



### **User Manual**

Version V1.0-20200909



# **User Manual For Tersus GNSS Center**

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# **Revision History**

Version	<b>Revision Date</b>	Change Summary
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## 1. Introduction

This user manual introduces how to use Tersus GNSS Center software.

### 1.1 Overview

The Tersus GNSS Center is configuration tool for Tersus GNSS products. This software integrates configuration, monitoring, data logging, firmware upgrade and other useful tools. With Tersus GNSS Center, you can communicate over the on-board serial ports, key in commands to configure the board, upgrade firmware, store data, playback data, convert data to RINEX format, display rover's trajectory in Google / Baidu map, calculate the average position of the base station, view status of the board and positioning results.



Figure 1.1 Tersus GNSS Center main interface

## 1.2 Features

Tersus GNSS Center has following features:



- Communicate over the on-board serial ports
- > Key in commands to configure the board
- Upgrade firmware
- Store data, playback data
- Convert data to RINEX format
- > Display the rover's trajectory in Google / Baidu map
- Calculate the average position of the base station
- View status of the board and positioning results

## 1.3 System Requirements

Tersus GNSS Center is to run on a wide range of different computer configurations. The systems requirements are listed as below:

Operating System	Microsoft Windows 7, 8, 10 (32-bit and 64-bit)				
Hardware	Minimum	Recommended			
Processor	Intel Core i3	Intel Core i5			
RAM	4GB	8GB			
Hard disk	10GB	1TB			
Graphics card	Direct X9 compatible	Direct X9 compatible 2GB			
	integrated graphics	discrete graphics			
Internet Connection	Ability to originate both http and https (SSL) connections				

Table 1 System Requirements for Tersus GNSS Center



## 2. Functions

This chapter describes the detailed operations of Tersus GNSS Center

Before using Tersus GNSS Center software, ensure one BX board or one receiver of David series GNSS Receiver is powered up and connected to the computer via serial port. The physical connection refers to corresponding user manual which can be downloaded from Tersus website <a href="https://tersus-gnss.com/document">https://tersus-gnss.com/document</a>.

### 2.1 Config window

When launching Tersus GNSS Center, the config window pops up automatically. This window can also be found in the menu bar Tools -> Config.

#### 2.1.1 Connection

Under the connection tab, there are two options:

1) Serial

If choosing Serial as connection type, choose the right port when a Tersus GNSS board or receiver is connected to computer via serial port. The baud rate is 115200 bps by default. It is not recommended to change baud rate. The serial port can be found in the windows device manager.

The 'Save Received Data' function is turned on by default. It can be turned off manually.



Connection Type:	Serial	•	~	
Serial Setting				
Port:	×	Save Recei	ived Data	
		() ON	OOFF	
Baud Rate:	115200 ~	_		
Working Mode				
Working Mode ⓒ Command Co	onsole Working Mode			
Working Mode © Command Co O Base Station	onsole Working Mode			
Working Mode © Command Ci O Base Station O Rovel Statio	onsole Working Mode I Config Mode n Mode			
Working Mode © Command Co Base Station Covel Station Custom Mod	onsole Working Mode . Config Mode n Mode e			
Working Mode © Command Co O Base Station O Rovel Statio O Custom Mod	onsole Working Mode . Config Mode n Mode e			

Figure 2.1 Connection config - serial connection



Figure 2.2 Device manager

#### 2) Demo file

If choosing demo file as connection type, click the file path and choose the demo file, selecting loop can play the demo repeatedly, then click [OK] to start playing demo file. The demo file can be .dat format files.



Connection Type:	Demo File	~	
Serial Setting Port:		Save Received	i Data
Baud Rate:	115200 ~	OON	OFF
Demo File Setting			
Input File :			
Play Speed			Loop

Figure 2.3 Connection config - demo file

#### 2.1.2 Working mode

There are three working mode to choose: command console working mode, base station config mode, and rover station mode.

1) Command console working mode

This mode is the major mode that is introduced in this user manual.

2) Base station config mode

If choosing base station config mode, it pops out below config window. Configuring parameters for base station by selecting in drop-down options is another method which is different from command configuration.

You can fill in the coordinates of the base station or tick Posave on to enable auto base station.



~
0

Figure 2.4 Base mode configuration

For differential GNSS message output, you can configure RTCM2, RTCM3 or CMR message for the current communication port. Click [Detail] to configure corresponding message types.

Extended Base Station	RTCM22	OFF	~	
GPS Reference Station Parameter	RTCM3	OFF	~	
Uncorrected Raw Measurement	RTCM1819	OFF	~	
Finish Default S	Setting	Cancel		

