

GEOMATE MateSurvey User Guide



Version 2.0 June 2023

Premium Surveying. Trusted Solutions

Warning

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1 MateSurvey Overview

1.1 Software Description

MateSurvey is an Android-based GNSS field data collection software designed to provide users with efficient and convenient surveying and stakeout. MateSurvey software features a distributed architecture that fully utilizes the convenience of the Internet, bringing a new operational experience to survey crews in the field. The integrated cloud service greatly simplifies data transfer between the surveyor's field controller and project supervisors in the office, and more. DXF and DWG project files are fully supported by MateSurvey and users can directly stake out points or lines from the original design drawings.

1.2 Key Features

One-button Switching Dual Styles

- Simple Style, designed for the entry-level surveyors, with all basic function in one screen.
- Classic Style, designed for professional surveyors, with more functions showing in different tables based on the frequently-used work flow.

Various Base Map Displays

- OSM, BING, Google Image, WMS, V-World, Geoportal online maps.
- DXF(including 3D DXF), SHP, TIF, SIT, KML, KMZ offline maps
- JPG

Extensive Import and Export Data Formats

■ Import from DXF(including 3D DXF), SHP, KML, KMZ, JPG, CSV, DAT, XLSX, TXT, TIFF and MBTILES.

- Export to DXF, SHP, KML, KMZ, RAW, HTML, CSV, DAT, TXT, XLSX formats.
- Customized import and export contents in CSV, DAT or TXT formats.

Various Types of Measurement

Supports static, RTK and stop & go measurement.

7 methods of point measurement, including topographic point, control point, quick point, continuous point, offset point, EBubble compensated point and corner point.

Simultaneous stop-and-go and RTK measurement using topographic point or continuous point.

Various Peripherals Supported

- Pipeline detector, VIVAX-METROTECH vLocPro2.
- Laser rangefinder, Leica Disto 810 touch, Disto 510 touch, and SNDWay SW-S120C.

Convenient Work Mode Management

Presetting common work modes of base and rover, selecting or switching work modes by one button.

Convenient to work in stop&go based on real-time kinematic (RTK) mode and static mode can be set at the same time.

Standard CGD Correction File

■ Multiple grid formats are avaliable, GGF, BIN, GRT DAT, DATCZ, GRD, GSF, GRI, STG, GBL, GXY, OSGB, JASC, GSA, GSB, BYN, GTX, NEGRID, TXT and ASC formats.

User-friendly Stakeout Interface

Two modes for stakeout, map mode shows the current position and target position, compass mode shows the target direction.

Users can set North, Sun or point as a reference direction.

Multiple Types of Stakeout

- Point and line stakeout by snapping feature point on DXF base map or survey point.
- Surface and road stakeout.

Correction Repeater Function

Easily repeating correction data from RTK network or radio mode to other rovers via radio.

RTCM Transformation Message

Using RTCM transformation messages (1021-1027) for datum transformation, projection, automated grid position and geoid adjustments.

Base Map rotates

Base map rotates with the direction of the PDA during the surveying process.

1.3 Devices Support



Device	Туре	Note
GeoMate SG5	GNSS geodetic receiver	
GeoMate SG7	GNSS geodetic receiver	
Android Smartphone or	With Internal GPS	Android version 4.2
handheld controller		and above
VIVAX-METROTECH vLocPro2	Pipeline Detector	-
Leica Disto 810 touch	Laser Rangefinder	-
Leica Disto 510 touch	Laser Rangefinder	-
SNDWay	Laser Rangefinder	-
Bosch	Laser Rangefinder	

1.4 Software Interface

Starting from MateSurvey 2.0, the interfaces has two styles: List style and Classic style.

Startup Interface: Install at the first time and run the software can directly into the main interface.

07:30:12 🖙 Ĝ N ≭ 1.00 🖬 ∯II 78% +

YOUR RELIABLE SURVEY MATE





In **List Style**, all the functions are listed in list style. It consists of four parts: Project, Survey, Stakeout and Tools.





In Classic Style, all the functions are listed in circular icons. It is made up of four parts: Project, Survey, Config and Tools.





1.5 Registry

If the software is not registered, please contact regional sales representative.

Register:

(1) Register via Email

Enter the **Slide menu** interface and click **Activate software/About**. Users will see register status is **Inactive**, click **Inactive**. Then users will see a pop-up window: "Enter an email address before activating the software.", click **OK**.

07:57:17 🧧 🛆	N ¥ 0.01 奈 ᡂ 4911 ⑦	07:57:45 🔳	○ N ★ 905 奈 Ⅲ %I	77
Click to login		← GEOMATE-/	Activate software/About	_
GEOMATE				
😤 Software settings	Projects	MateSu	rvey 2.0.2.20230529	
OD Interface style	So	Reg status	Inactive	
Uvice reminder	Lines	Check for update		>
∴ BaseChanged tip	\bigcirc			
My cloud disk	CodeList			
Collaborative work	29			
↓ Upload position Disable ↓	Features			
🟵 Localization packages				
Record track				
🗇 Feedback				
Remote support				
(i) Activate software/About				
	Project Su			

Then input user information and click **Register** to submit application. Please input your true e-mail address, because we will send "Account activation" mail to this e-mail address.

07:59:24 🔳	⇔⊠≯ 0.06 ≈ ⊡ "il)	08:00:35 🥃	0 N ≭ ‱ ?? ™ "II 777
← GEOMATE-A	ctivate app		OMATE-Register
Temporary code	Apply		
Permanent code	Apply		
		Name	
		Company email	
Create an email a	account to register		
Mates	Survey.	Country	
Cancel	ОК		
		Company name	
		Di su	
		Phone number	
Note: if you have already applie code, please use the same SIM software.	d a temporary or permanent card slot when reinstall		
Activate	by email	Existing accou	nt Register

When users submit application successfully, it will prompt "Register successfully. Check your email to activate your account". Click **OK** and go to mail box, and then users will see "Account activation" mail send by GeoMate. Please click the URL to activate your account. After activation of mail account, users can go to **Apply Register Code** interface in MateSurvey.





(2) Apply Register Code

(a) Temporary usage

Click **Apply** after **Temporary Code**, and users can apply register code immediately. Then users will see progress bar turns blue and the status reads "Successfully", please remember to restart MateSurvey after registry.



(b) Permanent usage

Click **Apply** after **Permanent Code**. Input a pre-code, and click OK. Users should ask regional sales manager or dealer for pre-codes. Then users will see progress bar turns blue and the status reads "Successfully", please remember to restart the application after registry.

(3) Unbind Pre-code

In general, one pre-code is corresponding to only one device. For some special situation, users can use unbind function to unbind the pre-code of current device, then this device will become unregistered status and the pre-code can be used in other device. Click **Unbind**, and users will see the progress bar turning blue. After the progress bar has turned blue "Unbind successfully" will appear. Then, users will find the current device becomes unregistered. It means you can use the pre-code in another device now.

2 Project

2.1 Projects

2.1.1 New

Click **New** to create a new project, users should set coordinate, codeList and other survey parameters.



Name: Input the project name, backslash (/) is forbidden.

Time Zone: Choose the time zone in drop-down list from UTC-12:00 to UTC+14:00.

Source project: choose a reference project and get the parameters automatically, including Coordinate system, Codes library and Projects settings. Control point, Enter, and Stakeout points are optional.



(1) Coordinate System:

Users can create a new coordinate system or use the template of existing projects. Click **User defined** to create a new coordinate system.





Set the right parameters according to the surveying area, and then click Save to finish CRS configuration.

÷	Pre defined CRS		÷	Pre defined CRS	
Continent	Asia	V	Continent	Asia	V
Region	Singapore	V	Region	Singapore	V
List			List		
SINGAPORE	SVY21 Singapore TM	0	SINGAPORE	SVY21 Singapore TM	0
SVY21		0	() SVY	21	
	Select			Select	

Click **Pre defined** to enter **Common Coordinate** interface, and then users are able to add a new coordinate system by clicking **Selecting**. Slide right and click the green button to check the coordinate system information.

÷	CR	\$	
Name	INGAPORE	SVY21 Singapo	ore TM
Ellipsoid	Projection	Datum trans	Horz. a
Туре	WGS84		~
а	6378137.0	000000	
1/f	298.25722	35630	
Positive direction	North-East		

Users can view the parameters of ellipsoid, projection, datum transformation, Horz. adjustment and Vert. adjustment. Click **OK**, it'll return to **Coordinate System** interface, and then click **Select** to finish CRS configuration.



Tick the **Source project** in Coordinate System to select project template, then it will show a list of historical projects. Users can select one and click **OK** to apply. It's used for applying the transformation parameters for different sites. For example, there is project A which has finished site calibration, while another project B needs the transformation parameters the same as project A. Then users can select project A in the project template while creating project B.



Note: Transformation parameters won't be applied if the new project is created without project template. Project template can apply all CRS parameters of the existing project.

(2) Codes library

General Template:





Firstly, users can import **from cloud** by inputting **IP address**, **Port**, **Users name**, **Password**. And users can choose whether **upload position**, **fixed time(s)** or **fixed distance** (the two can be modified).



Secondly, click **New** to create a new codelist, input file name and click **OK**.



Click **New**, then input new code name, description, and choose drawing type from Point and Line. Choose Symbol from symbol list and decide the size of it.



÷	Codes	:	÷	New
			Main Data	
			Name	
			Enter a nam	e.
			Drawing typ	e
			Point	~
			Desc	
			Enter a desc	ription
			Symbol	
				Create a layer with the same name
			Layer color	
			Line type	
			Line width	Normal
			Fill color	
			Transpare	
	New			ок

Users can choose color of the new code and decide if they want to color by layer.

÷	New	÷	Select sy	mbol
Main Data		•	907938	0
Name				
Drawing ty	/pe	0	907939	0
Point			907936	0
Point	earintico.		907937	0
Line		10	907942	0
Layer color			907941	0
Line type	Normal	× ×	907940	0
Fill color			1110	0
Transpare	OK		Import	Accept

Users can select layer color and linetypes. Click **OK**, so the new layer would be created.

Syr	nbol	
S	Line type	
C	CONTINUOUS	0
C	DASHED	0
	DOT	0
La	CENTER	0
Li	ARROW_CONTINUOUS	0
Fi	Cancel	ок
Tra	nspare 🕞	100 +

Users can create a new GIS attribute by clicking **New**. Input Name, default, and select type from pull-down menu.



Users can decide if this attribute is obligatory. Click **Add** to add values to the attribute. Then click **OK** to create a code.



Up (down respectively) button is to move the selected attribute up (down respectively). Left slide the attribute to **edit** or **delete** it.



Back to New code interface and click **OK**. The new code would be saved. Click the icon on the upper



right, and users can load, import, and save codes.

← job-202207	720173002-Codes :
	Import from codes library
	Load from file
	Save as codes library
	To cloud
	Share
	New

Click **load** to load from codes library. The library can be expanded **from cloud** and also users can create **new** library. Select a library and click **Accept**.

Left slide the code to **edit** or **delete** it. In Codes library, left slide to **delete**, **upload**, **share**, and **edit** the codes. Choose a code and click **Accept**.

÷	ÿ	Codes I	ibrary	
1 2023-0	6-27 09:52:	21		0
				matesurvey 2023-06-27 09:51:
Tem 2022-0	plate 7-20 17:30:	02		0
Pipe 2022-0	line Ten 7-20 17:30:	nplate		0
				C
			_	
	New			Accent

• Pipeline Template:

For high precision underground pipeline measurement, please remember to choose **PIPELINE TEMPLATE**, otherwise, users can't see **Pipeline** icon in **Survey** menu.





Click **Edit**, users will see only one line code named "Pipeline". Please don't create other code, because user-created code in **PIPELINE TEMPLATE** is void.

÷	Codes librar	'Y	÷	Codes	:
1 2023-06-27	09:52:21	0	N	Pipeline	>
matesur 2023-06-27	r vey 09:51:06	0			
Templat 2022-07-20	te 17:30:02	0			
0	<u>ም ሆ</u> /	Pipeline Tem 2022-07-20 17:30:0			
		0			
N	lew	Accept		New	

Choose Pipeline and click Edit, and then users can do as in general template.

÷	Edit code			
Main Data				
Name				
Pipeline				
Drawing type				
Line				~
Desc				
Enter a descrip	otion			
Node symbol				•
Symbol	G)	1	(+)
Color by laver	C			
Color				
Layer				
				>
	ок			

2.1.2 Delete

When users enter project, left slide to delete, upload, share and open. Click delete icon, it will prompt "Unrecoverable, delete the project?". Select **Delete** to delete the project, or select **Cancel** to cancel deleting.



2.1.3 Open

To continue an existing project, users can click open icon to open previous project.



2.2 CRS

Coordinate Reference System (CRS) offers users some parameters including ellipsoid, projection, datum transformation, plane adjustment and height fitting.

User should open the project first, then click CRS to set the coordinate system.

Name: Input CRS name, it's not required to define CRS name like LS7.

(1) **Ellipsoid**: Includes ellipsoid name, a, 1/f, etc. Users can choose ellipsoid name from pull-down menu (different ellipsoid name is corresponding to different parameters) as well as manually input.



(2) Projection: There are some built-in common projection methods of different countries and regions, including Gauss projection, Transverse Mercator projection, UTM projection and so on. And the parameters of the projection model are displayed in the interface. Only the central meridian is needed to change usually, which refers to the central meridian of the plane projection. The average latitude of the survey area needs to be input here for a custom coordinate system, requesting the latitude error less than 30 minutes.

Name	WGS84					
Ellipsoid	Projection	Datum trans	Horz. a			
Туре	Transverse	Mercator	~			
		Get central r	neridian			
Central meridian	117:00:00.000E					
Origin latitude	000:00:00.000N					
Scale factor	1.0					
False easting[m]	500000.0					
False nort hing[m]	0.0	0.0				
Average latitude	000:00:00.000N					
Projection height[m]	0.0					

(3) **Datum Trans**: Represents the mathematical model for transformation between two coordinate systems. Datum transformation model includes none parameter, three parameters, seven parameters, seven parameters Bursa, and grid models. Users can input the local 7 parameters directly, no needing the site calibration any more.



