	the storage device
LOG FILE GLOEPHEMERISB ONTIME 30	0 //output 30s interval of GLONASS
	ephemeris to the storage device
LOG FILE BDSEPHEMERISB ONTIME 30) //output 30s interval of BDS ephemeris to
	the storage device
STORETYPE EMMC	//set the storage device as eMMC
LOGFILE AUTO	//storage mode is automatic storage
SAVECONFIG	//save the configuration

Note: The output frequency is setup according to the speed of the drone.



4. Data Quality Check

After completing the above hardware and software configurations, it is recommended to take the computer and the whole kit of UAV to the outdoor open environment to do the following check.

Connect the BX316R receiver to the computer using serial port, open Tersus GNSS Center software and type below commands in the text console window:

LOG GPGSV ONTIME 1	//output the satellites information including elevation
	angle and CN0 of the L1 frequency
LOG RANGEB ONTIME 1	//output the observation messages including CN0 of
	L1 and L2 frequency

Check the signal strength of GPS, GLONASS, and BDS satellites in the 'Signal Strength' window. Check the elevation angle information in the 'Skyplot' window. Please ensure that at least FOUR satellites of each type of the three satellite system has the CN0 value greater than 45 dB in Asia-Pacific area, at least FOUR satellites of GPS and GLONASS systems has the CN0 value greater than 45 dB in other countries and regions. Following figures show the satellites information using two kinds of antenna as examples:



		- a ×
Voplet	TERSU	S
lignal Streigh	▼ 3 × led Conole	• 8 >
	* 8 × Test Console BICGOV2.22.00.166.30.194-01.109-02.297.01.77.34.22.84.417.44.1094.4190 Dimondoval Micciola LINCIPIC.220 Dimondoval Micciola LINCIPIC.220 Dimondoval Micciola LINCIPIC.220 GENERAL DIMONDOVAL DIMONDOVALI DIMONDOVAL DIMONDOVALI DIMONDOVAL DIMONDOVAL DIMONDOVAL	- a x
	1810/07X12.20.03.101.301.301.41.109.2029.41.173.4223.44.174.4208.44.192 1806/07X12.20.03.05.13178.451011222 1807/07X12.001.53178.451011222 1807/07X12.001.53178.451011222 1807/07X12.001.53178.451011222 1807/07X12.001.53478 1807/07X12.001.53478 1807/07X12.001.53478 1807/07X12.001.53478 1807/07X12.001.53478 1807/07X12.001.53478 1807/07X12.001.53478 1807/07X12.001.53478 1807/07X12.001.53478 1807/07X12.001.5347 1807/07X12.001.534 1807/07 1807/07X12.001.534 1807/07X12.001.534 1807/07 180	* 8 * ^ *

Figure 4.1 Check satellites information using AX3705 antenna

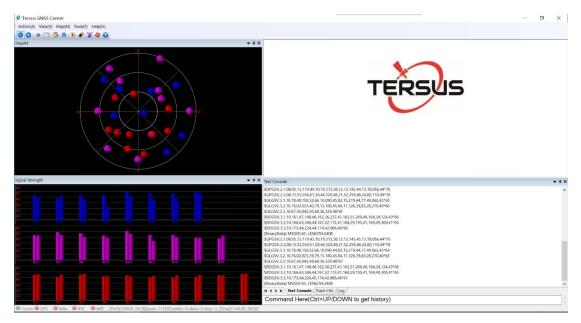


Figure 4.2 Check satellites information using AX3703 antenna



5. Data Download

Connect the BX316R receiver to the computer using the USB cable, and the corresponding serial port will appear in the device manager of the computer (if there is no serial port, please download the USB driver for Windows system from the official website https://www.tersus-gnss.com/software /david-receiver).

Open 'TersusDownload.exe' and select the corresponding serial port. Select 'use current baudrate (USB:80KB/Second, Serial:8~32KB/S)' for the 'Download Speed' and click [START] to start.

🔮 TersusDownloa	d	×
DownLoad Port:	COM20 ~	
DownLoad Speed:	use current baudrate(USB:80KB/Second, Serial:8~3.	
Progress Info:		
	Start	
	re normally retry when failed to download, You also can change confirm the cpu performance when failed to download.	
are lower speed of	commune que performance when failed to download.	

