

SurPro6.0 User Manual for TPS



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Chapter I SurPro6.0 Software Overview

1.1 Software Introduction

SurPro6.0 software, developed by GUANGZHOU ALPHA GEO-INFO CO.,LTD., is an engineering surveying application software based on Total Station Measurement applications. Developers according to years of mapping development and market experience accumulation, combined with a large number of industry users using habits and Android operating style habit fusion.

It sets the position of the total station as a known reference coordinate through known point orientation and free station setting, and then uses the angle and distance measurement functions of the total station to calculate the coordinate of the total station's measurement position. It uses the measurement result coordinates for point survey, multi-round survey, angle ccentricit, distance eccentricit, plane eccentricity, cylindrical eccentricity, remote heigh, point and line stakeout, road design and stakeout, CAD stakeout, electric lines survey and easy-to-use engineering surveying application software. The software has the characteristics of simple and user-friendly operation process, powerful road design and construction stakeout functions, powerful CAD mapping functions, and convenient display of function menus for users to customize designs and so on.

The following describes the basic functions of the software: the software mainly includes four parts: Project, Device, Survey and tool.

1.1.1 Project

This part is mainly for project configuration, project data management, and software settings related operations, including Project Manager, Project File, Points Dababase, Code Library Manager, Import data, Export data, Survey Area Settings, Layers Settings, Software Settings, About Software.

1.1.2 Device

This part is mainly aimed at the operations related to connect total station and set station orientation for the device, including Communication, Station Setup & Orientation, Free Station Setup, Orientate to Line, Height Transfer, Device Settings, and other functions.

1.1.3 Survey

This part mainly utilizes the measuring coordinates of the total station for field data surveying, stakeout, and industry applications related operations, including Point Survey, TPS Survey, Multi-Round Survey, Point Stakeout, CAD Stakeout, Line Stakeout, Spiral Stakeout, DSM Stakeout, Road Design and Stakeout, Angle Eccentricity, Distance Eccentricity, Plane Eccentricity, Cylindrical Eccentricity,

Remote Heigh, Electric Lines Survey, Electric Towers Stakeout, Function Customization.

1.1.4 Tools

This part is mainly related to some common practical tools for measurement field work, including Angle Converter, Perimeter and Area, Volume Calculation, Share File, Calculator, Circle Center Calculation, Average Calculation, Coordinate Positive calculation, Coordinate Inverse Calculation, Point Line Calculation, Angle Calculation, Intersection Calculation, Resection, Forward Intersection, Offset Point Calculation, Extension Point Calculation, Equal Point Calculation.

1.2 Software Installation and Uninstallation

Installation process:

1. Download android SurPro6.0 software installation (*.apk).

2. Copy the SurPro6.0 software installation program to your Total Station. Find the software installation in file Management and click to install.

3. Click the desktop SurPro6.0 software to enter the software (you need to create a project when entering the software for the first time, and it will automatically open the software and use the project after each startup).

Uninstallation process:

Uninstall Method 1: Hold down the software icon on the desktop, drag it to the [Uninstall] option box, and click "OK" to uninstall the software.

Chapter II Project

The main window is displayed as shown in Figure 2.1 when entering the software. Click [Project]. The project includes Project Manager, Project File, Points Dababase, Code Library Manager, Import data, Export data, Survey Area Settings, Layers Settings, Software Settings, About Software.



Figure 2.1

All data and operations of the software are stored and managed by engineering projects. After entering the software for the first time, you must create a project first. After that, every time when you enter the software it will automatically load the project last used. Each Project is stored in the corresponding directory (default location: Internal Storage/SurPro/Project) as a project name folder. The basic information of the project is stored in the "Project name.job", and other data is stored in the corresponding directory file.

2.1 Project Management

Click [Project Manager], as shown in Figure 2.1. Project Manager includes creating a project, removing a project, opening a project, and opening a disk project that is not in the list.

← Project Mar	nager			
Project List	Input	1	Current Project	
20250220_1 Internal Storage/SurPro	2025-02- D/Project	-20 11:25:45	20250220 Internal Storage/SurPro/Pr	2025-02-20 11:21:23 oject
20250220-2 Internal Storage/SurPro	2025-02- D/Project	-20 11:24:53		
			New	Open

Figure 2.1-1

Click [New] as shown in Figure 2.1-1. To create a new project, you need to fill in the Project Name, Operator, Distance Unit, Angle Format, Default 1st Point Name, Notes and other basic information of the project. You can also modify the path of the project in disk (Internal Storage/SurPro/Project by default), click OK start the new project.



Click [Open...] as shown in Figure 2.1-1 to open an existing project.



Click the project shown in the list, and the functions of "Remove", "Share" and "Open" will appear, as shown in Figure 2.1-2.



Figure 2.1-2

Remove

Click [Remove], as shown in Figure 2.1-2, to remove the project from the list. If you select "The data file will be deleted permanently at the same time", the data of the project on the disk will be deleted and can not be recovered any more; if not select, the project will only be removed from the list, and you can open the project again when you want.



Share

Click [Share] to send the project to the cloud server, it will display the sharing code and QR code for obtaining data. You can get the sharing data on other devices via the button 🕥 in the main interface ,



entering the sharing code or scanning the QR code to obtain the data (the same applies to data sharing in other functions when using the software).



Open

Click [Open] to open the project that selected in the list.

🔶 Project Manager			
Project List Input	1	Current Project	
20 Remove age/SurPr Share	2025-0 21:23 Open	20250220-2 Internal Storage/SurPro/Pro	2025-02-20 11:24:53 >
20250220_1	2025-02-20 11:25:45		
Internal Storage/SurPro/Project		2	
	Please	wait	
		New	Open

Figure 2.1-4

2.2 Points Dababase

Click [Points Dababase] as shown in Figure 2.2-1, 2.2-2. View and manage point data in the project here, including functions such as Add, Delete, Share, Point Details, Recover, Import, Export, etc.

← Points Databas	e		≣	← Points Database			≣
Name > Input			₹	Name > Input			1 T
Pt5 TPS Point N:-0.533	Code: E:-2.239	T:2025-02-25 Elev:0.590	11:17:49.000	Select All(1)	Code	T:2025-02-2	Share Delete Cance
Pt4 TPS Point N:-1.631	Code: E:1.540	T:2025-02-25 Elev:0.575	11:17:38.000	N:-0.533	E:-2.239	Elev:0.590	Range Select
Pt3 TPS Point	Code:	T:2025-02-25	11:17:31.000	N:-1.631	E:1.540	Elev:0.575	.5 11.17.36.000
Pt2 TPS Point	Code:	T:2025-02-25	11:16:07.000	Pt3 TPS Point N:1.813	Code: E:2.895	T:2025-02-2 Elev:0.876	25 11:17:31.000
N:4.128	E:-1.886	Elev:0.508		Pt2 TPS Point	Code:	T:2025-02-2	25 11:16:07.000
Add	Recover	Import	Export	Ádd	Recover	Import	Export

[Long press] the data item to select it for deleting or sharing.



Figure 2.2-2

Click on the data item in the list to view detailed information, modify name and code, as shown in Figure 2.2-3.

Click on the icon \blacksquare in the upper right corner can switch to list mode to view the data, as shown in Figure 2.2-4.

← Poi	nt Details					K	← ₽	oints D	atabas	se							88
Name Pt5	5 (X)	Code	Input 🔯	Occupy Point		1	Name	>	Input								T ₂
Reflector		F	Reflectorless,0m >	Northing	0.000m		Name	Northing	Easting	Elevation	Code	Slope Dist	НА	VA	Mileage	Offset	Time
VA:	284°23'21"	HA:	076°37'03"	Easting	0.000m		Pt5	-0.533	-2.239	0.590		2.376	76°37'03*	284°23'21"			2025-02-25 11
SD:	2.376m	N:	-0.533m	Elevation	0.000m	۲	Pt4	-1.631	1.540	0.575		2 316	316°38'31"	284°23'23"			2025-02-25 11
HD:	2.301m	E:	-2.239m	Instrument Height	0.000m		D+2	1 012	2 905	0.976		2 527	227°56'20"	204022'22"			2025.02.25.11
VD:	0.590m	Elev:	0.590m	Station Setup Time		•	FLJ	1.013	2.893	0.870		3.327	237 30 20	204 23 23			2023-02-23 11
Local Tim	e 2	025-02	2-25 11:17:49.000	Azimuth Offset	0°00'00"	¥	Pt2	4.128	-1.886	0.508		4.567	155°27'06'	276°23'15'			2025-02-25 11
						9	Pt1	3.003	0.152	-0.133		3.009	182°54'12"	267°27'53"			2025-02-25 11
Photo A	nd Sketch		ок					Add		C	elete	e	Re	cover		D	etails



Figure 2.2-4

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Click [Add] to manually enter point coordinate information as shown in Figure 2.2-5.