Figure 2.5 Options for RTCM2



	For RTCM3	6									>
Station Info	o(Interval:	second	1)						PTCM1005	(DEC	
RTK Base S	tation ARP	with	Antonna Hoic	ht					RTCM1005	OFF	~
Extended A		with r	or	ne					RTCM1007	onume 10	~
Extended A	Intenna De	foron	JI to Station Do	corintian					RTCM1007		
Paceiver an		doccri	intors	scription					RTCM1000	ontime 20	~
GLONASS I	1 and 12 (	ode D	haco Riacos N	operano					RTCM1035	ontime 30	
GLONASS L		Jue-P	lidse bidses M	lessaye					KTCM1250	Unturne 50	-
Ephem Info	)								PTOW AND	1.22	
GPS Ephen	nerides								RTCM1019	OFF	~
GLONASS E	phemeride	25							RTCM1020	OFF	~
BDS Ephen	nerides								RTCM1042	OFF	~
Observable	s										
MSM4, GPS	Code, Pha	ase and	d CNR Measur	ements					RTCM1074	ontime 1	~
MSM4, GLO	NASS Cod	e, Pha	se and CNR M	leasureme	nts				RTCM1084	ontime 1	~
MSM4 ReiD	ou Code, I	Phase	and CNR Mea	surement	5				RTCM1124	ontime 1	~
Thorny Dalo	-			-	-		1				
RTCM1001	OFF	~	RTCM1012	OFF	~	RTCM1013	OFF	~			
RTCM1001 RTCM1002	OFF OFF	~	RTCM1012 RTCM1071	OFF OFF	~	RTCM1013 RTCM1081	OFF OFF	~	RTCM1121	OFF	~
RTCM1001 RTCM1002 RTCM1003	OFF OFF OFF	> >	RTCM1012 RTCM1071 RTCM1072	OFF OFF OFF	× × ×	RTCM1013 RTCM1081 RTCM1082	OFF OFF OFF	> > >	RTCM1121 RTCM1122	OFF OFF	>
RTCM1001 RTCM1002 RTCM1003 RTCM1004	OFF OFF OFF OFF	> > > > >	RTCM1012 RTCM1071 RTCM1072 RTCM1073	OFF OFF OFF	× × ×	RTCM1013 RTCM1081 RTCM1082 RTCM1083	OFF OFF OFF OFF	> > >	RTCM1121 RTCM1122 RTCM1123	OFF OFF OFF	
RTCM1001 RTCM1002 RTCM1003 RTCM1004 RTCM1009	OFF OFF OFF OFF	> > > > > > > > >	RTCM1012 RTCM1071 RTCM1072 RTCM1073 RTCM1075	OFF OFF OFF OFF OFF	> > > > >	RTCM1013 RTCM1081 RTCM1082 RTCM1083 RTCM1085	OFF OFF OFF OFF	> > > >	RTCM1121 RTCM1122 RTCM1123 RTCM1125	OFF OFF OFF	
RTCM1001 RTCM1002 RTCM1003 RTCM1004 RTCM1009 RTCM1009	OFF OFF OFF OFF OFF		RTCM1012 RTCM1071 RTCM1072 RTCM1073 RTCM1075 RTCM1076	OFF OFF OFF OFF OFF	>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>	RTCM1013 RTCM1081 RTCM1082 RTCM1083 RTCM1085 RTCM1086	OFF OFF OFF OFF OFF	> > > > > >	RTCM1121 RTCM1122 RTCM1123 RTCM1125 RTCM1126	OFF OFF OFF OFF	

Figure 2.6 Options for RTCM3

Station Info Base station position	C	MRREF	OFF	~
Base station description information	n C	MRDESC	OFF	~
Observables			- Cr.	
Base station satellite observation in	formation C	MROBS	OFF	~
Base station position information (I	ow rate) C	MRPLUS	OFF	~

Figure 2.7 Options for CMR

For data recording mode, you can choose auto or manual, click [Detail] to configure corresponding output options.



Output Config								
RANGECMP(B)	OFF	~	RANGE(B)	OFF	~			
GPSEPHEM(B)	OFF	~	GLOEPHEMERIS	OFF	~	BDSEPHEMERIS(B)	OFF	~
BESTPOS(B)	OFF	~	BESTXYZ(B)	OFF	~	BESTVEL(B)	OFF	~
THISANTENNA(B)	OFF	~	MARKTIME(B)	OFF	~			
Fi	nish				Canc	el		

Figure 2.8 Output options

You can also set antenna height under Others. Click [Config&Save] to finish the base mode configuration.

3) Rover station mode

If choosing rover station mode, it will pops out a notice to confirm this action.

Connection Type:	Serial	~		
Serial Setting	[cour	Save Receiv	ed Data	
Baud Rate:	115200 V	(€) ON		
Terus GNSS Cente	er tion will restart the o	urrent run status,	are you sure?	*
Terus GNSS Centr	er tion will restart the d	urrent run status, Yes	are you sure? No	
Terus GNSS Centre	er ion will restart the o onsole Working Mode	urrent run status, - Yes	are you sure? No	
Terus GNSS Centre This act Command Co Base Station	er ion will restart the o onsole Working Mode 1 Config Mode	urrent run status, Yes	are you sure? No	×

Figure 2.9 Change to rover mode



In the rover mode configuration interface, you can configure rover's output from COM1/COM2/USB/File.