Figure 5.1 Select serial port and download speed

After waiting for the software recognize the USB transmission baud rate, the software automatically pops up the file name and other information stored in the EMMC. Select the storage directory for the downloaded data in 'DownloadPath'. Refer to the figure below.



TersusDownloa	ad					×
DownloadPath	E:\TersusGNSS_DA		lownload		Select	View
Media	EMMC	FreeSpace	3756068	KB	SelectAll	
	9903062007.dat 9905015327.dat	UTC Time 20180903 6:20 20180905 1:53	Size 282587 66405	status		
Refresh	Download	dele	tefile	Stop	Hide	e Window

Figure 5.2 Select download path

Select the data needs to be downloaded and click [Download] to start the download as

follows:

III TersusDownlo	ad					×
DownloadPath	E:\TersusGNSS_DA		lownload		Select	View
Media	EMMC	FreeSpace	3756044	КВ	SelectAll	
	80903062007.dat 80905015327.dat	UTC Time 20180903 6:20 20180905 1:53		status Download	ding	
Refresh	Download	dele	tefile	Stop	Hide	Window

Figure 5.3 Download data in progress

When the data download is completed, 'OK' is displayed in the 'status' of the file information window.



DownloadPath	E:\TersusGNSS_DA	Select	View			
Media	EMMC	FreeSpace	3756044	KB	SelectAll	
	80903062007.dət 80995015327.dət	UTC Time 20180903 6:20 20180905 1:53	Size 282587 91051	Status OK		

Figure 5.4 Data download is completed



6. GeoPix User Guide

6.1 Introduction of GeoPix

Tersus GeoPix is a software for processing GNSS observation data collected by UAVs and ground base stations, and tagging EXIF coordinate information of EVENT moment photos.

Tersus GeoPix is part of Tersus Tool Suite. The latest version of Tersus Tool Suite can be downloaded from Tersus official website (https://www.tersus-gnss.com/software). Install the Tersus Tool Suite software, and GeoPix can be found under the Tersus GNSS Center in the Start menu (in Windows 10 operating system for example).

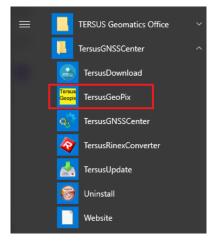


Figure 6.1 TersusGeoPix in the Start menu

6.2 Guide for GeoPix

Open Tersus GeoPix software and get below interface.



e Data			Select	rer Data			Select
Input Base Po no position in .at	osition (check it when (base data file) Lon	DEG O DMm(DDM Heigh	M.mm) ODMS(DD,MM,S t(Ellpsoid) Me	Height Offset	0.000 Metres k UTC Time to repla		de=Altitude+Off
FileName	CreateTime	ModifyTime	CaptureTime	UTC TIME	Latitude	Longitude	Altitude
				Map Use Goog	la com	Map Use Google	
	·	Original Li Tagged L Original L Tagged L Original A Tagged <i>I</i>	atitude ongitude ongitude Ititude		ect googlemap.	Map Use Google	.cn

Figure 6.2 Main interface of Tersus GeoPix

6.2.1 Set Working Directory and Import Pictures

Click [Select] on the right of 'Working directory (Auto load pictures with geotag if there are pictures in this directory)', select the folder of the pictures taken by the camera at the time of triggering EVENT as the working directory, and the software automatically recognize the pictures and display the photo shooting time and other information in the software. (Temporarily supports pictures of .JPG and .CR2 format only)

C:\Users\93906\	Desktop\UAV_DATA\Pict	tures						Select
se Data			Select	Rover Da	ta			Select
Input Base Pos no position in b Lat	ition (check it when observation (check it when observation observation) and the second secon	DEG ODMm(DDM	M.mm) ODMS(DD,N t(Ellipsoid)	M,SS) Metres	Height Offset 0			de=Altitude+Offse e of the pictures
✓ _MG_0133.j ✓ _MG_0134.j ✓ _MG_0135.j ✓ _MG_0135.j ✓ _MG_0136.j	Create Time pg 2018/09/05 14:54:	Modify Time 2018/07/31 14:06: 2018/07/31 14:06: 2018/07/31 14:07: 2018/07/31 14:07: 2018/07/31 14:07: 2018/07/31 14:07:	Capture Time 2018:07:31 14:06:3 2018:07:31 14:06:5 2018:07:31 14:06:5 2018:07:31 14:07:0 2018:07:31 14:07:0 2018:07:31 14:07:2	2 3 5 4	UTC TIME	Latitude	Longitude	Altitude
PIC1 C:	(Users)93906/Desktop/U/	Original La Tagged L Original Lo	atitude 0.00000000 atitude Not JPG/No ongitude 0.0000000 ongitude Not JPG/No titude 0.000000	Tag	○ Map Use Google	.com	Nap Use Google	.cn

