



SingularPad Surveying Software User Guide

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1 Introduction

SingularPad is professional Android-based surveying software developed by

SingularXYZ Intelligent Technology Ltd. SingularPad is fully functional as a field surveying software, equipped with complete work modes and necessary functions for surveyors. Projection/datum configuration, GSM/radio/PDA CORS work modes, point survey/stake out/CAD sketch/COGO calculation and etc. can all be found in SingularPad.

1.1 Installation environments

SingularPad is available, you can connect us to download

https://www.singularxyz.com

SingularPad can only run in Android operating system, and the android device specification should be at least or better than the ones listed below:

- •CPU: core 2.1 GHz (currently support ARM cortex only)
- At least 4G RAM
- •Android System version: ≥4.2
- Screen: 4.5 inches
- •Screen resolution: 960*640
- Hardware: Bluetooth/Wi-Fi/GPRS

2 User Interface

SingularPad has user-friendly interfaces, which provide you a convenient and effective surveying experience. SingularPad is designed with more advanced features, such as more import formats, more calculation tools, stake out accuracy analysis, auto-sketching by codes, CAD layer editing

etc.



And users can customize the information display content and measurement function menu according to their own usage scenarios, so that the software can better meet the needs of their own applications.

There are four main interfaces, **Project**, **Device**, **Survey** and **Tools** interface. Each main interface includes different functions.



2.1 Project interface

The interface mainly includes Project Manager, Localization, Calibrate Point, Coordinate system and Import/Export data.

- Project Manager: Build/Open/Delete a project.
- Localization: Transfer the WGS84 coordinates to local grid coordinates.
- Calibrate Point: Once change Base coordinate during one project, need do this.
- Coordinate System: Select and manage the datum.

• Points Database: Points manage; check points measured, key in known points and other function.

• Code Library Manager: Management codes in list.

• Import data: Import points file (including CASS, Local coordinates, Geodetic coordinates, SurvCE RW5,FG RAW, Google Earth file and NETCAD format ,PXY file and Carlson coordinate file).

• Export data: CASS, Local Coordinates and Geodetic coordinates, CAD, SHP, Google Earth file (based on WGS84 or Local) etc. you can also export measurement report and stake point report.

2.2 Device interface

This interface is related to setup the GNSS in RTK mode, and check the receiver information.

- Communication: Connect receiver
- Rover: Setup receiver work as rover
- Base: Setup receiver work as base
- Static: Log raw data
- •Inspection accuracy: Get 60 points and inspect their accuracy
- Device Settings: Set the rate of output
- •Restart Positioning: Get a new coordinate
- Device Information: Show firmware, hardware, status and so on.

2.3 Survey Interface

This interface contains all survey modes, such as the most used function Point Survey, Point Stakeout and Stake Road function.

- Topo survey: Measure points
- Detail Survey: Show local gird coordinate and Lat, Lon coordinate
- Control Point Survey: Measure control points
- Point Stakeout: Stake out points
- CAD: Import dxf or dwg file; edit layers and choose points/lines to stake out
- Line Stakeout: Stake out lines
- DSM Stakeout: Stake out elevation in an area
- Road stakeout: Edit roads and Stake out them

2.4 Tool Interface

The interface mainly includes Coordinates converter, File sharing, Calculator and COGO function.

• Coordinates Converter: Local coordinate, Geodetic coordinate and spatial coordinates are interchangeable

• Angle Converter: Different angle formats are interchangeable, such as dd (Decimal), dd. mmssss, Radian

• Perimeter and Area: Input some points form a face and calculation its area and perimeter

- Calculator: Just like the calculator in your phone
- File sharing: Share files with share code and QR code

• Coordinate inverse calculation: The known coordinates of points A and B, calculate the plane distance, vector, azimuth, elevation difference, ratio of slope and ratio(1:N)

• Point line calculation: The known coordinates of starting point A, end point B and side point C,P is the drop foot, calculate the start distance(AC),end distance(BC),start vertical distance(AP),end vertical distance(BP),Offset distance(CP),Offset angle(α) and corner angle (β).

• Vector: The latitude and longitude coordinates of the starting point A and the end point B are known, and the distance between the two points can be calculated.

• Two lines angel: The known point O, point A and point B, find the angle α between straight line OA and OB.

• Intersection calculation: The known starting point A and terminal point B of line AB , the known starting point C and terminal point D of line CD, calculate the coordinate of intersection point P

• Resection: The known coordinates of point A and point B, and the known distances of L1 and L2, calculate another coordinate of point P and the angles of triangle ABP

• Forward intersection: he known coordinates of point A and point B, and the known angles of α and β , calculate another coordinate of point P and the sides' length of triangle ABP

• Coordinate positive calculation: The known coordinates of starting point A and end point B, the known length L of line AP and the angle α between line AB and line AP, calculate the coordinate of point.

• Offset point calculation: The coordinates of known line AB starting point A and terminal B, the station distance L1 and offset distance L2 are known, calculate the coordinate of point P

• Extend point calculation: The coordinates of known line AB starting point A and terminal B, the extend distance L1 is known, calculate the coordinate of point P

• Equal point calculation: The coordinates of known line AB starting point A and terminal B, the line is divided into several segments averagely, calculate each coordinate.

5

2.5 Floating window



• Status Bar

The icons and their descriptions are as follows:

Icon	Description
33%	Indicates the receiver battery power
Carlo Carlo	31: number of the satellites used.
31/36	36: number of the satellites tracked;
Ē	Rover internal radio mode
((-€)	Rover device internet mode
1185B	Rover phone internet mode

The positioning status and their descriptions are as follows:

Status	Description
NONE	The receiver is searching the satellites.
SINGLE	Single positioning solution.
FLOAT	The whole week ambiguity is not fixed.
FIXED	The whole week ambiguity is fixed, high accuracy.
BASE	The base is setup successfully.

Age:***	The diff delay, * represent the diff delay value
H:, V:	Horizontal RMS, Vertical RMS

3 RTK Workflow

This figure shows the workflow of your survey through SingularPad.



3.1 Create a new project

Click Project manager, click the New button in the lower left corner of the screen and input project name, set coordinate systems parameters and save the project. In Project Manager interface, you can click previous projects in the Project List to remove or open it.



If you have added one project, you can click the project name in the main interface to check the current project details, including Project Name, Project Path and Coordinate systems parameters. And you can edit it. How to create a user defined datum: If you cannot find datum you want in the list, follow instructions below to add one: select ellipsoid para, projection para, datum para, and input horizon adjustment, vertical adjustment and local offsets based on your request. Save and apply it. Meanwhile you can share the coordinate system with your workmates.

Create Project	¥ マ 🖹 2: ct	:50 ⊡ ●	Coordin	ates System	¥ ▼ N £ 2:50 Favorites
Basic Information	Coordinate systems parameters	Cont	ent List		
Coordinate systems p type	arameters Local parameters	>			
Name	Default				
Ellipsoid Parameter					
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ITRF Parameter					
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3.2 Connect to receiver

After creating a new project, switch to Device, click Connection. You can connect

SingularPad with SingularXYZ Y1 GNSS receivers. Or choose other devices.



There are two connection types: Bluetooth and Demo.

	* 💎 🖹 🛃 2:58	→ ●	* 😌 🖹 🗜 2:58
\leftarrow Communication			
Device manufacturer	SingularXYZ >	Device manufacturer	SingularXYZ >
Device Type	rtk >	Device Type	rtk >
Connection type	Bluetooth >	Connection type	Bluetooth >
Device manufactu SingularXYZ Other	rer AC	Device Device Connection type Connection type Bluetooth Demo	AC >
Connect		Connect	
< 0		< 0	

Bluetooth: After connecting SingularXYZ receiver, you can check some information of receiver (like firmware version) in Device Info. And some functions are only available for specified device. After connected successfully, the floating window will show the positioning status.



Tips: If you failed to connect with receiver through SingularPad, *you can just follow* prompt info to go into the device Bluetooth setting interface to make sure Bluetooth paired successfully. Sometimes you need forget the device Bluetooth, restart the receiver or software and get pair again.