Click [recover] can restore the accidentally deleted point data as shown in Figure 2.2-6.

← New Point	← Deleted Points	
Name Pt6	Name > Input	
Code	Select All(0)	
Northing Input m		
Easting Input m		
Elevation Input m		
Property Type Input Point >		
ОК	Completely Delete Recover	

Figure 2.2-5

Figure 2.2-6

Click [import], select the corresponding data format, and the next step is to select the imported file for data import, as shown in Figure 2.2-7.

← Import Data		← Import Fi	le	Settings
Choose Import File Format		File Name		$\overline{\Omega}$ Go to internal storage root directory
Cass Format(dat) Point Name,Code,Easting,Northing,Elevation	>	File Type	Cass Format(*.dat) >	Go to program storage directory
Import Parameters		Internal Storage/S	SurPro/Import	
Property Type	Input Point >			
Distance Unit	Meter >			
Pop Up Confirmation of Import	OP			
Next		Preview	ок	





Click [Export], select the data format for export, choose the export location, and export the data results as shown in Figure 2.2-9. The data formats for export can be customized by adding custom formats in the format representation according to requirements, as shown in 2.2-10.

← Export Data		← Export Data		
Export Path	Internal Storage/SurPro/Export \geq	Point Type		Enable
File Name	Project Name > + Input	Survey Point	Control Point	
Choose Export File Format		TPS Point	Station Point	
Cass Format(dat)	×	Input Point	Cal. Point	
Point Name,Code,Easting,Northing,Elevation	1	Time		Enable
Export Parametes		Start Time		2025-02-25 00:00:00
Distance Unit	Meter >	End Time		2025-02-25 23-50-50
Chaine State		Line filme		2020 02 20 20.03.03
	Export		Export	





2.3 Code Library Manager

Click [Code Library Manager]. The Code Library is a pre-defined set of coding attributes for external collection points, which can be quickly filled in with coding values through the selection of visual name descriptions.(The first time you use the code library, there is none to be chosen as shown in Figure 2.3)



Figure 2.3-1

In the Code Library Manager, operations such as New, Import, Delete, Edit, Share and Apply the code library.



Figure 2.3-2



To create a new code library

Click on the icon <a>
 as shown in Figure 2.3-1 to create a new code library. Click [new], input the code library name, and click [Add] to add a function module

← Code Library Manager			← New A Code-Library			
Data Content			Name	Pls input the Code Libra	ry name, such as GAS PIPE Inpu	ıt
None			Data Content			
Common codes Common codes		Quantity:21				
GAS PIPE Internal Storage/SurPro/Import/Pt.cdb		Quantity:2				
New	Import	ок	Add	Export	ок	





The code library can be predefined according to the user's project needs, and the symbols and colors of the survey points corresponding to the coding can be set, as shown in Figure 2.3-5. It can also be set whether the survey points corresponding to the coding are automatically measured into a graph (line, polyline, polygons), as well as the color, layer, line style, line width, etc. of the lines, as shown in Figure 2.3-6.

← Symbol Librar	у			← Add			
Data Content				Remark	Pls input the function m	odule name, such as Valve Well	Input
	-0-			Code	Pls input the code for this	function module, such as GVW	Input
None	AE142	AB002	AE140	Group Name		(Ungr	ouped) >
7	-0-	\odot	M	Symbol			(•)
AE141	AE142	AE170	AE200	Point Color		1	
Р	1 1	4	0	Auto Connect by Code			0
AE2301	AE240	AE250	AE300	Auto connect by Gode			
A	dd	Imj	port	ок		Next	
A	dd	Imj	port	ок		Next	

Figure 2.3-5



2.4 Import Data

Click [Import data], as shown in Figure 2.4-1. This function is a unified entrance for data import, where you can import coordinate points database, stake points, lines dababase, Transformtion parameters file, code library, road datas, etc. Select the data type and format for import, and then choose the import file to import the relevant data, as in Figure 2.2-5 and Figure 2.2-6.

🗲 Import Data		← Import Data	
Data Type	Points Database >	Data Type	Points Database >
Choose Import File Format		Choose I Data Type	
Cass Format(dat)	\$	Cass For Points Database	
Point Name,Code,Easting,Northing,Elevation	· · · · · · · · · · · · · · · · · · ·	Point Name Stake points	
Import Parameters		Import Pa Lines Database(Lines File)	
Property Type	Input Point >	Property T Lines Database(Coordinates File)	nput Point >
Distance Unit	Meter >	Distance Unit	Meter >
Next		Next	

Figure 2.4-1

Figure 2.4-2

2.5 Export Data

Click [Export data], select the data format that needs to be exported, choose the export location and enter the export file name, click Export to complete the data export, as shown in Figure 2.5-1, 2.5-2.

← Export Data			← Export Data		
Export Path	Internal Storage/	SurPro/Export >	Point Type		Enable
File Name	Project Name > + Input		Survey Point	Control Point	
Choose Export File Format			TPS Point	Station Point	
Cass Format(dat)			MI Input Point	Cal. Point	
Point Name,Code,Easting,Northing,Elevation			Time		Enable
Export Parametes			Start Time		2025-02-25 00:00:00
Distance Unit		Meter >	End Time		2025-02-25 23-50-50
Carlo A.T.			Ling time		1010 01 10 10.07.07
	Export			Export	





2.6 Survey Area Settings

Click [Survey Area Settings], as shown in Figure 2.6-1. The function is to determine whether the current positioning position is within the range of the measurement area in real time by setting a certain range of coordinates in the process of field measurement. If it is beyond the range, it will timely remind the user of the scope of the work beyond the scope, so as to avoid the user to do the work beyond the scope of work.

Editing and management of the survey range, including Add, Delete, Move Up and Down coordinates, batch selecting coordinates from the point database, and import and export coordinates of the survey range; The range of the survey range can be previewed through a rough graphic, as shown in Figure 2.6-2.







2.7 Layers Settings

Click [Layers Settings], as shown in Figure 2.7-1, click [Import] to import graphic data in formats such as DXF, DWG, SHP, and LandXML as the working background, and display the background base during the survey operation.







2.8 Software Settings

Click [Software Settings], the settings include System Settings, Cloud Share Settings, Voice Settings, and Shortcuts Settings.

System Settings: As shown in Figure 2.8-1, the settings mainly include Language, Text Encoding, Distant Unit, Distance Decimal, Angle Format, Angle Decimal, Mileage Format, Coordinate Order, Interface Style, Full Screen Display.

← Software S	ettings				
	System	Cloud Share	Voice	Shortcuts	
Language					Auto >
Text Encoding					ansi >
Distance Unit					Meter >
Distance Decimal					3 >
Angle Format					dd°mm'ss.ssss" >
	Cancel			ок	

Figure 2.8-1

Cloud Share Setting: as shown in Figure 2.8-2, it mainly includes Server Address, Effective Duration, Private ID.



Figure 2.8-2

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Voice Settings: As shown in 2.8-3, it includes prompt tone of Stakeout Tolerance, Remind Range, Save Point, Low Battery Warning, Voice Broadcast and Volume level.

← Software S	Settings				
	System	Cloud Share	Voice	Shortcuts	
Prompt Tone					
Stakeout Tolerance	9				
Remind Range					
Save Point					
Low Battery Warnir	ng				0=
Mahuma			_	_	
	Cancel			ОК	

Figure 2.8-3

2.9 About Software

Click [About Software], as shown in Figure 2.9-1. Software registration and authorization information, software version information, copyright information, etc. Here you can activate authorization, transfer authorization, check the new version and get feedback.



Figure 2.9-1

Software Activation: Enter the entitlement code or scan the QR code to activate the software, as shown in Figure 2.9-2.

← Software Ac	ctivation			
Enter License				
				0/28
1	2	3	А	В
4	5	6	С	D
7	8	9	E	F
		Activate		

Figure 2.9-2



Check Latest Version: if there is a new version, the new version information will pop up. Click Update to update the software to the latest version. If there is no new version, a message is displayed indicating the latest version.

← About Softwar	e		
	Software ID	A0D4250224	182978
	Expiration Dat	e 2025-3-24	
	G	SurPro V6.0.20 UANGZHOU ALPHA G	0250220 EO-INFO CO.,LTD
	Latest ver	sion already	
Transfer Out Code	Software Activation	Check Latest Vers	sion Feedback

Feedback: As shown in Figure 2.9-3, in order to provide better services to users, if you have any problems during the use of the software, you can feedback the problems to our technology through here, and we will provide you with immediate support.