Figure 6.3 Select a folder for working directory



<u>I</u> Note: If there are no pictures at the EVENT moment need to be tagged, only the appropriate folder needs to be selected as the working directory to output the PPK calculation result.

6.2.2 Import Base Data and Rover Data

For Base Data and Rover Data, select the downloaded base data and rover data respectively, in which base data supports three kinds of formats including Tersus Binary (*.dat;*.trs), RINEX file (*.*o), and RTCM (*.dat); rover data supports Tersus Binary (*.dat;*.trs) only.

<u>!</u>	Note: Select Tersus Binary (*.dat;*.trs) when the observation data is obtained using
	Tersus GNSS receiver.

If the antenna coordinates of base station have been configured using the FIX POSITION command (details refer to section 3.1) in the base station configuration, there is no need to check the 'Input Base Position (check it when no position in base data file)' which is shown in Figure 6.4.

If the FIX POSITION command is not configured, it is needed to check this option and input the antenna coordinates of the base station. The coordinates are input in the DEG format (shown in Figure 6.5), DMm (DDMM.mm) format, or DMS (DD, MM, SS) format.



C:\Users\9	3906\Des	ktop\UAV_DATA\P	ictures									Select
se Data	200610-	ktop\UAV DATA\E					Rover Da	ta \93906\Desktop\U				
c:/users/s	3300/Des	KLOP (UAV_DATA)	Jaca BASE DA I		Se	elect	C:\Users	(93906/Desktop/0)	AV_DATA	Data ROVER	.uat	Select
no positi	se Position on in base		● DEG ○ C	Mm(DDMM.n		DMS(DD,M		Height Offset	0.000			le=Altitude+Offse
Lat		Lon		Height(E	lipsoid)		Metres	Use Event N	lark UTC T	Time to repla	ce Capture Time	e of the pictures
⊠_мg_0 ☑_мg_0 ☑_мg_0 ☑_мg_0	0132.jpg 0133.jpg 0134.jpg 0135.jpg 0135.jpg	Create Time 2018/09/05 14:54: 2018/09/05 14:54: 2018/09/05 14:54: 2018/09/05 14:54: 2018/09/05 14:54: 2018/09/05 14:54:	2018/07/3 2018/07/3 2018/07/3 2018/07/3	1 14:06: 1 14:06: 1 14:07: 1 14:07: 1 14:07:	2018:07: 2018:07: 2018:07: 2018:07:	Ime 31 14:06:33 31 14:06:52 31 14:07:03 31 14:07:04 31 14:07:14 31 14:07:23	2 3 5	UTC TIME		Latitude	Longitude	Altitude
PIC1	C:\Use	rs\93906\Desktop\		tures_MG_0 Original Latitu Tagged Latit Original Long Tagged Long Original Altitu Tagged Altitu	ude O ude N itude O gitude N ide O	.00000000 lot JPG/No .00000000 lot JPG/No .000000 lot JPG/No	Гад	O Map Use Go	ogle.com	۹۵	1ap Use Google	.cn

Figure 6.4 Select base data and rover data without base position

In the 'Height Offset' option, configure the elevation deviation between the antenna phase center and the camera focus, which is the fixed elevation difference of the camera focus elevation minus the antenna phase center elevation.

Check the pictures according to the needs to determine whether to tag the picture. The quantity of the pictures needs to be the same as the quantity of the EVENTs, and the pictures are arranged in chronological order in the software to ensure alignment with the EVENTs.