Demo: Simulate connecting SingularPad. On this model, some functions will not work.

3.3 Quick setup your receiver

In SingularPad, you need only one step to start your receiver: Choose work mode and apply. There are some default work modes, three for Base and three for Rover. Choose one mode; you can check the detailed information. If the default work mode suits for you, you can just click Apply to start your receiver. Usually, you need to add one mode yourself.

3.3.1 Start your receiver as Base

There are three modes you can choose, Device Internet, Internal Radio and External radio.

Internal Radio: This mode uses internal radio to transmit the correction data from Base to

Rover. You need to set Base and Rover with same protocol and frequency.

The following steps give an example of internal radio transmission.

- Protocol: Supports Transparent, MAC, South or TRIM450S for Base transmission
- Frequency: select a channel or customize a frequency, the range of frequency is 438.125-447.125MHz
- Power: Supports 0.5W, 1W or 2W

		* 🐨 🖹 🗄 3:06		* 🐨 🖹 🗄 3:06
🗲 🛛 Base m	ode settings		← Parameter	Settings
Base Setup Pa	ara		Internal Radio	
Cut-off Angle:	5 Diff Mod	e:RTCM3 >	Channel	5 >
Start Up Mode		Single Point >	Frequency	443.125
Datalink Settin	ngs		Protocol	Transparent >
Data Link		Internal Radio >	Power	500mW >
Channel:5 Protocol:Trans	Frequenc	:y:443.125 > 00mW >	Note: When Base station 500mW & below, RTK ra	n radio power is set to Low or nge will be reduced!
Share	Collection	Set Base Startup	Default radio settir	ngs OK
\bigtriangledown	0		\triangleleft	0 🗆

External Radio: This mode uses external radio to transmit the correction data from Base to Rover. You need set Base and Rover with same protocol and frequency. The steps to start external radio mode is similar with internal radio mode, but you need

select the protocol and frequency on the external radio, not In SingularPad.

• Baud rate: This option is to set the baud rate of lemo port.

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← Base m	node settings		🔶 Param	eter Settings	5
Base Setup Pa	ara	=	External Radio	5	
Cut-off Angle:	5 Diff Mod	e:RTCM3 >	Baud Rate		38400 >
Start Up Mode		Single Point \rightarrow	Baud	Rate	\checkmark
Datalink Settir	ngs		38400	1	×
Data Link		External Radio \rightarrow	9600		
Baud Rate:384	400		19200	1	
			38400	1	
			57600	1	
			11520	0	
		Out Dates	_		
Share	Collection	Set Base Startup		ОК	
\bigtriangledown	0		\bigtriangledown	0	

Internal GSM: This mode uses GPRS (internet data) to transmit the correction data from Base to Rover. You need insert a SIM card to Base, set the Base to log on server (with static IP address), and the Rover receives the correction data by Ntrip protocol. The following figures show an example of Base configuration with internal GSM transmission.

		* 🐨 🔟 🚊 3:15		≱ 🐨 🗒 ≜ 3:15
🗲 🛛 Base m	ode settings		← Parameter Settings	
Base Setup Pa	ira		Device Internet	
Cut-off Angle:	5 Diff Mod	e:RTCM3	CORS Settings	
Start Up Mode		Single Point >	IP	Ĺ
Datalink Settir	ngs		Port	0
Data Link	I	Device Internet >	Password	0
Connect Mode IP: Password:****	Server Po	ort:6060 >	APN Settings	:=
Base access p	oint	Y11L02207	Vser	
			Password	0
Share	Collection	Set Base Startup	ок	
\bigtriangledown	0		0 Þ	

3.3.2 Start your receiver as Rover

This chapter shows how to tart receiver as rover with Internal Radio, Device Internet and Phone Internet mode.

Internal Radio: Select the same protocol and frequency with the Base receiver, and then the receiver status will turn single to be fixed. The following steps show an example of internal radio.



Device Internet/Phone Internet: For Device Internet mode, we need insert a SIM card to

receiver, for Phone Internet mode, we need make sure controller can access to Internet.

You should input the server IP and Port. In addition, enter User (login name) and Password

to get mountpoint.

- The protocol supports NTRIP, TCP Client
- NTRIP: This is a common Ntrip protocol; you need to set the username and password.

And Device Internet mode only supports Ntrip protocol.

• TCP: This is used to directly obtain the corrections transmitted by TCP protocol.

	* 🔹 🖹 3:27
\leftarrow Rover mode setti	ings
Basic para	8
Cut-off Angle	5 >
Datalink Settings	
Data Link	Phone Internet >
Connect Mode:NTRIP	
IP: Serv	ver Port:0 >
line Dec	
User: Pas	sword:*****
MountPoint Settings	sword:***** Get
MountPoint Settings	Sword:****** Get 8KM-K803-RTCM32 >
MountPoint Settings MountPoint Receive data	Sword:***** Get 8KM-K803-RTCM32 >
MountPoint Settings MountPoint Receive data	Sword:****** Get 8KM-K803-RTCM32 >
MountPoint Settings MountPoint Receive data	Get 8KM-K803-RTCM32 > Start
MountPoint Settings MountPoint Receive data Share Collection	Start Apply

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← Parameter Settings		\leftarrow Rover mode setting	ngs
Phone Internet		Basic para	er en
Connect Mode	NTRIP >	Cut-off Angle	5 >
CORS Settings	ST	Datalink Settings	
IP		Data Link	Phone Internet >
Port	0	Connect Mode:NTRIP IP:140.207.166.210 Serve	er Port:25001
User		User:fghv Pass	word:*****
Password	O	MountPoint Settings	Get
		MountPoint 8	3KM-K803-RTCM32 >
		Receive data	
			Start
ОК		Share Collectio	n Apply
⊲ 0		⊲ 0	

4 RTK Survey-field Data Collect

This section describes the basic survey functions of SingularPad including Point Survey,

Detail Survey, CAD and Stakeout. In the first, you have to connect to rover receiver and make

it fixed.



4.1 Point survey

In the Survey interface, click Point Survey-> enter point name, code and antenna height,

->click to start or stop collecting data. Tilt Survey option will appear when receiver supports for tilt survey, it is available for SingularXYZ Y1 GNSS receiver. When the pole tilts within 60°, the built-in sensor based tilt measurement system precisely calculates the actual offset according to angle, which can not only meets the requirement of high precision measurement, but also relieves the users from continually checking whether the pole is plumb.

When using it for the first time, you should follow the interface prompts to initialize the IMU module; it will take you a few seconds. You have been confirmed the antenna information, and it is correct.

If calibration expired or you first use the receiver, tap Calibrate and follow the guidance until

succeed. During operation, make receiver can search the satellites. The angle should be less than 60°, for more accuracy, angle less than 30° will be better. When the pole tilts within 60°, the built-in sensor based IMU precisely calculates the actual offset, which accuracy can up to 2.5 cm.

If you power off the receiver or reset it, need to initialize again. After open IMU button, you can follow the guidance in interface to complete it. When you click IMU button to initialize, it will prompt you to confirm the pole height, default pole height is 1.8 meters. During operation, make receiver search satellites and get a fixed

Of course, you can get some information from the floating window, like coordinate and base distance.

• Click , it will auto jump map center.