Global Pos	itioning System	Fix D	Data			GPG	GA	ontin	me 1 🗸	1
GPS Satell	ites in view					GPG	sv	OFF	~	
Actual trac	ck made good a	nd s	peed	over gr	ound	GPV	TG	OFF	~	
GPZDA	OFF ~	GPO	GRS	OFF	~	GPR	мс	ontir	me 1 v	Ì
GPHDT	OFF ~	GPO	GSA	ontime	• 5 v	GPN	TR	OFF	~	1
GPGLL	OFF V	GPO	GST	OFF						1
Other Out	tput									
RANGE	ontime 5	~	BINA	RY ~	BESTPO	S	ontime 1	~	BINARY	
BESTVEL	OFF	$\sim$	BINA	RY ~	BESTXY	Z	OFF	~	BINARY	
RANGECM	P OFF	~	BINA	RY ~	PSRDOP		OFF	~	BINARY	
PSRXYZ	OFF	~	BINA	RY ~	HEADING	3	OFF	~	BINARY	
SATVIS	ontime 5	$\leq$	BINA	RY ~	TRACKS	TAT	OFF	~	BINARY	_
MARKTIME	OFF	$\sim \parallel$	BINA	RY ~	MARKPO	S	OFF	$\sim$	BINARY	

Figure 2.10 Configure COM1 for rover mode

Global Posit	tioning Svs	tem Fix	Data		G	PGGA	OFF	~
GPS Satellit	tes in view				G	PGSV	OFF	~
Actual trac	k made go	od and	speed	over gr	ound G	PVTG	OFF	~
GPZDA	OFF	~ G	PGRS	OFF	~ G	PRMC	OFF	~
GPHDT	OFF	↓ G	PGSA	OFF	G	PNTR	OFF	~
GPGLL	OFF	G	PGST	OFF	~			
Other Out	put					St		[
RANGE	OFF	~	BINA	RY ~	BESTPOS	OFF	~	BINARY
BESTVEL	OFF	~	BINA	RY v	BESTXYZ	OFF	~	BINARY
RANGECMP	OFF	~	BINA	RY 🗸	PSRDOP	OFF	~	BINARY
PSRXYZ	OFF	~	BINA	RY ∨	HEADING	OFF	~	BINARY
SATVIS	OFF	~	BINA	RY ~	TRACKSTA	T OFF	~	BINARY
MARKTIME	OFF	~	BINA	RY ~	MARKPOS	OFF	~	BINARY

Figure 2.11 Configure COM2 for rover mode



	ioning System	Fix Data		GPG	GA	ontin	ne 1 🗸 🗸	
GPS Satelli	es in view			GPO	sv	ontin	ne1 v	
Actual trac	k made good a	nd speed	l over gr	ound GPN	TG	OFF	~	
GPZDA	OFF ~	GPGRS	OFF	V GPR	MC	OFF	~	
GPHDT	OFF ~	GPGSA	OFF	V GPN	ITR	OFF	~	
GPGLL	OFF v	GPGST	OFF	~				
Other Out	put			() de la competencia de la com				
RANGE	ontime 1	BINA	RY ~	BESTPOS	OFF	~	BINARY	~
	OFF	V BINA	RY ~	BESTXYZ	OFF	~	BINARY	~
BESTVEL		V BINA	RY ~	PSRDOP	OFF	~	BINARY	
BESTVEL RANGECMP	OFF			UEADING	OFF	~	BINARY	5
BESTVEL RANGECMP PSRXYZ	OFF OFF	V BINA	NRY ∨	HEADING				
BESTVEL RANGECMP PSRXYZ SATVIS	OFF OFF OFF	<ul><li>✓ BINA</li><li>✓ BINA</li></ul>	RY ∽ RY ∽	TRACKSTAT	OFF	~	BINARY	1

Figure 2.12 Configure USB for rover mode

Global Posi	tioning System	Fix Data		GPG	ίGΑ	OFF	~
GPS Satelli	tes in view			GPG	isv	OFF	~
Actual trac	k made good a	nd speed	l over gr	ound GPV	TG	OFF	~
GPZDA	OFF v	GPGRS	OFF	✓ GPR	MC	OFF	Ŷ
GPHDT	OFF ~	GPGSA	OFF	V GPN	ITR	OFF	~
GPGLL	OFF ~	GPGST	OFF	~			
Other Out	puc			n en contra en co			-
RANGE	OFF	BINA	RY ~	BESTPOS	OFF	~	BINARY
BESTVEL	OFF	BINA	RY ~	BESTXYZ	OFF	~	BINARY
RANGECM	OFF	✓ BINA	RY ∨	PSRDOP	OFF	~	BINARY
PSRXYZ	OFF	V BINA	RY v	HEADING	OFF	~	BINARY
SATVIS	OFF	BINA	RY v	TRACKSTAT	OFF	~	BINARY
MADICTIME	OFF	BINA	RY V	MARKPOS	OFF	~	BINARY

Figure 2.13 Configure FILE for rover mode

After setting all required parameters, click [Config&Save] to finish the rover mode configuration.



## 2.1.3 Save option

Under the save option tab, the output directory can be set, the data format options can be checked according to different requirement. The log option is .log by default.

Connection	Save Option		
Outp	ut Setting		
Out	out directory	c:\TersusData\	
Save	Option Raw data(.t	rs)	
C	NMEA only(.	nmea)	
C	Binary data	only(.bin)	
-100.0	Ontion		
LUQ	spuon		

Figure 2.14 Save option config



## 2.2 Interface and functions

The main interface of Tersus GNSS Center is shown as below.



Figure 2.15 Tersus GNSS Center main interface

#### 2.2.1 Menu bar

The menu bar includes below options:

1) Action

Under the action tab, it has three options: play, stop and quit.

