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Chapter One: Engineering Star 3.0 Software Summarization

§1.1 Introduction

This manual explains how to implement and use S82T/S86T system in RTK mode, by operating the Engineer Star software that installed on the handheld computer.

Note that the functions supported by Engineer Star 3.0 to control conventional systems are not discussed in this manual. Likewise, the procedure to download logged static raw data from your receiver to your desktop computer is not discussed in this manual. For more information on this procedure, please refer to the KOLIDA GNSS Processor User Manual provided on CD-ROM.

In the last chapter (Appendix), you will find how to install Engineering Star 3.0, trouble shooting and important explanations that might be useful to you in case of problems when you operate Engineering Star 3.0.

§1.2 Function

Engineering Star3.0 surveying software is the graphic software with simplicity, high efficiency and strong function. It provides the most commonly used function, such as data collection, stake-out point and stake-out line, with engineering and graphic interface. It also has the added function of stake-out curve, and stake-out road. It does not only use the characteristics of international comparable software for reference, such as convenient graphic display and precise structural module, it also combines the concrete specialty of the domestic fieldwork, making engineering star keeps up with world trend and meet the needs of fieldwork as well. Engineering Star3.0 also has many other features, such as flexible zoom graphic interface, tabular menu, which directly display key task on the screen, abundant characteristics of fieldwork, complete edition, standard industrialized data output, coordinate collection, comprehensive RTK vector, GPS raw data and other data formations.

§1.3 Installation Requirement

Engineering Star needs to be installed in the Win CE System to work smoothly.

Win CE, as an operating system based on handheld computer, is the inlayed Win32 operating system with leading multi-task and powerful communication function. It is the strategic operating product designed specially for Non-PC products, such as information equipment, motion application, consumptive electric products and inlayed application etc.

Win CE is not simply transferred from Window NT or Windows 9x. Its applicative interface



program intimates that of Windows NT, but the inside is a totally new code foundation. Hereinafter are the two important standards.

- 1. No former 16 units applicative programmed interface (API)
- 2. The module adapting to the minimal equipment.
- (1) WinCE is the minimal Windows Edition by far,
- (2) WinCE is the fastest Windows Edition,
- (3) WinCE is the most reliable Windows Edition,
- (4) WinCE provides the most flexible operation system.



Chapter Two: Main Menus

§2.1 Main Screens

There are 6 menus giving access to the main functions of Engineer Star3.0. The figure below summarizes all the functions available from that screen.





: allows you to switch between several menus.

allows you to view satellite information. (see as figure 2-2)

S

E



횏 Satellite in	nformatii 💿 📑		💊 Graph 🗾	Ĩ
position Sate	ellite map 🛛 Satellite ta 💶 🕨		• -3.70	ļ
Lat:	023:07:35.3267			Ň
Lon:	113:21:55.7294			
h:	31.437			
Northing:	-1824515.739			
Easting:	-210672.532			
H:	4.762			
Real height:	2.088 m			
Status:	Single			
	Y		• -3.069 <mark>.0.6</mark>	53n
S P:Single	H:0.836 V:1.583 G		S P:Single H:0.852 V:1.630	G
I S:9+7	₹4 10:43:53 M		I S:9+7 ₹4 10:45:15	М
CGJobs	\11111\1111.eg OK		Exit 🔍 🔍 🕀 🔍 🖱 🕇	ок
Figure2-2	view satellite info.		Figure2-3 Graph interfac	ce
G : swite	ches to graph interfac	ce.(see as fi	igure 2-3)	
M : retur	ns to main screen.			

Exit Exit program.



§2.2 Job Menu



New Job: In general, you need to create a new job and input some parameters of ellipsoid and projection before you start your surveying work. A job consists of a number of file such as survey parameters, transformation parameters and result coordinates file etc.

Open Job: Opens an existing job.

File Import/Export: Outputs result coordinates file with the format you want, such as: Pt ID, N, E, H, Code or Pt ID, Code, E, N, H, etc.

Close Receiver: shuts down the receiver.

Exit: exit the Engineer Star program.



§2.3 Input Menu



Coordinates Library: to manage all plane coordinates.

Road design: there are two methods for road design, element mode and intersection mode.

Localization: Calculates transformation parameters between WGS-84 and your local coordinate system.

Correction: correct point coordinate with local known coordinate.



Localization

This operating mode is used in the following cases:

- The coordinate system is unknown or its characteristics are not accurate enough.

- The base station is operated on a reference point whose position was only determined in autonomous GPS mode.

- A local coordinate system is used for field operations.

In either of these three cases, you will have to localize your system before starting your job, using control points. The use of 3 control points or more is highly recommended to achieve horizontal localization. This number should be raised up to 4, or more, to ensure vertical localization, as this will guarantee the consistency of your control points.

Click the menu **Set** and select **Localization**. The screen that appears is described below.



Control coordinates can be entered manually or read from a

file stored in the handheld computer. When you click **Add** to add a point, a new screen is displayed.

You may either enter the points coordinates manually (see screen example opposite) or select an existing point from the pre-defined list.



Click on the 📃 button to access the list of points available from the open

job.

Click **OK** after inputting the point manually or selecting point from the list. A new screen then appears asking you to enter the true coordinates(or call raw coordinates) of the point. There are 3 different ways for entering these coordinates(see screen below)



1. They can be loaded from the results of a point that was logged earlier during the same job.(*select from library*)

2. They can be read from the rover receiver. In this case, the rover should be positioned over the concerned control point. (*Enter from GPS*)

3. They can be entered manually (Enter Lat. /Lon.).

If you choose *Enter from GPS*, then engineer star will ask you to indicate the antenna height before the receiver output the coordinates measured for the point.(see screen example opposite)

There are three ways to indicate the antenna height,



Add Control P	Pt.(Geodetic C OK 🗙	
Known poin	t geodetic	
Lat:	23.073533156	
Lon:	113.215571228	
h:	26.714	
Ant H:	0	
🔘 True	O Slant O Pole	
ОК	Cancel	
Degree format: dd.mmssssss When read coordinate from GPS,you need enter antenna height.		

True: the vertical height is from measuring point to phase center of receiver.

Slant: the slant height is from measuring point to the line edge of antenna.

Pole: the pole height is the carbon fiber pole length, which is 2m.(this option is recommended if you use rover with carbon fiber pole)

Then click **OK** to enable the result of that computation. Engineer star then takes back to the screen showing the point list. Resume the previous steps until the coordinates of all the controls point involved in the localization process have been determined.

Localizat	tion					ок 🗙
Horizo	Vertic		Use	h	U	se al
157.830	-219.6	j	,	Ý		Y
87.184	109.3	33	,	Y		Y
73.479	110.3	33	,	Y		Y
					-	
						•
Add	Edit	Dele	ete	On/C)ff	Set
Open	Save	Vie	w	App	ly	Cancel

On the points list screen(see screen example above) ,check the amount of residual for each control point involved in the localization. The lower these value, the better the consistency of your control point network. If some



residuals be highly abnormal, the relevant point(s) should be deleted using the **Delete** button or removed from localization progress using the **On/off** button. The **On/off** button gives access to a menu allowing you to enable/disable the selected control point for horizontal control progress, for vertical control progress, or for both(see screen opposite) the localization parameters can be saved as a *.cot file for the further use. Click the **Save** button to do this, but if you want the parameters effective after saved, you should use the **Apply** button, then click on the **OK** button to quit the localization dialog.

Use / Not Use Setting 🛛 🛛 😽 🗙	Calc. Transform ParaSet Ok	(×
	Localization method setting —	
Pt ID: 3	Method: One-step meti	r 💌
on /off	One step method is recommended	
	Altitude fitting setting	
Horizontal control	Method: Automatic dec	:i 🔻
Vertical control	🔲 Residual distri. 🛛 Inverse Distan	
	CAccuracy limit reminder	
	Horizontal accur. 0.1	
	Vertical accuracy 0.15	
OK Cancel	Cance	el

Correction

Usually we set base station on a known point, and input the known point coordinate to the base as reference coordinate, however, sometimes, we can set the base on unknown point or even we set base on known point, but we don't input the known point coordinates to base, we just use other known points to make the localization, which still can get the same effect as inputting known point to base. This method is very flexible, because sometimes, the known points are hard to reach for heavy base batch, then you can put the base on an unknown point, just take the handy rover batch to the known points, then make the localization. Because the base starts up with a random single positioning coordinate, so the base coordinate will change every time. So we need to use correction function to calculate the changing value. There are two situations as follows:





Adjust Mode Selectio	in OK ×		
溕			
Correction mode —			
Set base on kr	nown point		
🔿 Set base on unknown point			
Next	Cancel		
When rover doesn't red base,then the first mod Please quit the program receiver, connect again	ceive data from de is unavailable. n, restart h.		

Base station on the known point (Point A)

Use one point (Base Station Point A) to adjust

Steps: input->correction-> Set base on known point. You can just input the base known coordinate to the dialog, then you can acquire the raw data of base from rover.