Name	W	GS84			
d Projecti	on	Datum trans	Horz. adjustme		
Туре	7 p	arameters	~		
Trans lation X	0.0	1			
Trans lation Y	0.0				
Trans lation Z	0.0)			
Rotation X(Sec)	0.0000000000000000000000000000000000000				
Rotation Y(Sec)	0.000000000000000				
Rotation Z(Sec)	0.0	000000000000000000000000000000000000000	000		
Scale Fact or(ppm)	0.0				

- (a) None Parameters: Users can choose coordinate transformation mode, from XYZ or from BLH.
 - job-20220720173002-CRS
 i

 Name
 WGS84

 d
 Projection
 Datum trans
 Horz. adjustme

 Type
 No transformation
 Type
 No transformation
 Type
 No transformation
 From ECEF XYZ
 From ECEF XYZ
 From ELH

 From ILH

 From Ib
 Save to lib
 Accept
- (b) 7 Parameters: Requires at least three known points, and the points can be under the national coordinate system or the coordinate system that existing small rotation from the WGS84 coordinate system. Preferably three or more known points so that LandStar[™] 8 can check the correctness. The mathematical model of this method is strict, and it is critical to the precision of the known points. This method is usually used in a wide-range work.

Name	WGS84					
l Projecti	on	Datum trans	Horz. adjustn			
Туре	7 ;	parameters	~			
Trans lation X	0.0	D				
Trans lation Y	0.0	D				
Trans lation Z	0.0	D				
Rotation X(Sec)	0.0	000000000000000000000000000000000000000	000			
Rotation Y(Sec)	0.0	000000000000000000000000000000000000000	000			
Rotation Z(Sec)	0.0	000000000000000000000000000000000000000	000			
Scale Fact or(ppm)	0.0	D				



Note: When accuracy of known points is not high, 7 parameters transformation is not recommended.

(c) **7 Parameters Strict**: Add Strict modem for 7 parameters.

Name	WGS84
Projectio	on Datum trans Horz. adjustme
Туре	7 parameters(strict)
Trans lation X	0.0
Trans lation Y	0.0
Trans lation Z	0.0
Rotation X(Sec)	0.0000000000000000000000000000000000000
Rotation Y(Sec)	0.0000000000000000000000000000000000000
Rotation Z(Sec)	0.0000000000000000000000000000000000000
Scale Fact or(ppm)	0.0

(d) 3 Parameters: Requires at least one known point, and the points can be under the national coordinate system or the coordinate system that existing small rotation from the WGS84 coordinate system. Preferably two or more points are known so that checking the correctness of the known points. This method is suitable small-range work, of which accuracy is determined by the operating range. The larger the operating range users have, the lower the accuracy users get.

Name	W	3S84	
l Projec	tion	Datum trans	Horz. adjustme
Туре	3 p	parameters	~
Trans lation X	0.0)	
Trans lation Y	0.0)	
Trans lation Z	0.0)	
			G

(e) Grid: Choose to use grid file for datum transformation (recommend to use CGD file). to find Geoid folder in internal storage of controller, and put grid file in it before using this function. The software currently supports the grid file of CGD/GRD/BYN formats.



(4) Horz. adjustment: The calibration parameters will be displayed on the interface of the coordinate system parameters after site calibration and application, and users can check them when you open the project successfully. It supports Plane and No adjustment at present. The software currently supports the grid file of CGD/GRD/BYN formats..

Name	WGS84				
Datum trans	Horz. adjustment	Vert. adjustr			
Туре	Plane	~			
Origin N	0.0				
Origin E	0.0				
Trans lation N	0.0				
Trans lation E	0.0				
Rotation	000:00:00.00000000	00			
Scale Factor	1.0	6			
Interpo lation method	Bi-linear	~			
North grid	None				

(5) Vert. adjustment: Supports four kinds of algorithms: No adjustment, Constant adjustment, Surface Fitting and Inclined plane, of which No adjustment is the default one.

tarrie	WG584	
rans H	orz. adjustment Ve	ert. adjustmo
уре	No adjustment	~
eoid file	None	~
No adj	ustment	
Consta	ant adjustment	
Surfac	e fitting	
Incline	d plane	

- (a) **Constant adjustment**: Need at least one starting point.
- (b) **Surface Fitting**: Generates a best-fit parabola for the abnormal height of many benchmarks. It has high requirements for the starting data and it may cause divergence of the elevation corrections if the fitting level is too poor. This method needs at least five starting points.
- (c) Best Practice: Best Practice is the height transformation model of Trimble TGO software.
- (d) **Geoid Model**: Click to choose the geoid model file when select this method. The software currently supports the geoid model file of CGD/GGF/BIN/GSF/GRD/GRI/BYN/ASC formats.

2.3 Codes

The main function of **CodeList** is to manage codes under the different work conditions. If users save codes in one list, it is not easy to distinguish. So, it is better to create different codelist for saving different codes, and users can select the corresponding codelist based on the particular work condition. Please refer to 2.1.1(2)**Codes library**.

2.4 Cloud

Cloud is the login interface of Cloud service. Users can upload or download projects, coordinate systems, work modes, etc. Users should ask local dealer or sales manager for obtaining an account and password to use Cloud. GeoMate will help customers to build own cloud server (customers need to provide server and network) if necessary. For more information, please contact local dealer or sales manager.



2.5 Import

The function can be used for importing the point coordinates file in specific formats. Click **Import** in main interface, and the software will import the existing data according to the requirement format in device or SD card.

Point type: user can select the point type, enter point, control point, and points to be staked.



Format: user can select the target type from DAT, TXT, CSV, XLSX, and XLS. If the data contains table header, use header should be set by right slide menu.

← GEOMATE-3-Import		← GEOMATE-3-Import	
Name,code,n,e,elev(*.txt)	С	Name,code,n,e,elev(*.txt)	С
Name,n,e,elev(*.txt)	С	🔟 🖍 Name,n,e,elev(*.txt)	
Name,code,n,e,elev(*.csv)	С	Name,code,n,e,elev(*.csv)	С
Name,n,e,elev(*.csv)	С	Name,n,e,elev(*.csv)	С
Name,Code,n,e,elev(*.xlsx)	С	Name,Code,n,e,elev(*.xlsx)	С
Name,n,e,elev(*.xlsx)	С	Name,n,e,elev(*.xlsx)	С
Name,Code,n,e,elev(*.xls)	С	Name,Code,n,e,elev(*.xls)	С
Name,n,e,elev(*.xls)	С	Name,n,e,elev(*.xls)	С
Name,B,L,H (*.csv) (0°00'00.00000°)	С	Name,B,L,H (*.csv) (0°00'00.00000°)	С
Add format OK	^	Add format OK	-
		< ● ■	

Click the edit button, enter the user defined interface. use header should be set by right slide menu. Choose the extension, separator, and lat/lon format.



As for header, click the option to add the selected contents, and click selected contents to cancel the options. Click the arrow, add or cancel all the options at one time. After finishing settings, turn on the use header.

lame		Name	
		exampled	
Options	Selected	Longitude	Name
Longitude	Name	Latitude	North(N)
Latitude	North(N)	н	East(E)
н	East(E)	Local Lon	Elevation
Local Lon	Elevation	Desc	Local Lat
Desc	Local Lat	Code	Local H
Code	Local H	[Skip]	+
[Skip]	→		
	~		+
į	Save		Save

Other formats: Support DXF\DWG, SHP, KML\KMZ, TIFF, MBTILES, JPG, and POLYLINE file format. Users can change the format into points by selecting the function.

← GEOMATE-3-Import		← GEOMATE-3-Import	
Text file	Other formats	Text file	Other formats
Format		Format	
DXF\DWG file	~	DXF\DWG file	
Import as points		In SHP file	\supset
Point type		P KMIDKMZ file	
Enter points	~	E	
Start name		S TIFF file	
		MBTILES file	
		JPG file	_
		Polyline file(*.ins)	
N	lext	Nex	t
•	•	• •	

Select point type from Enter point, Control point and Points to be staked. Set the name, then click next to choose the imported file.

Note: MateSurvey will automatically apply the same setting when users create a new project.

2.6 Export

The function can be used for exporting the point coordinates file in specific formats.

Filter-Type: Users can choose exporting point types including Survey Point, Enter Point, Control Point and Base Point.

Filter-Measurement Time: Users can set the start time and the end time for exporting data.

Text file	c	Other formats	
		Detailed	
Format			
Name,code,n,e,ele	ev(*.txt)	>	
Filter-Type			
🖌 Survey	E	nter	
Control	В	ase	
Filter-Measurement	t time		
Today	1 Week	All	
Start date	~	End date	
Filter-Keyword			
	Next		

Format: Support DAT, TXT, CSV, XLSX, XLS. There are several available formats in common sequence that provides users to use and users can also set the format in **Customize** (users can customize the import contents while choosing the CSV, DAT and TXT format.)

Other format: Support DXF, SHP, KML, KMZ, HTML, and RAW date, it will be detailed in 2.5. **Path**: Select the path of export file. Click the folder and it will display a blue select prompt. Then, click **Export** to finish.

← GEOMATE-3-Export	
Text file	Other formats
Format	
DXF	~
Filter-Type	
Turne	🔽 Survey 🔽 Enter
Туре	Control 🗌 Base
Miscellaneous	
	Next

Note: MateSurvey will automatically apply the same setting when users create a new project.

2.7 Points

This function can view coordinates library, which includes input point, control point, survey point, and points to be staked.

2.7.1 Import

The function can be used for importing the point coordinates file in specific formats. Click **Import** in main interface, and the software will import the existing data according to the requirement format in device or SD card.

Point type: user can select the point type, enter point, control point, and points to be staked.



÷	GEOMATE-Im	port
Text	file	Other formats
Point type		
Enter point	ts	~
Format		
Name code	e n e elev(* tyt)	
F Enter po	pints	
U: Control	points	
E) Points t	o be staked	xt
Separator		Comma(,)
Lat/Lon for	mat	0°00'00.00000"
Name,Code	e,North(N),East(I	E),Elevation
Next		
	•	

Format: user can select the target type from DAT, TXT, CSV, XLSX, and XLS. If the data contains table header, use header should be set by right slide menu.

← GEOMATE-Import		← GEOMATE-Import	
Name,code,n,e,elev(*.txt)	0	Name,code,n,e,elev(*.txt)	0
Name,n,e,elev(*.txt)	0	Name,n,e,elev(*.txt)	0
Name,code,n,e,elev(*.csv)	0	Name,code,n,e,elev(*.csv)	0
Name,n,e,elev(*.csv)	0	🔟 🖍 Name,n,e,elev(*.csv)	
Name,Code,n,e,elev(*.xlsx)	0	Name,Code,n,e,elev(*.xlsx)	0
Name,n,e,elev(*.xlsx)	0	Name,n,e,elev(*.xlsx)	0
Name,Code,n,e,elev(*.xls)	0	Name,Code,n,e,elev(*.xls)	0
Name,n,e,elev(*.xls)	0	Name,n,e,elev(*.xls)	0
Name,B,L,H (*.csv) (0°00'00.00000")	0	Name,B,L,H (*.csv) (0°00'00.00000")	0
Add format OK	-	Add format OK	-

Click the edit button, enter the user defined interface. use header should be set by right slide menu. Choose the extension, separator, and lat/lon format.



As for header, click the option to add the selected contents, and click selected contents to cancel the options. Click the arrow, add or cancel all the options at one time. After finishing settings, turn on the use header.

ame		Name	
		example	
ptions	Selected	Use header	0
Longitude	Name	Extension	
Latitude	North(N)	.csv	~
н	East(E)	Separator	_
Local Lon	Elevation	Comma(,)	~
Local Lat		Lat/Lop format	
Local H		0°00'00.00000"	
Desc	→	Ontions	Selected
Code	+	Longitude	Name
[Skip]		Latitude	North(N)
		н	East(E)
		Localian	Elevation
	Save		Save

Other formats: Support DXF\DWG, SHP, KML\KMZ, TIFF, MBTILES, JPG, and POLYLINE file format. Users can change the format into points by selecting the function.



Select point type from Enter point, Control point and Points to be staked. Set the name, then click

next to choose the imported file.

Note: MateSurvey will automatically apply the same setting when users create a new project.

2.7.2 Export

The function can be used for exporting the point coordinates file in specific formats.

Filter-Type: Users can choose exporting point types including Survey Point, Enter Point, Control Point and Base Point.

Filter-Measurement Time: Users can set the start time and the end time for exporting data.



Format: Support DAT, TXT, CSV, XLSX, XLS. There are several available formats in common sequence that provides users to use and users can also set the format in **Customize** (users can customize the import contents while choosing the CSV, DAT and TXT format.)

Other format: Support DXF, SHP, KML, KMZ, HTML, and RAW date.



Path: Select the path of export file. Click the folder and it will display a blue select prompt. Then, click **Export** to finish.

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2.7.3 Add

This function can create a new point. Click **Add** to create a point. Creating a point needs some attributes as follows: name, code (input as need), type(including: enter and control point), coordinate formats (including: local NEH, local BLH, local XYZ, WGS84 BLH, WGS84 XYZ), point class (including normal point and control point). Then, input the point coordinates that users create, Desc is optional.

← G	EOMATE-Add point
Name	Enter a point name.
Code	>
Туре	Enter
Coordinate format	Grid(NEH)
North(N)	Coordinates
East(E)	Coordinates
Elevation	Coordinates
Desc	
	Save
•	•

Note: When the point has reel number, it will prompt "Projection Error" after adding point, and users should add reel number in "False East" in **Projection** table of **CRS** interface.

2.7.4 Coordinate type

This function can select different coordinate type. Click **Coordinate Type** to select point type.




2.7.5 Recycle Bin

This function can restore deleted points. Click **Restore** to recover selected deleted points. Click **Delete** to clear the bin.



2.7.6 Multiple-select

This function can select multiple points. Click **Multiple Operation** to manage not only one item but also multi-items and do operation on multiple points.



Po	ints				
		Points to be	staked		
All 🔻 Nar	me 🕶 🛛 Enter	a keyword.			
Select a	all .	Cancel	Delete		
	Name	North(N)[m]	East(E		
	157	1975665.078	22750		
	156	1975668.233	22751		
	155	1975684.696	22753		
	154	1975685.769	22754		
	153	1975687.044	22755		
	152	1975688.185	22756		
	151	1975689.786	22757		
	150	1975691.234	22758		
	149	1975693.298	22760		
Share					

2.7.7 Data statistics

This function can view the different type of points. There are five types, including total points, GNSS base points, survey points, control points and enter points.

÷	GEOM	ATE-Points	:
	Points	Points to	be staked
All	• Name • Ent		
IN	Data statis	stics	• • • • • • • • • • • • • • • • • • •
IN,	Total points	158	7.93
	GNSS base points	0	5.317
IN.	Survey points	0	1.31
IN,	Control points	0	1.323
<u>IN</u> ,	Enter points	158	3,493
	150	1975691.234	227590 84
IN,	149		
IN.	148		
	mport	Export	Add
	•	•	

2.7.8 Switch list style

This function can **Switch** list style. Click **Switch list style** to change the style.