2) View

Under the view tab, it has three options: windows, status bar and skin. For windows, you can check which window to display. For status bar, you can check to display status bar or not display this bar at the bottom. For skin, you can choose from seven skin types for this software.

3) Map

Under the map tab, it has two options: Google map and Baidu map.



#### 4) Tools

Under the tools tab, it has three categories:

- a. Config, References, and Restore Layout;
- b. Show position summary, auto base station list, pin output, and erase Trajectory;
- c. Data recording, RINEX converter, Position averaging, Download File, Update Firmware, and GeoPix. These are useful tools for different applications.

#### 5) Help

Under the help tab, it shows the Tersus GNSS Center version.

#### 2.2.2 Tool bar

The tool bar shows different tools in icons.

Play: play demo file like a video, or enable the serial port connection.

- Stop: stop playing demo file, or disable the serial port connection.
- Config: configure connection and save option, details refer to section 2.1.

Environment preferences: set environment preferences as shown below. You can switch google map URL, set Baidu map option, set map option with GCJ-02, set satellite color, set trajectory view display colors, set limit for tracing point clear interval, set limit for output session interval, and set text console clear interval.



nces					
Google Map I O Google.c	URL n			⊛ Go	ogle.com
Baidu Map Op Disable B	ption D09 Conve	ert			
GCJ-02 Cove	rter(Map C	ption)			
Auto	OD	isable	C	Enable	
Satelite Color					
Reset	GPS	GLONASS	BDS	GLA	QZSS
Background	~			<b>~</b>	~
Foreground			<b>~</b>	<b>—</b> ~	
Trajectory Vi	iew Display				
Reset	SINGLE	DGPS	FIX	FLOAT	OTHER
Dot Color					
Limit					
Trac Point Cl	ear Interva	l (Hour)		ſ	8
Output Sessi	ion Interva	l (Hour)		L.	8
TexConsole	lear Inten	al (Count)		L	50000
Texcollisole	clear tricery	ar (count)		L	50000
	-			1	

Figure 2.16 Set environment preferences

Restart the app to restore: restore to the default display after restart.

Position summary: shows the summary of position parameters including status, differential angel, satellite numbers, HDOP, ground speed, ellipsoidal height, longitude, latitude, UTC time, date and quality indicator.

Status Diff. Age Sat. Num. HDOP Ground Speed Ellipsoidal Height Longitude Latitude	
Diff. Age Sat. Num. HDOP Ground Speed Ellipsoidal Height Longitude Latitude	
Sat. Num. HDOP Ground Speed Ellipsoidal Height Longitude Latitude	
HDOP Ground Speed Ellipsoidal Height Longitude Latitude	
Ground Speed Ellipsoidal Height Longitude Latitude	
Ellipsoidal Height Longitude Latitude	
Longitude Latitude	
Latitude	
Time(UTC)	
Date	
Ouality Indicator	

Figure 2.17 Position summary



2 Google map: click it to display in google map.

Baidu map: click it to display in baidu map.

list Base network for posave: it pops out the Auto Base Station List window

to set PosAve on or off and show the base station position network as below.

ntion id Position Ra	ange(0: disable, default:	30) m	
) PosAve On	O PosAve Off		Modify
ase Station P	osition Network		
Select All			
LAT	LNG	HEIGHT(Ellipsoidal)	MarkID
Refresh	Add	Delete	Mark In Map

Figure 2.18 Auto base station list

If a base is setup with command POSAVE, according to its original definition, after a power cycle, the fixed position may be different even if the receiver is installed at the same point. Auto base station list function is for the users who need the base to keep the same fixed position after a power cycle.

Fill the valid position range, check PosAve On, and click [Modify]. It is recommended that valid position range is >20m. After the specific time (in the example, 0.01 hour is 36 seconds), the base is fixed with the 36 seconds averaging position. Click [Refresh], the fixed position is displayed as below.



to the second se			
alid Position Range(0	: disable, default:30)	20 m	
Posáve On		0.0100	Modify
Base Station Position	1 Network		
LAT	LNG	HEIGHT(Ellipsoidal)	MarkID
21 100 43930	121 50310162	27 41692204	

Figure 2.19 Fixed position for base station

After a power cycle, if the base is moved less than 20m away from the last position, it would fix with the same position. In the above example, latitude keeps 31.19042830, longitude keeps 121.59319162 and ellipsoid height keeps 37.4168.

Pin output: pause the message output in text console window.

Clear the trac point both in trajectory and map: click it to clear the track point both in trajectory and map.

Data recording: view data recording status shown as below. This function is only available after configuring raw data storage command. Only when turning on the raw data recording, it will show the data recording status.

File Status		
FileName:		
Data Recording Status:	close	
File Size(KByte):	0.00	
Rest Space(KByte):	3729268	
Start Recording	End Recording	

Figure 2.20 Data recording status



Convert to RINEX 3.02: click this icon to view below setting window.