• Click to show the layers or calibration: google map/open street map/map calibration



- Click I to show the whole points on the interface.
- Click to check point coordinates, you can add, recover, import, and export the

data. After you choose a point, you can check the details and take notes or photos

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\leftarrow Points Datab	ase 🔳	← P	Point Details	
Name > Input que	ry keyword	Name	Pt5 ×	Code
Pt6 Smooth Point	T:2022-03-14 07:19:54.408	Antenn	a Height	1.8+0.087m >
N:3450152.146 E:622976.065	h:16.464 Code:	Solutio	on Status	FIXED (31/36)
Pt5 Smooth Point	T:2022-03-14 07:13:16.373	вм	N31°09'59.4042"	N 3450150.935
N:3450150.935 E:622978.544	h:16.223 Code:	L E	121°17'23.5380"	E 622978.544
Vertex Smooth Point	T:2022-03-14 07:00:03.440	н	16.223	h 16.223
N:3450150.906 E:622978.928	h:17.773 Code:	Scale c	correction factor	1.0001839231
Pt3 Smooth Point T:2022-03-14	T:2022-03-14 06:35:43.398	Speed	3	Heading 0.020
E:622977.921	Code:	PDOP	0.270	HRMS 0.050
V Pt2 Smooth Point	T:2022-03-14 06:35:36.921	HDOP	0.200	VRMS 0.090
N:3450153.287 E:622978.217	h:19.046 Code:	VDOP	0.200	AGE 3
Pt1 Smooth Point	T:2022 03 14 06:35:26.208	Average	e GPS Count 5	Average GPS Count 5
Add Recover	Import Export	Photo	And Sketch	ОК
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• Click to set settings, display info and tool bar, in setting interface, you can edit receiver parameter, such as solution limit, HRMS limit, VRMS limit; in display info interface, you can add information to floating window you want below the interface; in tool bar interface, you can add or delete options to point survey interface. You can customize the interface to meet whatever layout needs you might have.

	* 💎 🖹 🗄 6:34	Setting	6	≱ 💎 🖹 🗜 6:35
Settings Display	v Info Tool Bar	Settings	Display Info	Tool Bar
Tolerance Setting		Display Item		
Colution Limit		N:3450153.28	5 H:19.1	10 stance:285 856
Solution Limit	FIXED	Options	Dase ui	stance.363.630
HRMS Limit	0.05 >	Long	Lat	
VRMS Limit	0.1 >	Altitude	Ant. H	
PDOP Limit	з >	Forward azimuth	n Speed	
AGE Limit	5 >	Time	Point di	st.
Smooth		Pt. H dist.	Pt. Elev	ation diff.
Survey delay	0 >	σN	σE	
Average GPS Count	5 >	PDOP	HDOP	
Default	ок	Backspace	Default	ок
		\triangleleft	0	
Settings Display Display Item	y Info Tool Bar Options Q Zoom in Q Zoom out Dump map center Jump map center Take screen point CAD Text Length&Area Measure	↓ N:3450152.370 E:622976.301 Long:E121°17'23 VDOP:0.200	FIXED H:0.050 Age2 V:0.090 H:16.40 Base dis 4.4540" Lat:N31 HDOP:0	7 tance:386.836 "09'59.4517" 200 270° 900 100° 500 100° 500
	Measure GAD Background Color CAD layer	Name Pt7	Code	50m
Clear Defa	ault OK	Antenna Heigh	t	1.8+0.087m >
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4.2 Detail survey

Show both local coordinate and Latitude/Longitude when measuring.

Click to start or stop collecting data

• Click to check point coordinates; you can add note, info, arrow drawing and photo.

• Click to set settings, display info and tool bar,



4.3 Control point survey

By measuring the coordinates of the same point several times, an accurate coordinate is obtained.



• Click to average GPS count, interval, and repeat count.

4.4 Point stakeout

Go into Stake point interface, add or import the point coordinates you need to stakeout, of course you can choose from the button library.

• Click Add to input coordinates.



• Click button library to choose one

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← Stake Point		← Cool	rdinate list	selection
Point Coordinates To-Stake-Point	Preview Map	Name >	Input query k	reyword
Name > Input query keyword	1	Select A	II(0)	
		Pt' N:3450 E:6229	Smooth Po. 0153.227 078.455	Range selection
		© Pt: N:3450 E:6229	2 Smooth Po. 0153.287 078.217	T:2022-03-14 06:35:36 h:19.046 Code:
		© Pt: N:3450 E:6229	3 Smooth Po. 0153.186 077.921	T:2022-03-14 06:35:43 h:19.067 Code:
		© Pt4 N:3450 E:6229	4 Smooth Po. 0150.906 078.928	T:2022-03-14 07:00:03 h:17.773 Code:
		Pt: N:3450 F:6220	5 Smooth Po. 0150.935	T:2022-03-14 07:13:16 h:16.223 Code:
Add Button Library Impo	ort Export	Add	Impo	ort OK
		<	0	

• Click Import to get coordinates with different kinds of files; you can also define a new

form.

Choose a point to stake, SingularPad provides a navigation map when staking points/lines. If you are close to the target point enough, it will alarm you based on the alarm range you set. For Y1 receiver, you can use IMU staking function. In the IMU staking, you can open IMU function, and don't need to keep the receiver vertical to the ground, and the tilt angle supports maximum to 60 degrees.



- There is a direction prompt on the floating window
- Click to start or stop stake points
- Click **I** to open or close IMU
- Click to scale automatically
- Click it, jump to lasted point
- Click , jump to next point
- Click , jump to previous point

• Click to set stakeout settings, display info and tool bar, you can edit the prompt range and range error

Click to open compass	
■ ● * ▼ ≥ 8:56 ← Settings	■ ● * ■ ≥ 1 8:50 ← ● FIXED H:0.050 * ■ 0
Settings Stakeout Settings Display Info Tool Bar	backwards:6.910 Target azimuth:318°50'40.057 to Left:86.386 Slope(%):-5.500
Navigation Prompt(Forward)	To North To West 🕹 Cut
Stakeout Reference Forward Direction >	65.250m 57.033m 4.766m
Prompt Range(m) 1 > Automatically enter the stakeout compass mode O	300 [°] 330 [°] N 300 [°] 30 [°] 0 [°]
Stakeout range error(m) 0.02 > Automatic scaling O	E 210° E 210° S 150° E
Automatic Stakeout Latest Point	Image: Second
	Name c101 X Code
Default OK	Ant. H:1.8+0.087m > Target:A1

4.5 Line stakeout

Go into Stake line interface, add or import lines you need to stakeout.

• Click Add to input line parameters, there are two types you can choose

••	米 🐨 🔟 🖻 9:	:08 🗖 🔍	* 💎 📉 星 9:08
← Line param	eters	🗲 🛛 Line para	meters
Name		Name	1
Start Station		0 Start Station	0
Input Type	Start Point+End Point	> Input Type	Start Point+Azimuth+Length \rightarrow
Set Start Point	5	Set Start Point	5
Northing:0.000 Easting:0.000	Name: Elevation:0.000	> Northing:0.000 Easting:0.000	Name: Elevation:0.000
Set End Point	5	Azimuth+Length	
Northing:0.000 Easting:0.000	Name: Elevation:0.000	Azimuth	0°00'00"
		Length	
		Height diff	
	ок		ок
\triangleleft	0	\triangleleft	0

• Click Import to get coordinates with different kinds of files; you can also define a new

format.



Choose a line to stake, set calculation mode and interval.



4.6 CAD mapping and stakeout

When using for the first time, the CAD interface has no layers and floating window to display the features you need to stake.



Input parameters and save it



Find the file you want to stake and import it. After create or import one, you can scan and

edit it in the CAD layer.

• Click to draw features, there are 12 types and methods you can choose, follow the

prompts and draw.



• Click into to find tools; they can help you to work smoothly. For example, to find the intersection points of neighboring circles.



In the CAD interface, you can choose a feature you want to stake, it will show up in blue. You can know the details about it, including length, start point, end point and center point. And choose the way to stake.



	\$ ▼ 1	¥ 3:10
← Object Info		
Layer	SPI-pav-hatch	
line		
Basic Information		
closed		open
Total Length 2D		17.684m
Total Length 3D		17.684m
Coordinate Info		
P1(0) N:2582811.747	E:892453.637	H:0.000
C(8.842)		H:0.000
N:2582820.515	E:892454.779	
P2(17.684) N:2582829.283	E:892455.922	H:0.000
Save	Stakeo	ut
\bigtriangledown	0 🗆	
	* 💎 🛛	3:11
← Stakeout Sett	ings	
Setting out centre poin	t	\bigcirc
Start Station		
Offset Dist		0
Setting out by pile by c	oordinate	-0
Calculation mode Sta	keout by station nun	nber >
Interval		5 >
Automatic Stakeout La	test Point	\bigcirc
Station(0~17.684)		0
C	ж	
< (

- Setting: Set the method of stakeout, offset distance, interval etc.
- Start station: If you set the start station as 5m, then final mileage will plus 5m.
- Offset: If you set the offset 5m, then you will stake the line 5m away from the line you

choose. Plus and minus represent different sides of the line.