÷	GEC	MATE-Points	:	← Gi	EOMATE-Poin	ts :
	Points	Points to	be staked	Points	Poi	nts to be staked
All 🔻	Name 🔻	Enter a keyword.		All 🔻 Name 🔻	Enter a keyword	d.
	Name	North(N)[m]	East(E)[m]	IN 157 Enter		
<u>IN</u> →	157	1975665.078	227501.730	N:1975665.078 E:227501.730	Code: Desc:	>
<u>IN</u> →	156	1975668.233	227517.933	Elev:538.413	T:2022-12-15 10:	54:37
<u>IN</u> →	155	1975684.696	227535.317	156 Enter		
<u>IN</u> →	154	1975685.769	227547.033	N:1975668.233 E:227517.933	Code: Desc:	>
<u>IN</u> →	153	1975687.044	227554.311	Elev:538.883	T:2022-12-15 10:	54:37
<u>IN</u> →	152	1975688.185	227564.322	N:1075694 696	Code:	
<u>IN</u> →	151	1975689.786	227578.493	E:227535.317	Desc:	>
<u>IN</u> →	150	1975691.234	227538,845	Elev:537.724	T:2022-12-15 10:	54:37
<u>IN</u> →	149	1975693.298	227602.046	154 Enter N:1975685.769	Code:	>
<u>IN</u> →	148	1975695.040	227603.051	E:227547.033	Desc: T-2022-12-15 10:	54:37
Im	port	Export	Add	Import	Export	Add
	•	•		•	٠	

2.7.9 Hide GNSS base points

This function can **Hide** GNSS points. Click **Hide** GNSS base points to hide them, click **Show** GNSS base points to show them.



2.7.10 Time asc.

This function can sort points in time ascending order. Click Time asc to sort points in time ascending order, also can click Time desc to sort points in time descending order.



2.8 Lines

Click Add to add different types of lines, including Line, Polyline, Arc, Circle and Alignment.

٢	Click to	connect		÷	GEOMATE-	Lines	÷	GEOMA	TE-Lines	
Project	Survey	Stakeout	Tools							
Proj	ects		>							
CRS			>				Γ.	1997		
No Poin	ts		>				P	ine olyline		- 1
∫ _☉ Line	S		>				- 4	irc		- 1
Do Surf	aces		>				c	lircle		- 1
Road	ds		>				A	lignment		
Code	eLíst		>							
🛃 Impo	ort		>							
d" Con	₽ •		nte		Add	1			Add	

Line:

Click Add to select Line, enter the following new interface to create a line. There are two Methods including Two Points and One Point + Azimuth + Length. Two points, user should input Name, North, East, and Elevation. The other way, user should input Name, North, East, Elevation, Azimuth, Length and Slope.

← GEOM	ATE-Add Lin	ie		← GEOM	IATE-Add Lii	ne	
Mode				Mode			
Line(2 points)			\sim	Line(point+azim	uth+length)		\sim
Start point		å	≔	Start point	CAD	2	:=
Name				Name			
Map_1				Map_1			
North(N)				North(N)			
3453364.248 m				3453296.730 m			
East(E)				East(E)			
611463.126 m				611501.552 m			
Elevation				Elevation			
0.000 m				3.600 m			
End point		凸	≔	Azimuth			
Name				090:00:00.000			
Map_2				Length			
	Save				Sava		

After setting the above values, click **Save**, a line can be created. Users can check the graph by clicking the rectangle button and inverse the direction by clicking the arrow button.





And there are 3 methods to select one point, including from CAD, from point survey and from point lists.



(1) **Delete:** Select a line, right slide to click **Delete**, and then it will pop up a dialog box "Delete Selected item?" Select **OK**, remove this record; select **Cancel**, do not delete this record.





Also, users can click the flag button to stakeout the selected line.

(2) Detail: Select Line, click Edit to view detailed information about the selected line.

÷	GEOMAT	E-Lines	← GEOMATE-Edit Line	
		Line Map_1-Map_2	Parameters	3 2
Û		K0+000.000-K0+034.854 2D:34.854m 3D:34.854m	Name	
		2D:34.854m 3D:34.854m	Map_1-Map_2	
			Start station	
			0.000 m	
			Mode	
			Line(2 points)	
			Start point	5 ≔
			Name	
			Map_1	
			North(N)	
			3453434.883 m	
			East(E)	
			611447.270 m	
	A	dd	Save	

Polyline:

Users input the name of the polyline, start station distance, and select points. Click **Up** and **Down** to adjust the order of the points.





Arc:

Users input the arc name, start station distance. Select the arc mode and input values as the mode needs.



Circle:

Users input the circle name. Select the circle mode and input values as the mode needs.



Alignment:

Users can click Add to create Line, Left arc and Right arc.





Input Length, Start offset, Start North, Start East and Azimuth if using specified azimuth. Click OK to finish adding.



Add

Click rectangle icon on the upper right to see the graph.



2.9 Roads

Please check Roads at Chapter 6. Road



3 Config

3.1 Connect instruments

For device connection.



(1) GNSS

GNSS table is for receiver connection.

Type:includes: RTK, Android location, Simulation.

Simulation: Enter simulation mode, and then users can use or test all the functions of this software.

Meanwhile, the function can simulate position by inputting coordinate.

Contact type: Including the choices of Bluetooth and WiFi.

← Conne	ect instrument	ts	← Conne	ct instrumen	its
GNSS	Pe	ripheral	GNSS	P	eripheral
Туре	RTK		Туре	RTK	~
Contact type	Wi-Fi		Contact type	Bluetooth	~
Antenna type	SG7	\rightarrow	Antenna type	SG7	\rightarrow
Target			Target		O Search
GNSS-3469	9140	>	🛞 GNSS-347	9379	0
			(8) GNSS-349	3339	0
			(8) GNSS-341	1955	0
			(8) GNSS-346	9140	0
			(8) GNSS-346	1666	0
			(8) GNSS-999	7752	0
	Connect			Connect	

Antenna Type: Click **Antenna Type List**, select antenna type (Users can select antenna type of different products in different manufacturers). Users can handle specific item by clicking **Add**.



Target: While using Bluetooth connection, click **Search** to the interface of Bluetooth. Select Bluetooth management, click **Refresh** to find the device to Pair (Default password is 1234 if it's required to input). When the pair is successful, just turn back to the connection interface. Then click **Connect**. When the connection is successful, users will back to config interface. While users use **WiFi** connection. Click **Search**, then it will show users **WLAN** interface. Click **Refresh** to find the SN of current receiver, input password (Default password is 12345678), then click to connect the target. When the connection is successful, just turn back to the connection interface. Then click **Connect**. When the connection is successful, users will back to config interface. Then click **Connect**.

Connect: Click to start connection.

Disconnect: Break the current connection.

GN	SS Perip	oheral
Туре	Pipeline detector	~
Model	vLoc Pro2	
Target		Search
B GNSS	-3479379	С
GNSS	-3493339	С
GNSS	-3411955	С
TIGGO	С	
GNSS	С	
GNSS	С	
B GNSS	-9999752	С

(2) Peripheral

Peripheral table is for peripheral device connection.

Type: Including the choices of Pipeline Detector, Laser Rangefinder.

Model: Including the choices of vLoc Pro2 and Simulation.

Simulation: Enter simulation mode, and then users can use or test all the functions of this software.

Meanwhile, the function can simulate position by inputting coordinate.

Target: While using Bluetooth connection (Suitable for i80 and GNSS receiver), click **Search** to the interface of Bluetooth. Select Bluetooth management, click **Refresh** to find the device to Pair (Default password is 1234 if it's required to input). When the pair is successful, just turn back to the connection interface. Then click **Connect**. When the connection is successful, users will back to config interface.

Connect: Click to start connection. **Disconnect**: Break the current device connection.

3.2 GNSS rover

Main screen of GNSS rover displays the configuration of the current equipment, including the receiver setting and device operating modes. In most cases, we use the common and specific operation mode to meet the daily trial.

3.2.1 NTRIP

Click **New** to create a work mode and choose **NTRIP** table.



Name: Enter a name for this work mode.

Network: Choose a model for supplying internet. Include PDA network and Receiver network.

Domain/IP: input the corresponding **Ntrip IP**.

Port: input the corresponding Port.

Select a server: you could add a server and save it. Next time you can choose it in this interface.

Add se	erver
Name	
Domain/IP	
Port	
Cancel	Save

Get Mountpoint: get the Mount point.

Mount point: choose a Mount point you need

Username: The name of user's Ntrip account.

Password: The password of user's Ntrip account.

Save: just save this work mode.

Save&Accept: save and apply this work mode.

If you click Save&Accept, it will pop up "Accept successfully, check detials?" Click **OK** to enter **Instrument Info** interface.

← Instr	ument info 🕴
Instrument type	RTH
PN	A1931943090106000
SN	3469140
Firmware	1.2.5.4 21893
Expiration date	Permanen
GNSS rover\base	Auto GNSS rove
Data link	PDA networkNTRIF
IP	211.144.118.5
Port	2102
Mountpoint	RTCM3.2
NTRIP username	t t
NTRIP password	***
NUMBER 1	Iccessfully

Users can see whether Ntrip login successfully and the reason of why login failed. For example:

- (1) When it prompts "Requesting...", Matesurvey is receiving login messages from the receiver.
- (2) When it prompts "No SIM Card!", users need to input SIM card in receiver first.
- (3) When it prompts "3G Module is Dialing, Please Wait...", users need to wait till 3G module dials up successfully. If users wait for a long time and still can't login successfully, users need to check status of 3G module and activate 3G module dialing up function.
- (4) When it prompts "User name and password error!", users need to check current user name and



password and input correct one.

Then the green LED will be flashing and the status will come from **Single** to **Fix**, which means the rover is getting the correction data.

3.2.2 APIS

Click **New** to create a work mode and choose **APIS** table.

Name: Enter a name for this work mode.

Network: Choose a model for supplying internet. Include PDA network and Receiver network.

Domain/IP: input the corresponding **APIS IP**.

Port: input the corresponding Port.

Select a server: choose a server. Or you could add a server and save it. Next time you can choose it in this interface.

GNSS base SN: Enter the serial number of base receiver.

Save: just save this work mode.

Save&Accept: save and apply this work mode.



Then the green LED will be flashing and the status will come from **Single** to **Fix**, which means the rover is getting the correction data.

3.2.3 Radio

Click New to create a work mode and choose Radio table.

Name: Enter a name for this work mode.

Protocol: Select a protocol. Include Transparent, TT450, SATEL_3AS.

Step Value: 25kHz or 12.5kHz optional, it will only display supported step value of receiver. **Baud**: 9600 or 19200.

Channel: different channel will show different frequency. And also can be customized.

Frequency: normally can't be changed and if you choose User defined, you can change it.

← GEOMA	TE-Radio
Name	
Radio_1	
Datalink params	
Protocol	
Transparent	~
Step value	
25KHz	~
Baud	
9600	
Channel	
1	~
Frequency	
456.0500MHZ	
Sensitivity	
High	~
Save	Save&Accept

Sensitivity: set as default

Call Sign: if you open it, the signal will transmit the message.

FEC: enable or not, if you need it.

Transfer differential data: Forward data through Bluetooth, Serial Port, and WiFi.

When users choose Bluetooth/WiFi, correction data in current device will be forwarded to Bluetooth/WiFi, so that other devices can receive the correction data by connecting the Bluetooth/WiFi of current device.

When users choose serial port, correction data in current device will be forwarded to serial port, users can not only connect current device to computer by serial port and view correction data, but also connect current device to external radio.

← GEOMATE-Rad	lio
Name	
Radio_1	
Baud	
9600	
Channel	
1	× 1
F Bluetooth	
Wi-Fi S	
H Serial port	
Call Sign	
	>
Transfer differential data	
То	
Bluetooth	~
Save	Save&Accept

Save: just save this work mode.

Save&Accept: save and apply this work mode.

Then the green LED will be flashing and the status will come from **Single** to **Fix**, which means the rover is getting the correction data.

3.2.4 TCP

Click **New** to create a work mode and choose **TCP** table.

Name: Enter a name for this work mode.

Network: Choose a model for supplying internet. Include PDA network and Receiver network. Domain/IP: input the corresponding IP.

GE@MATE

Port: input the corresponding Port.

Select a server: you could add a server and save it. Next time you can choose it in this interface. **Save**: just save this work mode.

Save&Accept: save and apply this work mode.

Name	
TCP_1	
Data link params	i -
Network	
PDA network	~
	Select a serve
Domain/IP	
Domain/IP	
Port	
Port	

Then the green LED will be flashing and the status will come from **Single** to **Fix**, which means the rover is getting the correction data.

3.2.5 PPP

Click **New** to create a work mode and choose **PPP** table. **Name**: Enter a name for this work mode.

÷	РРР
Name	
PPP_1	
Save	Save&Accept

3.2.6 From cloud

Click an icon like "cloud" and then select From cloud to into cloud interface.

From cloud: Select a project, click the arrow, the project will be downloaded from cloud server, and it will be listed in **Projects** interface.

3.2.7 From sharing code

Click an icon like "cloud" and then select From sharing code to into cloud interface.



Cancel: cancel this operation.Get: input the sharing code to get the project.Use: click use to use this project.



3.3 GNSS base

Main screen of GNSS base displays the configuration of the current equipment, including the receiver setting and device operating modes. In most cases, we use the common and specific operation mode to meet the daily trial.

3.3.1 Internal radio

Click New to create a work mode and choose Internal radio table.



Name: Enter a name for this work mode.

Differential format: Select RTCM3.2.

Protocol: Select Transparent.

Step Value: 25kHz or 12.5kHz, the value depends on the receiver.

Baud: 9600 or 19200.

Transmitting power: Select the radio power of the base receiver.

Channel: different channel will show different frequency. And also can be customized.



Frequency: normally can't be changed and if you choose User defined, you can change it.Sensitivity: set as defaultCall Sign: if you open it, the signal will transmit the message.Elevation mask: 10.

Name	
Internal radio_2	
Data link params	
Differential format	
AUTO	~
Protocol	
Transparent	\sim
Step value	
25KHz	~
Baud	
9600	
Transmitting power	
2W	~
Channel	
1	~
Frequency	
456.0500MHZ	
Sensitivity	
High	
Call Sign	
	>
Elevation mask	
10	

Start on a known position: ON or OFF. When you click accept, you will come into an interface to input the information.