Base Station At Known Pt 🛛 OK 🗙	Adjust Wizard Tips OK 🗙
$\boxed{\mathbf{k}}$ Local coord.of known base $\boxed{\frac{1}{3}}$	Are you sure to make correction?
Pt ID: pt1 Northing: 2558738.097 Easting: 435141.369 H: 51.795 Ant H: 2 Real Slant Pole Base ID: Image: Compared to the second sec	Base modification is set on known If you will make correction, please press OK button after centering And levelling the rover(when using the first mode, you can ignore this step) Press cancel button to cancel correction.
Lat/Lon B: 23.07353231 L: 113.2155779 H: 28.861 ID: 0800 Cal.3 parameters Adjust	OK Cancel

Base station on the unknown point

1) (Suppose that the point is Point B)

Step: input->correction->Set base on unknown point. Then you need put rover to a known point, and input this known point coordinate to the dialog.



횏 b	b		
		Coordinat	e Library
		Road Design 🔶 🕨	
	× .	Localizatio)n
	Job	Correctior	ו
	Å	X Ŧ	
s	urvey	Tool	About
S	D: Nodatau:		G
Ι	S: T	0.	м
Exit	Disk\EGJo	bs\bb\bb.e	ед ОК

Adjust Mode Selection	ок 🗙			
7				
Correction mode				
O Set base on known poi	int			
Set base on unknown point				
Next Ca	ncel			
When rover doesn't receive dat base,then the first mode is unay Please quit the program, restart receiver, connect again.	a from vailable.			

Base Station At Unknown Pt OK 🗙	Adjust Wizard Tips OK 🗙		
Local coord.of known rover	② Are you sure to make correction?		
Pt ID: pt1	Base modification is set on unknown		
Northing: 2558738	If you will make correction,		
Easting: 435129.368	please press OK button after centering		
н: 31.801	And levelling the rover(when using the first mode you can ignore this step)		
Ant H: 2			
🔿 Real 🔿 Slant 💿 Pole	correction.		
Choose Lat/Lon mode			
B: 0 L: 0			
Cal.3 parameters Adjust			

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Road Design

There are two manners of road design, element mode and intersection mode. **Element mode**: a stretch of complicated road includes line, circle curve, transition curve. If you use element mode to design a road, you need input the parameters of every element in sequence. So it's only suitable for short distance and simple road.



Intersection mode: it's more suitable for complicate road design.

Usually the designer selects several points which is suitable for building road in map, then connect them by lines (see below figure, point 1,2,3), and designs transition curve and circle curve in every turning corner. These points are called intersection points, and this manner is called intersection mode. You only need input intersection point coordinate, radius of circle curve, length of transition curve, the program will calculate every key factor automatically (like center point of circle curve, intersection point of line and transition curve).





Element mode

The steps are as follows:

1. Press "New" button to create a road design file

(See the screen below)



2. Input distance interval value, and give a name to the road, then press "**Add**" button to design this road.

3. You need select a start point, and must input the coordinate of it.



Element mode-	Add 🛛 🔀
•	
Element type:	Point
Northing:	
Easting:	
Azimuth:	<can't input=""></can't>
Length:	<can't input=""></can't>
Radius:	<can't input=""></can't>
Angle of	<can't input=""></can't>
ОК	Cancel

- 4. Then select a line element, you need input azimuth and length.
- 5. If there is a transition curve, you need select spiral, then input the length.
- 6. Select a circle element, and need input the radius.

7. The element behind the circle could be a transition curve or a line, so you can select the element as real situation, then input parameters.

But the end element must be a line element.

After you input a section of one road, you can press "OK" button to return the main screen of road design.

Road DesignElement Mode 🛛 🗙				
Data input	a input Graph show			
Element	No	rth		East
 Point 	1	D		0
🔨 Line	3.5	355		3.5355
🙃 Circle	1.8	347		6.9291
💿 Spiral	-0.5	5032		5.1702
🔨 Line	∖Line -0.5032 5.1		5.1702	
4				
\Flash Disk'	\EGJobs\	bb\Info\1	rod	
int.mile	.no. Sta .dist. Inf	art.Mileagi terval:	e: [0 5	0
Add	Edit	Inser	t	Delete
New	Open	Save		OK

Then you can press "save" button to save the design file, and it will calculate the stakeout points on the road as interval distance, all of the calculated points



are saved in the *.rod file, it also generates a *.dat file with a same file name. After this process, you can click the Graph show tab to check the design road graph. (see below screen)



About ROD file type description, please refer to following content.

File Format Instruction:

The format of road file is "ROD", the detailed format is as follows: CLINE FILE V1.00 START CHAINAGE, 500.0000 RN, GuoGuang-3-2-13 PT, 435118.000000, 2558744.000000, R., 433.333000, 90.00000000, CC, 321.751000,-500.000000, R., 252.195000, 53.13005129, CL, 240.000000, 346.410162, CC, 160.875000, 500.000000, R., 551.317000, 85.31595543,

LS: start point of line LE: end point of line QZ: center point of circle curve

Format Instruction:

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CLINEFILEV1.00Default line, mark the data editionSTARTCHAINAGE,X.XXMark the start mileageRN, YYYY marks the road name

PT marks points: *Type in the coordinates of points, the first is the east coordinates* (Y)*, and the second is the north coordinates* (X)

R. marks lines: *defines the line and azimuth, if you do not define it, the software will auto calculate the azimuth. The first is the line length, the second is the azimuth.*

CL marks transition curve: it is defined by the curve length and K gene, the formula of K gene is as follows:

$A = \sqrt{R \times L}$

A means K gene

R means the radius of the curve

L means the length of assuasive curve

Note: transition curve must meet one arc in both ends, the first one is the length of the transition curve and the second is the K gene.

CC *marks arcs: to define the arc length and the radius,*

negative means left curve.

The first is arc length, and the second is radius.

Note: the minus and plus value of radius only means the direction. Plus is the right side of the road direction, and the minus means the left side of the road direction.



Intersection mode

This screen is nearly like element mode.

Data input	Graph	show		
Point of in		North		Ea
				_
				▶
💿 int.mile.no Start.Mileage 🛛				
🔿 int.mile.dist. Interval: 50				
Add	Edit	Insert	De	lete
New	Open	Save] [(Ж

You need press "New" button to create a road design file, the file type is *.ip. And input distance interval value and road name.

Save file	ок 🗙
🔍 File type: 🛛 *.ip	•
\Flash Disk\EGJobs\bb\Info	
File Name:	

Then press "Insert" button to input intersection point information.

The information includes intersection point ID, coordinate, length of 1st graceful (transition) curve, length of 2nd graceful (transition) curve, Radius of circle curve.



Intersection mode-Edit		
Δ		
Intersection	1	
Northing:	0.0000	
Easting:	0.0000	
1st graceful curve:	0.0000	
Radius:	0.0000	
2nd graceful curve:	0.0000	
ОК	Cancel	

Usually the start intersection point and last intersection point don't need input transition curve length and circle radius, just input point coordinate.

You can press "**insert**" button to add intersection point one by one. After you input all of the intersection points and related information you need to press "**save**" button to save it, it will calculate every stakeout point as interval distance.(see screen below)

Road Design-Intersect Pt Mode 🛛 🗙				
Data input	Graph	show		
Point of in		North		Ea
1 1	(0.0000		0.0
1 2	(0.0000		0.0
<u></u> ∆3	(0.0000		0.0
				Þ
J\Hash Disk\EQ	iJobs\b	ib(555.ip		
● int.mile.no Start.Mileage 0				
O int.mile.dist. Interval: 50				
Add	Edit	Insert	Del	ete
New	Open	Save	0	IK

If you input one intersection point by mistake, you can press "**Edit**" button to modify it, or select it and press "**Delete**" button to delete this point.

If you have a *.ip file, you can also press "Import" button to import to the screen.



When you want to check the road design graph, you can click "Graph show" tab, the designed road will show in the screen.(see screen below)

Road Design	-Intersect Pt	Mode	×
Data input	Graph show		
ЧҮ-01 QD • ZH-01		_ <u>1</u>	
		•	Ð

The intersection mode will generate 4 kinds of files, *.dat file, *.ip file, *.rod file.

.Dat file and .rod file are the same as the one generated in element mode. The content of .ip file is the same as rod file in stakeout road library.

About IP file format description, please refer to following content,

File format instruction

IP is road design file, the detailed format is as follows,

CLINE FILE V1.0(Intersection)
START CHAINAGE,0.0000

/*default line, mark the file version */*mark the start mileage, in this file, the*

start mileage is 0.

RN,11

/* 11 is road name b3,58711.7380,-4890.1240,20.0000,15.0000,20.0000,1000.0000 b67,58726.9090,-4872.0580,25.0000,15.0000,25.0000,0.0000 b121,58731.1310,-4888.3590,18.0000,14.0000,18.0000,0.0000 b313,58718.0170,-4875.0030,0.0000,0.0000,0.0000,0.0000

/* the 4 lines represent 4 intersection points, the field meaning is point name, N, E, length of left transition curve, circle curve radius, length of right transition curve, mileage.