← Feedback
Feedback Content(Required)
Input
Contact
Input
E-Mail(Required)
Submit

Figure 2.9-3

Note: Be sure to leave your contact information (mainly email), and describe the problem in as much detail as possible, if there is any attachment (icon, video, document, etc.), you can submit it at the same time, thank you!

Chapter III Device

On the main interface of the software, click the corresponding function menu of [Device], as shown in Figure 3.1-1. The device includes Communication, Station Setup & Orientation, Free Station Setup, Orientate to Line, Height Transfer, Device Settings, and other functions.



Figure 3.1-1

The data survey and application of the software are based on the application of measuring coordinate positions with a total station. Before the operation, communication needs to be established with the total station. The software obtains the measurement distance, angle, and reference coordinates of the position from the device to calculate the coordinate position of the survey point.

3.1 Communication

Click [Communication] as shown in Figure 3.1-1. Select the Device Type, Device Manufacturer, Model Type, and Connection Type, and click "Connect" to complete the device connection as shown in Figure 3.1-2. After successfully connecting the device, it will directly return to the software main interface.

The connection methods include Bluetooth, WIFI, serial port, TCP client, etc. The supported methods for different models of devices may vary. Android total stations with Surpro 6.0 installed should choose "Connection Type" with "Internal" to connect. Remember to click [Connect] to complete connection.

If you need to use commands to troubleshoot problems during use, you can click [Debug] as shown in Figure 3.1-3, and manually send commands for data debugging. Check [save] as shown in Figure 3.1-4, will save the communication data during software use to the debugging file for easy troubleshooting.

Device Type	Total Station $>$
Device Manufacturer	Alpha GEO $>$
Model Type	ALPHA Y $>$
Connection Type	Internal >
	Connect

Figure 3.1-2

		← Communication Deb	ug	Shared
Device Type	Total Station >	Common Commands		Get Angle \geq
Device Manufacturer	Alpha GEO >	Command		%R1Q,2003,2003:0
Model Type	ALPHA Y >	RX Data		Save
Connection Type	Internal >	%R1P,0,0:0		
		%R1P,0,2003:0,2.044776958,	4.963360327,0.000000000,174	40492426426,0.000353677,-0.
Debug	Stop	Stop	Send	Clear





3.2 Station Setup & Orientation

Click [Station Setup & Orientation] to set up the total station at a known point, input the coordinates of the total station's location and the known coordinate or angle of the backsight point, and set the angle to the device, so that the angle output by the device is consistent with the azimuth angle of known point. There are three ways to set up a station:

1. Point Set Backsight, as shown in Figure 3.2-1, 3.2-2. Set a known backsight point, and then observe the backsight point, obtain the angle and distance of device to the known backsight point, Surpro 6.0 will calculate the angle difference as well as the distance difference and height difference from the device towards the known backsight point itself. Determine whether there is a possibility of aiming error based on the distance difference and height difference, and set the angle difference to the device. At the same time, the scale correction factor can be calculated based on the distance, which can be used to correct the distance measured by the total station.

← Station Setup &	Orientation				← Station Setup &	Orientation				
Instrument Height	0 m	Set Backsight	Point Set Backs	ight >	Northing	1000 m	Set Backsight		Point Set Backs	sight >
Reflector	Reflectorless,0m >	Survey Rounds		0 >	Easting	1000 m	Survey Rounds			0 >
Laser point-to-point	Level 2 >	Backsight Point	2		Elevation	12 m	Backsight Poi	nt	2	
Occupy Point	9 B C			>	Result		Pt7			>
N:? E:?	Elev:?	N:? E:?	Elev:?		Station Setup Time Azimuth Offset Distance Deviation Height Offset Scale Correction Factor	2025-02-26 11:18:19 -53*55'34.5" 0.009m 0.003m 1.00132982	N:994.178	E:1004.014	Elev:15.	.7
		Obser	rve		Using a new scale correc	tion factor	Redo		Apply	





2. Multipoint Set Backsight, as shown in Figure 3.2-3, 3.2-4. Set multiple known backsight points, observe them separately, obtain device angles and distances to the known points, Surpro 6.0 will calculate the angle differences, as well as the accuracy error of each point, and set the angle difference to the device. At the same time, the scale correction factor can be calculated based on the distance, which can be used to correct the distance measured by the total station.

← Station Setup 8	a Orienta	tion				← Station Setup &	& Orientatio	on					
Instrument Height		1.15 m	Set Backsight	Multipoint	Set Backsight $>$	Occupy Point	9	ß	Backsight Poi	nt		8	=
Reflector	Reflec	torless,0m >	Survey Rounds		0 >	Northing		1000 m	Pt5	ΔL:0.00	1/∆R:-0.00	1/∆H:-	0.001
Laser point-to-point		Level 2 >	Backsight Poi	nt	8	Easting		1000 m	N:1007.534 H:011°44'18"	E:993. HD:10	173 .167	Elev:1 VD:-1.4	1.668 481
Occupy Point	۲	§	Pt5 N:1007.534	E:993.173	Not Measure Elev:11.668	Elevation		12 m	Pt6	ΔL:0.0	01/∆R:0.00	01/ΔH:	0.001
Northing		1000 m	H:?	HD:?	VD:?	Result			H:078°21'16"	HD:7.8	81	VD:1.2	225
Easting		1000 m	Pt6 N:1007.175	E:1003.258	Not Measure Elev:14.376	Station Setup Time Azimuth Offset	2025-02-2	6 11:25:14 -53°55'45"					
Elevation		12 m	H:/	HD:?	VD:?	Scale Correction Factor	0	.99994278					
				Add		Using a new scale correc	ction factor	00	Add		C	K	







3. Azimuth Set Backsight, as shown in Figure 3.2-5,6,7. Set a known angle of the backsight point, observe the backsight point, obtain the current device's angle to the backsight point, Surpro 6.0 will calculate the difference between the known angle and the device's angle itself, and then set the known angle to the device when [Apply] is clicked.

← Station Setup 8	& Orientation			← Station	Setup & Orier	ntation			
Instrument Height	1.15 m	Set Backsight	Azimuth Set Backsight \geq	Instrument Hei	ight	1 15 m	Set Backsight	Azimuth Set	Backsight 🗦
Reflector	Reflectorless,0m >	Azimuth	10°00'00"	Reflector	R	emind		10°0	D'00"
Laser point-to-point	Level 2 >			Laser point-to-p	point	lease aim to bac	cksight!		
Occupy Point	💡 🖏 🖺			Occupy Point	t	Only Observation	n Angles		
Northing	1000 m			Northing		С	ancel OK		
Easting	1000 m			Easting		1000 m			
Elevation	12 m			Elevation		12 m			
			Observe			•		Observe	Ť
	Figure	e 3.2-5				Figure 3	8.2-6		
← Station Setup 8	& Orientation				or Setting				
Laser point-to-point	Level 2	Set Backsight	Azimuth Set Backsight \geq	Prism	() L	ong Prism.	Used list		
	 Image: Image: Ima	Azimuth	10°00'00"	Sheet	O R	Reflectorless			
Northing	1000 m			Target Height		0 m	1		
Easting	1000 m			Laser Flash S	Switch				
Elevation	12 m			OFF	Level 1	Level 2			
Result									
Station Setup Time Azimuth Offset	2025-02-26 10:47:44 126°04'23.5"	Redo	Apply		ОК				

Figure 3.2-7

Figure 3.2-8

Note: The instrument height and reflector (as shown in Figure 3.2-8) need to be set according to the actual situation.

3.3 Free Station Setup

Click [Free Station Setup]. Set up the total station on an unknown point, measure the angle and distance of the known point and calculate the coordinates and the angle difference of the total station, set the azimuth angle to the total station, and match the subsequent survey coordinates with the known points.

Instrument Height	1.15 m	Data Content		8 🔀
Reflector	Reflectorless,0m >	Pt7 N:994.178	E:1004.014	Not Measure Elev:15.707 VD:2
Survey Rounds	0 >	Pt6	5:1000.050	Not Measur
		N:1007.175 H:?	E:1003.258 HD:?	VD:?
		Pt5 N:1007.534	E:993.173	Not Measure Elev:11.668
		H:?	HD:?	VD:?