*	
no	
	>
() si	ant H
8	
	~

Save: just save this work mode.

Save&Accept: save and apply this work mode.

3.3.2 External radio

Click **New** to create a work mode and choose **External radio** table. **Differential format**: Select RTCM3.2. **Baud**: 9600 or 19200.



Elevation mask: 10.

Start on a known point: ON or OFF. When you click accept, you will come into an interface to input the information.



Save: just save this work mode.

Save&Accept: save and apply this work mode.

3.3.3 Receiver network

Click New to create a work mode and choose Receiver network table.

Name: Enter a name for this work mode.

Differential format: Select RTCM3.2.

Select a server: choose a server.

Elevation Mask: The angle is set for shielding obstruction. The satellites lower than this angle will not be tracked, the default is 10.

Name	
Receiver network_1	
Data link params	
Differential format	
AUTO	~
	APN Select a serve
Domain/IP	
Domain/IP	
Port	
Port	
Elevation mask	
10	
Start on a known positior	n O

Star on a known position: ON or OFF. When you click accept, you will come into an interface to input the information.

3.3.4 Receiver network + external radio

Click New to create a work mode and choose Receiver network + external radio table.

Name: Enter a name for this work mode.

Differential format: Select RTCM3.2.

APN: APN setting, you can see more details in 4.9.

Select a server: choose a server.

Elevation Mask: The angle is set for shielding obstruction. The satellites lower than this angle will not be tracked, the default is 10.

Name	
Receiver network + extern	nal radio_1
Data link params	
Differential format	
AUTO	~
	APN Select a serve
Domain/IP	
Domain/IP	
Port	
Port	
Baud	
9600	\sim
Elevation mask	
10	
Start on a known position	0

Star on a known position: ON or OFF. When you click accept, you will come into an interface to input the information.

3.4 GNSS static

Start logging: click it to get right to edit the settings.

Automatically log when the receiver is turn on: if you choose this function, it will automatically to record the static data when it turns on.

Interval: Including choices of 1HZ, 2S, 5S, 10S, 15S, 30S and 1M.

Elevation Mask: The angle is set for shielding obstruction. The satellites lower than this angle will not be tracked, the default is 10.

Logging duration(mins): Input duration time as you wish, the default is 1440.

Station name: Input station name, the default is the SN of connected device.

Antenna Height: Input antenna height, the default is 0.

Antenna height measurement method: Including choices of Slant Height, Phase Height, Vertical Height, and the default is Slant Height.

RINEX: Choose the type of RINEX data, includes 2.11,3.0x or choose close.

Compressed RINEX: choose to compress or not.

Start logging	0
Automatically log when the turned on	e receiver is
Interval	
1HZ	
Elevation mask	
10	
Logging duration(mins)	
1440	
Chainage Name	
3469140	
Antenna height	
1.600 m	
Antenna height measure	ment method
Vertical H	

3.5 Instrument info

After connecting between controller and receiver, MateSurvey will read out the receiver information, such as device type, serial number, expire date, work mode, datalink and so on.

← GEOMATE-I	nstrument info 🚦	← GEOM	ATE-Instrument info
Instrument type	RTK	Instrument	Activate instrument
PN	A1931943090106000 2	PN	Reset receiver
SN	3469140	SN	Modify data link
Firmware	1.2.5.4 21893	Firmware	Disconnect PDA network
Expiration date	Permanent	Expiration c	Liporade firmware
GNSS rover\base	Auto GNSS rover	GNSS rover	Upgrade CNSS heard firmware
Data link	PDA networkNTRIP	Data link	opgrade GN35 board Inniware
IP	211.144.118.5	IP	RIK mode
Port	2102	Port	2102
Mountpoint	RTCM3.2	Mountpoint	RTCM3.2
NTRIP username	b	NTRIP userr	name b
NTRIP nassword **** NTRIP login successfully.		NTRIP passy NTRIP log	word *****
Refresh			Refresh

Activate instrument: Click Register then the interface of "Please Input Reg Code" will appear. If you need the code please contact with regional sales manager or dealer.

Reset receiver: Click to reset the receiver main board. Then, it will restart the receiver and star search.

Modify data link: Click to display the list of the **Work Mode** to modify the receiver work mode. **Switch radio off**: if you click it, just close the radio module.

Disconnect PDA Network: Click to break network when you accept receiver/PDA network mode. Then, receiver won't receive Ntrip/APIS messages.

Upgrade firmware: lick and choose firmware to update firmware for receiver, only support updating firmware via WiFi connection.

Update GNSS board firmware: Click and choose firmware to update firmware for receiver, only support updating firmware via WiFi connection.

RTK mode: There are three mode, n, f and a.

3.6 Output NMEA

This function is set for outputting NMEA messages for other external equipment. GNSS RTK can use Bluetooth, Port to connect receiver; smart RTK can use the Bluetooth, port or WiFi to connect receiver. When the config is modified, users need to click Set to confirm the setting is done successfully.

When users finish setting of one output mode, users can copy the setting parameters and paste it to other output mode if users want to apply the same setting parameters to another output mode.



When users use receivers and set GPGGA output via serial port as 1Hz, please make sure that baud rate sets 9600.

3.7 NFC/Wi-Fi

NFC, also known as short-range wireless communication, is a short-range high-frequency wireless communication technology, allowing electronic Non contact point-to-point data transmission (within 10 cm) is carried out between devices to exchange data.

Here, NFC has three functions: 1. WiFi, Bluetooth connection; 2. modify WiFi password. 3. software start function.

(1) Turn on NFC function

Use the NFC function of hce600 Android to make a detailed description

Click [settings] - [more...], and then open NFC. Some phones the HFC are switched on by default.



(2) Connecting the receiver

After the NFC function is turned on, lean the NFC function area on the back of the controller against the NFC logo of the receiver and touch it gently.

At this time, the system will automatically open the Bluetooth or WiFi of the controller to start the connection. If the connection is successful, there will be a sound prompt.

If the controller is the first time to connect to the receiver via Bluetooth / WiFi, just clickyou need to enter the Bluetooth / WiFi password.

Pair the connection manually, after that no need to input again. Connection method defaults to last time.



(3) Change WiFi password

Turn on NFC / WiFi, you can change the WiFi password of the current device, and follow the prompts below.

3.8 RTK KEEP

Click open to open this function. It can make your device keep fix solution even after you loose the differential data connection. The max time can be 10 minutes.





4 Software settings

4.1 Global settings

4.1.1 Keyboard shortcut

User can set different keyboard buttons for **Surveying**, moving to **previous point** or **next point**. The buttons include **NONE**, **Enter**, **Up**, **Down**, **Left** and **Right**.

GEOMATE-Software setting		← /board shortcut GE
Global settings		Measure
Keyboard shortcut	>	Enter\OK\Side measurement buttor
Sensors	>	Previous point
		NONE
Share method	>	Next point
Project settings		NONE
Units	>	
Decimals	>	
Coordinates	>	
GNSS	>	
rs	>	
Display settings	>	
Restore to default Save as defa	ult	

4.1.2 Share method

User can use different share methods for project files sharing, for example, you can share the project files by sharing code, or share by third APP.



4.2 Project settings

4.2.1 Units

Angle: displayed in dd:mm:ss.ssssss or Centesimal (gon).

Horizontal distance: displayed in Meter (m), U.S. feet (US) or International feet (intern.).

Vertical distance: the same as Horizontal distance.

Chainage: Users can choose to use chainage prefix or not. The prefix can be set as users wish. Format can be chosen from the pull-down menu.

Angle		
dd:mm:s	5.9555555	
Horizon	tal distance	
Meters(r	n)	\sim
Vertical	distance	
Meters(r	n)	
Chainag	le	
K0+000.	000	

4.2.2 Decimals

Users can set the display precision of Angle, Horizontal distance, Vertical distance, Area, Slope (%), and Lat/lon (dd:mm:ss.sssss) from respectively pull-down menu. The unit of Angle, Horizontal distance, Vertical distance here is identical with Units set in 4.2.1. And unit of Area is according to Horizontal distance. For example, here 4 means four decimal places.

Angle(dd:mm:ss.sssssss)	_
0.000	~
Horizontal distance(m)	
0.000	~
Vertical distance(m)	
0.000	~
Area(m²)	
0.000	~
Slope	
0.00	×
Lat/Lon(dd:mm:ss.ssssss)	
0.00000	

4.2.3 Coordinates



Users can choose coordinates format between North, East and East, North.



4.2.4 GNSS

4.2.4.1 Survey

• Accuracy check

Users can modify **H tolerance**, **V tolerance**, **Diff age**, and **Max PDOP** respectively. The defaults of them are 0.030 m, 0.050 m, 5, and 4.000 respectively. Users can decide whether to "Store only in fixed" or not.

• Store

Users can modify **Auto increment name interval, Measurements**, and **Warn if measurement average exceeds**, respectively. The defaults of them are 1, 5, and 0.100m respectively. Warn if measurement average exceeds will be used when user set observation times to 2 or more. If the horizontal distance from current measure to the 1st measurement >0.1m (depends on user setting), the software will pop up: The rover may be moved.

Users can decide whether to "Confirm before saving" or not.



• Code

Users can decide to open "Use quick codes" or not.

Users can create new code with the same name layer or not.

• PPK

Users can decide to log PPK data or not.

Miscellaneous

Users can decide to respectively open "Show average report after measure", "Log epoch coordinate", and "Show E-Bubble" or not. Users can also decide on the Geometry factor number.

There are two ways to "**Save track**", one is "**By time**" where the unit is sec, and another one is "**By distance**" where the unit is meter. The default is by 5 sec.

÷	GEOMATE	E-Settings	
Survey	Stakeout	Surface stakeout	Ro
Survey	method		
Topogra	aphic point s	urvey	/
		o	-
Code			
Use qui	ck codes	C	
Create r layer	new code wit	h the same name 🧲	0
РРК			
Log PPK	(data	C	
Miscella	ineous		
Show av	verage report	after measure	
Log epo	ich coordinat	e 🤇	0
Geome	try factor		
1			
Show E-	Bubble	C	



4.2.4.2 Stakeout

• Store

Users can modify 'Points name prefix' and decide whether to use 'Chainage as point name'.

• Tolerance

Users can modify '**Stakeout tolerance 1, 2, and 3**' respectively. Three different tolerances are available to be set with different degree of urgency sound prompts. The smaller the number is, the smaller the tolerance shall be set.

Miscellaneous

Users can decide to respectively open "Auto Zoom" "Use PDA compass", "Remove staked points from list after stakeout", "Previous/Next skip staked points", "Stakeout survey points" and "Search the nearest point from the stakeout list only "or not. When opening "Use PDA compass", please do as the pop-up window says.

← GEOMATE-Settings				← GEOMATE-Settings				
Survey	Stakeout	Surface stakeout	R	Survey	Stakeout	Surface stake	out	Ro
Store				Tioleran				
Point r	ame prefix		Stakeout tolerance 1					
STK				0.050 h	1			
				Stakeo	ut tolerance	2		
Chainag	je as point na	ime 🧲	O	0.500 m	1			
Toleran	ce			Stakeout tolerance 3				
Stakeout tolerance 1				1.000 m				
0.050 m				Miscellaneous				
Stakeo	ut tolerance	2					-	~
0.500 n	n			Auto zo	om		-	2
Stakeout tolerance 3				Use PDA compass				
1.000 m				Remove staked points from list after				
Miscella	aneous						_	~
Auto zo	om		D	Prévious	s/ivext skip s	taked points	-	2
			-	Stakeou	t survey poir	its	0	
Use PD/	A compass		U	Search t	he nearest p	oint from the	0	
Remove staked points from list after				stakeout list only				

4.2.4.3 Surface takeout

Users can open "Voice prompt" to give voice prompt after the fill/cut within the range of tolerance.

Users can modify "**Tolerance**" to check tolerance value before store.

Users can open "Display cut/fill in fixed solution only" or not.

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4.2.4.4 Road

Users can open "Display all roads" or not.

Users can open "Stakeout main points" or not.

If users open "Realtime chainage as point name", the real-time station is input as point name.

If users open "Enter chainage as point name", users should enter station as point name.

Users can modify "Along offset tolerance of cross-section" and "Length of cross-section reference axis".

If users close "Horizontal extension elevation", use outmost string slope instead of elevation would be displayed.

If users close **"From smaller to larger chainage**", please stakeout from larger chainage to smaller, otherwise from smaller to larger.

Users can choose "Chainage calculation model" between "Smaller chainage" and "Larger chainage". This function will be used when the software is calculating the mileage from current receiver position. If current position has two mileages on the road, display the smaller/larger chainage.





4.2.5 Display settings

Users can decide whether to display "**Point name**", "**Point elevation**", "**Point code**" and "Line name" or not. "Text size" can be adjusted from 1 to 10.

Users can also decide whether to turn on"Display coordinates after select a point" or not.



5 Survey

5.1 Site calibration and base shift

5.1.1 Site CAL

When the correction parameters of application points prompt "abnormal ratio for flat correction" or "residual value is too large", we suggest check the control point that participate point correction input wrong or not, whether match control point or not. If users confirm there is no error, please continue operations.

Assuming there are some known points K1, K2, K3, K4, and find the field position of known points. After that measure corresponding points 1,2,3,4 in the case of the base station does not move.

Site calibration: Click to enter point calibration interface.



Vert.adjustment Method: Include Inclined plane, Constant adjustment, Surface fitting. Default plane fitting method is Inclined plane.

Add: Click to select correspond GNSS points and Known points. Select Horizontal + Vertical Calibration. The best choice is to choose 3 couples of points based on actual situation.

user can select Known Point or input Known Point coordinate. Then click **NEXT** until all necessary points have been selected.

	Ъ	GNSS point	≡ 8		
Vert. adjustment method		Name			
Inclined plane	\sim				
Method GNSS p Known	H.Resid[V.Resid[.	Latitude(B)			
		000:00:00.00000N			
		Longitude(L)			
		000:00:00.00000E			
		H(H)			
		Known point			
	6	Name			
		North(N)			
Scale Fact	or:				

Calculate: Click **Calculate**. The software will prompt "Horz.adjust successfully". After that click **OK**, it will make current calculated correction parameters apply in the coordinate system which can affect into the whole project.



Click **Export/Import**, so users can export .Loc file from current controller/project and import the .Loc file into other controller/project.