§2.4 Config Menu



Config menu includes 5 submenus, job config, instrument config, Radio config, mobile config and port config. It covers most of parameters setting.

ر 🍋 آ	ob setting 📃 🚺			
Cool	rd. 🛛 Antenna 🗍 Save 🗍 Display 🔳 🕨			
0	Coordinate system:			
Chir	na/BJ54/38 🔹			
	Edit Browse			
ER Parameter This is not ER Job ER List				
Thi	s is not ER Job ER List			
Thi S	P:Fixed H:0.004 V:0.007 G			
Thi S I	P:Fixed H:0.004 V:0.007 6 S:8+2 ¥411111:49:08 M			

Job config

In this menu, there are 5 pages, coord., antenna, save, display, other.

In coord. Page, you can define your coordinate system, select your local system, modify projection parameters and so on..

For antenna page, you can input the pole height, the software will show the real point height which you measured on the ground.



i (ob setting 📃 🗖	Ē	
Cool	rd, Antenna Save Display	<u>م</u>	
An	it.H 2	-	
0	Real 🔿 Slant 🔘 Pole		
	Detail		
	Display real height directly		
Real H: the distance from antenna phase to ground survey point. Slant H: the distance from rubber ring to ground survey point. Pole H: the length of carbon fibre pole.			
S	P:Base MH:0.000 V:0.000	G	
Ι	S:7 TR 17:01:10	Μ	
С	obs\steven\steven.ea	ок	

In the save page, you can set storage method: general, offset, average, and automatic.

N 🜔	ob setting 📃		
Cool	rd. Antenna Save Display	- F	
Me	Method of storing point General Offset Offset Average		
	Average time Name add		
F Ger	General mode		
Cursor init. ● Gen∉ 000000 ● Name ○ Code		Code	
	Ditto Same Name Shortcut: A	•	
S	P:Base MH:0.000 V:0.000	G	
Ι	S:7 ∜R 17:03:3 2	Μ	
С	obs\steven\steven.eg	ОК	

In the display page, you can specify how points will show on the screen, and their point names display method.



נ 🧕	ob setting 📃 🔳	
Ante	enna Save Display Other 💶 🕨	
Ma	sk angle: 15	
Time zone(E+,W-) 8		
	ordinate Order 🛛 East,North 🗨	
HRI	MS limit: 0.03	
VRMS limit: 0.06		
PD(OP limit: 🔽 Use 🛛 🖉	
Encrypted key set		
s		
Ι	S:7 TR 17:06:08 M	
С	obs\steven\steven.eg OK	

In the other page, you can set mask angle, time zone, pdop limit and other information.

Instrument config

The operating mode is to set working mode and parameters, data link, it can only be operated when the engineer star connected with receiver. The operation will be effective after restarting receiver.

🌖 Iı	nstrument settini 🛛 📑 🔳
Rov	/er
	Rover setting
	Base setting
	Work mode setting
S	P:Fixed H:0.004 V:0.007 G
Ι	S:8+1 T4 11:49:45 M
С	GJobs\11111\11111.eg OK

These operations also can be realized on receiver, about the detailed operating steps, you can refer to relevant product manual.

In base setting screen, there are two modes to set up base station. One is auto start, the other is manual start. You can set the detailed parameters after entering base setting screen (see screen below)



🔌 Instrument setting 💦 🔲	Base Station Setting OK 🗙
Base	_F Base parameters —
	Msg.type 🚺 🔽 Interval time 1
Rover setting	Diff.mode RTK 💌 Mask angle 🛛 🛛
	Ant.H D PDOP Limit 3
Base setting	🖲 Real 🔿 Pole 🔿 Slant 🛛 😨
	_r Base coordinate —————
Work mode setting	Latitude 📃 🚊
	Longitud 💽 Lat/Lor
	Elevation O Plane
S P:Base MH:0.000 V:0.000 G	Calc.7 para.mode 🗌 repeated station
I S:8 ₹R 18:29:52 M	Can't input ant.H in single position status
Cobs\steven\steven.eg OK	Start Help Exit

Start up base station by two methods:

If you want to make the base station transmitting signal automatically every time, you can select the first option (Base parameters), and set the transmission condition, by this way, you don't need make any operation on base station, just need power on it. But there is a shortage, even you put it on the same point, if you restart it, the base transmitting coordinate will change.

If you want to use a specified coordinate to start up base station, you need select the second option (Base Coordinate), and set the parameters, correction type, transmission interval time, PDOP, antenna height.

Base Station Setting	OK ×
_F Base parameters ————	
Msg.type RTC/ Interval time	1
Diff.mode RTK 💌 Mask angle	D
Antri Denonicia	<u> </u>
EGstar 3.0 OK	× FT
	╶┢
📲 🖊 Base start successfi	┉╘┓
Lati	
Longitud 113.215577959) Lat/Lor
Elevation 26.763 C) Plane
🔲 Calc.7 para.mode 🦳 repeate	ed statior
Can't input ant.H in single position	n status
Start Help	Exit

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In static parameter screen, you can set observation interval time, elevation Mask angle, PDOP value, and antenna height.

Receiver Mode Set Wizard 🛛 🛛 🗙 🗙	Static Sample Para. Setting 🛛 🛛 🗙
₽ ²	⊊
 Set work mode Set static parameters 	Sampling interval: 5 Mask angle: 0 Antenna height: 0
🔿 Set data link	PDOP Limit value: 3
Next Cancel	OK Cancel

Warning: if the receiver is already in static mode, you can not use engineer star to operate it, if you connect receiver by blue tooth or cable, you will see that the status is **No data.** So you also can not switch the work mode to rover mode or base mode again, you need operate on receiver.

Set data link: there are three kinds of data link: Internal radio, GPRS/GSM module, and external radio, and the operation in this screen is just suitable for RTK receiver.(see screen below)

Receiver Data Link Setting 🛛 🛛 🗙
₽\$ -
Internal radio
O GPRS/GSM
O External radio
OK Cancel

Note: you can also make this operation on receiver, please refer to relevant



product manual.

Radio Config /GPRS Config

This operating mode is to make the detailed setting to data link.

When the software connect with receiver, it will search the data link, if it find that the data link is radio, the **Radio Config** menu will appear. If the data link is GPRS, the GPRS Config menu will appear automatically. (see screen below)



💊 si	teven				
		Job	Config		
		Inst	rument Cor	ifig	
			(S Config		
	Job	Mob	oile Config		
		Port	t Config		
MÅ		Ĭł	I! 🚍		
s	urvey	Tool	Abo	ut	
S	P: Single	H:2.118	V:3.425	G	
Ι	S: 9	Ψ̈́R	16:11:20	м	
Exit	obs\steven\steven.eg OK				

🔍 R	💊 Radio setting 📃 🔲			
₽ ³	7			
Cur.o	channel No. 4 Read			
Swit	ch 1 💌 Switch			
S	P:Single H:1.080 V:1.975 G			
Ι	S:10+6 T4 16:49:42 M			
С	GJobs\11111\1111.eg OK			

There are two buttons in this screen.

Read: reads the current radio channel, the value is between 1 and 8. When you didn't see the channel number icon \mathbb{T}^1 showing at the bottom of main screen, you can use this button to learn it. If it always shows "unknown" after you

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press **Read** button, may be the built-in radio has problem. **Switch**: when you want to switch the built-in radio channel to specified one, you can tap the pull-down menu **and** select the specified channel number,

then click on **Switch** button to change it.

When you change the data link to gprs/gsm module, you will see the menu change to **GPRS Config**, and there is a module icon $\P R$ showing at the bottom of main screen.



When you want to use gprs/gsm module to establish connection with CORS network, which transmit differential corrections via NTRIP, the steps are as follows,

1. Config→GPRS Config (see screen below)





Network Setting			
Network setting			
Network1 <eagle 58.248.35.130:6060<br="">Network1 <vrs 194.30.147.82:2101=""> Network<eagle 58.248.35.130:6060=""></eagle></vrs></eagle>			
Add Edit Delete			
Sonnect Break OK Cancel			

2. You can add a new cors server address to the list, or select an existed record to operate, you can edit or delete it.

Click on Edit button to enter parameters setting screen.

Network Setting 🛛 🗙							
Name:	Network1				٦		
Mode:	EAGLE			-			
Connect:	GPRS/CDMA			•			
APN:	CMNET		Char	nge			
IP:	58.248.35.:	130		▼			
Port:	6060	-		DN:	=		
Usr Name:	111						
Password:	111						
Access	V1124734796 🔽						
	Get sourcetable						
	Read from module						
	OK Cancel						

3. Input a name in the first column,

Select GPRS/CDMA on connect option, select NTRIP-VRS on mode option

- IP Address
- Port
- User Name
- Password
- APN
- Access



Note: usually this information is given by NTRIP caster (Cors network server), after you input these parameters, press **Get sourcetable** button to get the sourcetable.