R Tersus Rinex C	onverter			×
Source File:				Open
Save Path:				Save as
		Options		
Source Format:		Station Name:		
	·	Maker Number:		
Rinex Version:	3.02 ~	Time interval(sec):		
		Time start(GPST):	2017/07/01 00:00:00	
тс		Time end(GPST):	2019/12/25 08:30:41	
16		Constellation: 📿 🕻	GPS ☑GLO ☑BDS Dutput .pos File	☑ GAL
Tersus Rine Copyright 2	ex Converter V3.6 1018 Tersus GNSS	Process	sed Epoch:	AboutBPE

Figure 2.21 Tersus Rinex Converter

Position averaging for base stations: set input and output parameters for

position averaging.

Input		
Min Sampler Number(100~10	)000) Max	distance deviation(1~10m)
3000 ~	3	3
Output		
Averaging Begin:	End	1:
		fix position
Lat/Lon :	O DDmm.mm	fix position

Figure 2.22 Position averaging for base stations

Download SD/EMMC file: download data files from internal storage of the receiver to the computer.



DownloadPath	c:\TersusData\2019	1225			Select	Viev
Auto Create I	RINEX File <mark>(\$</mark> DownloadP	ath/RINEX) after	download			
1edia		FreeSpace		KB	SelectAll	
FileName		UTC Time	Size(Byte)	status	Station ID	

Figure 2.23 Tersus download

Update firmware: upgrade firmware using serial port.



Figure 2.24 Update firmware



#### GeoPix: launch GeoPix software to process GNSS observations.

onding direcco	ry (Picture Dir)	*E	ase Data			*Rover Data			
IEM						Offsets between ca	mera center and	phase cente	r
		n			g	FRD (CM)			
		c				O MRK File			
no position in at	base data file)	DEG O DMm	DDMM.mm) ODMS	6(DD,MM,SS) Metres	Use Event N	Mark UTC Time to repla	ace Capture Time	e of the pictu	res
FileName	CreateTime	ModifyTime	Capture Time		UTC TIME	Latitude	Longitude	Altitude	Po
					<				
					Man Use Go	ogle.com OMa	n Use Google.cr	O Baidu	Map
					- water-statement				
		Oria	inal Latitude						
		Tag	ged Latitude						
		Orig	nal Longitude						
		Tag	ged Longitude						
		Orig	inal Altitude						

Figure 2.25 GeoPix main interface

About version: view Tersus GNSS Center version.

#### 2.2.3 Skyplot view

The Skyplot view displays the number of GNSS systems (GPS / GLONASS / Beidou / Galileo / QZSS) being tracked by the board or receiver and their elevation / azimuth angle. The different GNSS constellations are distinguished with different colors, which can be configured in Tools - > Preference. The satellite PRN are marked in the figure with capitalized character 'G', 'R', 'B', 'E', 'J' referring GPS, GLONASS, Beidou, Galileo and QZSS constellation respectively. The figure is expressed in polar coordinate system with its direction refers to the azimuth angle and radius refers to its zenith distance (90-elevation angle in degree). Please note the view works only when GPGSV message is logged.





Figure 2.26 Skyplot view

#### 2.2.4 Signal strength view

The Signal strength view shows the signal noise ratio of different frequencies of corresponding GNSS systems (GPS/GLONASS/Beidou/Galileo/QZSS). The horizontal axes represent the number and the PRN. The vertical axes represent the carrier to noise ratio (C/N0) in dB/Hz. Note: the receiver is capable of tracking multiple frequency signals for some constellation, check the box at the bottom left corner to present the C/N0 of different frequency signals. Please note the view works only when GPGSV message is logged.





Figure 2.27 Signal strength view

#### 2.2.5 Map view

The map view can be chosen from flat map or satellite map. The map source can be selected from Google map or Baidu map.

**Note**: In Mainland China it only supports Baidu map, needs proxy network to access Google map.



Figure 2.28 Google map

Figure 2.29 Baidu map



#### 2.2.6 Console window

The console window has three tabs: Text Console, Track Info and Log.

The Text console window provides a way for users to communicate directly with the board. Commands can be sent to the board using this window and all ASCII-format messages are displayed. When binary format data is received, the Text console window will show a summary of the binary data, including message type and data length. If the unrecognizable characters are received, they will be considered as error log and shown in Log view.



#### Figure 2.30 Text console window

> The track info window provides the coordinates at a frequency of 1Hz.

31 100436185000	121 593197796667 34 596
31 190436491667	121 593197843333 34 678
31.190436700000	121.593197873333 34.751
31.190436931667	121.593197915000 34.815
31.190437111667	121.593197880000 34.864
31.190436841667	121.593197748333 34.868
31.190437170000	121.593197766667 34.931
31.190436861667	121.593197775000 34.919
31.190437166667	121.593197910000 34.977
31.190436975000	121.593197896667 34.961

II I Fit Console Track Info Log



The log window lists output messages of ASCII or abbreviated ASCII format.