← G	EOMATE	-3-5	Site c	alibration	:	÷	GEOMATE-3-Export		
Guide mode						File name			
Vert. adjustment me						GEOMATE-3-Site calibration			
Incline	d plane		export			Туре			
Method	GNSS p	Kr	Imp	ort		LOC	×		
✓ H ✓ V	19	1	10	0.000	0.000	Share			
							AExportFolder		
						1.	AMateSurveyShareCodeFolder /storage/emulated/ /)1AMateSurveyShareCodeFolder		
						1	AShareCodeFolder /storage/emulated/0/1AShareCodeFolder		
					٢	14	ASharingCodeFolder		
	Scal	e Fa	ctor:1	.0000		1	A分享文件夹 /storace/omulated/0/18公宣女/性生		
	Add		T	Accep	ot		Export		

5.1.2 Base shift

When moving or setting up the base again in **Auto Base** mode, **Base Shift** is required to ensure all the current points are belong to the same coordinate system as before.

Calc: Click to enter base shift interface. In base shift Interface, click the icon beside Measure Point to select a current point surveyed at a control point, click Next to select the corresponding control point. The calculation results would show automatically. Then click **Accept**. The software prompts "Accept base shift Parameters?" click **OK**, then the software prompts "GNSS Base and related points were shifted successfully, open points manager?". Click **OK**, the point library is opened and the plane coordinates are changed because shift parameters have been applied to all the points surveyed under this base.

÷	GEOMATE-Base shift
Shift v	value
N shif	t
E shif	t
H shif	ît
GNSS	Base
-Ģ́-	 Find a control point in the survey area and measure it. Enter gird coordinates of the control point. Calculate and accept the shift values. After that, the receiver will starts to work on the right coordinate system. You had better find another control point and check the coordinates. Note: The function is used when you own a CNSS base
	No need it when using NTRIP.
	٢
	Calc Accept

5.2 Map Survey

Users could select the type of antenna height and input the value. Click OK.



Vertical H: The height from ground point to the bottom of receiver. When using range pole, the vertical height is the pole height.

Slant H: The height from the ground point to static measurement tick mark (X91+ is the blue rubber ring, smart receiver is to the auxiliary H.I. tool) of receiver, usually this height is needed when setting up the receiver on a tripod.

In survey, users could **manually** input the point name or let the system create it **automatically** according to name step size.



÷	21/21		H: 1.455 V: 1.414	÷	MateSurv	vey-Sett	ings	
Name	27		¶∃ 1.600 >	Survey	Display	Tools	IMU	E-Bub
Code >		v Se ortike	Point >	Survey	method			
ත		25	146.165	Topogr	aphic point	survey		~
**		2.01	\bigcirc	Accurat	y check			
-8				Horizo	ntal tolerar	nce		
and and			(e)	10.000	m			
	C. C.		1 Jak.	Vertica	l tolerance			
23 -	N. W.	in .	No. 1	10.000	m			
YK XK		5.3	\times	DIFF ag	ge			
*	8 223	1 1	A	10 Seco	ond			
State of the second	al al	AN STR	A C	MAX P	DOP			
				6.000				
				Store fix	ed solution	s only		
	1/m	The second	1955 3 3	Store				
		K Z		Auto in	ncrement n	ame inter	val	
	13	Sale -		1				
	$\langle \rangle$			Measu	rements			

Users could select survey type between point and line.



Uses could add the new type.

← MateSurvey	-New
Main Data	
Name	
Enter a name.	
Drawing type	
Point	~
Desc	
Enter a description	
Symbol	
Create a lay	er with the same name
Layer color	
Line type	
GIS Attributes	>
ок	

In line survey, if users open Confirm before saving, they should give the line name after the



start point is measured. In next points, they could name new line name or choose from the existing list before saving it.



 \mathbb{N}^n icon opens the line manager. Users could select a line to continue drawing or add a new line. Right slide to get more operations: delete, complete, invert, and rename.

← eSurvey-Drawi	ngs manager	← vings manager	Mat		
Active	Completed	Active	Completed		
1 Code:Pipeline Points:0 Name:1		@ ₽ ∿	Points:0 Name:1		
Add	Continue	Add	Continue		

icon defines the map type to display.

 $\frac{3}{5}$ icon moves the current point in the center of the screen.

icon is the full-screen display button.
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i icon opens four cells to display. Users could select in each cell what they want to display.



		~	2
N	0.000	E	0.000
Elevation	-1.023	PDOP	3.705
DIFF age	0	2D dist.	3279396.390

icon is the same like in Error! Reference source not found.Error! Reference source not found..

P Icon shows batteries condition of the Rover.

÷	Average	-3-Battery
Rover		
	Battery A	Battery B
	97%	99%
Base		
E	attery A+B	
(0%	

5.3 Point survey

5.3.1 Interface of the Point Survey

The antenna height, point name, and code parts are the same as those in map survey. Here users could also add a **description** of the points (Code).



	×	2
Ν	0.000 E	0.000
Elevation	0.000 PDOP	0.000
DIFF age	0 2D dist.	

Users can click the gear icon ⁽²⁾ to change the settings in	the survey of point.
---	----------------------

Format:Local N/E/Elev >

User can also change the **format** of points by clicking Fomat button



Users can also change the different way of surveying the point by clicking

 \bigotimes



Users can locate where they are using this button

Click the _____, you can hide or show the display of the point parameters.

13:10:25 ■	n 41 65	13:02:24 🧧	© № ¥ 20	₩ 🧙 🎟 491 660
← Click to connect		÷	Click to connect	
Name 1	1.800 >	Name 1		¶± 1.800 >
Code > 🔻 •	Point	Code ゝ	•	 Point
Format:Local N/E/Elev >		Format:Lo	cal N/E/Elev >	
•• Local N: Local E: Elev:	\mathfrak{P}	••• Local N: Local E: Elev:		$\langle \! \! \ \rangle$
DIFF age(10Second): PDOP(6.000): Distance:		DIFF age PDOP(6.0 Distance	(10Second): 000): :	

				Z
	Ν	0.000	E	0.000
9	Elevation	0.000	PDOP	0.000
	DIFF age	0	2D dist.	

Click the parameters to change the displayed parameter.





5.3.2 Settings

When we want to change the detailed settings of the point survey, you can click the gear icon $^{\textcircled{3}}$.



Survey: when doing the survey job, you can choose three different survey methods: Topographic point survey, Continuous survey and the Control point survey.

1) Topographic point survey:

when you choose this way, change the horizontal and vertical tolerance to the number that you need. Also, can change the maximum differential delay. If you only want the fixed data and high accuracy data, you can only store the fixed data.

13:15:26 🔳		0 10 * 2	۵№≭‱ ? ₪ %II						
÷	GEOM	ATE-Set	tings						
Survey	Display	Tools	IMU	E-Bubble					
Survey me	Survey method								
Topograph	nic point su	rvey		~					
Accuracy c	heck								
Horizonta	l tolerance								
0.030 m									
Vertical to	lerance								
0.050 m									
DIFF age									
10 Second	ł								
MAX PDO	Р								
6.000									
Store fixed	solutions o	only							
Store									
Auto incre	ment name	e interval							
1	1								
Measuren	nents								
5 Second									
Offset war	Offset warning								
Warn if m	easuremen	t average	exceeds						
0.100 m									

If you change the Auto increment name interval number, when you finished a survey of point, the name of next point will be automatically increasing the number that you set.

Measurements: the time that you survey a point.

Offset warning: warn if measurement average exceeds

You can also choose to create new code with the same name layer. Also, can log the PPK data when you measure a point.

After the measure, you can choose to show the average report and log epoch coordinate for the point.

13:26:37 💼			© N ¥ ² k	\$ N \$ 2000 ♀ 100 1511 @		
÷	GEOM	ATE-Set	tings			
Survey	Display	Tools	IMU	E-Bubble		
Survey m	ethod					
Topograp	hic point su	rvey		\sim		
5 Second						
Offset war	ning					
Warn if m	easuremen	t average	exceeds			
0.100 m						
Confirm be	efore saving	ſ		\bigcirc		
Code						
Use quick	codes			\bigcirc		
Create nev	v code with	the same	name lay	er 🌔		
РРК						
Log PPK d	ata			\bigcirc		
Miscellane	eous					
Show aver	age report a	after meas	ure	\bigcirc		
Log epoch	coordinate					
Geometry	factor					
1						
Show E-Bu	bble			\bigcirc		

2) Continuous Survey:

you can change the measuring mode from time to distance2D, distance3D or Delta H. As you change, it also changes the principle of interval for recording data.

13:27:38 🧧)		© № ¥ 0,	ᅇ ᅇ ᅇ ᅇ ᅇ ᅇ ᅇ ᅇ	13:27:41 🔳)		© N ¥ %	‱ 奈 ₪ ╬I ֎)
÷	GEOM	ATE-Sett	ings		÷	GEOM	ATE-Set	tings	
Survey	Display	Tools	IMU	E-Bubble	Survey	Display	Tools	IMU	E-Bubble
Survey m	ethod				Survey m	ethod			
Continuou	is survey			\sim	Continuou	us survey			~
Accuracy of	heck				Accuracy of	check			
Store fixed	solutions o	only			Store fixed	solutions c	only		
Store					Store				
Auto incre	ement name	e interval			Auto incre	ement name	e interval		
1					1 Time				
Mode					N				
Time				\sim	T	ice 2D			
Time inte	rval				T Distan	ice 3D			
1.0 Secon	d				1 Distan	ice 2D or delt	аH		
Code					10				
Create nev	v code with	the same	name lay	er 🌔	Create nev	v code with	the same	name lay	er 🌑
РРК					РРК				
Log PPK d	ata			\bigcirc	Log PPK d	ata			
Miscellane	eous				Miscellane	eous			
Show E-Bu	bble			\bigcirc	Show E-Bu	bble			

3) Control Point Survey:



13:28:26 🧧			0 № ¥ %	0 N ≭ ‱ ? 🖬 4:11 ⊗				
÷	GEOM	ATE-Set	tings					
Survey	Display	Tools	IMU	E-Bubble				
Survey me	Survey method							
Control po	pint survey			~				
Accuracy of	heck							
Measuren	nents							
1								
Survey po	ints numbe	er						
60								
Epoch me	asurement	s						
1 Second								
Horizonta	l tolerance							
0.020 m								
Vertical to	olerance							
0.030 m								
Epoch hor	izontal tole	rance						
0.020 m								
Epoch ver	tical tolera	nce						
0.030 m								
Time dela	y after fixe	d						
15 Second	ł							
Max PDO	Р							
4.000								

Horizontal/Vertical Tolerance: Determine the accuracy of the received data. DIFF Age: Acceptable differential time. MAX PDOP: Maximum position accuracy.

(1) **Display**: any display options will be in this interface. You can change the snap settings to choose the point you want. The background color also can be changed to black or white.

13:29:46 🔳	ļ.		0 N ≭ 🕷	ي 19 ڪ انڊ سو
÷	GEOM	ATE-Sett	ings	
Survey	Display	Tools	IMU	E-Bubble
Snap settir	ngs			
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Labels dis	olav settings			

If you want the display of the line width and the line nodes, you can turn these buttons on. When opening a CAD map, you can change the unit and the coordinate system.



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Line name				
Text size			•	3/10
Display co	ordinates af	ter select	a point	\bigcirc
WFS featu	re color			

Different layers can be created, and you can choose to display different type of points and change the display of labels.

(2) **Tools**: Select and unselect different items, then put it on the left side of the point survey interface.



CAD View: Open this data base in the CAD view.

Points Manager: At this manager, you can import, export and add points you want. Also, we can choose the points you want to stake.

Offset Survey: Choose your reference point, generate new points according to your offset, azimuth, or the way two points meet

Map Survey: Open this points base in the map survey interface, so you can change the auto center or the follow mode.

(3) **IMU**: you can choose to use the IMU or not and can activate the IMU button and choose to show the button or not. if you want other frequency, you also can change the outputs option.





(4) **E-Bubble:** If you turn on the auto measurement button, after the leveling of the pole, it will immediately measure automatically. The E-bubble sensitivity and response will affect the tilt warning, when the tilt reach the limit of the sensitivity, it will response.



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Tilt warnin	g						
E-Bubble	sensitivity						
8 Minute							
E-Bubble	response						
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5.3.3 Control survey

Control points would take **long** time to observe, but it could provide high precision result. Users could adjust parameters for survey and click **Next** to start control survey. After measuring is finished, users could check its attribute, then click **OK** to finish.

5.3.4 PPK survey

Users could choose **Interval**, **Elevation mask**, and **Observation time** as they wish. Click **Next** to enter PPK mode. Click PPK icon to start PPK measure.



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5.3.5 Continuous survey

Continuous survey automatically accords to a preset fixed **time period** or **space distance**. There are four modes to select.



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5.4 CAD view

Open the software, select the CAD view module to view the CAD file.



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Data	Draw	Measure

5.4.1 Open CAD file

Click icon

icon to open the file manager

select the file to be opened, and then click **open**.

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click to choose From cloud or From sharing code to upload the file to be downloaded.



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Data Draw Measu	Draw	Data

5.4.2 Side bar

- 1) 🗳 Load the map
- 2) C Refresh the CAD file
- 3) Snap to object

Users can long press the button to modify the snap settings.



After snap a object you can click stakeout this button to jump to stakeout function.

- 4) Full data display of collected data and CAD graphics
- 5) The current position is centered
- 6) Point Stakeout button, directly input point coordinates



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7) Buttons for layer display control





8) 🍄 Set button

You can set the Snap settings, CAD settings, Layers, Points display settings, Labels display settings.

5.4.3 Tools

There are three modules at the bottom of the interface: Data, Draw, Measure

	1	×	
Data	Draw	Measure	

1) Data

Delete : Select an object or an area, and delete them from the CAD file.

Export Dxf : Export the CAD file in DXF format, and can choose the Filter type of Survey, Enter,

Control, Base.





2) Draw

Can draw the Point, Line, Polyline, Arc, Circle, Circle 2points, Circle 3points, Text,



3) Measure

Can select the points and measure their distance, angle, area.



Open the software, select the survey module and click [CAD Stakeout] to enter the CAD Stakeout. When there is no stakeout task, the upper left navigation area displays NEH coordinates by default.

Snap point button

⁺ Point Stakeout button, directly input point coordinates

The current position is centered

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└ ┘ Full data display of collected data and CAD graphics



Buttons for layer display control

Explode polyline and block

5.5 Point Stakeout

First of all, we need to open a project or create a project before we start the point stakeout





In this case, we will use a CAD file as simple.