• Setting out by pile by coordinate: including station number, station distance and

segment

(1) Station distance: Stake the line at a specified distance, for example, if the line is 40m,

you set the specified distance as 8m. Then you will stake the line at 8m distance every segment

(2)Segment: For example, if you set the line segment as 4, then you will stake the line at4 segments, every segment length is the same.

(3)Station number: You will stake the line at the station at each interval point You can stake it out according to the direction.

(4)key node: It will stakeout the line with starting point, ending point, midpoint, fold point, etc



4.7 DSM stakeout

You can stake the elevation using the design surface, if you don't open a surface before, then you need to add one by adding, importing coordinates or choosing from the button library.

You can get a preview map after adding points and don't forget save it.

	* 💎 🖹 🛔 7:16		* 💎 🖹 🗎
← Triangulation Fi	le	← Triangulation	n File
Name	singular xyz 🗙	Name	singular xyz
Point Coordinates	Preview Map	Point Coordinates	Preview Map
Content List			
1 N:3450000.000 E:6220	00.000 H:14.000		
2 N:3450000.000 E:6240	00.000 H:14.000	2	
3 N:3451000.000 E:6223	00.000 H:15.000		
			. 500
Add Button Library	Import OK	Export	ок
< 0		\bigtriangledown	0 🗆

At the content list interface, you can find the surfaces you made, and you can edit, share and

stake them.


If the current position is not within the range of the design surface, it will show "Out of Surface!" if the current position is within the range of the design surface, it will show the fill or excavation value.



4.8 Stakeout road

To stake road alignment, first you need design the road, including the broken station, center line, vertical profile, standard cross section and slop. You can design it by editing or importing.

→ ●	* 😌 🖹 🕏 8:02
← Road Design	
Name	singularxyz $ imes$
Road Data	Preview Map
Broken station	
none	>
Centerline	
Line Element met Count:0 Station range:0 ~ 0	:hod Length:0m >
Vertical Profile	
none	>
Standard Cross Sect	tion
none	>
Slone	
Check	ОК

4.8.1 Broken station

Broken station refers to the phenomenon of discontinuity of pile numbers caused by local changes or section measurement. There are two main situations, one is that the front stake is larger than the back stake, and the other is that the front stake is smaller than the back stake. Classification of broken station has two types:

The first type, the front pile number is greater than the back pile number, for example: K112+943.305 = K112+900.001, and there will be duplicate piles. In this case, it is called a long chain. The distance between two long chains is the difference between the two piles, 43.304 meters.

The second type, the front pile is smaller than the back pile, for example:

K115+309.227 = K115+320.001, there will be a discontinuity in the stake. This situation is called a short chain, and the distance between two short chains is also the difference between the two piles, 10.774 meters.

To sum up in a short sentence, it is: if the pile number is repeated, it is a long chain, and if the pile number is broken, it is a short chain.

SingularPad supports long chain, short chain, and supports multiple broken stations at the

same time. It is recommended that the user enter the broken station first before entering other parameters to avoid changing the broken station later and affect other parameters. Of course, you can also enter the broken later.

When you enter the broken station, it is entered as real number, for example,

K1+234.000 = K1+238.000, the mileage before the broken station, you need to enter 1234, the mileage after broken station, you need to enter 1238;

K112+943.305 = K112+900.001, the mileage before the broken station, you need to enter

112943.305, the mileage after broken station, you need to enter 112900.001.

•		* 💎	8:35		_	* 💎 🖹 🛿 8:36
← Brok	en station			+ Broken	station	
Before stati	on		1234	Content List		
After station	ı	1	238 ×	1.Short Before station	n:1234.0 After s	Length:4.000m tation:1238.000
				2.Long Before station	n:11294 After s	Length:43.304m tation:112900
Ok		Next				
1	2	3	-			
4	5	6	,			
7	8	9	×			
	0	_		Add	Import	ок
\bigtriangledown	0			\bigtriangledown	0	

4.8.2 Centerline

SingularPad can use three methods to define an alignment: line element, Intersection and Coordinate element method.



Intersection method

Intersection method refers to point of intersection, which mainly use point coordinates to define the alignment;

••	>	\$ 💎 🖹 🛿 2:25	 (* 💎 🖹 🛿 2:2:
🗲 Centerlir	ne		÷	Intersect	tion Coordi	nates
Design Data	a Pre	view Map	Stat	tion		17221.801
Design Method	Intersec	ction method >	Set I	ntersectior	Point	8
ontent List			Nan	ne		bp 🗙
			Nor	thing		3226521.691
			Eas	ting		510801.597
Add	Import	Check			ОК	
\triangleleft	0			\triangleleft	0	

	* 💌 🖹 2:38		* 💎 🖹 🛿 2:39		
← Intersection Coordinates		← Intersection Coordinates			
Station	17297.585	Station	17551.46		
Set Intersection Point	9	Set Intersection Point	37		
Name	jd1 $ imes$	Name	$_{\rm zd}$ $ imes$		
Northing	3226446.207	Northing	3226239.905		
Easting	510794.853	Easting	510869.629		
Parameter Settings		Parameter Settings			
First Spiral Length	25	First Spiral Length			
First Spiral Param	57.009	First Spiral Param			
Radius	130	Radius	0		
Second Spiral Length	25	Second Spiral Length			
ок		ок			
		⊲ O			

First tap Add to input the parameters of the start point and save it

And input parameters of each station one by one, finally input the end point.

⊷ ●		* 💎 🖹 🛿 2:39				* 💎 🖹 🛿 2:24
🗲 Centerli	ne		÷	Centerline		
Design Dat	a Pr	eview Map		Design Data		Preview Map
Design Method	Interse	ection method \rightarrow				t bp
Content List						
1. bp(Station: N:3226521.69 First Spiral len	:17221.801) 1 E:5108 agth:0.0 Second	01.597 I Spiral length:			/	/ •jd1
2. jd1(Station N:3226446.20 First Spiral len	n:17297.585) 7 E:5107 ngth:25 Second	Radius:130.000 94.853 Spiral length:		/	•jd2	
3. jd2(Station N:3226357.86 First Spiral len	n:17396.607) 5 E:5107 ngth:25 Second	Radius:65.000 48.496 I Spiral length:	Q			-zd
4. zd(Station: N:3226239.90 First Spiral len	:17551.46) 5 E:5108 igth:0.0 Second	Radius:0.000 69.629 I Spiral length:		1		100m
Add	Import	Check		_	Chec	k
\bigtriangledown	0			\triangleleft	0	

You can view details and get a preview map in the center line interface

Tap Check, you can make s inspection about the coordinates with three methods, stakeout

by station number, distance or input station and offset. check three or four coordinates of the stations to make sure no wrong data entered.



→ ●	* 💎 🖹 🛿 2:25
🗲 Road Check	
Coordinates List	Input Station and offset
Station(17221.801~176	521.973) 17300
Offset Dist	0 ×
Result	
Northing	3226447.531
Easting	510779.375
Elevation	0.000
Azimuth	207°41'17.7387"
\triangleleft \sim	

Line element method

Line element method is more popular, which use element parameters such as line length, azimuth, Spiral and curve to define the alignment



Firstly, choose line element method and add start station.

Next, enter parameters of the features one by one. Usually, after you finish one feature and tap click, it cycle in order of line spiral curve spiral. You can change according to the actual situation.