Figure 3.3

3.4 Orientation to Line

Click [Orientation to Line], as shown in 3.4-1. Given a coordinate origin and axis direction position, set up a total station at an unknown point, measure the angle and distance between the known point and axis point, calculate the coordinates of the station and the angle difference of the total station, set the azimuth to the total station, and match the subsequent survey coordinates with the known point.

← Orientate to Li	ne			
Instrument Height	1.15 m	Known Point		ß.
Reflector	Reflectorless,0m >	K1 N:1005.000	E:1001.000	Measured Elev:12.000
Result		HA:031°14'32"	HD:4.223	VD:0.515
Northing	1002.267	Axis Point		
Easting	1004.220	To East		Measure
Elevation	10.335	HA:068°51'25"	HD:2.795	VD:0.341
Azimuth Offset	279°05'10"			
Save&	Apply			

Figure 3.4-1

3.5 Height Transfer

Click [Height Transfer], as shown in Figure 3.5-1. Given the height of a certain observation point, measure the angle and distance of the observation point, calculate the height difference between the station and the observation point, and then calculate the height of the current station and apply it to subsequent measurements.

← Height Transfer	
Reflector	Reflectorless,0 >
Known Point	§. 📋
Elevation	12.8 🛞
Observation Data	
HA:043°59'32" HD:3.523m	VA:279°39'13" VD:0.591m
Result	
Elevation	11.059m
Observe	Apply

Figure 3.5-1

3.6 Device Setting

Click [Device Settings], as shown in Figure 3.6-1. You can swap the left and right sides. If you want to set up display information, click on the angle display at the top of the main interface, as shown in Figure 3.6-2, to enter the display information settings, as shown in Figure 3.6-3. You can set the angle resolution, angle mode, scale correction factor, etc.











Chapter IV Survey

On the main interface of the software, click [Survey] as shown in Figure 4.0. The Survey includes Point Survey, TPS Survey, Multi-Round Survey, Point Stakeout, CAD Stakeout, Line Stakeout, Spiral Stakeout, DSM Stakeout, Stake Road, Angle Eccentricity, Distance Eccentricity, Plane Eccentricity, Cylindrical Eccentricity, Remote Heigh, Electric Lines Survey, Electric Towers Stakeout, Function Customization and other functions based on total station coordinates.



Figure 4.0

4.1 Survey

Click [Point Survey], as shown in Figure 4.1-1. In the point survey interface, the title bar displays the *Horizontal and Vertical Angles* of the total station as well as the instrument's *Power Level*. The right area displays survey information, while the left area is the drawing range.

On the left lower corner of the drawing range are the function menu keys, which can display other functions according to the user's needs in the settings.



Figure 4.1-1



(1) is the survey function key. Click this button to survey coordinates, as shown in Figure 4.1-2. Below the survey key is the switch for whether to save the survey results or not. Measuring a collection point usually requires entering name and code, click code icon 2, the icon can select the preset code in the code base for quick filling of ground object attributes, as shown in Figure 4.1-3. If there are many codes in the code library, the codes that are used more frequently will be displayed in the front for users to quickly select.







Click *C*, call the CAD drawing function to draw while survey. As shown in Figure 4.1-4, it includes various types of shapes such as Line, Polyline, Arc, Polygon, Square, Square Center, Rectangle, Rect-Center, Circle-2Pt, Circle-3Pt, Spline, etc. You can draw a new graph directly in the drawing area, and point elements can select existing points or freely take points from the screen.

Click *call CAD tools for calculation, as shown in Figure 4.1-5, including intersection point of two circles, intersection point of two lines, intersection point of two entities, distance offset point, entity translation, dividing points by number, calculating points by distance, line invert, line lengthen and area division point, rectangle offset point, etc.*

←		- 0-	0	HA:175°12'27" VA:279°39'09" 99%	÷			9	HA:175°12'27" VA:279°39'09" 99%
) .Pt11	.Pt18		N:1002.758 E:999.769 H:13.621 Slope Dist:2.807) .Pt11	.Pt15		N:1002.758 E:999.769 H:13.621 Slope Dist:2.807
Save	/ Line		<pre></pre>	Horizontal Dist:2.767 Elev. Offset:0.471	Save	Int 2 Dist	X Int 4 Point	Int Entity	Horizontal Dist:2.767 Elev. Offset:0.471
	O Polygon	Square	Square Center	Name Pt18 🛞		Dist Offset	// Translation	📝 Equal Parts	Name Pt18 🛞
M	Rectangle	Rect-Center	Circle-2Pt	Code Input	M	Measure	⇔ Invert	/ Lengthen	Code Input
	Circle-3Pt	M Spline	Settings	Work Layer:0 >	·@·	Area Division Point	Rectangle Offset		Work Layer:0 >
	۵ 🖺 🖏		2m	1 Om >		گ 🖺 🏟	0.0	2m] Om >





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Click to enter the settings interface and make settings for survey, information display, tool bar, etc. As shown in Figure 4.1-6, 4.1-7, and 4.1-8.

\leftarrow Settings				
	Settings	Display Info	Tool Bar	
Basic Settings				
Survey Rounds				0 >
More Settings				
Pop Up the Survey Confir	mation Page			OP
Remind When Point Nam	e Repeat			
Point Name Increment				1 >
Defa	ult		ОК	

Figure 4.1-6

← Settings			
	Settings Disp	lay Info Tool Bar	
Options			Display Items
НА	VA	Station Northing	N:1002.758 E:999.769
Station Easting	Station Height	Instrument Height	H:13.621 Slope Dist:2.807 Horizontal Dist:2.767
Known Azimuth	Azimuth Offset	Reflector	
Target Height	Prism Constant(mm)	Slope(%)	Elev. Offset:0.4/1
Slope(1:N)			
Backspace	De	fault	ОК

Figure 4.1-7

← Settings				
	Settings	Display Info	Tool Bar	
Display Items		Optio	ons	
Ranging Mode		(Zoom In	
Position Auto Centered		O,	Zoom Out	
Full Map		6	Select Disable	
		Ŷ	Input Point	
Clear		Default		ок

Figure 4.1-8

4.2 TPS Survey

Click [TPS Survey], as shown in Figure 4.2-1. This function has a similar function to point survey, but does not have a graphical interface for point survey. It provides a more concise and intuitive display of the content required for measuring and collecting points, as well as information about the current site. Users can use this function to directly survey points without the need for drawing references. At the bottom of the interface are the entry of survey settings and point database.

۲	TPS Su	irvey					HA:175°12'22" VA:279°39'07"
Name	Pt18	\otimes	Code	Input	is)	Occupy Point	
Reflect	tor		F	eflectorles	s,0m >	Northing	1000.000n
Targe	et Poin	t				Easting Elevation	1000.000n 12.000n
SD:		3.609m	Ν	1003	.545m	Instrument Height	1.150n
HD:		3.557m	E	999	.703m	Azimuth Offset	2025-02-26 10:43:4 -233°55'37.5483
VD:		0.605m	Elev	13	.755m		
(E				Save	

Figure 4.2-1

4.3 Multi-Round Survey

Click [Multi-Round Survey], as shown in Figure 4.3-1, 4.3-2. This function eliminates angle errors and improves the accuracy of survey points through multiple positive and negative mirror measurements. After each survey, the instrument needs to be rotated 180 degrees clockwise before measurement. After measuring you should click [Save] to save the point you want or click [Clear] to abandon the current data and measure again.

← Multi-Round S	urvey				← Mu	lti-Round Survey			
Name Pt18	Code Input	Data Content		X	Name Pt	18 🛞 Code	Input 😥	Data Content	X
Reflector	Reflectorless,0m >	1 VA-272°49'21"	VA-070*40/01# UA-010*00/05#		Reflector	Re	eflectorless,0m >	1 ΔN:-0.1	2mm/ΔE:-0.2mm/ΔH:-0.1mm
Survey Rounds	1 >	HD:3.657	VD:0.180		Survey Ro	unds	1 >	HD:3.657	VD:0.180
Please turn the	instrument's horizon	tal angle 180 deg	rees then sight th	e	Result			2 ΔN:0 VA:087°10'49"	l.2mm/ΔE:0.2mm/ΔH:0.1mm HA:189°59'53"
	tar	get!			VA: SD: HD: VD:	087°10'44" HA: 3.661m N 3.657m E 0.180m Elev	316°04'31 1002.634n 997.463n 13.330n	" HD:3.657	VD:0.180
Clear	Points Database				Clear	Points Database	Save		



Figure 4.3-2

Note: When it asked you to turn the instrument's horizontal angle 180 degrees, you should go clockwise, otherwise, it wouldn't work.