From **points library**: Select a point from points library ,you can also add a point manually, or import/export the point file in this faction .

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Points		Points	to be st	aked
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IN example	_1 Enter			
N:3237774.568	Code:			×
E:515799.165	Desc:			
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IN 1 Enter				
N:1975662.347	Code:			
E:227480.801	Desc:			
Elev:538.306	T:2022-1	2-15 10:54:	37	
IN 2 Enter				
N:1975659.565	Code:			\
E:227471.423	Desc:			
Elev:538.210	T:2022-1	2-15 10:54:	37	
IN 3 Enter				
N:1975659.485	Code:			
E:227462.667	Desc:			
Elev:538.078	T:2022-1	2-15 10:54:	37	
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From **Stakeout points**: Select a point from stakeout points library .



Online map: Users can choose the online map which they want to use as background.



Enter a point: Users manually input the name, code, and coordinates, then click Stakeout.

Name	
TempPoint1	٥
Code	
	>
North(N)	
East(E)	
Elevation	
Desc	
Caus ta anir	nen läh
Cancel	Stakeout



ATUO nearest point: The ATUO nearest button is to rank points according to distances.



Full view: Users can view the full map.



Center: Users can click it once to make the map always heading north, click it twice the map will rotate in the direction of PDA, click it three time the Auto centering will be turned off.





Snap: Users can choose a point from the map by the arrow.



Click the compass icon will show distance and direction to the point.

Click the survey button to stakeout the point.



Users can set the Antenna height in Antenna height.





Click Settings icon to open the settings.

	Stakeout	Display	Tools	IMU
Survey	method			
Topogra	aphic point s	urvey		~]
Accurat	y check			
Horizor	ntal toleranc	e		
0.030 n	n			
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0.050 n	n			
DIFF ag	e			
10 Seco	ond			
MAX PI	DOP			
4.000				
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	crement nan	ne interval		

Stakeout settings: Users can change the store settings, the tolerance settings and the miscellaneous settings in this part.





Tools

The Tools setting includes all the tools, selected and unselected.



Import DXF: Users can import the DXF flies from memories.



Layers: Users can show/hide the layers .





Map Zoom in/out: User can zoom in/out the map by these two tools.

CAD View : Users can edit the CAD map in this tool.



Redraw : User can regenerate the drawing. Click **OK** to redraw the map.



Explode: Users can break a compound object into its component objects. Click OK to explode the selected object. It's the same command in AUTOCAD.



Add text: Users can add text to where they tap the screen.



Save/Delete object: User can save or delete the choosed object

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Locate to: Users can locate the screen center manually.



Off set stakeout point: Users could manually input coordinates, pick from the map, instant survey, or select from point library. After inputting distance and azimuth, click **Result** then input the **name** of the new point. Click **OK**.

Method			
Distance + Azimuth			~
Ref.point	CAD	凸	≔
North(N)			
East(E)			
Elevation			
Distance + Azimuth			
Horizontal distance			
			ė
Azimuth(0~360)			
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Users can also choose the Alignment offset function to stakeout point by entering lengthen and offset distance.



			Б	Elevation			
Method							
Alignment offset			~	End point	CAD	8	:=
Start point	CAD	2	≔	North(N)			
North(N)							
				East(E)			
East(E)							
				Elevation			
Elevation							
				Lengthen + offset			
End point		2	≔	Lengthen			
North(N)							
				Offset distance			
East(E)						+	
	Result				Result		

IMU: Users can change the IMU settings. (The device must have the title sensor)

ceout	Display	Tools	IMU	E-Bubble
Tilt(IMU)			
Use	IMU			
Show	v IMU butto	n		
Free	quency of o	utput		
5HZ				

E-bubble: Users can change the E-bubble settings. To use this function, the device must have the title sensor



5.6 Line stakeout



Lines: Users can choose different types of lines in line management.



Stake: Click the stake button can choose the way how we stakeout the line.

Stake: In this mode, users can stakeout the line stake by stake. Users can also change the parameters, Start station, Station interval and the offset settings.



To line: Users can stakeout any point on the line in this mode. Users can also change the Start station and the Offset distance.



Node: The system will automatically choose the spatial point of the polygon or the line. Such


as the center of the circle, the corner of the polygon and the line.



Invert: Click the button will switch the start and end point off the line.



Move as the instructions say and users can switch between map mode and compass mode for convenience. Click the survey button to stakeout the item.

icon is to the CAD view function.

6 Road

6.1 Road stakeout

LandStar Roading is a module that allows to create and manage road design data and perform all the necessary stakeout operations without to use point coordinates but by using original design data. The user is free to stakeout and to have road design information at any stations.

Road design data can be created or be imported from LandXML format and the complete design can be managed directly on the controller; it is possible to manage more than one axis at the same time and all design data are displayed in the plan view and cross-section view.

It is possible to work in two different ways:

Cross-sections at specific stations: in this case at any stations the interpolated cross-section is calculated.

Cross-sections templates: one or more cross-section template can be applied along the center line; cross-section template can be fully customized by the user by defining the cross-section shape and also additional information as superelevations and widenings.

Is is possible to stakeout the road design data and sideslopes at any station and with any offset; the point to stakeout can be easily specified on the cross-section view and your current position is displayed in two different views: plan, cross-sections.

A useful command called **'Where am I'** allow to have all design information about your current position along the road: station, H offset, H alignment, V alignment, Design elevation, Elevation, elevation difference from design elevation and from current surface, Cross slope.

A command called 'Survey cross-section' allow to measure cross-section points at any stations. It is possible to stakeout road design data and use a tridimensional design model(surface) as reference for the elevations.

6.2 Roads manager

Road manager is the control panel of all the data of the road project. They are listed all axes that have been loaded; the road definition can be imported from LandXML format.

It is possible to list road in two different ways:

Select: in this case you can select a road to stakeout.

Edit: when you click a road, the **Delete**, **Edit** and **Property** menus appear, enabling you to delete or edit the road definition, or to edit the properties of the road.

You can switch between **Select** and **Edit** modes via the **Modify** menu at the top right.

TIP

If the road is imported through a LandXML file, you can't edit the definition of the road, can only view it.

Define a road

When defining a road, you create a rodx file and add elements to complete the road definition.

The station equations define station values for an alignment.

The **horizontal alignment** defines a line that runs along the center of the road.

The **vertical alignment** defines the changes in the elevation of the road.

The cross-section template defines a cross section of the road at a point across the road to

define how wide it is at different points.

The cross-section template must be defined only for the right side of the section but the definition can also be used for the left side.

Add a template for each change in width. The template may consist of any number of strings. Add **cross-section template positions** to assign the appropriate template at different stations along the road.

Add **superelevation and widening** to add extra slope and widening on curves in a road design to assist vehicles negotiating the curves.

The **sideslope tempate** defines the shape and the characteristics of the section to be applied along a track; through the composition of simple linear elements it's also possible to define shapes of complex sections.

The sideslope template must be defined only for the right side of the section but the definition can also be used for the left side.

Add **sideslope template positions** to assign the appropriate template at different stations along the road.

Field	Description
Name	Enter the Name to define the road.
Horizontal alignment	Select the Horizontal alignment entry method to define the
entry method	horizontal alignment: Elements, PI, Coordinates.
Element entry	If select Elements to define the horizontal alignment, you
method	can select the Element entry method: Length, End station
Elevation rotation	Enter the distance of the point of rotation referring to the
axis position	central axis.
Start station	Enter the Start station to define the road.

Key int the station equations

Use **Station equations** when the horizontal alignment has changed but you wish to remain the original station values.

Field	Description
Ahead	Enter a station value to define the equation.
Back	Enter a station value to define the equation.

TIP

If the Ahead station value is greater than the Backside station value, this equation is an Overlap. If the Ahead station value is less than the Backside station value, this equation is a Gap.

Key in the horizontal alignment

To define the horizontal alignment you can use the:

Elements entry method

Points of intersection (PI) entry method

Coordinates entry method

TIP

To change the entry method for the road, eidt the properties of the road. However, once you have entered two or more elements definition the horizontal or vertical alignment definition, the entry method can't be changed.

Elements entry method

As you add each element to the alignment, fill out the fields required for the selected element type.

Line elements

To add a line to the alignment, select **Line** in the **Type** menu:

Field	Description
Length	Enter the Length to define the line.
Start offset	Enter the perpendicular offset of the starting coordinate of
	the current element and the ending coordinate of the
	previous element.
Start north	Enter the Start north to define the line. If current element
	isn't the first one, the value will be calculated automatically.
Start east	Enter the Start east to define the line. If current element
	isn't the first one, the value will be calculated automatically.
Azimuth	Enter the Azimuth to define the line. If current element isn`t
	the first one, the value will be calculated automatically.
Use azimuth	If check it, you can enter Azimuth instead of the
constraint	automatically computed value.

Left arc / Right arc elements

To add an arc to the alignment, select **Left arc\Right arc** in the **Type** menu:

Field	Description
Length	Enter the Length to define the arc.
Start offset	Enter the perpendicular offset of the starting coordinate of
	the current element and the ending coordinate of the
	previous element.
Start north	Enter the Start north to define the arc. If current element
	isn`t the first one, the value will be calculated automatically.
Start east	Enter the Start east to define the arc. If current element isn`t
	the first one, the value will be calculated automatically.
Radius	Enter the Radius to define the arc.
Azimuth	Enter the Azimuth to define the arc. If current element isn`t
	the first one, the value will be calculated automatically.
Use azimuth	If check it, you can enter Azimuth instead of the
constraint	automatically computed value.

Left transition\Right transition elements

To add a transition to the alignment, select **Left transition** **Right transition** in the **Type** menu:

Field	Description
Length	Enter the Length to define the transition.
Start offset	Enter the perpendicular offset of the starting coordinate of
	the current element and the ending coordinate of the
	previous element.
Start north	Enter the Start north to define the transition. If current
	element isn`t the first one, the value will be calculated
	automatically.
Start east	Enter the Start east to define the transition. If current



	element isn`t the first one, the value will be calculated automatically.
Start radius	Enter the Start Radius of the transition to define the transition. For Entry Transition , the Start Radius is usually infinite.
End radius	Enter the End Radius of the transition to define the transition. For Exit Transition , the End Radius is usually infinite.
Azimuth	Enter the Azimuth to define the arc. If current element isn`t the first one, the value will be calculated automatically.
Use azimuth constraint	If check it, you can enter Azimuth instead of the automatically computed value.

Points of intersection (PI) entry method

To add an element to the alignment, select **PI Type**:

PI without curve

PI Without Curve is a point of intersection that doesn't contain curves.

Field	Description
Name	Enter the Name to define the point of intersection.
North	Enter the North to define the point of intersection.
East	Enter the East to define the point of intersection.

TIP

The start point and end point of the alignment must be PI without curve.

ΡΙ

PI is a point of intersection that contains curves.

Field	Description
Virtual PI	Define a curve with a corner greater than 180 with the
	previous PI.
Name	Enter the Name to define the point of intersection.
Radius	Enter the Radius to define the point of intersection, if the PI
	contains an arc.
North	Enter the North to define the point of intersection.
East	Enter the East to define the point of intersection.
Transition length in	Enter the Transition Length In to define the point of
	intersection, if the PI contains an Entry Transition.
Transition length out	Enter the Transition Length Out to define the point of
	intersection, if the PI contains an Exit Transition.
Transition start radius	Enter the Transition Start Radius In to define the point of
in	intersection, if the Entry Transition is incomplete. If a
	negative number is entered, it will be used as a parameter
	to calculate the length of the transition.
Transition end radius	Enter the Transition End Radius Out to define the point of
out	intersection, if the Exit Transition is incomplete. If a
	negative number is entered, it will be used as a parameter
	to calculate the length of the transition.

TIP

The type of transition supported by the software is clothoid spiral. The clothoid spiral is defined by the length of the spiral and the radius of the adjoining arc. If $A^2 = R^*L$, the clothoid spiral is complete, otherwise it is incomplete. If the entry transition is incomplete, you need to enter the start radius. If the exit transition is incomplete, you need to enter the radius.

Coordinates entry method

As you add each element to the alignment, fill out the fields required for the selected element type.

Line elements

To add a line to the alignment, select **Line** in the **Type** menu:

Field	Description
Start north	Enter the Start north to define the line. If current element
	isn`t the first one, the value will be calculated automatically.
Start east	Enter the Start east to define the line. If current element
	isn`t the first one, the value will be calculated automatically.
End north	Enter the End north to define the line. If current element
	isn`t the first one, the value will be calculated automatically.
End east	Enter the End east to define the line. If current element isn`t
	the first one, the value will be calculated automatically.

Left arc/Right arc elements

To add an arc to the alignment, select Left arc\Right arc in the Type menu:

Field	Description
Start north	Enter the Start north to define the line. If current element
	isn`t the first one, the value will be calculated automatically.
Start east	Enter the Start east to define the line. If current element
	isn`t the first one, the value will be calculated automatically.
End north	Enter the End north to define the line. If current element
	isn`t the first one, the value will be calculated automatically.
End east	Enter the End east to define the line. If current element isn't
	the first one, the value will be calculated automatically.
Radius	Enter the Radius to define the arc.

Key in the vertical alignment

If you created the road definition by keying in the horizontal alignment, the elevations of those items are used to define the vertical alignment as a series of **Point** elements. As you add each element to the vertical alignment, fill out the fields required for the selected element type.

Point elements

To add a point to the vertical alignment, select **Point** in the **Type** menu:

Field	Description
Station	Enter the Station to define the vertical point of intersection.
Elevation	Enter the Elevation to define the vertical point of
	intersection.

Symmetric parabola

To add a symmetric parabola to the vertical alignment, select Symmetric Parabola in the



Type menu:

Field	Description
Station	Enter the Station to define the vertical point of intersection.
Elevation	Enter the Elevation to define the vertical point of
	intersection.
Radius	Enter the Radius to define the vertical point of intersection.

TIP

The start point and end point of the vertical alignment must be Point.

Key in the cross-section templates

The cross-section template defines the shape and the characteristics of the section to be applied along a track; through the composition of simple linear elements it's also possible to define models of complex sections that may be subject to superelevations and widenings in curves. Strings typically define the shoulder, edge of the pavement, curb, and similar features that make up a road.

Each element is defined by the **Name**, **Slope**, **Width** and **Vertical offset** referring to the previous element:

Field	Description
Name	Enter the Name to define the element of the cross-section.
Slope	Enter the Slope to define the element of the cross-section.
	From the central axis to the side axis, positive values
	represent uphill and negative values represent downhill.
Width	Enter the Width to define the element of the cross-section.
Vertical offset	Enter the Vertical offset referring to the previous element of
	the cross-section.