■ * N 1:39 ← Line element parameters					
Line Type	Line >				
Length	37.29276269				
Azimuth	185.06208 🗙				

••		* 💎	🖹 🛿 3:38			
← Line element parameters						
Line Type			Spiral >			
Start Radius		00	∞ 📡			
Length			25			
End Radius	130	×	$\square \infty$			
Heading			Right >			
Azimuth		185	°06'20.8"			

the first spiral

ОК		Next	
\bigtriangledown	0		
	*	💎 🖹 🛿 3:39	•
← Line elemer	nt paramete	ers	← Li
Line Type		Curve >	Line Typ
Radius		130	Start Ra
Length	26	.237444 🗙	Length
Heading		Right >	End Rad
Azimuth	190°36	5'53.954447"	Heading
			Azimuth

ОК	Nex	t
\bigtriangledown	0 🗆	
••	* 🗇	3:39
\leftarrow Line element	t parameters	
Line Type		Spiral >
Start Radius	130	∞ □
Length		25 ×
End Radius	00	₫ ∞
Heading		Right >
Azimuth	202°10'43	.656778"

the second spiral

ОК		Next	ОК		Next	
\bigtriangledown	0		\bigtriangledown	0		

_			* 💎 🖹 🛿 3:20
÷	Line elemen	t param	eters
Line	Туре		Line >
Leng	th		
Azim	uth		0°00'00"
	Line Type		
	Line		
	Curve		
	Spiral		
	ок		Next
	\triangleleft	0	

Tips: in most cases, the start radius of the fist spiral is infinite; end radius is the radius of next curve. The start radius of the fist spiral the radius of previous curve, end radius is infinite.

Also, you can check and edit it in the center line interface.

			* 🎔 🖹 🛿 2:20		٢			* 🎔 🖹 🛿 2:20
← Centerl	ine			←	- Road (Check		
Design Da	ta	Pre	eview Map		Coordinates	s List	Inpu	t Station and offset
Design Method	ł	Line Ele	ement method >	St	ation(17221	.801~17	550.74)	17300 ×
Content List				Of	fset Dist			
1.Start Point N:3226521.69	91	Start	ation:17221.801 01.597	Re	sult			
2.Line Azimuth:185°	06'20.8	Start	ation:17221.801 37.293	N E E	orthing asting levation			3226444.324 510791.380 0.000
3.Spiral(Righ Azimuth:185° Start Radius:c	t) 06'20.8 ∞	Start	ation:17259.094 25.000 dius:130	A	zimuth		l	197°37'31.6229"
4.Curve(Right) Azimuth:190°36'53.9 Radius:130		Start	ation:17284.094 26.237					
5.Spiral(Righ	t) 10'43.6	Start Start	ation:17310.331 25 000					
Add	Imp	ort	Check					
\triangleleft	С)			\bigtriangledown	(C	

Coordinate element method

Coordinate element method can be used in the situation that the road is made up of lines and

curves only.



Add	Import	Check
\Diamond	0	

You can check and edit it in the center line interface. You can design roads by importing files of road. There are abundant formats you can choose. Also, you can create a new one.



4.8.3 Vertical Profile

Vertical profile contains grade breaks, there are two methods, you can choose, enter the elevation data in each station and check.





4.8.4 Standard cross section

You can import cross section files. Each cross section has two parts, the left section and right section.

		* 🖹 🛿 6:47		-		* 🖹 🛿 6:25
← Standard Cross Section			←	Standard	Cross Sect	ion
Left section	on Ri	ght section	Na	me >		section1
Content List			Wic	ith		5
			Slo	ре		2
			Ele	vation		$\mathfrak{s} imes$
Add	Import	Symmetry		ОК		Next
\bigtriangledown	0			\bigtriangledown	0	

Usually we edit the left section first, enter parameters of width, slop and elevation data, and

tap OK to save or tap next to enter the next one. The unit is meters



If the right section was same with left section, just tap the symmetry in the right section

interface, it will get the right section automatically. If not, enter the right one.



If you need to enter ultra-height and ultra-width data, tap the cross section data you have already entered in the content list, and enter them.



4.8.6 Slope data

Enter cut or fill data of each station if you need.



4.9 Road stakeout

After design the road, click and stake it out in the roads database interface, it will auto add the start point of the road to the target stake point, follow the navigation information shown on the map.



When go near the target point, the map will show big circle as below, and when the accuracy

high enough to stake the point, SingularPad will alarm to let you know, then press it finish this point stake, and there serial modes you can choose in different situation.



• Stake road by line: Default mode, when you get close to the road, it will guide you

towards the road vertically. Just follow the row and stake it out.

• Stake road by point: Before your work, you need to enter the parameters to calculate the

points you will stake next.



• Add peg: Calculate a point one time, enter the station and offset distance, enter positive distance, the point will be on the life side of the road. Enter negative distance, the point will be on the right of the road.

→		* 🖹 🛿 9:03	🗷 🌒 🖹 9:18
← Stakeo	ut target list		🗲 👜 FIXED н:0.050 🦗
			Age1 V:0.090 31/36 100%
Automatic Stal	keout Latest Poin	t =O	Station.: <over limit=""> Offset:[Right]<over limit=""></over></over>
Content List			To South:77.603 To West:12.994 Fill:7.782
17300.00 N:3226445.83	38 E:5107	Offset Dist:5.000 86.615	C.1.4025
17400.00	0	ffset Dist:-5.000	
N:3226351.84	42 E:5107	72.111	
			Name c107 X Code
Add Peg	Recalculate	ОК	Ant. H:1.8+0.087m \geq Stake road by point \geq
\bigtriangledown	0		

Choose one point and follow the navigation information to stake it out,

• Recalculate: Calculate points with interval and offset distance, it will calculate points at

one time according to the set parameters

	\$ 🖹 🛿 9:25	•		* 🖹 🛿 9:26
← Calculate Stake		← Stakeou	t target list	
Calculation mode Stakeout by station	n number >	Automatic Stake	eout Latest Poin	t = O
Interval	50 >	Content List		
Offeet Diet	0 ×	N:3226460.660) E:5107	90.344
Unset Dist	0 ~	SC1(17284.09	94)	Offset Dist:0.000
Side-Stake Point		N:3226459.739	E:5107	95.258
Left neg offset	5.2	SC1_L	C	offset Dist:-5.000
Len peg onset	5 /	N:3226458.818	B E:5108	00.173
Right peg offset	5 >	CM1 L	C	offset Dist:-5.000
		N:3226445.577	E:5107	96.992
		CM1(17297.2	13)	Offset Dist:0.000
		N:3226446.989	E:5107	92.196
		CM1 R	(Offset Dist:5.000
		N:3226448.400	E:5107	87.399
		17300.00_R	(Offset Dist:5.000
ок		Add Peg	Recalculate	ок
]	\triangleleft	0	

Cross section measurement, auxiliary profile stakeout and stake road by cross section are similar to this mode, set parameters and stake them out.

4.10 Points database

The points, which are surveyed, staked, added, imported, and input from display map, will be stored in point database. The surveyed points will be shown under one base while surveying. Also, no matter where you need to select a point, all the points of the database are available.

	¥ 🖹 🖬 1:38 :──	■ ●
Points Datab	ase 📃	← Points Database
Name > Input que	ry keyword	Name > nput query keyword
C108 Smooth Poin	t T:2022-03-18 09:54:49.942	Select All(1) Share Delete Cancel
N:3226520.344 E:510752.802	h:12.228 Code:	N:3226520.344 In 19 292 E:510752.802 C Range selection
© c107 Smooth Poin N:3226520.590	nt T:2022-03-18 09:54:28.157 h:12.262	C107 Smooth T:2022-03-18 09:54:28 N:3226520.590 h:12.262
E:510752.431	Code:	E:510752.431 Code:
C106 Input Point	T:2022-03-18 08:31:54.000	C106 Input PointT:2022-03-18 08:31:54
E:510801.597	Code:	N:3226521.690 h:12.500 E:510801.597 Code:
C105 Smooth Poin	t T:2022-03-18 08:29:54.490	T:2022-03-18 08:29:54
N:3226520.840	h:-0.844	N:3226520.840 h:-0.844
E:510806.843	Code:	E:510806.843 Code:
© c104 Input Point N:3226521.691 E:510801.597	T:2022-03-18 08:29:40.000 h:0.000 Code:	C104 Input PointT:2022-03-18 08:29:40 N:3226521.691 h:0.000 E:510801.597 Code:
CIOS Smooth Poir	t T·2022-03-18 08·24·29 899	C .103 Smooth T.2022-03-18 08-24-29
Add Recover	Import Export	Add Recover Import Export
\triangleleft	0	

• Add: Supports to add Input Point, and Display type Supports Local coordinate and geodetic coordinate

- Recover: After delete the points, you can recover them in deleted points interface
- Import: Import points by different formats of files
- Export: Export points by different formats of files
- Search: Enter the name of the point you want to inspect and show it out
- Share/Delete: Long press to choose the point you want share or delete

Tap a point to check the information about the base coordinate. The information includes antenna height, solution status, WGS84 Coordinate, local grid coordinate, base id and measure time. if you had calibrated the point, it will display offset parameters.