	AV_DATA\Pictu								Select
se Data					Rover Dat				
C:\Users\93906\Desktop\L	AV_DATA\Data	\BASE.DAT		Select	C:\Users\	93906\Desktop\UAV	/_DATA\Data\ROVE	R.dat	Select
Input Base Position (chec no position in base data f Lat 31.19040097	e)	DEG ODMm(DDN .59319263 Heigh	IM.mm) t(Ellipsoid)	O DMS(DD,M		Height Offset	-0.190 Metre		de=Altitude+Offset e of the pictures
FileName Create	Гime	ModifyTime	Capture	Time	^	UTC TIME	Latitude	Longitude	Altitude
✓ _MG_0132.jpg 2018/0	9/05 14:54:	2018/07/31 14:06:	2018:0	7:31 14:06:35					
☑ _MG_0133.jpg 2018/0		2018/07/31 14:06:		7:31 14:06:52					
✓ _MG_0134.jpg 2018/0		2018/07/31 14:07:		7:31 14:07:03					
✓ _MG_0135.jpg 2018/0		2018/07/31 14:07:		7:31 14:07:06					
✓ _MG_0136.jpg 2018/0		2018/07/31 14:07:		7:31 14:07:14					
	9/05 14:54:	2018/07/31 14:07:	2018:0	7:31 14:07:23	~				
PIC1 C:\Users\939	06\Desktop\UA\	/_DATA\Pictures_M	G_0132.jpg)		Map Use Goog	gle.com 🔾	Map Use Google	.cn
		Original L Tagged I		0.00000000 Not JPG/No 1	` an	Failed to com	nect googlemap.		
				0.000000000	ug				
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1.1	-	Not JPG/No T					
	Sala and	1 11	-		ay				
		Original A	ltitude	0.000000					
	AN AND	Tagged /	Vititudo	Not JPG/No T	20				

Figure 6.5 Select base data and rover data with base position

6.2.3 Data Processing

Click the 'RUN' at the bottom to start GNSS post-processing as shown in Figure 6.6 below.

C:\Users\93906\De	sktop\UAV_DATA	Pictures							Select
se Data C:\Users\93906\De	sktop\UAV_DATA	\Data\BASE.DAT	•	Select	Rover Dat C:\Users\	-	V_DATA\Data\ROVER	.dat	Select
Input Base Positio no position in base Lat 31.19040		DEG 121.59319263	DMm(DDMM.mm) Height(Ellipsoid	O DMS(DD,M) 40.2957		Height Offset	-0.190 Metres		le=Altitude+Offset) e of the pictures
FileName MG_0132.jpg MG_0133.jpg MG_0134.jpg MG_0135.jpg MG_0137.jpg MG_0137.jpg PIC1 C:\Us	2018/09/05 1 2018/09/05 1 2018/09/05 1 2018/09/05 1	Progress Inf	until this process fini			UTC TIME	Latitude	Longitude	Altitude
			Original Latitude Tagged Latitude Original Longitude Tagged Longitude Original Altitude Tagged Altitude		Tag Tag				

Figure 6.6 Click RUN to start data processing



If the captured pictures do not contain EXIF information, the software automatically tag the pictures according to the calculated antenna coordinates at the EVENT time (add the EXIF information to the pictures). Or manually tag the pictures by clicking the 'Geotag' at the bottom of Figure 6.6. The geotagged result list is shown as below.