Key in the cross-section template positions

After adding cross-section templates, you must specify the station at which the Roads software starts to apply each template. A template is applied from that point to the station where the next template is applied.

Field	Description
Station	Enter the Station to define the cross-section template
	position. The station is the start point of the cross-section
	template will be applied.
Left template	Enter the Left template to define the cross-section template
	position.
Right template	Enter the Right template to define the cross-section
	template position.

TIP

If the cross-section definition changes, you need to reedit the cross-section template positions.

Cross-section template position examples

Add a template for each change in cross-section strings number.

This example explains how positioning of templates and use of widenings can be used to control a road definition:

GE@MATE

Key in the superelevations

Superelevation values are applied at the start station, and values are then interpolated from that point to the station where the next superelevation values are applied.

Each element of the cross-section can apply a superelevation value.

The software supports the following superelevation interpolated types.

Linear

Cubic parabola

Field	Description
Station	The start station where the superelevation value is applied.
Primitive slope(%)	The original slope value of the current element of the cross-
	section.
Superelevation(%)	Enter the Superelevation to the selected element.

Key in the widenings

Widening values are applied at the start station, and values are then interpolated from that point to the station where the next widening values are applied.

Each element of the cross-section can apply a widening value.

The software supports the following widening interpolated types:

Linear

Cubic parabola

Quartic parabola

Field	Description
Station	The start station where the widening value is applied.
Primitive width	The original width value of the current element of the cross-
	section.
Widening	Enter the Widening to the selected element.

Key in the sideslope templates

The sideslope template define the shape and the characteristics of the sideslope to be applied along a track; through the composition of simple linear elements it's also possible to define models of complex sideslope.

Each element is defined by the Name, Slope, Width:

Field	Description
Name	Enter the Name to define the element of the sideslope.
Slope	Enter the Slope to define the element of the sideslope. The shape of the sideslope is relative to the left/right side axis point at a certain station. From the side axis to the direction away from the center axis, positive values represent uphill and negative values represent downhill.
Width	Enter the Width to define the element of the cross-section.

Key in the sideslope template positions

After adding sideslope templates, you can specify the station at which the Roads software starts to apply each template. A template is applied within a range specified by the start station and end station.

The software supports the following sideslope transition types:

GE@MATE

No gradient: The same sideslope template is used for this range.

Gradient: A start template is applied at the start station and an end template is applied at the end station. The values defining each element are then interpolated linearly from the start station to the end station. The start and end template must have the same number of elements.

Field	Description
Start station	The station that the sideslope template begin to be applied.
End station	The station that the sideslope template stop to be applied.
Transition method	The transition type from the start sideslope template to the
	end sideslope template.
Start template	Define a sideslope shape at the starting of the range.
End template	Define a sideslooe shape at the ending of the range.

Import road definition from LandXML format

LandXML road file can contain one or more alignments with associated road definition information.

Select the LandXML file to import. All axes will be loaded and visualized in the list.

The software can obtain the following road components from a LandXML file:

Station equations: Define station values for an alignment.

Horizontal alignment: Define a line that runs along the center of the road.

Vertical alignment: Define the changes in the elevation of the road.

Cross-section: Define how wide it is at different points across the road. The cross-section may consist of any number of strings.

String interpolation

The cross-sections are computed by determining where the cross-section line, formed at right angles to the alignment cuts the strings associated with the alignment. For interpolated stations the offset and elevation values for the position on an associated string is interpolated from the offset and elevation values of the previous and next positions on that string. This ensures the integrity of the design, especially on tight curves. See the following example, where the cross section at station 100 has a string offset from the alignment by 3 and an elevation of 25. The next cross section at station 120 has a string offset has a string offset by 5 and an elevation of 25.

offset by 5 and an elevation of 23. The position on the string for the interpolated station 110 is interpolated as shown to give an offset of 4 and an elevation of 24.



TIP

No interpolation occurs between cross-sections with an unequal number of strings.

6.3 Stakeout road

Stakeout of a road axis is quite similar to stakeout an element by station and offset. According to the entered station it's interpolated and visualized the corresponding crosssection. On the calculated section specify the distance from the center line; it's possible to select the vertex also from graphic view.

Field	Description
Real time station	Automatically calculate the stakeout station according to the
	current position.
Station	The station of will be stakeouted.
Station interval	
Mode	The mode of offset value, right angle offset or skew offset.
Cross-section	Select the vertex from graphic view.
surface	
Offset	Define a point at a right angle to the alignment. It's possible to
	add an additional offset for construction.
Elevation	The elevation of the target; It's possible to add an additional
	vertical offset for subgrade.
Azimuth	Skew direction, a delta from the alignment tangent clockwise.
Length	The offset along the skew.

The stakeout panel contains the information to get the target point.

The last part of the panel can show the following information:

Dist.: The distance from current position to the target.

Stat.: The station of the current position.

Forward/Backward: Navigation information from current position to the target.

Left/Right: Navigation information from current position to the target.

H.Offset: The distance from the current position to the alignment.

Delta station: The difference between the station of current position and the station of the target.

Cur/Fill: Vertical cut/fill to the design.

Stakeout relative to a DTM

You can display the cut/fill to a digital terrain model (DTM) during stakeout, where the horizontal navigation is relative to the road but the displayed cut/fill delta value is from your current position to a selected DTM.

6.4 Stakeout side-slope

The procedure allows to perform the calculation and the stakeout of the point of intersection of the project side-slope with the existing terrain; the position is calculated on the basis of a slope of project and referring to a station and to a distance(offset) on the outermost of the cross-section.

Field	Description
Match the template according to the station	Automatically select a sideslope template based on the current position and the sideslope template positions.
Station	The station of the current position.
Template	The sideslope template of automatic or manual selection.
Target	The stakeout target, feature points of the sideslope or the slopes.

The side panel contains the information to get the point of intersection; The lastest information reports the current value of the slope and the direction to take, on the perpendicular to the

reference element, to achieve the value of project slope. The last part of the panel can show the following information: **Stat.:** The station of the current position. **H Offset:** The distance from the current position to the alignment. **Inward/Outward:** Away from or near the centerline. **Down/Up:** Vertical cut/fill to the design.

Cur/Fill: Perpendicular cut/fill to the design.

6.5 Where am I

This function is able to provide much information concerning the current position referring to the selected road.

Field	Description
Station	Station in which you are located.
H Offset	Distance from the center line of current road.
H alignment	Element of the planimetric track.
V alignment	Element of the altimetry track.
Design elev.	Design elevation in which you are located.
Elev.	Elevation in which you are located.
Cut/Fill	Elevation difference.
Cross slope	Cross slope in which you are located.

Basing on the position they are visualized the following information:

6.6 Survey cross-section

The procedure allows to perform the measurement along a cross-section. During the cross-section measurement, a red auxiliary line will be created. The cross-section data measured can be used to calculate the volume.

Field	Description
current	Get the station of current position.
Station	The station of the current position.

The cross-section survey panel contains the information to measure cross-section points.

The last part of the panel can show the following information:

Stat.: The station of the current position.

CL offset: The distance from the current position to the alignment.

Delete station: The difference between the station of current position and the station of the target. **Cur/Fill:** Vertical cut/fill to the design.

6.7 Stakeout report

Use the **Report export** function in the software to generate a report from survey data. Use the report to transfer data from the field to your client or the office for further processing with office software.

A table present the list of all the stakeout points with differences, in distances and elevations, between the design coordinate and the stakeout coordinate.

The file format is:

Field	Description
Point name	The name of the measured point.
Target N	The northing coordinate of the target.

Target E	The easting coordinate of the target.
Target elevation	The elevation of the target.
Target station	The station of the target.
Target H Offset	The H Offset the target.
Measured N	The northing coordinate of the measured point.
Measured E	The easting coordinate of the measured point.
Measured elevation	The elevation of the measured point.
Measured station	The station of the measured point.
Measured H Offset	The H Offset of the measured point.
Delta station	The difference between the design station and the stakeout
	station.
Delta H Offset	The difference between the design H Offset and the stakeout
	H Offset.
Delta elevation	The difference between the design elevation and the stakeout
	elevation.
Cross-section offset	Horizontal offset relative to the cross-section.
Time	The time of the measuring point.

6.8 Display the available stations

Some key stations defined by the horizontal alignment will display on the screen. The station abbreviations used in the Roads software is:

Abbreviation	Meaning			
RS	Road start			
RE	Road end			
CC	Curve to transition			
LT	Line to transition			
CL	Curve to line			
TL	Transition to line			
LC	Line to curve			
ТС	Transition to curve			

7 Tools

7.1 Volumes

Surface with Height:

Top/Bottom Surface: Import above surface file. Click import icon to enter **Surface File** interface.



Users can choose surface file or create a new surface file by selecting points. Click **New** to create a new surface file, users can add a new point or select point in **Points**, then click **OK** to preview the surface.

÷	Mate	Survey-Point	s :	÷	MateSurve	y-New surfa	ce
AI 🔻 IA	Name 🔻	Enter a keyword.		Name	Local N(m)	Local E (m)	Elev(m)
Sele	t all			1	11.000	20.000	1.000
	Name	North(N)[m]	East(E)[m]	2	15.000	24.000	1.300
6	3	13.000	27.000	3	13.000	27.000	0.900
2	2	15.000	24.000				
25	1	11.000	20.000				
			G				

GF@MATF



In this interface users can modify constraint line, boundary, and points of surface.

□ Tap to view coordinates of points. Users can also input new points, select more points

from points library, or delete points.

: Tap to view full screen.



 $\overset{@@}{=}$: Tap to determine the constraint line. Select two constraint points and create a constraint

line. Then tap the triangulation networks generating icon. The line created by the constraint points won't be changed after calculating.

: Tap to modify the boundary. Choose two points to create a new line for determining a new

boundary, and then delete the wrong part of the boundary.

: Tap to delete a useless point or wrong part of the boundary. Tap the icon, select a target point or line, and tap **[OK]** to confirm the deletion.

E Tap to generate new triangulation networks.

Cut swell factor: Input cut swell factor, range from 0 to 1.

Finally, click Calculate to get result. From the result interface users can select Map or Detail. In the Map interface users can get cut or fill value, in the Detail interface users can know area and triangle of top surface and bottom surface.





Click Export users can export the result with some photos (no more than 8).

Filename		
File path		
🖌 Export table	(top and bot	om surface)
Export photos (no more than	3)
+		

7.2 Inverse

Select starting point A and ending point B from point manager, click **Calculate** to calculate. The results calculated according to grid or ground surface will be shown in the table. The results contain: azimuth, vertical angle, horizontal distance, slope distance, offset N, offset E, offset H and slope.

← GEOMATE-Inverse A 1 1 > B 2 1 ● Result ● Grid ● Ground Azimuth 045:00:00.0000000 Vertical angle 004:00:30.1388072 Horizontal 156.978 distance[m] 157.363 Offset N[m] 111.000 Offset E[m] 111.000 Offset H[m] 1100 Slope 7.01%	08:20:22		۵ ا× ۵۵۵ ≌ ۳۵ ۹۹۱ (۵۵)		
A 1 > B 2 > I result I of cround I of cround Azimuth 045:00:00.0000000 I of cround Vertical angle 004:00:30.1388072 I of cround Vertical angle 004:00:30.1388072 I of cround Horizontal distance[m] 156.978 I of cround Slope distance[m] 157.363 I of cround Offset N[m] 111.000 I of cround Offset E[m] 111.000 I of cround Slope 7.01% I of cround	<	GEOMATE-	Inverse		
1 > B 2 > I Result I Grid I Ground Azimuth 045:00:00.0000000 Vertical angle Vertical angle 004:00:30.1388072 Horizontal distance[m] 156.978 Slope distance[m] 157.363 Offset N[m] 111.000 Offset E[m] 111.000 Slope 7.01%	A				
B 2 > Result O Grid O Ground Azimuth 045:00:00.000000 Vertical angle 004:00:30.1388072 Horizontal distance[m] 156.978 Slope distance[m] 157.363 Offset N[m] 111.000 Offset E[m] 111.000 Slope 7.01%	1		>		
2 > Result O for Grid O for Ground Azimuth 045:00:00.0000000 Vertical angle 004:00:30.1388072 Horizontal distance[m] 156.978 Slope distance[m] 157.363 Offset N[m] 111.000 Offset E[m] 111.000 Slope 7.01%	В				
ResultImage: GridGroundAzimuth045:00:00.0000000Vertical angle004:00:30.1388072Horizontal distance[m]156.978Slope distance[m]157.363Offset N[m]111.000Offset E[m]111.000Slope Slope7.01%	2		>		
Azimuth045:00:00.0000000Vertical angle004:00:30.1388072Horizontal distance[m]156.978Slope distance[m]157.363Offset N[m]111.000Offset E[m]111.000Offset H[m]11.000Slope7.01%	Result	🖲 Grid	O Ground		
Vertical angle004:00:30.1388072Horizontal distance[m]156.978Slope distance[m]157.363Offset N[m]111.000Offset E[m]111.000Offset H[m]11.000Slope7.01%	Azimuth	04	45:00:00.0000000		
Horizontal distance[m]156.978Slope distance[m]157.363Offset N[m]111.000Offset E[m]111.000Offset H[m]11.000Slope7.01%	Vertical angle	0	04:00:30.1388072		
Slope distance[m] 157.363 Offset N[m] 111.000 Offset E[m] 111.000 Offset H[m] 11.000 Slope 7.01%	Horizontal distance[m]	156.978			
Offset N[m] 111.000 Offset E[m] 111.000 Offset H[m] 11.000 Slope 7.01%	Slope distance[m]	157.363			
Offset E[m] 111.000 Offset H[m] 11.000 Slope 7.01%	Offset N[m]		111.000		
Offset H[m] 11.000 Slope 7.01%	Offset E[m]		111.000		
Slope 7.01%	Offset H[m]		11.000		
	Slope		7.01%		
Clean Calculate	Clear	n	Calculate		

7.3 Area

This function is to calculate the area, perimeter of figure, the coordinates that participates resolve are chosen from point management by library chosen. The unit of perimeter is metric, and the unit of area supports square meters.

Add: Enter coordinate, select from library or map to add points to the list.

Up/Down: Make selected points move up or down.

Right slide: Right slide to delete point or check the details of the point.

OK: Calculate the perimeter and area of the figure which is composed of points in sequence.