•	* 🖹 💈 2:14	🗳 🔍 🛸 🚺 2:1:
\leftarrow Edit Point		← Point Details
Name	A1	Name c108 × Code
Code	- 71	Antenna Height 1.8+0.087m
Coordinates Type	Local Coordinate >	Solution Status FIXED (31/36
		B N29°09'20.1510" N 3226520.34
Northing	3450216.297	L E120°06'37.8727" E 510752.803
Easting	622921.962	H 12.228 h 12.228
Elevation	14.759	Scale correction factor 0.999999508
Add Size a	0000 00 15 06 00 40 000	North Offset -222314.20
Add time	2022-03-15 06:28:49.000	East Offset -131159.78
		Height Offset -4.02
		Speed 2 Heading 0.02
		PDOP 0.284 HRMS 0.05
	ок	Photo And Sketch OK
\triangleleft	0	

• Photo And Sketch: add notes by note, arrow, drawing and photo

4.11 Data export/import

SingularPad supports to import/export data including grid coordinate, Lat/Lon coordinate with various data format, support import dat/csv/kml file and export result of DXF/KML/shp/xls/csv.

4.11.1 Import points data

Tap Import data in project interface, there are some predefined data formats, click More to get more predefined formats.

<u>م</u>	* 🖹 🛿 5:45	۵ 🖬 🖿 🕺 🖉 5:50
← Import File		← Format select
Data Type	Points Database >	File Format
Choose Import File Forma	at	Cass format(dat) Point Name,Code,Easting,Northing,Elevation
Local coordinates form Point Name,Northing,Easting,Ele	nat(txt) evation,Code	Local coordinates format(csv dat txt) Point Name,Northing,Easting,Elevation,Code
Import Para Distance Unit	Meter >	Geodetic coordinates format(csv dat txt) Point Name,Latitude,Longitude,Altitude,Code
		More
Next		New OK

• Data Type: support point database, line data base, transformation parameters file and code library

- Import File Format: support *.csv, *.dat, *.txt, *.kml format etc.
- Distance Unit: support meter, US survey feet and international feet

Besides, you can click new to create a User defined type.



- Format name: Enter the name for the format
- Extension name: support *.csv, *.dat, *.txt, *.xls,*.xlsx format
- Delimiter: support comma (,), semicolon (;), space (), tab (Tab)

Click to choose elements in the options list. Click backspace to eliminate the previous element selected. The elements include: code, name, northing, easting, elevation, latitude, longitude, altitude.

Choose one format to import data. The default export path is internal storage/ SingularPad / import. You can also change to any other path where the file is. Click preview to take an inspection whether the format is right.

	渚 🔟 📴 6:14	—		* 🖹 🛿 6:14
\leftarrow Import File	Settings	🔶 Previ	iew	
File Name	ceshiceshi.txt	Point Name	Northing	Easting
File Type	Local coordinates > format(*.csv,*.dat,*.txt) >	A1	3450216.297	622921.962
Internal Storage/Singula	arPad/Import	A2	3450216.286	622921.968
		A3	3450216.283	622921.969
Go to internal st	orage root directory	A4	3450216.284	622921.970
Go to program s	torage directory	A5	3450216.288	622921.963
🥱 Return		A6	3450216.286	622921.968
ceshiceshi.txt				
Draviau	OK	0.000		01/
Preview	UK	Cano		UK
\bigtriangledown	0 🗆	\triangleleft	0	

4.11.2 Export points data

Tap Export in Project interface to export simple data of survey points. Also, click

More formats to export the survey points with detailed information or other formats like stake points/lines, DXF, SHP, KML, RAW, RW5, HTML, CASS feature result.



• Export Path: the default export path is internal storage/ SingularPad/export; you can

also change to any other path where the file is.

- File Name: support project name, operator, date, data time
- Export File Format: support *.csv, *.dat, *.txt, *.kml format etc.
- Distance Unit: support meter, US survey feet and international feet
- Distance Unit: open to export road section data

Besides, you can click New to create a user defined type. The elements include: id, name, code, latitude, longitude, altitude, northing , easting, elevation, N, E, Z, type, local time, UTC time, solution status, AGE, max delay, min delay, used satellites, tracked satellites, cut-off angle, mount point, measurement method, repeat, start data, end time

,RMS,HRMS,VRMS,PDOP,VDOP, speed, heading, antenna type, measuring type, measuring height, antenna height, base id, base latitude, base longitude, base altitude, distance to ref, original latitude, original longitude, original altitude, undulation height, station correction x, station correction y, station correction h, inclination correction, pitch, roll, yaw, inclined angle, projected angle, stakeout type, target, station, offset, north diff, east diff, elevation diff.

For the points, lines and polygons you surveyed in point survey, you can export dxf file, then you can edit them in third party CAD software, or import to basemap to check, or import to CAD to stake. Choose the data that you want to export including survey point, input point, control point, stake point, base, line and polygon, and the layer properties includes name, code and height.

_	* 🖹 🕻 7:00	•	* 🖹 🛿 7:03	
\leftarrow Custom for	mat	← Format select		
Format name		Road section data	\bigcirc	
Extension name	dat >	File Format		
Point Id	Point Name	Local coordinates for	mat(txt)	
Code	Latitude	Point Name,Northing,Easting,Elevation,Code		
Longitude	Altitude	Point Name,Latitude,Longitude	e,Altitude,Code	
Northing	Easting	Survey point data format(csv)		
Elevation	x	Point Name,Code,Northing,Easting,Elevation, Latitude,Longitude,Altitude,Station Correction x Station Correction v Station Correction b Original		
Y	z	AutoCAD format(dxf)		
Point Type	Local time			
UTC time	Solution Status	Shape File(Local coor	dinates)(shp)	
AGE	MaxDelay	Shana File/Goodatia a	oordinates)(chn)	
Backspace	ОК	New	ОК	
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5 Total Station

SingularPad also can work with our TS1000 total station, and realize point survey, stakeout, CAD, etc.



5.1 Connect to total station

Click Connection. You can connect TS1000 total station to SingularPad. Choose device type as total station, and enable Bluetooth of TS1000 and connect.



After connecting TS1000, you can see the parameters showing in the window, VA (vertical angle) and HA (horizontal angle).

5.2 Set station

There are two methods you can set the station: Set station & orientation and free set station.

5.2.1 Set station & orientation

After you set up your total station at a control point, and you have a point or azimuth that you can set backsight, you can choose this mode.