After you set all parameters, you can press **OK** button to make it effective. Or press **Cancel** button to cancel the settings.

4. Press **OK** button to quit the setting screen, then you can press **Connect** button to connect with network, press **Break** to disconnect.

Network Setting			
Network setting			
Network1 <eagle 58.248.35.130:6060;<br="">Network1 <vrs 194.30.147.82:2101=""> Network<eagle 58.248.35.130:6060=""></eagle></vrs></eagle>			
Add Edit Delete			
Connect Break OK Cancel			

When you want to establish connection with another GPS receiver by GSM mode, the steps are as follows,

- 1. Config→GPRS Config
- 2. Click on Edit button to enter parameters setting screen
- 3.Selet GSM on connect option, select Eagle on mode option

(see screen below)



Network Set	ting 🛛 🗙		Net con	nect-Eagle mode	
Name:	Network1			Network	T.
Mode:	EAGLE			Initialization	1
Connect:	GSM 🗨			GPRS connection	
APN:	CMNET Change				
IP:	58.248.35.130 🔽			Log on server	
Port:	6060 🔽 🗖 DNS			(authentification)	
Usr Name:	111				
Password:	111		_		
Access No.:	1325425886 🔽				
	Get sourcetable		Startin	ig module	
	Read from module				
	OK Cancel	J	(Ж	Cancel

You just need to input Base receiver sim card number, then press **OK** button to make it effective. Note that the sim card must have data/fax function.

After you set the parameters, press **OK** button to quit, return to the **Net connect** screen, then restart gps receiver, the rover will connect the base automatically.

Notice: If you set the parameters once, you don't need set it again at next time, it will be saved in the module, and when you power on the receiver, the module will connect to network automatically.

Mobile config



Sometimes, you can use mobile phone to replace internal gprs module, you just



need prepare a cell phone (with bluetooth function), and make it connected with the controller,

The steps are as follows,

1. Scan bluetooth device.

Bluetooth						0K	×		Blu	
Paired	aired Device Ser			Mode	∍Ì.	Abou	ıt		P.	
Select	: device t	o start	: pa	iring.					9	
Name	;	A	۱dd	ress			Τİ			
W110	19739270	0	080	02507	'DD	57				
WORk	ORKABOUTPRO 0024D29F07FB									
X1138	138831419		138831419 UU8U25U/F218		00802507F218					
	nknown		Jnknown		00802507D4C2					
Liehov	0-1080(-1D80L 00127EB/46EB								
K750d	1KNUWN 00. 750a 00.			23600	201	СГ 0Л				
	n All		.011	.	0	lear				

B	luetoo	th				OK	×
	Paired	Ser	vers	Mode	e 🛾 Abo	out	
	Select device to start pairing.						
	Name			Add	ress		Т
	W1109739270			008	02507	'DD57	
	WORK/	ABOUTPI	RO	0024	4D29F	07FB	
	X11388	331419		00802507F218			
	Unknov	wn		00802507D4C2			
	Unknov	wn		0080	025A0)221E	
	Lenovo	o-TD80t		0012	2FEB7	'4BEB	
	Unknov	wn		0012	23E0C)76CF	
	K7500	Pair			5922	23A9A	
		Refrest	n Na	ame			
	<u>S</u> cal	Delete				Clea	r
	L						

2. Select bluetooth service, for mobile phone, you need select dialup network.

Services OK	Dial-up Network
Device Name: K750c Select service for pairing.	Select profile options and press 'Next'.
Dialup Netwo Serial Port OBEX OPP Input Device Refresh Done	Port COM5: COM0: COM6: COM8: BSP0: BSP1: BSP2: BSP3: BSP4: BSP5: Cancel Next

- 3. Select a com port for connection.
- 4. Enter control panel interface, select network and dial-up connections option.





5. Tap **make new connection**, type in a name for the connection, and select **dial-up connection**, then press **Next** button.

<u>File E</u> dit Adva <u>n</u> ced X	<u>File Edit Advanced</u> ×
Make New Connection	Modem
Type a name for the connection:	Select a modem:
Select the connection type:	K750c(Dialup Networking)
	K750c(Dialup Networking) Standard Modem on COM2:
Virtual Private Network Virtual Private Network (L2TP)	ICP/IP Settings
● PPP over Ethernet [PPPoE] < <u>Back</u> Next >	< <u>Back</u> <u>Next</u> >

6. Select the modem. (your cell phone name), then press Next button.



<u>File Edit Advanced</u> ×	<u>F</u> ile	<u>E</u> dit	Adva	<u>n</u> ced	×
Phone Number × Phone Number × Image: Country code: 86	Make M Connec	New		Conr Set a	as Default top Shortcut
<u>A</u> rea code: 20 Phone number: ^{*99} # Eorce long distance ✓ Force local				Delet Rena Prop	te ime erties
< <u>B</u> ack Finish					

- 7. Input the GPRS dial number for your sim card (for example, *99#), then press **finish** button.
- 8. Click the new created connection, and press **connect** button. It will connect after a while.

File Edit Advanced X Dial-Up Connection X	
🛃 mobile	
User name:	
Password:	
D <u>o</u> main:	
Save password	
Phone: *99#	
Dial from:	
Home	
<u>C</u> onnect <u>D</u> ial Properties	







9. Then you can use the controller to connect gps bluetooth, and open engineer star, select **mobile config**.

💊 Mobile differential 🛛 📑 🗐	💊 Mobile differential 🛛 🔲 🗐
📄 Mobile differential	🖨 Mobile differential
Open moblie differential mode? Cellphone differential mode setting	Open moblie differential mode? EGstar 3.0 OK × Ce Set data link successful g
	status, naver r start uniterence
S P:Single H:1.167 V:2.208 G	S P: Single H: 0.930 V: 1.784
I S:8+2 ∜R 13:22:46 M	I S:8+4 TB 13:24:11 M
Cobs\steven\steven.eg OK	Cobs\steven\steven.eg OK

10. Then you press open mobile differential mode first, you will see the label

TB showing at the bottom of main screen, which means it's in the correct mode.

11. Select the second option to set CORS parameters.


Mobile Diff. Mode Setting	Mobile Diff. Mode Setting
	📄 Getting domain list
IP: 58.248.35.130	IP: 58.30.241.162
Port: 6060	Port: 2010
UsrName: Test	UsrName: Test
Password: *****	Password: *****
Soucetable Mode: NTRIP	Soucetable H5982110755 ▼ Mode: H5982110755 H5986113331 T0902301316 T1048721041
Get soucetable Connect Break	[CMR] [RTCM30] Get soucetable Connect Break

- 12. After you input parameters, you can press **get sourcetable** button to get the list, and select one to connect. If the get-list process failed, you need check the gprs connection, see if it's disconnected, or if the cors server can't be accessed.
- 13. Press **connect** button to link to the cors server.



Port Config

This operating mode is to establish connection between controller and receiver via bluetooth or cable.

If you connect with receiver by bluetooth, please select **Config->port config** option, and input relevant com port no. (how to connect receiver via bluetooth,



please refer to RTK user manual).

🌖 C	💊 Com port setting 🛛 📑						
 _ GP9	6 port —						
	Port: COMB						
	Baud rate: 115200						
Cable 9600 586; 582, Bluet 1152 pair i	Cable connection: use com1 baud rate: 9600 is for S82 and S80; 57600 is for S86;115200 is for new S86 and new S82. Bluetooth connection:the baud rate is 115200, use the com port when you pair it in bluetooth manage.						
S	P:Fixed H:0.011 V:0.018						
Ι	S:10+5 YR 17:27:33 M						
С	GJobs\11111\11111.eg OK						

If the bluetooth link is disconnected, you can enter this menu to set it again, it will reconnect.

§2.4 Survey Menu

Point Survey: Point data collection. After you press this option, the coordinate of current rover position will be shown on pop-up screen, after you input relevant information, press **Enter** key on keyboard to confirm. To save the point, click **I** then choose **SA**.

Notice: there is a hotkey to save point: button A on keyboard.



💊 Р	oint survey			
				A
	,	2		
		ى		
			F	38m
PT.II	0:6	N:2558	738.000)
H:31	.798	E:4351	29.368	
S	P:Fixed H:O.	004 V:I	0.005	G
Ι	S: 10+5 \¶4	11	:20:56	Μ
С	⊇, ⊕, ⊕,	Q	•	ОК

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Auto Survey: store point automatically by time or distance.

Control Point Survey: when you want to make localization, you can use this function to collect raw data of control point firstly.

Stakeout Point: allows you to stakeout a selected point.

Stakeout Line: allows you to stakeout your line.

Stakeout Curve: allows you to design curve, line and spiral and stakeout them. **Stakeout Road**: You should design the road file first, then use this screen to stakeout road element.

Staking out Points

Click on the **survey** menu and then select **Stakeout Point**. The following screen shows the main stakeout screen. You need press the **use** button on the tool bar to select stakeout points.