÷	MateSurve	ey-Areas	÷	MateSurvey	-Areas	AN S
	List	View		List	Vie	~
ID	Name	North(N)	10	Name		th(N)
			-		-	~
				Add		- 1
			Ent	ter coordinate		- 1
			Sel	ect from library		- 1
			Sel	ect from map		- 1
				_		
Up	Down	Add OK	Up	Down	Add	ок

÷	MateSurve	y-Areas	÷	MateSurve	ey-Areas
	List	View		List	View
ID	Name	North(N)	10	Name	North(N)
۵	1	2	1	2	15.0000
2	3	13.0000	2	Re	sult
3	4	15.0000	3	Perimeter	
				7.434	m
				Area	
				1.000	Sq.M
				0.002	mu
				10.764	Sq.Ft
				0.000	Acres
				0.000	Hectare
Up	Down	Add OK		Jp Down	Add OK

Area Division: Cut the selected area according to the value inputted.

Choose the Calculation type, input the area, should less than the whole selected area.



Click Calculate, after that, you can store or stakeout calculated point.

÷	MateS	Survey-Areas
	List	View
Total 2rea.	1.0005cmeta	a_0.050_1
Subdiv Rotate	vide meth around 1	od point
Point	3	
Directio	on 🕐	\odot
Area	0.05	Sq.M
Result		
area_0. N:15.000	050_1 00 E:24.95	000
Calcul	late	Store Stakeout

7.4 Angle conversion

Angle conversion can convert degrees, minutes, seconds and radians among these 3 types of conversion.

Enter a value in degrees, minutes and seconds edit box, click on the **Calculate** button to calculate the value of the corresponding degrees and radians.

Similarly, it can convert radians to degrees and degrees, minutes and seconds, or converts degrees to radians and the value of every minute.

10 De	gree 10 Minute 10.0 Second
Degree	10.169444444
Minute	610.1666666667
Second	36610.000000000
Radian	0.1774902887
Care	
Gon	11.2993827160
Gon	11.2993827160

7.5 Parameter calculation

Calculation Type: Include 7 Parameters, 7 Parameters(strict) and 3 Parameters. **7 Parameters/(strict)**: The application scope of 7 Parameters/(strict) is relatively large, generally larger than 50 km. Users need to know at least three/four pairs of known point values in local coordinate system and their corresponding WGS-84 coordinates. Only when we get the 7 parameters transmitting from WGS coordinate system to local coordinate system, can we start the parameter calculation.

3 parameters: At least one known point pair is requested which is usually used in small scales. The accuracy is up to the operating range, decreasing with the increase of operating distance.
Mode: We can choose Guide mode or Simple mode to add point pairs based on different situations.
Select Point Pair: Click Add to add point pairs and input pairs of GNSS points and known points to calculate parameters. Add WGS-84 coordinates at GNSS Point and add plane coordinates at Known Point.

GNSS Point: Select from library, survey or enter manually to add GNSS points.Known Point: Select from library, map or just enter manually to add known points.Note: Select corresponding point pairs and add to the interface of parameter calculation.

← y-Parameter	r calculation		÷	ter calculation	n Mat	ŧ
		Ф				5
Туре			Тур	pe		
7 parameters		~	7 p	arameters		×
GNSS point Known	D H.Resid[m]	V.Resid[m]	GN	A	dd	imi
				Guide mode for new for regular users.		
				Cancel	ок	
Add	Calc	ulate		Add	Calculate	

Calculate: Click to calculate. The results will be popped up automatically. Then click **OK** to apply the parameters to the current project.

GNSS	point	:=	ß
Name			
Latitu	ude(B)		
000:0	0:00.00000N		
Longi	itude(L)		
000:0	0:00.00000E		
H(H)			
Ģ.	Define a GNSS following metho 1.Measure a ner 2.Select an exis GNSS coordina 3.Enter the GNS	position in one ods: w GNSS positic ting point with tes. SS coordinates.	of the on. valid

Datum trans: Back to the main menu, click **CRS** to view Datum trans interface and the parameters can be viewed. Click more, you can choose to lock the parameters and the default password is 123456, which can also be changed. And we can also click unlock to edit parameters.

÷	MateS	urvey-Para	m i	← ∍ter	calculation	Ν	1at :
			Б				Ъ
Туре				Туре			
7 paramet	ters		~	7 parame	ters		
GNSS point	Known p	H.Resid[m]	V.Resid[m]	GNSS point	Known p	H.Resid[m]	V.Resid[m]
10	11	855	11751	10	11	-	-
12	13		100	12	13	-	-
14	15	12	(2)	14	15	-	-
				Preview			×
						·	0.694 GNSS Known
				0	0.728m 14 0.504 0.504 10 0.504 10 0.504 100000000000000000000000000000000000	12 10mDH:0.00 1m ^H :- V:- H:0.100 :- V:-	0
Ad	dd	Calc	ulate				

7.6 Point to line dist

Select points A, B, C from point management and click **OK** to calculate. The result is displayed in a pop-up box, as follows: click **Clean** to clear current data.

← Point to line distance	← MateSurvey-Point to line di
C Calculate: the perpendicular distance of point C to I ine AB.	C Calculate: the perpendicular distance of point C to I ine AB.
A 5	A 5
B 6	B Result
c	Distance:6.774m
7	7 Back
Clean Calculate	Clean Calculate

7.7 Offset distance

Origin (A): Select form Points.

Horizontal distance (AP'): Input the horizontal distance.

Vertical distance (PP'): Input the vertical distance.

Azimuth Angle: Input the azimuth angle.

Calculate: Click **Calculate** to display a calculation result interface, enter the point name, and click **OK** to save the calculated point.

← Survey-Offset distance	← Survey-Calculation result
Known: point A, azimuth angle of AP, horizontal di stance of AP and height d	Name
Calculate: point P.	Code
Origin(A)	North(N)
12	14.298 m
Horizontal distance(AP')	East(E)
3 m	14.300 m
Vertical distance(PP')	Elevation
4 m	5.100 m
Azimuth	
30:00:00.000	
Clean Calculate	Clean OK

7.8 Deflection

Deflection: Click **Deflection** to calculate deflection angle. Select Point A, B, C, and click **OK**, the angle will be displayed in pop-up interface.

← -Deflection angle N	← teSurvey-Deflection angle
Known: point A,B,C. Calculate: deflection angle e from AB to BC.	Known: point A.B.C. Calculate: deflection angle e from AB to BC.
Α	A
10	10
B	P
11	Result
c	C Angle:-007:07:30.0588560
12	Back
Clean Calculate	Clean Colculate

7.9 Rotation

Rotation: Point P is on the line AB which rotates a certain angle. After selecting AB points, the system will calculate the distance between point A and point B as default and this distance as initial value for AP.

A/B: Select the coordinate of A, B from **Points**.

AP: Distance from point A to point P.

Rotation Angle: The rotated angle between AB and AP.

Calculation Result: Click **Calculate** to get the result. Input name and then click **OK** to save this calculated point.

MateSurvey-Rotation	 Survey-Calculation result
B Known: points A,B; the ro tated angle between AB a nd AP: and the distance A	Name
A L P between point A and p oint P (the distance of AP will be the same as AB by default). Calculate: point P.	Code
A	North(N)
11 >	11.700 m
в	East(E)
12	12.800 m
AP	Elevation
0.224 m	0.000 m
Rotation angle	
000:00:00.000	
Clean Calculate	Clean OK

7.10 Intersection

Known Points: Select points from point management and click **Calculate** to calculate the intersection P of line AB and line CD.



1	Known: point A.B.C.D. Calculate: intersection co ordinates between AB an d CD.	Code
		North(N)
i		28.580 m
	>	East(E)
		20.637 m
	>	Elevation
		0.000 m
	>	
	>	
	>	

Points + 2 Sides: Select points A and B from point management. Enter the length of line AP and line BP. Click **Calculate** to calculate. Input a name and click **OK** to save.

known points 2 points + 2 si 2 points + 2 a	Name
Known: point A.B and dis	
L1 L2 L1 L1 L1 L2 L1 L1 L1 L2 L1 L1 L1 L2 L1 L1 L1 L2 L1 L1 L2 L1 L2 L1 L2 L1 L2 L1 L2 L1 L2 L1 L2 L1 L2 L2 L2 L2 L2 L2 L2 L2 L2 L2 L2 L2 L2	Code
A. → B.	North(N)
А	1.06 m
10	East(E)
в	6.50 m
11	Elevation
AP	0.000 m
3 m	
BP	
4 m 💿	
Clean Calculate	Clean OK

Points + 2 Angles: Calculate intersection P with known points A and B and the inner angle of PAB. Click **Calculate** to calculate. Input a name and click **OK** to save.

\wedge	Known: point A,B and an gle PAB, angle PBA. Calculate: point P(Point P s on the left side of AB).	Code	
21 22 B		North(N)	
		11.035 m	
0	>	East(E)	
		12.329 m	
3	>	Elevation	
ngle PAB		0.000 m	
30:00:00.000			
ngle PBA			
0:00:00.000	0		

7.11 Bisection angle

Bisection Angle: Given line BA and BC comes to an angle ABC, P is one point on the angle bisection line, according to the coordinates of Points A, B, C, and the plane distance from Point P to Point B,

we can have the coordinate of Point P. If the distance value is negative, it means Point P is on the oppositely extension line of the angle bisection line. Click **Calculate**, the results will show out, input the point name, and click **OK** to save the calculated point.

← eSurvey-Bised	ction angle	← culation result	Mat
B KO	nown: point A, B, C and listance BP. P is a point o the angular bisector of	Name	
	ngle ABC. Negative BP neans P is on the opposit elongated line of the an jular bisector. alculate: point P.	Code	
А		North(N)	
12	>	12.009 m	
в		East(E)	
13	>	12.518 m	
c		Elevation	
14	>	0.000 m	
BP			
1 m	0		
14			01/
Clean	Calculate	Clean	ok

7.12 Dividing line

Dividing Line: Select start point and end point from **Points**, select **Method**, Input step length, first point name and name interval, then click **Calc&Save**; it will remind users a successful division. Click **Points** manager to review points.

Start point		Points	Points 1	to be staked
11 >	All V	Name 🕶	Enter a keyword.	
End point			an in maters	-
12 >	88	b	11,700	12.800
Method	60	a	11.500	12.700
Step length	5	16	11.600	12.100
Step length	3	15	11.400	12.200
rha finaka a laka sana	3	14	11.500	12.100
The first point name	3	13	11.100	12.100
Auto increment name interval	3	12	11.700	12.800
0	3	11	11.500	12.700
Code	3	10	11.200	12.500
	3	8	31.000	20.000
	6	7	12.000	25.000
	\mathcal{C}	6	31.000	21.000
	B	5	11.000	18.000

7.13 Average of points

Select: Select points to calculate.



÷	MateSur	vey-Points	÷	÷	urvey-Ave	erage of points	:
All 🔻 Na	ame 🕶 🛛 Ente	er a keyword.		ID	Name	North(N)[m]	East(E)[m]
Select	all			1	15	11,400	12.200
	Name	North(N)[m]	East(E)[n	2	14	11.500	12.100
88	ь	11,700	12.800	3	13	11.100	12.100
88	а	11.500	12.700	4	12	11.700	12.800
00	16	11.600	12.100	5	11	11.500	12.700
00	15	11.400	12.200				
08	14	11.500	12.100				
00	13	11.100	12.100				
00	12	11.700	12.800				
08	11	11.500	12.700				
08	10	11.200	12.500				
00	8	31.000	20000				
00	7	12.000	25.000				
08	6	31.000	21.000				
00	5	11.000	18.000				
Impor		Add	OK		Select		ok

OK: Report the average value of selected points in calculation result interface.

Name	
Code	
North(N)	
11.440 m	
East(E)	
12.380 m	
Elevation	
1.080 m	



Coordinate Type: Users can set coordinate types of points.



7.14 Grid to ground

While surveying in the same area, users can get grid coordinates or ground coordinates with a GPS receiver or a total station, but it is unable to deal with different kinds of coordinates when post-process data. **Grid to Ground** function is used for calculating the combined factor and transform grid coordinates into ground coordinates, so that users can work with both total station and RTK receiver



in the same project.



Tap **Grid to ground** in **Tools** interface. There are three methods to select grid coordinate: from Points, map selection and calculate directly. There needs two points for calculation, the first point coordinates are default as current base station coordinates. Grid scale factor, height scale and combined factor will be calculated after selecting second point coordinates. (Combined factor can also be inputted.)

3 ways to choose points:

- (1) Map Selection: Select a point in base map or measured point.
- (2) Survey: Click to get the current position.
- (3) Points: Click to choose points in points list.



Click **Accept**, and then users will see transformed ground coordinates in point detail. There is no need to apply combined factor when it's 1, because default combined factor is 1 and users can view the ground coordinates in point detail directly. These ground coordinates can also be exported as TXT, DAT, or CSV format with customized content.

← ма	ateSurvey-Edit poi	int	← MateSurvey	-User defined
Normal	Attributes	Multimedia	Name	
Survey inf	0			
Name	14		Lat/Lon format	
		-	0°00′00.00000″	~
Code		>	Coordinate decima	al(m)
Туре	Enter	\sim	0.000	
Format	Local N/E/Elev		Elevation decimal(m)
			0.000	\sim
North(N)	11.500 m		Lat/Lon Decimal	
East(E)	12.100 m		0.00000	~
Elevation	1.050 m		Coordinates with NE	E suffix
Desc			Export GIS attribute	rs 🔿
Survey	2022-12-17 19:14:1	6	Options	Selected
time		-	Point type	Name
			Longitude	Code
			Latitude	North(N)
	Save			Save

7.15 Map Adjustment

Add: Click add to add Map point and Known point (point pair).

Map point: Choose point on base map.

Known point: Choose point on base map, points, or survey directly. Click **OK&Next** to add next point pair; click **OK** to finish adding points.



After adding all point pairs, click **OK** and there will show **H.Resid**. The smaller the residual is, the better the accuracy is.



← MateS	urvey-Map adj	ustme	← MateSurvey-MateSurvey
			Move
Map point	Known point	H.Resid	۵N
3238773.428 514602.877	3238773.422 514602.811	0.000	422.808 m
238948.490 3238948.436 0.000	۵E		
314072.017	10/2.019 0140/2.000		-1914.967 m
			Rotate
			Rotate angle
			000:02:03.127
			Scale
			Scale
			1.000
Add		Next	ок

Click **Next** to calculate the translation, the rotation, and the scale. It shows how the base map moved. Finally click **OK** to apply



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By surveyor, for surveyor