4.4 Point Stakeout

Click [Point Stakeout] to enter the interface of stakeout point library. Point stakeout refers to finding the location of a point on the field site through coordinate points with known coordinates.

Unstakeout points and stakeout points will be displayed in the "To-Stake-Point". If there isn't any data, you can choose it from the "Point Coordingnates", which are measured before, or click [Add] to manually add points or click [Import] to import the points. Click the item in point list and you can Navigate, Share, view Details and Stakeout the point as shown in Figure 4.4-1.

Long press the item and you can Share or Remove the points that have been selected as shown in Figure 4.4-2.

\leftarrow Stake Point				← Stake Point			
Poir	nt Coordinates To-Stak	e-Point Preview Ma	p	Point	Coordinates To-Stak	e-Point Preview Ma	ар
Name > Input	L.773.1/3	LIEV. 11.000		Name > Input			
Pt6 Navigate	Co Share 8	Details :14.376	Stakeout	N:1002.963	E:1000.552	Elev:13.663	Share Remove Cancel Range Select
Pt7 To-Stake N:994.178	Code: E:1004.014	Elev:15.707		Pt17 To-Stake N:1002.288	Code: E:1001.556	Elev:13.621	1
Pt18 Staked N:1002.634	Code: E:997.463	Elev:13.330		Pt18 Staked N:1002.634	Code: E:997.463	Elev:13.330	0
Add	Database	Import	Export	Add	Database	Import	Export



Figure 4.4-2

You can also see the Preview Map after you have add the points to the "To-Stake-Point" as shown in Figure 4.4-3.

The layout of the point stakeout interface is similar to point measurement but with some differences. The deviation values of Forward/Backward, Left/Right and Filling/Excavation from the target are displayed in the status information bar when you aim to the target and click measure key.

In addition to the survey function, there are also functions such as stakeout the previous point, and stakeout the next point below the drawing range.

← Stake Point				÷		<u>0</u>	HA:136°14'54" A:272°50'52" 79%
Point Coordinates To-S	take-Point	Preview Map		Backward	To Right	Cut	Target Distance:3.657 Azimuth Offset:-233°55'38" N:1002 635
Put			ŧ		-000°10'23" .Pt11		H:13.331 Name Pt19 🛞
	PUTS	Pt r 6			Pt18	Pt15 .Pt16 .Pt17	Code Input
P (198		PUT					Target:Pt18 >
			1m,		→•	rd Save 2m	,

Figure 4.4-3

Figure 4.4-4



How to stakeout quickly with a prism?

Click , enable the auxiliary viewing function if you use the Prism to stakeout. After turn on this function, as shown in Figure 4.4-5, 4.4-6, it will provide you a sharing code as shown in Figure 4.4-7 and the prism operator can get the stakeout information via scanning the sharing code with Surpro 6.0 installed in his phone or tablet. After Connection, every time you click the measure function key, the prism operator will immediately get the direction and distance information between the current position and the target position, as shown in Figure 4.4-8, which can greatly improve the speed of stakeout.











4.5 CAD Stakeout

Click [CAD Stakeout], as shown in Figure 4.5-1. The CAD stakeout function is to open the CAD drawing and stakeout it. You can capture points for stakeout or select entity data for stakeout; In addition to stakeout the drawings, CAD mapping and some CAD tool calculations can also be performed.





Click icon io enter the interface for opening CAD drawing files, where the historical file records are listed. You can click to quickly open them or open drawings from other locations. Long press to select data for deletion and share. As shown in Figure 4.5-2, 4.5-3, 4.5-4, 4.5-5.

← Import File	Settings	← Import File			Settings
File Name	$\overline{\widehat{\Omega}}$ Go to internal storage root directory	File Name	Input	CAD DEMO.dwg	
File Type AutoCAD Format(*.dxf,*.dwg) Image: Comparison of the second s	Go to program storage directory	File Type AutoCAD F	format(*.dxf,*.dwg) >	CGCS2000-120.dwg	
Internal Storage/SurPro/Map				Internal Storage/SurPro/Import BASE.dwg Internal Storage/SurPro/Import	
ОК	1				



Figure 4.5-3

← AutoCAD Format		← AutoCAD Format	
CGCS2000-120.dwg Internal Storage/SurPro/Import/CGCS2000-120.dwg	2025-02-28 10:13:26	Select All(1) GGCS2000-120.dwg	Share Delete Cancel 2025-02-28 10:13:26
CAD DEMO.dwg Internal Storage/SurPro/Import/CAD DEMO.dwg	2025-02-28 10:09:31	CAD DEMO.dwg	2025-02-28 10:09:31
BASE.dwg Internal Storage/SurPro/Import/BASE.dwg	2025-02-28 09:30:21	Internal Storage/SurPro/Import/CAD DEMO.dwg BASE.dwg Internal Storage/SurPro/Import/BASE.dwg	2025-02-28 09:30:21
Open			





Click icon k to capture the points on the drawing for stakeout, as shown in Figure 4.5-6, 4.5-7.







Click the drawing data on the screen, select the entity, as shown in 4.5-3. You can perform operations such as delete, details, and stakeout on the data. Click to stakeout and stakeout the data, as shown in 4.5-4. According to actual stakeout needs, stakeout can be carried out using methods such as centerline, left and right side line, real-time pile, input pile, key pile, and divide pile.



Figure 4.5-8



4.6 Line Stakeout

Click [Line Stakeout] to enter the Lines Database. Line stakeout is to provide a designed line, input it into the line library, and perform field stake on the line. Points on a straight line can be staked point by point according to real-time stake mileage, skew distance, height difference, etc., or by dividing the line into points at a certain interval.Lines Database, as shown in Figure 4.6-1, can Add, Import, Export line data. Add a line, as shown in Figure 4.6-2. There are two Input Type, "Start Point + End Point and Start Point" + "Azimuth + Length".

\leftarrow Lines Database			← Line Parameters		
Data Content			Name		Input
			Start Mileage		1407.848 m
			Connect the Previous Line End F	Point	
			Input Type		Start Point+End Point >
			Set Start Point		R 🗶 🖉
			N:0.000 E:0.000	Name: Elev:0.000	>
	-		Set End Point		B t C
Add	Import	Export		ОК	





Click the line list item to Delete, Edit, Insert and Stakeout lines as shown in Figure 4.6-3. Click stakeout, and you can make the Stakeout Settings as shown in Figure 4.6-4, then click OK to enter the line stakeout interface, as shown in Figure 4.6-5. You can also click I to add Pile Stake.



Figure 4.6-5



4.7 Spiral Stakeout

Click [Spiral Stakeout] to enter the Spirals Database interface, as shown in Figure 4.7-1. Spiral Stakeout is the process of inputting data such as circular curves and spiral curves into the Spirals Database and stakeout the curves.

Add a new curve as shown in Figure 4.7-2. You can input a circular curve using known offset angle and intersection, coordinates and radius, three points, and other methods.

Click the curve list item to Delete, Edit, and Stakeout curves. Click Stakeout to enter spiral stakeout settings, as shown in 4.7-3. Perform operations such as the previous point, the next point, and add pile as shown in Figure 4.7-4.

\leftarrow Spirals Database		
Data Content		
curve1 (Mileage:0) N1:998.1 Delete N2:997.2 N3:998.625	E1:100 Edit E2:998 E3:997.652	Curve (known three coordinates) h1:5 takeout h2:5 h3:5.318
	Add	

Figure 4.7-1











Figure 4.7-4

4

Name

Pt5

Pt17

Pt8

Data Content

N:1007.534

N:1002.288

Add

Triangulation File

Point Coordinates

4.8 DSM Stakeout

Click [DSM Stakeout] to enter the DSM management interface, as shown in Figure 4.8-1, where you can create, Import, Remove, Share, and Stakeout the DSM data.

Create DSM data, as shown in Figure 4.8-2. You can create data such as One-Point Area, Two-Point Area, Three-Point Area, Triangulation File, etc; Create a new Triangulation File data, as shown in Figure 4.8-3, select coordinate points and boundary points to generate the triangulation file.

Click stakeout to stakeout the DSM data, as shown in Figure 4.8-4, and indicate the amount of cut and fill based on the survey coordinate.