▲ ●	* 🖨 💎 🖹 🔒 10:13	→	՝ 🖨 🛡 🖹 📱 10:13
← Set Station &	Orientation	← Set Station &	Orientation
Occupy Pt		Occupy Pt	
Name Northing Easting Elevation	Pt3 4567508.9250 5114819.8170 4.1590	Name Northing Easting Elevation	Pt3 4567508.9250 5114819.8170 4.1590
Instrument height	1.657 🗙	Instrument height	1.657 🗙
Set backsight	Point Set Backsight \rightarrow	Set backsight	Point Set Backsight \rightarrow
Backsight Pt		Backsight Pt	
Name Northing Easting	Pt3 4567508.9250 > 5114819.8170	Name Northing Easting	Pt3 4567508.9250 > 5114819.8170
		Result	
		Set station time Azimuth diff.	2022-12-08 10:13:48 108°00'31.0000"
Obs	erve	Observe	Apply
⊲ (\triangleleft	0 🗆

- Occupy Pt: Click to add or import the control coordinate
- Instrument height: the height from the measuring mark to the ground
- Set backsight: choose point or azimuth as backsight
- Backsight Pt: Click to add or import the control coordinate. If you choose azimuth as backsight, here need to enter Azimuth
- Observe: calculate the result, azimuth diff and distance diff

After enter all the parameters, Stand the prism at the backsight point, and the total station

points the prism and clicks to observe. It will calculate the result, and apply it.

5.2.2 Free set station

If you want to set up TS1000 in the place without coordinate. You need to set up the total station to a place where the known points can be seen, input the coordinates of the known points, and then measure the known points, and finally calculate the coordinates of the erection points of the total station. The greater the number of known points, the higher the

accuracy.



- Instrument height: the height of TS1000, from the measuring mark to the ground
- Reflector: it includes 3 modes prism, sheet and reflectorless
- Ranging mode: click 🔄 to choose ranging mode, precision measurement, fast measurement or tracking measurement.
- Add or Button Library: you can import through clicking buttons to enter or choose the coordinates of known points
- Calculate: after measured all the known points, click Calculate to get the coordinate of your current position.

5.3 Total station survey

After set station, you can start work in Survey interface, including all kind of survey and stakeout.

5.3.1 Point survey

Use total station to measure points. In the Survey interface, click Point Survey-> enter point name, code and reflector mode



- Suspension window: When not measured, the data is empty, and the coordinates and related information will be displayed after measurement
- Click to choose ranging mode, precision measurement, fast measurement or tracking measurement.
- Click , it will auto jump map center.
- Click us to show the layers or calibration: google map/open street map/map calibration
- Click 💾 to show the whole points on the interface.
- Click to check point coordinates, you can add, recover, import, and export the data.

After you choose a point, you can check the details and take notes or photos

- Click ^{Click} to set settings, display info and tool bar, in setting interface, you can choose the mode of point; in display info interface, you can add information to floating window you want below the interface; in tool bar interface, you can add or delete options to point survey interface. You can customize the interface to meet whatever layout needs you might have.
- Click Click connect dots into different shapes, line, polyline, polygon, arc, square, circle, etc.

5.3.2 Tps survey

Tps survey is similar with point survey, but shows more information of the point (vertical angle), HA (horizontal angle), SD (slope distance), HD (horizontal distance), VD (vertical distance)



Before survey, enter point name, code and choose reflector mode, then click to start or

stop collecting data, click 🖆 to record coordinates in controller.

- to set settings, display info and tool bar, in setting interface, you can choose the • Click mode of point.
- Click to check point coordinates, you can add, recover, import, and export the data.

After you choose a point, you can check the details and take notes or photos

• Click 🔛 to choose ranging mode, precision measurement, fast measurement or tracking measurement

5.3.3 Point stakeout

Go into Stake point interface, add or import the point coordinates you need to stakeout, of course you can choose from the button library.

• Click Add to input coordinates.

▲ ● * ♥ № ₺ 8:15	▲ ● * * 15
← Stake Point	← New point
Point Coordinates To-Stake-Point Preview Map	Name Pt7
Name > Input query keyword	Code
	Coordinates Type Local Coordinate >
	Northing 0
	Easting 0
	Elevation
	Add time 2022-03-14 08:15:27
Add Button Import Export	ОК
	< 0 □

- Click button library to choose one.
- Click Import to get coordinates with different kinds of files; you can also define a new form.

•		* 💎 🖹 💈 8:15	—		* 🎔 🖹 🛓 8:15
🗲 Stake I	Point		← Coord	inate list selec	tion
Point Coordinates	To-Stake-Point	Preview Map	Name >	Input query keyword	
Name >	Input query keyword		Select All())	
			Pt1 N:34501 E:62297	Smooth Po T 53.227 h 8.455 Code	Range selection
			© Pt2 N:34501 E:62297	Smooth Po T:202 53.287 h:19. 8.217 Code	2-03-14 06:35:36 046 9:
			Pt3 N:34501 E:62297	Smooth Po T:202 53.186 h:19. 7.921 Code	2-03-14 06:35:43 067 ::
			Pt4 N:34501 E:622975	Smooth Po T:202 50.906 h:17. 8.928 Code	2-03-14 07:00:03 773 ::
			Pt5 N:34501 F:62207	Smooth Po T:202 50.935 h:16.	2-03-14 07:13:16 223 •
Add L	Button Library	rt Export	Add	Import	ок
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When you choose a point to stake, SingularPad provides a navigation information, target distance and azimuth diff. According to the azimuth, adjust your total station and make it about $0^{\circ}0'0''$.

Then have your colleague walk to the line between the total station and the target point

with the prism, and click to measure it. The hover window will then show you the distance forward or backward, guiding you to move the prism until you get it.



• Click to create a QR code, if your colleague scanning this code with SingularPad, he can see the navigation information in real-time.

■ ●	•	🔶 Auxiliar	y perspective	
 Auxiliary perspective 	0	Status	Connection Suc	cessful!
Share code:186993	н	A:310°44′01′	′ VA:310°4	4′01″
	Т	arget:Pt14	Distanc	e:2.2971
<u>e</u> xe		backwa	. 🗲 to Left	↑ Fill
		2.2971m	0.0002m	1.4372m
同225			凇	
			i	
Please enter the sharing code or scan the			I	
QR code to view the stakeout information remotely			i	
			\$	
Stop				

- Click to choose ranging mode, precision measurement, fast measurement or tracking measurement.
- Click to show the layers or calibration: google map/open street map/map calibration
- Click to show the whole points on the interface.
- Click Scale automatically
- Click _____, it will auto jump map center.
- Click to set stakeout settings, display info and tool bar, you can edit the prompt range and range error
- Click im, jump to lasted point
- Click , jump to next point
- Click 1, jump to previous point

5.3.4 CAD mapping

CAD mapping and CAD stakeout are similar, both are based on CAD file to realize. CAD mapping is mainly used for drawing, CAD stakeout is aimed to stakeout all the things in CAD files.

• Click 📚 to build or import a new CAD file, supporting *.dxf, *.dwg format, Input

parameters and save it.

—		* 💎 📉 月 2:09			• *		* 💎 🖹 🛿 2:10
← CAD lay	ver			←	Import Fi	le	Settings
Content List				File	Name		
O Default	Wo	ork Layer	[File	Туре	AutoCAD	file(*.dxf,*.dwg) $>$
			[Inte	ernal Storage/S	ingularPad/Ma	ip
				So to internal storage root directory			
				$I\!$			
				\$> F	Return		
New	Import	Export				ОК	
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Find the file you want to stake and import it. After create or import one, you can scan and edit it in the CAD layer.

• Click to draw features, there are 12 types and methods you can choose, follow the prompts and draw. Click to delete the thing you are drawing, click to delete the last point, click to finish it.



- Click to choose ranging mode, precision measurement, fast measurement or tracking measurement.
- Click 🐚 to select a point anywhere you want to know the coordinate
- Click to show the whole points on the interface.
- Click , it will auto jump map center.
- Click 🚺 to show or hide the measure information and measure button.
- Click to find tools; they can help you to work smoothly. For example, to find the intersection points of neighboring circles.
- Click to set CAD settings, display info and tool bar, you can edit the prompt range and range error

In the CAD interface, you can choose a feature you want to stake, it will show up in blue. You can know the details about it, including length, start point, end point and center point. And choose the way to stake.









- Start station: If you set the start station as 5m, then final mileage will plus 5m.
- Offset dist: If you set the offset 5m, then you will stake the line 5m away from the line you choose. Plus and minus represent different sides of the line.
- Setting out by pile by coordinate: including station number, station distance, segment and key node.