utput Dir		0.01				
C:/Users/93906/D6	esktop\2018-7-31\3	IPG\geotag				
FileName	Lat	Lon	Altitude	CaptureTime	Туре	
MG 0132.jpg	N31.19821689	E121.60010726	16.053	2018:07:31 1	FIX	
MG 0133.jpg	N31.19869818	E121.59984354	16.205	2018:07:31 1	FIX	
MG 0134.jpg	N31.19936298	E121.59954526	16.747	2018:07:31 1	FIX	
MG 0135.jpg	N31.19957363	E121.59944721	17.151	2018:07:31 1	FIX	
MG 0136.jpg	N31.19997257	E121.59928047	16.150	2018:07:31 1	FIX	
_MG_0137.jpg	N31.20020024	E121.59919950	16.117	2018:07:31 1	FIX	
_MG_0138.jpg	N31.20029101	E121.59961426	16.240	2018:07:31 1	FIX	
_MG_0139.jpg	N31.20031336	E121.60059020	17.413	2018:07:31 1	FIX	
_MG_0140.jpg	N31.20031583	E121.60222546	17.489	2018:07:31 1	FLOAT	
_MG_0141.jpg	N31.20031854	E121.60313209	16.420	2018:07:31 1	FIX	
_MG_0142.jpg	N31.20031796	E121.60396117	16.286	2018:07:31 1	FLOAT	
_MG_0143.jpg	N31.20032387	E121.60535620	16.447	2018:07:31 1	FIX	
_MG_0144.jpg	N31.20032359	E121.60654665	16.296	2018:07:31 1	FIX	
_MG_0145.jpg	N31.20032435	E121.60725310	16.174	2018:07:31 1	FLOAT	
_MG_0146.jpg	N31.20032428	E121.60737382	16.226	2018:07:31 1	FIX	
_MG_0147.jpg	N31.20035721	E121.60795778	16.412			
_MG_0148.jpg	N31.20067544	E121.60825685	16.219	2018:07:31 1	FLOAT	
<					2	Þ
Result (93/95)	Shade SS, Shade S	4, Single: 0, Other:				-

Figure 6.7 Geotagged Result List

6.2.4 View processed results

After the geotag for the pictures is completed, the software automatically generates folders named 'geotag' and 'workingtemp' in the working directory, where the 'geotag' folder contains the pictures that have been tagged and ppk.txt file which indicates the information of the tagged pictures, and the 'workingtemp' folder contains the post-processing positioning results and the RINEX format file.

The coordinate information of the tagged pictures including latitude, longitude, altitude and position status can be seen by clicking the picture file name in Tersus GeoPix software. Whether the position status of the tagged picture is FIX or Float can also be seen in the ppk.txt file which locates in 'geotag' folder.



	over Data
C:\Users\93906\Desktop\2018-7-31\BASE.180 Select C	
	C:\Users\93906\Desktop\2018-7-31\ROVER.dat Select
Input Base Position (check it when DEG OMm(DDMM.mm) OMS(DD,MM,SS) Lat Lon Height(Ellipsoid) Metres	Height Offset -0.120 Metres(Tagged Altitude=Altitude+Offset) Use Event Mark UTC Time to replace Capture Time of the pictures
FileName Create Time Modify Time Capture Time M.G.0132.jpg 2018/08/02 10:49: 2018/07/31 14:06: 2018:07:31 14:06:35 M.G.0133.jpg 2018/08/02 10:49: 2018/07/31 14:06: 2018:07:31 14:06:52 M.G.0134.jpg 2018/08/02 10:49: 2018/07/31 14:07: 2018:07:31 14:07:03 M.G.0135.jpg 2018/08/02 10:49: 2018/07/31 14:07: 2018:07:31 14:07:04 M.G.0136.jpg 2018/08/02 10:49: 2018/07/31 14:07: 2018:07:31 14:07:14	VICC TIME Latthude Longitude Altitude Pos Type ☑ 2018:07:31 06:2 N31 11 5 E121 36 0 16.0532 FIX ☑ 2018:07:31 06:2 N31 11 5 E121 35 5 16.2058 FIX ☑ 2018:07:31 06:2 N31 11 5 E121 35 5 16.2740 FIX ☑ 2018:07:31 06:2 N31 11 5 E121 35 5 17.470 FIX ☑ 2018:07:31 06:2 N31 11 5 E121 35 5 16.7470 FIX ☑ 2018:07:31 06:2 N31 11 5 E121 35 5 16.1508 FIX ☑ 2018:07:31 06:2 N31 11 5 E121 35 5 16.1508 FIX
PIC3 C:\Users\93906\Desktop\2018-7-31\JPG_MG_0134.jpg Original Latitude 0.00000000 Tagged Latitude N31.19936298 Original Longitude 0.00000000 Tagged Longitude E121.59954526 Original Altitude 0.000000	O Map Use Google.cm