← DSM Stakeout			← DSM Stakeout	
Data Content			Data Content	
AREA	193.1730	Three-Point Area	Data Type	
N:100	Details 001.5560	Elev:13.	One-Point Area	
N:996.7240	E:999.1130	Elev:5.5450	T	
AREA2		Two-Point Area	I wo-Point Area	
N:998.6250	E:997.6520	Elev:5.3180	Three-Point Area	
N:998.1200	E:1001.5620	Elev:5.2240		
Grade(%):0.00			Triangulation File	
	More			
Ne	ew [Import	New	Import



Figure 4.8-3

Import

Figure 4.8-1

Boundary Coordinates

E:993.173

E:1001.556

Database

Figure 4.8-4

 \otimes

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4.9 Road Design and Stakeout

Click [Stake Road] to enter the Road Database interface, as shown in Figure 4.9-1. The road design and stakeout function is to design the road file based on the design element data of the road's centerline, vertical profile, broken mileage, standard cross section, ultra height, ultra width, slope data, bridges and culverts, and conical slope. According to the road design file and the total station survey coordinates, a series of road thread related applications such as construction stakeout and section data measurement are carried out for the thread.







Road design, as shown in Figure 4.9-2. The road design elements includes centerline, vertical profile, broken mileage, standard cross sections, slopes, bridges and culverts, and conical slope. The standard cross-section includes the ultra height and ultra width of the section blocks. After the road design is completed, the road data can be previewed in a preview image, as shown in Figure 4.9-3.

🗲 Road Design			← Centerline		
Name		ZT		Design Data Preview Ma	p
	Road Data Preview Map		Design Method		Coordinate Element Method >
Centerline	Vertical Profile	Cross-Section Change	Data Content		₹
	_	+	1.Start Point N:3696803.178	E:289954.64	Mileage:0m
	ANT OF OTHER DESIGNED GOT	411 cm cm cm cm	2.Line N:3697605.172	E:290742.65	Mileage:1124.341m
(+),			3.Curve(Right)		Mileage:2211.053m
		500m	Add	Import	Calculate





1. Centerline: As shown in Figure 4.9-4. The methods for designing centerline include line element method, intersection method, and coordinate element method. All roads are composed of a combination of road start point, line, spiral, and curve. The line element method is a design road by input the elements of the road, where the start point includes the start station and coordinates, the line includes the start azimuth and length, the spiral includes the start azimuth and start radius, end radius and length, and the curve includes the start azimuth, radius and length. Usually, in the line element method, the endpoint azimuth of the previous element is equal to the start azimuth of the next element. The radius of the connecting end of the sprial and the line is infinite, and the radius of the connecting

end of the sprial and the circle is equal to the radius of the circle. The intersection method calculates the combination of road design elements through a certain algorithm based on the coordinates of control points on the road and the sprial length, sprial parameter, circle radius, and other parameters of the control points. The coordinate method calculates the combination of road design elements using a certain algorithm based on the coordinate points on the road and the radius of the arc before the coordinate points. The road generated by the coordinate method only has a start point, line, and arc, which is a simplified road without sprial.

2. Vertical profile: as shown in Figure 4.9-5. The vertical profile is the elevation fluctuation of the road centerline at each station. It is the design height of the centerline of the line, which requires the input of the elevation to each station of the line elevation point and the arc radius to the elevation point. The software calculates the elevation values of the line at each station point based on design elements.

3. Broken station: In the process of road design, sometimes a pre designed road needs to be partially modified at a certain location. After the road modification, the road may be longer or shorter than the original road. In order to modify the design station data after the road unchanged, a broken chain is used, which is divided into long chain and short chain. Start using a new station value at a certain station point, keeping the station data after this station value unchanged.

4. Standard cross section: as shown in Figure 4.9-6. In construction roads, the centerline of the road is only the planned direction of the road, and the road includes sections such as motor lane, non motorrized vehicle, sidewalks, hard shoulder, etc. The width, slope, and other parameters of the road design for these sections are called standard cross sections. In roads, Sometimes it is necessary to set the superelevation and widening parameters of the section. Superelevation and widening are set according to the needs of each section and added according to the station.

5. Slope data: In the road construction, it may be necessary to construct slopes for mountains and lakes according to certain standards to protect roads.



Note: For the convenience of road design editing, the software supports the import of various formats of roads.







4.10 Angle Eccentricity

Due to the influence of survey environmental, it is not possible to directly measure the target point, but it is possible to measure the position at the same distance as the target point.

Click [Angle Eccentricity] to enter, and Click Survey function key to measure the same distance point as shown in Figure 4.10-1, then rotate the device to align with the target point. By using the angle at which the device is aligned with the target and the distance measured previously, the coordinates of the target point can be calculated, as shown in Figure 4.10-2.







4.11 Distance Eccentricity

Click [Distance Eccentricity], as shown in Figure 4.11-1. Click Survey function key to measure the eccentric point as shown in Figure 4.11-2 and input the offset value from the target point to determine the coordinates of the target point, as shown in Figure 4.11-3.

÷	Distance	Eccer	ntricity						÷	Distance Eco	entric	ity					
Name	Pt38	\otimes	Code Input [S	Eccentric	c Point			Name	Pt38	Code	Input	is:	Eccentric	e Point		
Reflec	tor		Reflectorless,0	m >	VA:	263°42'23"	HA:	036°18'53"	Reflec	tor		Reflectorless,	0m >	VA:	263°42'23"	HA:	036°18'52"
Targe	et Point				HD:	?	VD:	?	Targe	et Point				HD:	2.783m	VD:	-0.307m
VA:		?	HA:	?	Offset				VA:	083°42'23	" HA:	036°1	8'52"	Offset			
SD:		?	Ν	?	🖲 Left	Right		Input	SD:	2.800n	n N	1002.2	43m	left	Right	nt	Input
HD:		?	E	?	Front	Back		Input	HD:	2.783n	n E	1001.6	48m	Front	Bac	k	Input
VD:		?	Elev	?	🖲 Up	Down		Input	VD:	-0.307n	n Ele	4.7	07m	🔘 Up	Dov	vn	Input
					١									١			
			Fig	ure	€ 4.11-3	1 Distance Ecc	entr	icity				Figu	ıre	4.11-2			
					Name	Pt38	Co	de Input	Eccentri	c Point							
					Reflect	or		Reflectorless,0m >	VA:	263°42'23"	HA:	036°18'52					
					Targe	t Point			HD:	2.783m	VD:	-0.307n	n				
					VA:	092°20'18	" н	IA: 061°20'37"	Offset								
					SD:	4.731n	n N	1002.267m	🖲 Left	Right	2	8					
					HD:	4.727n	n E	1004.148m	Front	🖲 Back	1	.5					
					VD:	0.193n	n E	Elev 4.207m	🔘 Up	Down	C	.5 0	\mathbf{S}				
									٤ ۲								

Figure 4.11-3



4.12 Plane Eccentricity

Due to the influence of measurement environmental, it is not possible to directly measure the target point, but it is possible to measure other positions on the plane where the target point is located. Click [Plane Eccentricity], as shown in Figure 4.12-1, measure the three positions of this plane separately as shown in Figure 4.12-2., then rotate the instrument to align with the target point, and the coordinates of the target point can be calculated, as shown in Figure 4.12-3.

← Р	lane Eccentri	city						÷	Plane Eccer	ntri	city						
Name F	Pt38 🛞	Code Input	S	Eccentric Point			۶.	Name	Pt38 (\otimes	Code	Input	i <u>S</u> i	Eccent	ric Point		东
Reflector	r	Reflectorless,)m >	VA:	?	HA:	?	Reflect	or		R	Reflectorles	s,0m >	VA:	263°42'25"	HA:	018°59'39"
Target	Point			HD:	?	VD:	?	Targe	t Point					HD:	3.229m	VD:	-0.356m
VA:	263°42'25"	HA: 036°1	4'25"	Eccentric Point			*	VA:	263°43'0)5"	HA:	048	°41'55"	Eccent	ric Point		*
SD:	?	N	?	VA:	?	HA:	?	SD:	2.685	īm	N	998	3.238m	VA:	278°45'25"	HA:	029°22'18"
HD:	?	E	?	HD:	?	VD:	?	HD:	2.669	m	Е	997	7.995m	HD:	2.909m	VD:	0.448m
VD:	?	Elev	?	Eccentric Point			×	VD:	-0.294	1m	Elev	4	1.106m	Eccent	ric Point		*
				VA:	?	HA:	?							VA:	263°43'03"	HA:	02 Image: 6" Save





← Plane B	Eccentri	city						
Name Pt38	\otimes	Code	Input	IS:	Eccent	tric Point		*
Reflector		F	Reflectorles	s,0m >	VA:	263°42'25"	HA:	018°59'39"
Target Point					HD:	3.229m	VD:	-0.356m
VA: 26	3°43'07"	HA:	036°	26'10"	Eccent	tric Point		*
SD:	2.800m	N	997	.761m	VA:	278°45'25"	HA:	029°22'18"
HD:	2.783m	Е	998	.347m	HD:	2.909m	VD:	0.448m
VD:	0.306m	Elev	4	.094m	Eccent	tric Point		*
					VA:	263°43'03"	HA:	02 P 6" Save



4.13 Cylinder Eccentricity

Click [Cylinder Eccentricity], as shown in Figure 4.13-1. The total station cannot directly measure the coordinates of the center position of the circular pile. You can measure the distance of the cylinder surface and angles of the two edges of the cylinder separately, you will get the coordinates of the center of the cylinder, as shown in Figure 4.13-2.