) I	Point	stake	out				A N	
		*****		€}spt5	x11 8000 1		38m	
ToN	lorth:?	,		ToEa	st:?			
Up:7	,		Ť	Dist.:	2			
1-022/-1		ked	H:0.0	008 \	/:0.0:	15	G	
S I	S:8		T 2	1	0:22	:07	Μ	



SA: save current position.

LIB: stakeout point library.

LA: previous target point.

NE: next target point.

OP: options.

switch to the tool panel on the second layer.

ESTAR manual





You can import or edit coordinates of stakeout points on stakeout point Library.



There are 3 kinds of coordinates can be added to stakeout points library.

--WGS84 space coordinate

--WGS84 Lat/Lon

--Plane Coordinate (see as below screen)



				×	
Pt ID:					
X:					×
Y:		Pt ID:			
Z:	0.0	Latitude			×
Code:	00	Longitude	Ε	Pt ID:	
Coord.	W	Elevation	0.0	North	
Attr. Type	In	Code:	00	East	
ОК		Coord.		Altitude	0.0
	_	Attr. Type	Int	Code:	00000000
		OK		Coord.	Plane coordinate
	l			Attr. Type	Input point
				OK	Cancel

3 kinds of coordinates

This option is just for adding few points, if you have many points needed to stake out. You can edit your point file as KOLIDA format by text editor tool. The supported file format is *.rtk ,*.dat and *.nib, also you can use user defined function to edit your own format, but it must be text format.

×				
🕒 Input file type:				
EGStar3.0 Coord.Library File(*.nib) 💌				
EGStar3.0 Original Survey File(*.RTK) EGStar3.0 Survey Result File(*.dat)				
EGStar3.0 Coord.Library File(*.nib) Text File(*.txt)-Pn,x,y,h,Pc Text File(*.txt)-Pn,B,I,H,Pc				
Text File(*.txt)-Pn,X,Y,Z,Pc				
Import Exit				



the file format description is as follows,



*.nib 0,point name, N, E, H, code, 0,pt1,1000,1000,10,roof 0,pt_n,1052,1021,20,roof *.dat Point name, N, E, H, code, Pt1,1000,1000,10,roof Pt_n,2000,3000,20,roof

Remember that you need press **enter** key at the end of every line, otherwise, the point in this line will be not recognized in Estar.

After you input the stakeout point, you can select one point, then press "OK" button to stake out it.(see as following screen)







When getting closer to the point as the indicator indicated, 3 concentric circles appear in the screen informing you that you have near to the target. You can now materialize and log the Position of this point. (press hotkey "A" to log this point).

If you want to stakeout next point, you can click **NE** on screen or press hotkey "6" on keyboard,

If you want to stakeout previous point, you can click **LA** on screen or press hotkey "4" on keyboard,

To change the setting for indication display, such as the radius of alarm circle, point display setting, click OP. (see the screen below)



Point Stakeou	t Options	×
💮 Tips range:	1.00m	◄
All stakeout	Display	•
Track:	No Display	•
Select Mode:	Manual	▣
Init. mode:	Select New PT.	•
Zoom Mode:	Auto	•
OK	Cancel	

Tips range means the radius of maximum circle. If you select **Beep** option, when you enter into the area of alarm circle, the beeper will beep to remind you that you are close to the target.

Also you can define if show all stakeout points or not.

Staking out line

Click on **survey** menu, then select **stakeout line**, the below screen shows the main stakeout line screen. You need press **LIB** button to select stakeout line.

💊 Line stakeout 🛛 🔂 🗐							
				€}aspt4j	,		Z
						⊢	<u>38m</u>
ToNo	orth:?			ToEas	st:?		
Verti	cal:?			Peg:?			
S P:Fixed H:0.009 V:0.014 G							G
Ι	I S:9+5 \ranger R				8:17	:18	Μ
C	SA	LIB	LA	NE	OP	t	ОК

Line Sta	Line Stakeout Library 🛛 🛛 🗙						
Index	Line name		Start	: pt. Mile.			
•				►			
Add	Edit	Dele	te	Clear			
Import	Save	OK		Cancel			



Then you can import or edit stakeout line in the pop-up line library. (see the above screen)

You can press "**Add**" button to edit a line to stake out, you need specify the start point and end point, also the start mileage. (see the below screen).

	Edit line		×	
	Line name:	1-2		
Start point —	Start	asd 🗦		
	x:	1.000		
	y:	1.000		
	h:	1.000		
End point -	End Pt:	sd 🗦		Provide access to point list
	x:	4.000		
	у:	56.000		
	h:	9.000		
Start mileage:	—Start mileage:	0.000		
	OK	Cancel		

After you edit a new line, press "OK" button to return previous screen

Then you can select it to stake out.

Or you can import a stakeout file to the line library, the supported file format is *.lnb. The file format description is as follows:

*.lnb

Point name(start point), N, E, height, code, point name(end point), N., E, height, code, mileage of start point,line name, <line 1> J13-1,9202.3460,7747.0240,0.0000,road, JGL13-2,857.9000,8008.5340,0.0000,road,100.0000 <line 2>.....



) L	ine stakeout	
6	1-2	* d
		_ <u>13m_</u>
ToNo	orth:2.933m	ToEast:-0.160m
Verti	cal:2.937m	Peg:-3.069m
S	P:Fixed H:0.0	010 V:0.014 G
I	S: 8+5 ∜R	18:20:42 M
С	SA LIB LA	NE OP 🕇 OK

After you select one line, and press "**OK**" button, you will enter stakeout line screen. (see as above screen).

Target	
To North	
To East	🛛 👧 🖌 🕺
Up	
Distance	
Peg	
Start Distance	9
End Distance	
Course	
Speed	<u>U4862r</u>
Time	End:-1.007m
North	Deg:126.676m
East	Peg. 120.070m
Height	.065 V:1.595 G
Antenna	17:05:40 M
C Q Q	🔍 🔍 🖱 🕇 ОК

Tap the middle display panel, it will pop up a list, you can choose what you want to show on the screen.

Target: stakeout line name.

To north: north offset value.

To East: east offset value.

Up: height offset distance.

Distance: vertical offset distance.

Peg: the mileage of current point.

Start.Distance: offset distance from start point of line.

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End Distance: offset distance from end point of line.

And other information, like course, speed, time, north, east height and so on. About the parameters, you can press **OP** button, refer to following figure.

Line Stakeout (Options 🛛 🗙
💮 Tips range:	1.00m 💌
Stakeout line:	Display 💌
Track:	No Display 💌
Select Mode:	Manual 💌
Peg Tip:	50m 💌
Init. mode:	Stakeout last lin 💌
Zoom Mode:	Auto 💌
OK	Cancel

You can set alarm line by tips range option, also you can set display stakeout line or not, zoom mode and so on.

Stake out curve

It's an extension function for staking out point, which includes design, calculate and stakeout function. You can design line, circular curve and transition curve, also you need specify a distance interval, then the program will separate line (curve) into many points as the interval, then you can stake out these points to realize the function of staking out curve.

Firstly, you need press **Cal** button to select one item, there are 3 items in this menu (see the below screen)

🜖 Stakeout Curve		Curve Calculate Wizard
	ନ୍ଦ୍ ଜ	La Calculate Line
	<u>_38m_</u>	Calculate Circle
DX:?	DY:?	
DH:?	Dist.(?	Calculate Spiral
S P:Single H:1.	406 V:2.142 G	
I S:9+7 ₹4	17:27:50 M	
C SA LIB Ca	Add OP 🔒 OK	



Calculate Line

After you select **Calculate line** option, it will appear the **Calculate line** screen, In this screen, you need specify the start point, end point and distance interval and so on. (see screen below)

Interval (m): distance interval

Dist: calculate points by integral distance. For example, the mileage of start point is 4.5, and interval is 10m, the mileage of first calculated point is 14.5, second is 24.5.

No. Calculate points by integral No. for example, the start point mileage is 4.5, and interval is 10m, the first calculated point mileage is 10, second is 20.





Peg: set the mileage of the line.

Start: the specified mileage is start point's.

End: the specified mileage is end point's.

After you input all of the parameters, press "**File**" button to save the file.(See as above figure), then you can press "**Calculate**" button to calculate coordinate, the program will calculate the points automatically, the default storage path is \Flash Disk\EGJobs\job name\info\XXX.dat

Then you can press **LIB** button to select stakeout point, the following steps are the same as stakeout point.

Calculate Circle

This operating mode is suitable for circular curve.

When you enter the Circle wizard 1-setup screen, you need set the radius of

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curve, angle (it's the turning angle of curve), peg, and the direction (azimuth).

Radius: the radius of circular curve

Dist: distance interval

Angle: turning angle of curve

Left: the curve inclines left

Right: the curve inclines right

Peg: mileage

JD: if you select this option, it means it's intersection point mileage.

Circle Wizard 1-Setup	💊 Stakeout Curve 📰 🔲
Radius: 60.000 Dist.: 16.000 Angle: 80.00000 Eeft Right Peg: 11111.00 JD ST	A N № 2
Inter.PT. N 2558727	•1 •27 ■ DX:S7.213m DY:E100.355m
Ref.Coord.E	DH:-30.108m Dist.:100.614m
Two Point O Azimuth OK Help Cancel	S P:Single H:1.541 V:1.852 G I S:10+8 ₹4 18:38:26 M C SA LIB Cal Add OP ↑ OK

ST: if you select this option, it means it's start point mileage.