Console		

Taut

16:37:38.080 Abbreviated ASCII Output: <com2 10.000000="" nohold<="" ontime="" rtcm1006="" th=""><th>^</th></com2>	^
16:37:38.086 Abbreviated ASCII Output: < COM1 BESTPOSB ONTIME 1.000000 NOHOLD	
16:37:38.092 Abbreviated ASCII Output: < COM1 RANGEB ONTIME 5.000000 NOHOLD	
16:37:38.097 Abbreviated ASCII Output: < USB RANGEB ONTIME 1.000000 NOHOLD	
16:37:38.104 Abbreviated ASCII Output: <com1 5.000000="" nohold<="" ontime="" satvisb="" td=""><td></td></com1>	
16:37:38.112 Abbreviated ASCII Output: < COM2 RTCM1230 ONTIME 30.000000 NOHOLD	
16:37:38.118 Abbreviated ASCII Output: <com2 30.000000="" nohold<="" ontime="" rtcm1033="" td=""><td></td></com2>	
16:37:38.124 Abbreviated ASCII Output: <com1 3.000000="" baseantennaa="" nohold<="" ontime="" td=""><td></td></com1>	
16:37:38.946 Command Input: - FIX NONE	100
16:37:38.955 Abbreviated ASCII Output: <ok< td=""><td></td></ok<>	
	~
I I P P Text Console / Track Info Log	

Figure 2.32 Log window



#### 2.2.7 Command window

The command window is to input/type commands. Press Enter to send the commands to the boards or receivers. Press Ctrl + Up/Down to get history commands.

Command Here(Ctrl+UP/DOWN to get history)

Figure 2.33 Command window

#### 2.2.8 Trajectory view

The Trajectory view provides real-time graphic plotting of the current horizontal position (longitude and latitude). Different solution status are presented in different colors, which are defined as:

- SIN (Single point positioning solution)
- DIF (DGPS solution)
- FLT (RTK float solution)
- FIX (RTK fixed solution)
- OT (others solution status , e.g. Dead Reckoning or invalid solution)

You can turn on certain type of solution status via tool bar. Please note the view works only when GPGGA message is logged.



Figure 2.34 Trajectory view



#### 2.2.9 PVT views

The PVT views display the detailed PVT information including heading, position, velocity and time (UTC). Please notice that the unit of velocity is km/h and that of attitude is meter. The time system is UTC time and the time shows in the figure may be different from your local time. Please note these views work only when GPGGA, GPRMC and GPVTG message is logged.



Figure 2.35 Heading info



Figure 2.37 Altitude info



Figure 2.36 Velocity info



Figure 2.38 UTC time

#### 2.2.10 Status bar

Tersus GNSS Center indicates the working status of the board or receiver with a group of indicators and connection status on the status bar at the bottom of the main interface.



Figure 2.39 Indicators



#### Table 2 Indicators description

Indicator	Status	Description
Comm	Red	Tersus GNSS Center is not connected to the board
	Green	Tersus GNSS Center is well connected to the board
GPS	Red	No GNSS signal is received
	Green	GNSS signal is received
Base Red No data from base static		No data from base station is received
	Green	Data from base station is received
RTK	Red	No RTK solution received
	Yellow	RTK Float solution
	Green	RTK Fix solution
WiFi	Red	Onboard Wifi is not connected
	Green	Onboard Wifi is connected

[Port]COM5, [DCB]baud=115200 parity=N data=8 stop=1, [Time]04:56:52, [NO]0

Figure 2.40 Connection status



### 2.3 Tools

software.

Besides Tersus GNSS Center, there are other four tools integrated into the Tersus Tool Suite software package: Tersus Download, Tersus GeoPix, Tersus Rinex Converter and Tersus Update.

#### 2.3.1 Tersus Download

Tersus Download is to download data files from internal storage of the receiver

to the computer. You can click the icon  $\blacksquare$  in the tool bar or click Tools ->

Tersu	D
Lownload lie or double-click the desktop shortcut	sDown adl

to launch the

Auto Create RINEX File(\$DownloadPath/RINEX) after download  Media  FreeSpace  KB  FileName  UTC Time Size(Byte) status	SelectAll
FileName UTC Time Size(Byte) status	
	Station ID

Figure 2.41 Tersus download

Make sure the receiver is connected to the computer through the serial port, click [Refresh] to view the files in the internal storage of the receiver, click 32/45



[Select] to choose download path, and click [Download] to download files to the designated folder of the computer.

#### 2.3.2 Tersus 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. You can click the icon

in the tool bar or click



Tools -> GeoPix or double-click the desktop shortcut TersusGeoPix to launch the software.

/orking director	ry (Picture Dir)	*Base	Data			*Rover Data			
HEM					g	Offsets between ca	mera center and	phase center	r
Input Base Po no position in Lat	sition (check it when base data file) Lon	DEG O DMm(DD     Heig	MM.mm) ODMS pht(Ellipsoid)	6(DD,MM,SS) Metres	Use Event M	fark UTC Time to repl	ace Capture Tim	e of the pictu	res
FileName	CreateTime	ModifyTime	Capture Time		UTC TIME	Latitude	Longitude	Altitude	Po
					<				
					Map Use Gr	ogle.com O Ma	p Use Google.cr	O Baidu	Мар
		Original Tagged Original	Latitude Latitude						
		Tagged Original	Longitude Altitude						
		Tagged	Altitude						

Figure 2.42 GeoPix main interface

The detailed usage of GeoPix refers to the User Manual for UAV PPK Solution which is available on <u>www.tersus-gnss.com/product/uav-ppk-solution</u>.