← Cylinder	Eccer	ntricity	/						← cy	linder Ecce	ntricity	/					
Name Pt38	\otimes	Code	Input	iSi	Eccent	ric Point		*	Name P	t38 🛞	Code	Input	is)	Eccent	tric Point		Ť
Reflector		F	Reflectorle	ss,0m >	VA:	263°43'08"	HA:	036°26'10"	Reflector		F	Reflectorle	ss,0m >	VA:	265°25'49"	HA:	058°03'14"
Target Point					HD:	?	VD:	?	Target F	Point				HD:	2.452m	VD:	-0.196m
VA:	?	HA:		?	Edge F	oint[A]		*	VA:	085°37'39"	HA:	057	"°42'51"	Edge F	Point[A]		禾
Radius	?	N		?	VA:	?	HA:	?	Radius	0.111m	N	100	1.369m	VA:	265°25'47"	HA:	055°13'46"
HD:	?	Е		?	Edge P	oint[B]		*	HD:	2.563m	E	100	2.167m	Edge F	Point[B]		*
VD:	?	Elev		?	VA:	?	HA:	?	VD:	-0.196m	Elev		4.596m	VA:	265°25'43"	HA:	060°11'57"
					<u>نې</u>									<u>نې</u>			Save

Figure 4.13-1





4.14 Remote Height

Click [Remote Height], as shown in Figure 4.14-1, to measure the height of a vertical object. First, measure the distance and angle at the bottom of the target, and then align it with the top of the target by rotating the angle to calculate the height of the target.as shown in Figure 4.14-2.

← R	emote Heigh	t						← Re	mote Heigh	t					
Survey	Point			Target	Point			Survey I	Point			Target I	Point		
Reflector		Re	flectorless,0m >	VA:	257°06'04"	HA:	034°43'50"	Reflector		Ret	lectorless,0m >	VA:	302°54'01"	HA:	034°43'59"
VA:	257°06'04"	HA:	034°43'50"	SD:	2.888m	Ν	997.687m	VA:	257°06'04"	HA:	034°43'50"	SD:	3.353m	Ν	997.687m
SD:	2.888m	N	997.687m	HD:	2.815m	Е	998.396m	SD:	2.888m	N	997.687m	HD:	2.815m	Е	998.396m
HD:	2.815m	E	998.396m	VD:	-0.645m	Elev	3.755m	HD:	2.815m	E	998.396m	VD:	1.821m	Elev	6.221m
VD:	-0.645m	Elev	3.755m	Result				VD:	-0.645m	Elev	3.755m	Result			
				Remote	e Height		0.000m					Remote	Height		2.466m





4.15 Electric Lines Survey

Click [Electric Lines Survey], as shown in Figure 4.15-1. The Electric Lines Survey function is to stakeout known power lines and record survey object data near the electric lines. The surveyed object data is exported and used in professional electric lines design software to determine whether the set electric lines meet the specifications based on the survey data.

÷	HA:077°5 VA:276°0	3'44" 0'57" 54%	← Settings			
DM0	N:999. E:997.	.392 163	Settings	Electric Lines Survey	Display Info	Tool Bar
1(43)	H:4.70 Slope	06 Dist:2.917	Electric Data Type			Default >
	Horizo Elev. C	ontal Dist:2.901 Offset:0.306	Stakeout Settings			
	Mileag	ge:6.226 :[Right]2.609	Remind Range			1m >
	Name	Pt52 🛞	Stakeout Tolerance			0.02m >
·@·	Code	Input				
🖗 🛞 🖺 🕅 🔀 🔟	Save 5m		Def	ault	ОК	e -
Figure 4.15-	1			Figur	e 4.15-2	

Click on (enter the electric lines survey settings, as shown in Figure 4.15-2, where you can

modify the storage type of electric lines survey data and the stakeout prompt settings. You can click the Electric Data Type to enter the electric object data storage type management library. In addition to supporting default point saving, it also supports customization of electric object types, as well as create, edit, delete, share, and apply data types.

Click Survey&Save to save the survey data.

Click 🖹 to enter the electric lines library management, you can add, edit, import, and delete electric lines.

Click is to enter the electric point database, view the surveyed electric point data, export the result

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data, etc.

Click \bowtie to enter the bisector stakeout and stakeout the bisector of the electric line towers.

Click (Laterative Click Click

4.16 Electric Towers Stakeout

Click [Electric Towers Stakeout] to stakeout tower point of the electric lines. Select the tower that needs to be surveyed, set the tower's parameters, calculate the tower point, and it also support the calculation methods of four section and eight section. Enter the length and width of the towers, select the tower point, and click stakeout, as shown in Figure 4.16-1 to 4.

← Electric Tower Stakeout		← Calculating Parameters	
Electric Tower Point	Data Content	4-Cross-Section 8-Cross-Section	
	>	Length(OA) 1.414 m	в
Calculating Parameters		Width(AP) 1 m	
4-Cross-Section Length:50.0000 Width:0.0000	>	Calculate	A
	Stakeout	OK	

Figure 4.16-1







Figure 4.16-4

4.17 Function Customization

Click [Function Customization], as shown in Figure 4.17-1. You can define various types of terrain data and their attributes required for the project as need, and use them as a functional module. You can directly use this functional module to record and export the data results required for the project.

You can perform operations such as create, edit, delete, hide, and share on functional modules. Each function can define multiple different types of features and attributes data, as shown in Figure 4.17-2 and Figure 4.17-3. After defining the function, it will be displayed on the main interface. Click to enter the data survey interface. Select the terrain to be surveyed, as shown in 4.17-5.

Click on 🛐, View the survey result data as shown in Figure 4.17-6.











Figure 4.17-5



Text Value >
Normal >
50
Real-Time Value >
Length 2D $>$



Data Content	
Length:3.113m	Length(3D):3.115m
	Export

Figure 4.17-6

Chapter V Tools

On the main interface, click [Tools], as shown in Figure 5.1. The tools include Angle Converter, Perimeter and Area, Volume Calculation, Share File, Calculator, Circle Center Calculation, Average Calculation, Coordinate Positive Calculation, Coordinate Inverse Calculation, Point Line Calculation, Angle Calculation, Intersection Calculation, Resection, Forward Intersection, Offset Point Calculation, Extension Point Calculation, Equal Point Calculation.



Figure 5.1

5.1 Angle Converter

Click [Angle Converter], as shown in Figure 5.1-1. Through the function of degree, degree minute second, radian and other Angle display formats before the transformation, select input one of the formats, calculate the value of the other formats.

Format	dd.mmssss >				
dd.mmssss	23.10324291 🛞	1	2	3	Del
Result		4	5	6	<-
dd (Decimal)	23.17567475				
dd:mm:ss.ssss	23:10:32.4291	7	8	9	->
dd°mm'ss.ssss"	23°10'32.4291"				
Radian	0.4044918308	=	0		Clear
(x.xxxxxxx)g	25.75074972				ĵ
(x)g(xx)c(xx.xxxx)cc	25g75c07.4972cc	Abc	+	-	Hide

Figure 5.1-1

5.2 Perimeter and Area

Click [Perimeter and Area], as shown in Figure 5.2-1, you can add and delete coordinate points, import and export coordinate points. And view the block graph in the preview view as shown in Figure 5.2-2.

\leftarrow Perimeter and	Area			Export	← Perimeter a	nd Area		Save
	Point Coordinates	Preview Map				Point Coordinates	Preview Map	
Data Content				2	Perimeter:23.21m Area:19.695m ^a Area:0.00197ha	Pt49		🖲 2D 🔘 3D
Pt49 N:1004.253	E:992.479		H:5.210			18.	21m	
Pt51 N:1000.210	E:1001.856		H:4.596			7.94m	P151	
Pt59 N:997.962	E:997.327		H:4.754			P	5.06m	
Add	Database	Import	Calculate		Select Point/Line o	on Polygon		2m
	Figure	5.2-1				Figure	5.2-2	

5.3 Volume Calculation

Click [Volume Calculation] to Enter the triangulation database as shown in Figure 5.3-1. And select the calculation surface, as shown in Figure 5.3-2. After selecting the calculation surface, enter the reference height or select the reference surface to calculate the earthwork volume of the positive and negative volume for that surface.