There are two manners to fix the azimuth of circular curve. One is by **two points**, you need input the coordinate of intersection point and another point in this direction. The other manner is by **azimuth**, you should know the coordinate of intersection point and the azimuth.

The radius and angle determine the length of curve, the intersection point and azimuth determine the position of curve.

About the parameters of curve, you can refer to the following figure,



R is radius, **a** is the angle of circular curve, **b** is azimuth of circular curve, in this example, the curve inclines right.

After you input the parameter, and press "OK" button, it will



appear a new screen, it will show the calculated curve elements in the screen. You just need press "**Result**" button to save the result file, the result file type is *.dat. (see screen below),

Circle	Circle Wizard 2-Result				
8					
Т	50.3460	JU	11111.000		
LY	83.7758	ΖY	11060.654		
Q	16.9162	QZ	11102.541		
E	18.3244	ΥZ	11144.429		
Res					
\Flash Disk\EGJobs\15\Info\st2					
Calculate Exit					

After you press **Calculate** button, it will calculate the coordinates and return to the main screen, then you can press **LIB** button to open the result file to stake out , the following steps are the same as staking out point.

Calculate spiral

This operating mode is suitable for comprehensive curve.

It consists of circular curve and transition curve.

So in the spiral wizard 1-setup screen, you need set radius of circular curve,

The turning angle of whole curve, length of transition curve and so on. (see screen below)

Spiral W	izard 1-Setup 🛛 🗙		
87			
Angle:	90 🛛 🔐 💿 Left 🔿 Right		
Peg:	1250 🔘 JD 🔿 ST		
Radius:	1200		
Spiral:	500 Dist.: 150		
Inter.P	PT. N: 2558730		
Inter.P	чт. Е: 435100		
Ref.Co	ord.N 2558780		
Ref.Co	ord.E 435150		
🖲 Two Point 🔿 Azimuth			
Help	OK Cancel		

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Radius: the radius of circular curve in the comprehensive curve.
Dist: distance interval for calculating point coordinate.
Angle: turning angle of whole curve.
Left: the curve inclines left
Right: the curve inclines right
Peg: mileage
ID: if you select this option, it means it's intersection point mileage.
ST: if you select this option, it means it's start point mileage
Spiral: the length of transition curve.

There are two manners to fix the azimuth of comprehensive curve. One is by **two points**, you need to input the coordinate of intersection point and another point in this direction. The other manner is by **azimuth**, you should know the coordinate of intersection point and the azimuth.

Usually it will generate two transition curves and one circular curve, it starts with transition curve, then connects a circular curve, end with the other transition curve.



About the parameters of comprehensive curve, you can refer to following figure.







After you input the parameter, and press **OK** button, it will appear a new screen, it will show the calculated curve elements in the screen.

You just need press **File** to save the result file, the result file type is *.dat.(see screen below), after you press **Calculate** button, it will calculate the coordinates, and return to the main screen, then you can press **LIB** button to open the result file to stake out , the following steps are the same as staking out point function.

Spiral Wi	Spiral Wizard 2-Result 🛛 🛛 🗙				
\$					
Т	1458.3054	ZH	-208.305	4	
LY	2384.9556	ΗY	291.6946	5	
Q	531.6552	QZ	984.1724	1	
E	509.3134	YH	1676.650	12	
JD	1250.0000	ΗZ	2176.650	12	
Result	File ———			_	
File	File 💿 Distance 🔿 Peg				
\Flash Di	\Flash Disk\EGJobs\15\Info\st3				
Calcu	Calculate Exit				



Add peg

With above 3 functions, you can calculate the points on line (circle, curve) as specified interval value. But sometimes, you want to know a special point on the line (circle, curve) with random mileage value which can't be calculated by the interval value. You can use this function to realize it. For example, the interval value is 10m, after calculation, you can get the points with station 0, 10,20,30....., but now you want to get the point with station 12.5, you can use **add peg** to calculate. The steps are as follows:



1. Select a point you want to insert behind it from library. (Point ID is 2 in the above screen).then press **Add** button.

2. The mileage of the point you selected is 91.695, you want to calculate the point with mileage 111.695, just need input 20 in the **Dist**. Field. And input a point name in the **name** field. Then press OK button to exit.



Curve Stakeo	ut-Add Peg 🛛 🗙
№] Dist.: 20	Name: A22
_[Object Poin	t
Name:	2
North:	2559543.864
East:	435924.466
Code:	91.695
ОК	Cancel

3. You will see the added point appears on the curve, the coordinate of the point will be added in the result coordinate file (st3.dat).

Curve Point Library 💦 👌				×		
Index	Po	int ID			Code	
10		JD			1250.000	
*1		ZH			-208.305	
<u>*</u> 2		1			-58,305	
* 3		2			91.695	
香 4	/	422			111.695	
*5		W 103.		103.695		
*6		3			241.695	
*7		HΥ			291.695	
*8		4			391.695	-
1						
ID A22	2 Peg			111	.695	
N 255	59528.635 E		E	435	5911.501	
\EGJob	\EGJobs\15\Info\st3.dat					
Open		Stakeout Cano		Cance	I	

Also you can press **OP** button to make some settings. (See the screen below). You can set alarm area via tips range option when you stake out. It will beep when you walk close to the target.



Curve Stakeout	Option 🛛 🗙
8	
Tips range:	1.00m 💌
All stakeout	Display 💌
Track:	Display 💌
Select Mode:	Manual 💌
Init. mode:	Select New PT. 💌
Zoom Mode:	Auto
OK	Cancel

Also you can set display ways of the stakeout graph, Display all target or none.

Staking out Road

This function is very import and useful. But you need finish the road design before staking out road. The option is under the **Tools** menu.

After you make road design, you can start to stake out road, you can click "**survey**"->"**stakeout road**" to enter stakeout road screen. (See screen below)

💊 Road stakeout 🛛 📑						
			J			N
No B	egin				<u>,</u>).42m
Targ	et:?		Offset	02		
Course:? V		Vertic	al:?			
S P:Single H:1.048 V:1.302 G			G			
Ι	S:11+7	₹4	0	9:55	:34	Μ
С	SALI	3 Add	EX	OP	Î	OK

You need press **LIB** button to select stakeout file (*.rod, *.ip) There are 6 important buttons on this screen.(see screen below)



Road Stake	out-Library	×		
Point ID	Code	No		
🛆 QD	0.000	1.0		
🛆 ZY-01 👘	3.000	3.9		
🛆 YZ-01	6.000	6.4		
🛆 ZD	6.000	6.4		
🔽 Flag pt 🛛 🔽 Peg pt 📄 Calc pt				
\Flash Disk\EGJobs\11111\Info\ss.rod				
Open	Find	Cancel		
Point	Road	Section		

Open: to import stakeout-road file. **Find**: to find a stakeout point by mileage, then locate on the table.

Road: it's a kind of way to stakeout, you don't need to select any point first. It will show the whole road map and your current location on the main screen, you can find the target by your current station and the offset from road. For example, you want to stake out the point with station 200, but the station of your local position is 180, the offset value is 25m, it means you need go on moving, when the station become to 200, and offset become to 0, then you find the target.

Point: you need select one point first, then press "**point mode**", the main screen is the same as stakeout point.

Section: it's designed for collecting data on cross-section. When you select one point on the table, then press "**Travel Mode**" button, it will create a cross-section line on the road (see screen below), then you can collect data on this cross-section.

Flag pt: shows the key elements on the table, like the start point of line (LS for short display), central point of circle (QZ for short display), etc.

Peg pt: shows the added points by calculation from **Add peg** function. **Cal pt:** shows the calculated points by **road design** function.



Road stakeout	
(ZY-01	real cross-section
Point <u>, 2.1m</u> , Target:0.000 Offset:-3.577	
S P:Single H:1.114 V:1.393 G I S:11+7 T4 09:57:21 M C SA LIB Add EX OP T OK	design cross-section

On the main screen of stakeout road, there are several additional tools.

Add peg

When you want to add a center peg on one road, you can use this command to calculate and create it.

- 1. You need to open a road design file first, then return to the main screen.
- 2. Press **Add** button, it will open a new screen.

(See screen below)

Road StakeoutAdd Peg 🛛 🛛 🗙		
Peg calculate.	alc. O Offset calc.	
Pt ID:		
Mileage:	0	
Offset:	0	
Coffset calcula	te	
Northing:	0	
Easting:	D	
Bearing of tangent:		
Calculate	Peg	

There are two manners to calculate the new peg

a. if you know the mileage and offset value, you can input to the above box, and press **calculate** button, it will calculate the coordinate of the point and add it to the road file.



b. If you know coordinate, you can input it to the below box, then press ok button, it will calculate the station and offset value automatically. Press Peg button to add it to the road file.