#### 2.3.3 Tersus Rinex Converter

Tersus Rinex Converter is a tool to convert the logged binary observation data into RINEX3.02 or RINEX2.10 format. You can click the icon in the tool bar or click Tools -> RINEX Converter or double-click the desktop shortcut

Tersus Rinex (	Converter				
Source File:				1	Open
Save Path:					Save as
	81		Options		
ource Format:		~	Station Name:		
nex Version:	3.02	~	Maker Number:		
	• ~		Time start(GPST):	2017/07/01 00:00:00	
-	X_)	_	Time end(GPST):	2019/12/25 08:30:41	
16		5	Constellation:	GPS ⊡GLO ⊡BDS Output .pos File	GAL

Figure 2.43 Tersus Rinex Converter

The detailed usage of Tersus Rinex Converter refers to section 3.4 Convert Raw Data into Rinex.

#### 2.3.4 Tersus Update

Tersus Update is a tool to upgrade firmware for Tersus GNSS products via serial ports. You can click the icon in the tool bar or click Tools -> GeoPix  $_{34/45}$ 





#### or double-click the desktop shortcut TersusUpdate to launch the software.

elect file to update(1	1/2)				
Update Setting Update File:				]	
Port:	COM3 v	Baudrate:	460800 ~	Advance Setting	
Version:3.1	TĘ	R	SI	JS	
		< <u>E</u>	ack <u>N</u> ext >	Cancel	Help

Figure 2.44 Update firmware

Select the upgrade file, select port and baud rate, and click [Next]. After the firmware is upgraded successfully, it will prompt a windows indicating successful update. Click [OK] and [Finish] buttons to close the firmware upgrade windows, the receiver will reset automatically.

Take BX306 board for example, download the latest firmware file from Tersus official website, and put it in the designated folder of your computer. Launch the Tersus Update software, select the firmware file (.bin format), port, baud rate as 115200 and click [Next] for the firmware update. Details refer to section 3.2 in *User Manual for BX Series GNSS Receiver*.



## 3. General operations

This chapter describes generation operations of Tersus GNSS Center software.

## 3.1 Connect to a BX RTK board

Before connecting the board with Tersus GNSS Center, please make sure the board is powered up and physically connected to the computer via its serial ports. The detailed to establish a physical connection between the board and PC can be found in the User Manual for BX series board or David series receiver. (Available at <u>www.tersus-gnss.com/document</u>). The following steps show how to do connect the Tersus GNSS Center software to the board:

- Launch Tersus GNSS Center, the Config dialog pops up automatically. The dialog can also be found in menu bar Tools -> Config.
- 2) Choose Serial as Connection type and choose the correct port. The baud rate of the board is 115200 by default and changing baud rate is not recommended. The serial port can be found in your windows device manager.

Serial Setting       Port:       Baud Rate:       115200         Demo File Setting   Input File :
Demo File Setting Input File :
Play Speed Loop
Apply Ok Cancel

Figure 3.1 Connection configuration



3) Click [OK] to establish the connection. If the connection is established, the COMM indicator on the status bar will turn to green.

## 3.2 Configure RTK board with commands

Before starting field work, configure the RTK board or receiver with the Tersus GNSS Center software.

The board or receiver can be configured with commands which you can key in via the **Text Console** window of Tersus GNSS Center.

Text Console	×
SGPGGA,070332.00,,000,0.0,,*63           SGPGGA,070333.00,,000,0.0,,*65           SGPGGA,070335.00,,000,0.0,,*65           SGPGGA,070335.00,,000,0.0,,*64           SGPGGA,070335.00,,000,0.0,,*67           SGPGGA,070336.00,,000,0.0,,*68           SGPGGA,070339.00,,000,0.0,,*68           SGPGGA,070340.00,,000,0.0,,*68           SGPGGA,070341.00,,000,0.0,,*64           SGPGGA,070342.00,,000,0.0,,*64           SGPGGA,070342.00,,000,0.0,,*65           SGPGGA,070343.00,,000,0.0,,*65           SGPGGA,070344.00,,000,0.0,,*61           SGPGGA,070345.00,,000,0.0,,*61           SGPGGA,070345.00,,000,0.0,,*61           SGPGGA,070345.00,,000,0.0,,*61           SGPGGA,070345.00,,000,0.0,,*61           SGPGGA,070345.00,,000,0.0,,*61           SGPGGA,070345.00,,000,0.0,,*61           SGPGGA,070345.00,,000,0.0,,*61           SGPGGA,070345.00,,000,0.0,,*61           SGPGGA,070350.0,,000,0.0,,*61           SGPGGA,070350.0,,000,0.0,,*61           SGPGGA,070350.0,,000,0.0,,*61           SGPGGA,070350.0,,000,0.0,,*61           SGPGGA,070350.0,,000,0.0,,*61           SGPGGA,070350.0,,000,0.0,,*64           SGPGGA,070351.00,,000,0.0,,*63 <t< td=""><td>•</td></t<>	•
I I I I I Text Console Track Info Log	
Command Here	*

Figure 3.2 Command prompt and text console

#### 3.2.1 Configure the board into base station mode

Commands for base station mode:

fix position 31.1874808 121.58111234 41.4618 log com2 rtcm1074 ontime 1 log com2 rtcm1084 ontime 1 log com2 rtcm1124 ontime 1 log com2 rtcm1005 ontime 10 saveconfig



These commands fix the coordinate of the base station and configure RTCM message to be transmitted. The coordinates are expressed in degree/meter. After each command is sent, the board will automatically acknowledge a '>OK', which means the configuration takes effect. If no acknowledge is received, please refer to 'trouble shooting' section in the user guide or contact Tersus Technical Support. If the base station coordinate is unknown, you can get it by averaging the point position solution for a while.