In the triangulation database, you can create, import, edit, delete, and share triangulation data.



Figure 5.3-3



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5.4 Share File

Click [Share File], as shown in Figure 5.4-1. Select the files that need to be shared. After sharing, as shown in Figure 5.4-2, other devices can enter the sharing code or scan the QR code on the main interface of the software to obtain the shared files.





Figure 5.4-2

5.5 Calculator

Click [Calculator], as shown in Figure 5.5-1. Perform some simple mathematical operations.

← Calculator				
				1+1=
				2
√	()	С	DEL
π	7	8	9	÷
tan	4	5	6	*
cos	1	2	3	
sin	0		=	+



5.6 Center Point Calculation

Click [Center Point Calculation], as shown in Figure 5.6-1. Calculate the center point using three known points and save the result to the point database.

\leftarrow Circle	← Circle Center Calculation												
A C	B Description: Given the coordinates of three points on the circle, point A, point B and point C, calculate the coordinates of the center point P.												
Point A			2	¥									
N:998.885 E:997.311		Name:Pt60 Elevation:4.707			>								
Point B			2	*									
N:1000.210 E:1001.856		Name:Pt51 Elevation:4.596		_	>								
	Save		Calculate										

Figure 5.6-1

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5.7 Average Calculation

Click [Average Calculation], as shown in Figure 5.7-1. It is possible to calculate the average of N points, display the difference between each point and the result, and save the result to the point database.

← Average Calculation			🗲 Coordi	nate Positive Calculation				
Data Content	Result		В∳ _₽	Description: Knowing the coordinates of the point A and the point B, $\angle A=\alpha$, AP=L1 the coordinates of point P.				
Pt60 ΔN:2231.0mm/ΔE:-95.7mm/ΔH:130.7m N:998.885 E:997.311 H:4.707	n Northing Easting	1001.116m 997.215m	ALL					
Pt5 1 ΔΝ:906.0mm/ΔΕ:-4640.7mm/ΔΗ:241.7m	Elevation	4.838m	Point A		[5]	*	
N:1000.210 E:1001.856 H:4.596			N:997.941		Name:Pt58			>
Pt ΔN:-3137.0mm/ΔE:4736.3mm/ΔH:-372.3m	n		E.997.336	Discation	Elevation.4.755	Delet	0	
N:1004.253 E:992.479 H:5.210			Azimuth Refer	ence Direction	Reference	Point	Direct	ion >
			Azimuth Ref	erence Point	[5]	*	
Add Database	Save	Calculate		Save	Calculate			



Figure 5.8-1

5.8 Coordinate Positive Calculation

Click [Coordinate Positive Calculation], as shown in Figure 5.8-1. Input/select known point A and azimuth reference point B, input offset distance and angle, calculate the offset point coordinates, and save the results to the point database.

5.9 Coordinate Inverse Calculation

Click [Coordinate Inverse Calculation], as shown in Figure 5.9-1. Input/select known points A and B, calculate the distance, azimuth, slope ratio, etc. between the two points.

← Coordi	nate Inverse Calculation		← Point Lin	ne Calculation						
Description: Knowing the coordinates of point A and point B, calculate the azimuth angle a of the two points AB, the plane distance of AB, the spatial distance of AB, the elevation difference between the two points AB, and the slope ratio.				Description: The coordinates of the starting point A, the ending point B, and th C are known, and the point P is the vertical foot. Calculate the starting point d the ending point distance BC, the starting point vertical distance AP, the endin distance BP, the offset distance CP, and the offset angle a.			offset (tance A point ve	ooint IC, ertical		
Point A	[2]	*	- [2	Point A			2	¥	
N:997.941 E:997.358	Name:Pt58 Elevation:4.753			>	N:998.885 E:997.311	1	Name:Pt60 Elevation:4.707			>
Point B	[2]	*	[L	Point B			8	*	
N:998.885 E:997.311	Name:Pt60 Elevation:4.707			>	N:999.231 E:997.314		Name:Pt56 Elevation:4.694			>
Calculate					Save		С	Calculate		





5.10 Point Line Calculation

Click [Point Line Calculation], as shown in Figure 5.10-1. Input/select three known points, calculate the distance, vertical distance, deviation angle, corner, etc. of the points.

5.11 Angle Calculation

Click [Angle Calculation], as shown in Figure 5.11-1. Calculate the angle by three points.

← Angle (Calculation				← Intersec	tion Calculation			
	Description: Given the coordinates of point O, point A and point B, calculate the angle a between line OA and line OB.				C D B	B Description: Given the coordinates of the starting point A and the ending point straight line AB, and the coordinates of the starting point C and the ending point straight line CD, calculate the coordinates of the intersection point P of the st and the straight line CD.			e AB
Point O		3	*		Point A		2	*	
N:998.885 E:997.311	Name:Pt60 Elevation:4.707			>	> N:998.885 E:997.311	Name:Pt60 Elevation:4.707			>
Point A		8	*		Point B		2	*	
N:997.941 E:997.358	Name:Pt58 Elevation:4.753			>	> N:999.231 E:997.314	Name:Pt56 Elevation:4.694			>
	Calculate					Save	Calculate		





5.12 Intersection Calculation

Click [Intersection Calculation], as shown in Figure 5.12-1. Calculate the intersection point of two lines and save the result to the point database.

5.13 Resection

Click [Resection], as shown in Figure 5.14-1. Given two points and their respective distances to the target, calculate the target points and save the results to the point database.

\leftarrow Resect	← Resection						Intersection				
	Description: Given the coordinates of point A and point B of triangle ABP, AP=L1, BP=L2, calculate the coordinates of point P. B				A B B	Description: Given the coordinates of calculate the coordinates of point P.	point A and point B of triangle ABP,	∠A=a,	∠B=β,		
Point A			8	*		Point A			8	*	L
N:998.885 E:997.311		Name:Pt60 Elevation:4.707			>	> N:998.885 E:997.311		Name:Pt60 Elevation:4.707			>
Point B			8	*		Point B			8	*	
N:1000.210 E:1001.856		Name:Pt51 Elevation:4.596			>	> N:1000.210 E:1001.856		Name:Pt51 Elevation:4.596			>
	Save Calculate			Save		Calculate					





5.14 Forward Intersection

Click [Forward Intersection], as shown in Figure 5.15-1. Given two points and their azimuth angles with the target, calculate the target point and save the result to the point database.

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5.15 Offset Point Calculation

Click [Offset Point Calculation], as shown in Figure 5.16-1. Given two points, calculate the coordinate of the mileage and offset, and save the results to the point database.

← Offset F	Point Calculation					← Extend	Point Calculation				
B L2 L1 C A	Description: Knowing the coordinates straight line AB, calculate the coordin the straight line.	on: Knowing the coordinates of the starting point A and the ending point B of the ine AB, calculate the coordinate P of the specified mileage L1 offset distance L2 of the line.					Description: Knowing the coordinates straight line AB, calculate the coordin	of the starting point A and ates of point P on the exter	I the ending poir nsion of the stra	nt B of t aight line	he e.
Point A			2	*		Point A			2	*	
N:998.885 E:997.311		Name:Pt60 Elevation:4.707			>	N:998.885 E:997.311		Name:Pt60 Elevation:4.707			>
Point B			2	*		Point B			ß	*	
N:1000.210 E:1001.856		Name:Pt51 Elevation:4.596			>	N:998.372 E:997.350		Name:Pt52 Elevation:4.728			>
	Save	Ca	lculate				Save		Calculate		





5.16 Extend Point Calculation

Click [Extend Point Calculation], as shown in 5.17-1. Enter two known points, calculate the coordinate on the extension line, and save the results to the point database.

5.17 Equal Point Calculation

Click [Equal Point Calculation], as shown in 5.18-1. Enter two known points, calculate the coordinates of the line segment, and save the results to the point database.

🗲 Equal P	Point Calculation				
A Piter	Description: Knowing the coordinate straight line AB, calculate the coord	es of the starting point A an inates of the line segment d	d the ending poir livided into n equ	it B of th al parts	he
Point A			2	*	
N:998.885 E:997.311		Name:Pt60 Elevation:4.707			>
Point B			ß	*	
N:1004.253 E:992.479		Name:Pt49 Elevation:5.210			>
	Save	Ca	alculate		

Figure 5.17-1