Road Stakeout	tAdd Peg 🛛 🗙
or Contraction Interview States Contraction Interview Contraction Interview Contraction Interview Personal Per	alc. Offset calc.
Pt ID:	1
Mileage:	-12012292.345
Offset:	5
_[Offset calcula	te
Northing:	2557242.094
Easting:	434801.479
Bearing of tangent:	279.38585339
Calculate	Peg

Result file export

After you finish the stakeout road survey, you can press button to save the result. Select your survey file first, then select a format to transform. Finally you can press **output** button to save it.

Export Wizard X	Section Export 🛛 🗙
	4
	Open survey file
	Select trans. section result format
	🖲 Weidi 🔿 Tianzheng
Transverse section result export	In order: Sort 💌
	Diff.H To the previous
	Offset 0.5 m is mid.peg
	Output Exit



§2.5 Tool Menu

There are six submenus under the tool menu: **Port debug**, **coordinate convert**, **Cogo**, **other Cogo**, **other tools**, **Data process**, menus instruction is as follows:



§2.5.1 Port debug



You can view NMEA 0183 data from this dialog.



§2.5.2 Coordinate Convert (calculate parameter)

Coordinate Convert

Coordinate conversion is that you can transform the coordinates between geodetic coordinates, cartesian coordinates and plane coordinates.

Operation steps:

1. To convert plane coordinate system to geodetic system, please select the plane coordinate system (N E H), and input the coordinate to the window of conversion, then select **Geodetic** in the Coordinate after transformation field. Then click **Transform** button.

Coo	ordinate Tran	sform	×
			8
гCa	ordinate bef	ore tran	sformation –
C)Geodetic (🔵 Space	🔘 Plane
×	255280.278		1=
у	46439.396	h	2.223
Co	ordinate aft	er trans	formation —
)Geodetic 🤇	🔵 Space	🔿 Plane
В		Pt	ConvertPt
L		Code	0000000
н]	Save
Τι	ransform		Exit

To convert geodetic system to plane coordinate system, please select the geodetic system (Lat/Lon), input the coordinate to the window of conversion, then select **Plane** in the coordinate after transformation field. Then click **Transform** button.



Coc	ordinate Trans	form	×
			9 🕄
CC م	oordinate befo	ore trans	sformation –
)Geodetic 🤇) Space	O Plane
B	.073560792		<u>]</u>
L	3.22000288	н	29.498
	oordinate afte	r transf	ormation —
C)Geodetic 🤇) Space	🔘 Plane
×	2558739.62	Pt	111
у	435128.558	Code	0000000
h	29.498		Save
T	ransform	[Exit

Notice: Before coordinate conversion, you should set the projection scale factor. You should set it in the "**config-**>**Job config**".

Steps: Tools→Coordinate convert→Calculate Parameter

Note : This function includes Calculate Four-parameters and Calculate Seven-parameters, the operation is similar, but the meaning is different.

Calculate Four Parameter

This function needs local coordinates of two or more than two points, acquire the source coordinates and input it with the local coordinates. When the points are sufficient, you can start the calculation and acquire conversion parameter (from WGS84 system to local coordinate system). Parameters include: X shift component, Y shift component, Turning angle, scale difference (Scale Ratio)

Steps: Enter **calculate four parameter**, make a new file, then click **Add** button to input coordinates in turn, click **OK** to save it, see following figure click **Calculate** to generate conversion parameter.



Calculate	e 4 Parameto	ers	×	Calculate 4	parametersAdo	t X
Index	Point ID	Raw no	orthing	Raw coord	dinate:	
				Pt ID:	1	
				Northing	255280.278	
				Easting:	46439.396	
				Target		
				Northing	44270.277	
Add	Edit	Delete	Clear	Easting:	5338.394	
Now		alculate	Euit		-	
New	open o			ОК		Cancel
INCW				ОК		Cancel
Calculate	4 Paramete	ers	×	OK Calc. 4 Para	metersResult	Cancel
Calculate	4 Paramete Point ID	Raw no	rthing	OK Calc. 4 Paran	metersResult	Cancel
Calculate	e 4 Paramete Point ID 1 1	rs Raw no 255280 265330	rthing .2780 .5510	Calc. 4 Parat 4 parameter Northing:	metersResult ers	178
Calculate	A Paramete Point ID 1 1	Raw no 255280 265330	Exit x thing 1.2780 1.5510	OK Calc. 4 Paran 4 paramete Northing: Easting:	metersResult ers	178 4244
Calculate Index A 1 A 2	Point ID 1	Raw no 255280 265330	X rthing 1.2780 1.5510	OK Calc. 4 Parat 4 paramete Northing: Easting: Rot.	metersResult ers 23154.6450532: 247926.2754694 -95.2008027528	178 4244
Calculate	Point ID 1	Raw no 255280 265330	× rthing 1.2780 1.5510	OK Calc. 4 Paran 4 paramete Northing: Easting: Rot. Scale:	metersResult ers	178 4244 512880
Calculate Index A 1 A 2 Item 1 Item 1 Ite	<pre>Point ID 1 1 (\EGJobs\15\)</pre>	Raw no 255280 265330	Exit	OK Calc. 4 Paran 4 paramete Northing: Easting: Rot. Scale:	metersResult ers 23154.6450532: 247926.2754694 -95.2008027528 0.938471544293	2ancel
Calculate Index 1 2 1 2 1 (Flash Disk Add	Copen of the second	Raw no 255280 265330	Exit x rthing .2780 .5510 ↓ .5510 ↓ .2780 .5510	Calc. 4 Paran 4 parameter Northing: Easting: Rot. Scale:	metersResult ers 23154.6450532 247926.275469 -95.2008027528 0.93847154429	2ancel

Calculate Seven Parameter (Bursa-Wolf)

If the area to be measured is too large (more than 50Km), you can use Seven Parameter to acquire more accurate coordinates, which needs three known points with local coordinates and their relative WGS-84 coordinates to calculate it. The seven transformation parameter is transformed from WGS-84 coordinates to local coordinate.

Notice: You'd better make the area of three points cover the whole survey area to acquire preferable effect.





Three known points and survey area map

The seven parameter includes: X shift component, Y shift component, Z shift component, X axis rotation, Y axis rotation, Z axis rotation, Scale difference (Scale Ratio).

Principle: As you know, the RTK survey with transformation parameter can make the plane coordinates of survey point, height accuracy and control net cooperate very well in small area (such as ten sq. km) and you only need two or more than two local coordinates. But when you do the survey work in a large area (such as hundreds of sq.km), the transformation parameter cannot improve the accuracy of plane and height within parts of area. Thus you need to use seven-parameters, the detailed operation is as follows:

First, you need to do the control survey and level survey, and do the static control on the control point with known coordinates within the area, then select a control point A as the WGS84 reference station of static net adjustment before you start the net adjustment. Use a static instrument to do the single point survey on Point A for more than 24 hours, and then import to the software to note down the average as its WGS84 coordinates. For having done the long time survey, the absolute accuracy should be about 2m, then start the 3D adjustment, which needs to take WGS84 coordinates as known coordinates. Calculate the 3D coordinates of other points, but at least three groups, then you can acquire the seven parameters after calculation.

When you use seven parameters, open it and close 4 parameter (if it is opened). **Note**: the unit of shift component is meter, the unit of rotation parameter is second. After you finish this, you can start the detailing or layout road. The base station should be mounted on the known point according to handy principle, if the known point has been used in seven parameter calculation, the accuracy control will be better. You can also use the WGS84 longitude and



latitude of this point to set the base station.

Note: Seven-parameters has a limitation, X, Y, axis rotation values are generally second level, X, Y, Z axis shift values are usually less than 1000. If the seven parameters are not within this area, it will not work..

Steps: you can directly input the local coordinates of three known points and their WGS-84 coordinates, or open the point file to select three points.

Calculate	e 7 Parame	eters	×
Index	Point ID	Rav	w Lat
			<u> </u>
Add	Edit	Delete	Clear
New	Onen	Calculate	Evit
New	open	Calculate	EXIL

After you acquire the seven-parameters, system will automatically switch to this parameter, use this parameter and acquire the correct coordinates of the surveying point.

Note: The concept of three parameter is generated from seven parameter, if do not calculate all axis rotation and scale for seven parameter, you only need shift component which is mostly used in the small area and low-accuracy demanded area.

§2.5.3 COGO (Coordinated Geometry)

Steps: Tools→COGO

It includes coordinate, Azimuth/Dist., offset dist./angle, offset point, intersection, angles. The software provides many tools to calculating coordinate, so you can get the point coordinate very conveniently.



N		
• 11111		
		500 000 000
Job	Input	Config
a T	Port Debug	
A A	Coordinate	Convert 🕨
Coordinate	Cogo	•
Azimuth/Dist.	Other Cogo) 🔸
Dist./Angle	Other Tool:	5
Untset Point	Data Proce:	55
Angles	10:24	4:14 M
EXITGJobs\11	1111/11111	.eg OK

Calculate Coordinates

Calculating coordinates is to calculate unknown point coordinates by the coordinates, azimuth and distance, height difference of a known point.