Message type	Message Name
1074	Full GPS Pseudoranges and PhaseRanges plus CNR
1084	Full GLONASS Pseudoranges and PhaseRanges plus CNR
1124	Full BeiDou Pseudoranges and PhaseRanges plus CNR
1033	Receiver and Antenna Descriptors
1005 or 1006	Station Description

#### 3.2.2 Configure the board into rover mode

Commands for rover mode:

fix none interfacemode com2 automatic automatic on log com1 GPGGA ontime 1 saveconfig

The rover can automatically recognize the RTCM message and compute RTK solution, so what you need is to make sure the rover position is not fixed, the serial port is in correct mode and it output RTK solution as normal.

After configuration, you can see that the board outputs empty NMEA sentences as the GNSS antenna are not connected to the board.

Details of commands and logs could be found in *Log&Command Reference for Tersus BX GNSS OEM boards*. (Available at

www.tersus-gnss.com/document).



## 3.3 Data logging

Tersus GNSS Center allows user logging the raw observation, ephemeris or RTK solution to PC. The procedure of data logging is as follows:

- Configure the board output according to your requirement with Tersus GNSS Center. (Details of commands and logs could be found in Log&Command Reference for Tersus BX GNSS OEM boards, available at www.tersus-gnss.com/document).
- 2) Make sure the Save Received Data option in Config window is turned on. Then go to Save Option tab to configure the save directory and log information. Tersus GNSS Center allows to save NMEA data only, binary data only and save all received data. The error messages, e.g. corrupted NMEA sentences, unrecognizable characters will be saved in log file for error diagnosis.

Connection Type:	Serial	~		
Serial Setting		Save Receiv	ed Data	
Port:	COM5 ~	() ON	OOFF	
Baud Rate:	115200 ~	0	0.1.	
Working Mode				
Working Mode	Console Working Mode			
Working Mode © Command O Base Static	Console Working Mode on Config Mode			
Working Mode © Command ( ) Base Static ) Rovel Stati	Console Working Mode on Config Mode ion Mode			
Working Mode © Command ( ) Base Statio ) Rovel Statio ) Custom Mo	Console Working Mode on Config Mode ion Mode			

Figure 3.3 Save Received Data option



Connection Save Option	
Output Setting	
Output directory C:\TersusData\	
Save Option	
✓ Raw data(.trs)	
NMEA only(.nmea)	
Binary data only(.bin)	
Log Option	

Figure 3.4 Choosing saved data location

3) When Tersus GNSS Center is configured well, it will log received data once the serial connection is established. Tersus GNSS Center will create a sub-directory in the output directory named with the date (in yyyymmdd format) and save the data of each connection with a single file named with the starting time (hhmmss.trs or hhmmss.nmea).



## 3.4 Convert Raw Data into Rinex

The receiver independent exchange format (RINEX) is commonly used in post GNSS data processing missions. Tersus GNSS Center allows user to convert the logged binary observation data into RINEX3.02 or RINEX2.10 format. Here is guidance for the conversion:

- 1) Select Tools -> RINEX Converter to initiate the Tersus RINEX Converter.
- 2) Click [Open] to select the logged binary observation file. An alternative way is drag the file onto the text box. The output RINEX file will be stored in the same directory as the binary file. You can also change it by click [Save as]. Please note that the output RINEX file name is the same as the binary file as well by default.
- 3) Choose the source format according to your board/receiver type. It also supports converting RTCM3.2 messages into RINEX as well, but an approximate UTC time of start logging need to be provided.
- 4) A Station Name should be extracted from the source file before the conversion. If the Time Interval option is ticked, the converter also allows to downsampling the observation data.
- Click **Process** and the RINEX files will be found in the folder of Save Path.
   There are four kinds of RINEX files, including:
  - .yyo file observation file
  - .yyn file GPS ephemeris file
  - .yyg file GLONASS ephemeris file
  - .yyc file Beidou ephemeris file
  - .yyl file Galileo ephemeris file
  - .yyp file All ephemeris file

Note: \*yy in file extension is two digits of year.



R Tersus Rinex (	Converter		×
Source File:		Q	pen
Save Path:		Se	ive as
		Options	
Source Format:	~	Station Name:	
	·	Maker Number:	
Rinex Version:	3.02 ~	Time interval(sec):	
		Time start(GPST): 2017/07/01 00:00:00	
-	Xelle	Time end(GPST): 2019/12/25 08:30:41	
		Constellation: ☑ GPS ☑ GLO ☑ BDS ☑ GA	L.
		Output .pos File	
Tersus Rine	ex Converter V3.6	Processed Epoch:	
copyright 2		Process Quit About	3PE

Figure 3.5 Converting data



# 4. Terminology

BDS	BeiDou Navigation Satellite System
CMR	Compact Measurement Record
eMMC	Embedded Multi Media Card
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
USB	Universal Serial BUS
UTC	Universal Time Coordinated



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