Figure 6.8 Check the coordinate information of the tagged pictures

📗 ppk.txt - Note	pad		_		×
<u>F</u> ile <u>E</u> dit F <u>o</u> rma	at <u>V</u> iew <u>H</u> elp				
MG 0132.jpg	31.19821689421	121.60010726119	16.0532	FIX	~
MG 0133.jpg	31.19869818445	121.59984354075	16.2058	FIX	
_MG_0134.jpg	31.19936297992	121.59954526153	16.7470	FIX	
MG_0135.jpg	31.19957362808	121.59944721363	17.1511	FIX	
MG_0136.jpg	31.19997257214	121.59928046970	16.1508	FIX	
MG_0137.jpg	31.20020024198	121.59919950245	16.1178	FIX	
_MG_0138.jpg	31.20029100948	121.59961425946	16.2408	FIX	
_MG_0139.jpg	31.20031335827	121.60059020252	17.4133	FIX	
_MG_0140.jpg	31.20031582509	121.60222545638	17.4892	FLOAT	
_MG_0141.jpg	31.20031853957	121.60313208929	16.4204	FIX	
_MG_0142.jpg	31.20031796453	121.60396116515	16.2867	FLOAT	
_MG_0143.jpg	31.20032387112	121.60535619851	16.4479	FIX	
_MG_0144.jpg	31.20032358755	121.60654665129	16.2964	FIX	
_MG_0145.jpg	31.20032435118	121.60725310181	16.1746	FLOAT	
_MG_0146.jpg	31.20032427759	121.60737382360	16.2269	FIX	
_MG_0147.jpg	31.20035720801	121.60795777639	16.4127	FLOAT	
_MG_0148.jpg	31.20067544105	121.60825685474	16.2197	FLOAT	
_MG_0149.jpg	31.20094709229	121.60842096045	16.1861	FIX	
_MG_0150.jpg	31.20148644347	121.60875465811	16.0410	FIX	
					~

Figure 6.9 Information in ppk.txt file

Click [ViewPlot] at the bottom to view the positioning results of the GNSS postprocessing data and the location information of the EVENT moments. The example is shown in Figure 6.10 and Figure 6.11. In the screenshots below, the position status of green points are fixed, the position status of yellow points are float.



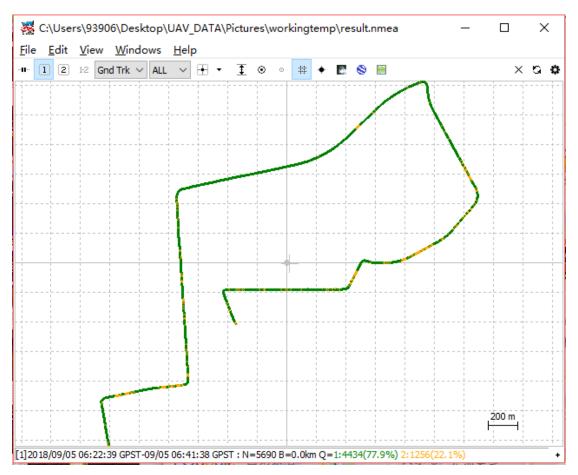


Figure 6.10 Positioning results of the GNSS post-processing

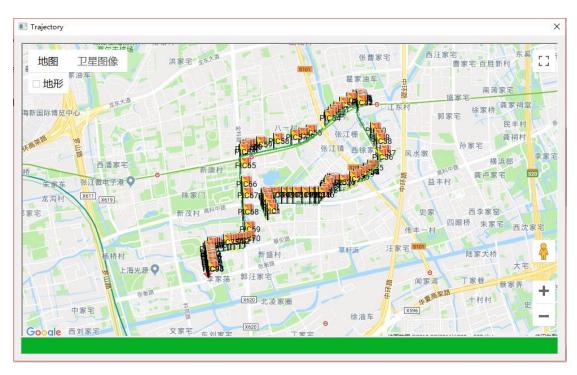


Figure 6.11 The location information of the EVENT moments





7. Terminology

BDS	BeiDou Navigation Satellite System
DC	Direct Current
eMMC	Embedded Multi Media Card
EXIF	Exchangeable Image File Format
GLONASS	GLObal NAvigation Satellite System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
PC	Personal Computer
РРК	Post-Processing Kinematic
PPS	Pulse Per Second
RINEX	Receiver Independent Exchange format
RMS	Root Mean Squares
RTK	Real-Time Kinematic
RTCM	Radio Technical Commission for Maritime Services
UAV	Unmanned Aerial Vehicle, drone
USB	Universal Serial BUS



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