(1) Station distance: Stake the line at a specified distance, for example, if the line is 40m, you set the specified distance as 8m. Then you will stake the line at 8m distance every segment

(2) Segment: For example, if you set the line segment as 4, then you will stake the line at 4 segments, every segment length is the same.

(3) Station number: You will stake the line at the station at each interval point You can stake it out according to the direction.

(4) key node: It will stakeout the line with starting point, ending point, midpoint, fold point, etc.



Finally, according to the detailed points, you can stake the line out.

5.3.5 CAD stakeout

CAD stakeout is similar with CAD mapping.

• Click to open a new CAD file, supporting *.dxf, *.dwg format, input parameters and

save it

range error

- Click to manage each layer
- Click to choose ranging mode, precision measurement, fast measurement or tracking measurement.
- Click Bg to set CAD background color, white, gray or black
- Click **b** to select a point anywhere you want to know the coordinate
- Click to show the whole points on the interface.
- Click *it will auto jump map center.*
- Click to set CAD settings, display info and tool bar, you can edit the prompt range and
- Click is to check point coordinates, you can add, recover, import, and export the data.

After you choose a point, you can check the details and take notes or photos.


Also, you can choose a feature you want to stake, it will show up in blue. You can know the details about it, including length, start point, end point and center point. And choose the way to stake.



- Click to create a QR code, if your colleague scanning this code with SingularPad, he can see the navigation information in time.
- Click im, jump to lasted point
- Click 📕 , jump to next point
- Click _____, jump to previous point
- Click Solution to set stakeout settings, display info and tool bar, you can edit the prompt range and range error.

5.3.6 Line stakeout

Go into Stake line interface, add or import lines you need to stakeout.

• Click Add to input line parameters, there are two types you can choose

	* 🗢 🛙 1	9:08	—	* マ 📉 💈 9:08	
← Line parameters			\leftarrow Line parameters		
Name			Name	1	
Start Station		0	Start Station	0	
Input Type	Start Point+End Po	oint >	Input Type	Start Point+Azimuth+Length \rightarrow	
Set Start Point	č,		Set Start Point	5	
Northing:0.000 Easting:0.000	Name: Elevation:0.000	>	Northing:0.000 Easting:0.000	Name: Elevation:0.000	
Set End Point	Ğ.		Azimuth+Length		
Northing:0.000 Easting:0.000	Name: Elevation:0.000	>	Azimuth	0°00'00"	
			Length		
			Height diff		
	ОК			ок	
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• Click Import to get coordinates with different kinds of files; you can also define a new

format.



Choose a line to stake, set calculation mode and interval.



5.3.7 DSM stakeout

You can stake the elevation using the design surface, if you don't open a surface before, then you need to add one by adding, importing coordinates or choosing from the button library.

You can get a preview map after adding points and don't forget save it.



At the content list interface, you can find the surfaces you made, and you can edit, share and

stake them.



If the current position is not within the range of the design surface, it will show "Out of Surface!" if the current position is within the range of the design surface, it will show the fill or excavation value.



6 Frequently asked functions

This chapter will show some frequently used functions, including device Information,

localization, calibrate point

6.1 Device information

Go device information, click to check hardware version, firmware version, current data link, battery power and any other information of the device after connecting Bluetooth.



6.2 Location

Location is commonly needed once in one project, and all the points will be collected based on calibrated datum system.

Enter at least three groups' point to compute (for example, take K1, K2, K3 as known points,

take A1, A2, A3 as measured points). After click calculate, the software will calibrate automatically.



- Add: Enter the coordinates of corresponding known point and GNSS point
- Import/Export: Support *.loc format
- Calculate: Calculate conversion parameters
- Name: Enter name
- Use horizontal/vertical control: Open to calculate the parameters to convert

Localization	* 🛛 🛿 8:46	Localization calculation re	¥ 🔍 🛿 8:47 parameter esult	
Content List		Conversion residual		
K1 BN31°10'01.5474" LE121°17'21.4305"	HRMS:0.003 VRMS:-0.000 N:50216.297 E:22921.962	K1 K2 K3	HRMS:0.003 VRMS:-0.000 HRMS:0.004 VRMS:0.000 HRMS:0.001	
K2 BN31°10'01.2376" LE121°17'21.1858" H14.808	HRMS:0.000 VRMS:0.000 N:50206.674 E:22915.594 h:4.800	Ellipsoid Parameter WGS84 Semimajor axis: 6378137	1/f:298.257223563	
K3 BN31°09'59.7130" LE121°17'22.2797" H14.869	HRMS:0.000 N:50160.077 E:22945.131 h:4.784	Projections Paramet Transverse Merca Central Meridian False Northing(m)	Projections Parameter Transverse Mercator Central Meridian E120°00'00" False Northing(m) 0.000	
		False Easting(m) Scale Factor Projection Height Latitude of Origin	500000.000 1.000000000 0.0000 N0°00'00"	
Add Import	Export Calculate	Export Report	Apply	
\bigtriangledown	0 🗆	\bigtriangledown	0 🗆	

After calculation, you can inspect the details in result interface, including conversion residual ((H. \leq 0.02, and V \leq 0.05), ellipsoid parameter, projections parameter, horizontal adjustment and vertical adjustment parameter. Click Apply to confirm to replace datum.

6.3 Calibrate point

Calibrate Point function is applied when you need to change the position of Base station in the same project.

Click Calibrate Point in project interface, add known point coordinate, and measure GNSS point coordinate. The software will calibrate automatically. Apply to complete grid shift, all rover points will upgrade the coordinate.

▲ ●	* 🖹 🕻 9:03	_	* 🖹 🛿 9:03
← Calibrate Point		← Calibrate Point	
GNSS Point Coordinates	:	GNSS Point Coordinates	5
Name Latitude Longitude Altitude	>	Name Base ID Latitude Longitude	c107 22*7D N31°09'59.5859" > E121°17'25.3805"
Known Point Coordinates	5	Altitude	14.229
Northing		Known Point Coordinate	s 🔊 🖉
Easting Elevation	>	Name Northing	C106 3450160.059
Result		Easting Elevation	622945.103 14.841
		Result	
		Adjust Time North Offset East Offset Height Offset	2022-03-21 09:00:42 3373624.450 1182630.917 10.569
Clear	ок	Clear	ОК

• Click is to choose a point from database map

- Click v to start or stop collecting data
- Click to choose a point from points database
- Click 🚺 to edit the coordinate
- Click Clear to delete conversion parameters

After calculate the offset of north, east and height in the base detail from Element will be changed, you can also clear offset to zero, which will cancel the grid shift setting.

6.4 Code library manager

This is a function for adding or managing the code. You can add the code for point, line and polygon by grouping. After add a code list what you need, it will be convenient to use point survey and stakeout. In addition, the description of code is good for you to survey features. In some situation, code will be easy, so you can select the description to know what you are surveying.

If you don't have a code list, you can modify current code list and add the code, if you add a



code list before, you can choose this code list when you create a new project.

- Click to create or import a new code
- New: edit a new code
- Import: support *.cbd, *.csv, *.dat, *.txt formats



Input group name and code for layers, open auto connect by code, and choose data type and

color, supporting line and polyline, you can scan the code you have created in edit interface,

don't forget apply it.

Tips:

1. When you add a code library in the point interface, it will not apply in line or polygon interface.

2. You can enter a new code in the Survey and Stake surface, when you survey the point, the code will be stored in the current code list.

7 About Software

There is activation id, expiry date, the current version, company contact number, company official website.

Check whether there is an update, click "check lasted version" to download the latest version

for installation when there is an update. If your software was not registered, call the

salesman and get activation code, click software activation and enter it.

If you have some suggestions or advice, give us the feedback.



If you have any question and cannot find the answer in this manual, please contact us from

SingularXYZ Website: <u>www.singularxyz.com</u>

Technical support email: support@singularxyz.com

Your feedback about this manual will help us improve it with future revisions.