Calculate Coordinate 🛛 🗙		
Data input	Graph show	
∫Start Pt.—		
Pt ID:		
Northing:	4457336.838	
Easting:	485549.758	
H:	1271.842	
Parameters		
Azimuth:	90	
Distance:	0	
Diff.H	1	
Exit	Calculate	



Calculate Coordinate 🛛 🗙	Calc. Pt Save	×
Data input Graph show		
^ ∧	Pt ID:	2
	Code:	0000000
vi vi	Northing	4457336.838
. <mark>0.42m</mark> .,	Easting:	485551.758
Start Point:4457336.838,485549.758,1271.84: bearing:90.00000000 distance:2.000 Altitude difference:1.000	H:	1272.842
Regilt-4457336 838 485551 758 1272 84	Save	Cancel

In the graph window, you can see the position of the unknown point relative to

the known point. You can press **L** button to save the calculated coordinate.

(See the screen above)

Azimuth/ Dist.

This function is to calculate the azimuth, distance and height difference and central point coordinate between two known points.

Steps: select "**Cogo->azimuth/Dist.**", input the two known points' coordinates, click **calculate** button, you will see the result of the azimuth, distance and the relative height.



Calculate Azii	muth 🛛 🗙	Calculate Azimuth	×
Data input	Graph show	Data input Graph show	
_∫ Start Pt.—			A
Pt ID:	2		×3
Northing:	4457891.596		
Easting:	485000.317	· ·	
H:	1236.460		
Find Pt. —			
Pt ID:	3	•2 _£	345m
Northing:	4460452.930	Start	
Easting:	489648.875	Point:4457891.596,485000.317,12 End	36.46
H:	1190.476	Point:4460452.930,489648.875,11	.90.47i 7 407
Exit	Calculate		₿₽ ₽

At the same time, you can see the relative graph in the window of Graph. You can press button to save the coordinate of central point. (See the screen below)

Calc. Pt Save	×
Pt ID:	4
Code:	00000000
Northing	4459172.263
Easting:	487324.596
H:	1213.468
Save	Cancel

Distance/Angle

Calculating offset distance/angle is to calculate the offset from the point to a known line (from start point to end point). Including distance to start point, distance to end point and offset distance.



Calc. Offset Angle & Dist. 🛛 🗙	Calc. Offset Angle & Dist.
Data input Graph show	Data input Graph show
Start Pt.	A 1
Pt 1	N N
N: 4457336.83 E: 485549.758	
End Pt.	
Pt 2	
N: 4457891.59 E: 485000.317	845m
Coffset Pt.	
Pt 3	Start pt distance(vertical interval) :670.529
N: 4460452.93 E: 489648.875	End pt distance(vertical interval) :1451.324
Exit Calculate	Cittet distance:5105211

Steps: select "**Cogo->dist/angle**", input the coordinates of start point, end point and the offset point.

Then click **calculate** button, you will see the "start distance", "end distance" and "offset distance". The sign of offset value shows the direction of offset point. If the offset point is at left of the line, it is minus. If the offset point is at right of the line, it is positive. The line direction which we defined is start point to end. At the same time, you can see the relative graph in this page.(see the figure above)

Offset point

"Calculate offset point" is reversed to "Calculate offset distance/angle". It is to calculate the unknown point coordinates by the known offset distance and offset angle.

Steps: select "**Cogo->offset point**", input the start point coordinates, end point coordinates and the information of offset point. Then click **calculate**, you will see the result in the result page. You also can see the relative graph between offset point and the line in the display page. Furthermore, when inputting

coordinates you also can press 💷 button to select them from coordinate library.



Calc. Offset Point 🛛 🗙	Calc. Offset Point
Data input Graph show	Data input Graph show
Start Pt. Image: Start Pt. Pt 1 Image: Start Pt. Image: StartPt. Image: StartPt. Im	*2 Å
End Pt. Image: Control of the second se	
Parameters Left ORight Mode: Start Dist.	↓ ^{1<u>41m</u>}
Offset: Offset Dist. Offset: Offset Dist. Offset mode, the start pt. distance is vertical interval, in other mode, start/end pt. distance is the distance between Pts.	Start Point:4457336.838,485549.758 End Point:4457891.596,485000.317 Offset point:4457336.838,485549.758
Exit Calculate	

Intersection

Intersection program is to calculate the position of intersection point by two known lines.

Steps: select "Cogo->intersect"

In the window please input start point and end point coordinates of two known

lines. Or click the right button is to select the coordinates from the coordinates lib. You also can open the existed file, then select the coordinates which you need.

Calculate	e Intersect	×		
Data input Graph show				
F Line 1 ⋅ Start	1			
North:	4457336.	East: 485549.7		
End Pt	2			
North:	4457891.	East: 485000.3		
Line 2				
Start	7			
North:	4457343	East: 485542.0		
End Pt	3			
North:	4460452.	East: 489648.8		
Exi	t	Calculate		



After input the coordinates, click **calculate** button, then you will see the intersection coordinates in the graph show page. You also can see the sketch map in this screen.

Calculate Int	tersect	×	
Data input	Graph show		
*2		N N	
Line1Start Point:4457336.838, 485549.758 End Point:4457891.596, 485000.317 Line2Start Point:4457343.000 Q. (1) (1) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2			

Angles

It's to calculate the horizontal and vertical angles between 3 known points which compose a triangle.

Steps: Tool->cogo>angles

Calculate Angle					
Data	Data input Graph show				
[The	e other 2	2 point	ts of	triangle	e —
Pt:	В		Pt:	jc	
N:	445733	6.838	N:	4460452	2.930
E:	485549	.758	E:	489648.	.875
H:	1271.84	12	H:	1190.47	6
Enc	lpoint –				
Pt:	A		N:	445789:	1.596
E:	485000	.317	H:	1236.46	i0
Offset distance must 1					
Cal.Hor.Ang. Cal.Ver.Ang. Exit					







Input coordinates, then press **Cal.Hor.Ang** and **Cal.Ver.Ang** buttons to get the horizontal angle and vertical angle.

OTHER COGO Space Distance

Space distance is to calculate the baseline length by two known points.

Steps: Tool->Other Cogo->space distance

Input geodetic coordinates of two points, click **calculate** button, you will get the baseline length in the last column (space dist).

Notice: The format of latitude/ longitude is dd.mmsssss.

Calc. Space Distance 🛛 🗙		
Start		
Lat:	44.142944030	
Lon:	112.045367974	
h:	1196.117	
End Pt.:		
Lat:	40.144738764	
Lon:	112.043039333	
h:	1214.715	
Baseline len.	443752.985	
Calculate	Report	





Areas

Steps: Tool->other Cogo->Areas

Areas is to calculate the closed area which is selected from the picture.

Calcula	te Acrea	age		×
				A
				_
			H	38m
Q	Đ			,mj
	<u>v</u> 9	Α̈́υ		L L L L L L L L L L L L L L L L L L L

Steps: Firstly, other Cogo->Areas, secondly, select "open", then select surveying data, click "OK". All points will be display on the screen.

Select Point From List 🛛 🗙			
Point ID	North	Ea:	
₹4	123455.123	12345	
2	123455.123	12345	
∠ 3	123456.123	12345	
1	123456.123	12345	
•			
J56.123,123456.123,10.000,00000000			
Select All Unselect All			
Open	Add	ОК	

Operation of selecting points is as follows:

1. Select many points to calculate the closed area.

Click the tool button" [1], then select points in order. The last point can not connect with any point, because it will be closed automatically when you click


the "____" button. For example, when you select three points, you can see their names in the list.



2. Insert points in the current picture.

If you find that some points are not shown in the current picture, they're not included for area calculation, if you want to import these point to the current

picture, you can click the button "**D**", now you enter the mode of "select Point From List". Now you should notice that if you click **Open**, you can make some points shown in the current picture, but it can only show points included in the file you open. For add some extra points in the current picture, you can click button **Add**, now you enter the mode of "coordinate Library". You have two choices: the first choice is you can click the icon **Add**, create some new points by editing the attributes of the points; the other choice is to import some points has existed in some project files. Click the icon **File** then **Import**, choose the project file to import points.



Coordinate Library	×
Pt ID V Cancel	Pt ID:
Index Point ID E	North
	East
	Altitude 0.0
	Code: 00000000
	Coord. Plane coordinate 💌
Green:plane Yellow:Lat/Lon Blue:space	Attr. Type Input point 💌
File Detail Set Filter	OK Cancel
Coordinate Library ×	
Coordinate Library × Pt ID OK Cancel Index Point ID E	Input file type:
Coordinate Library × Pt ID ▼ OK Cancel Index Point ID E	Input file type: EGStar3.0 Original Survey File(*.RTI ▼
Coordinate Library × Pt ID Pt ID Pt ID Point ID E	 ✓ /ul>
Coordinate Library X Pt ID Pt ID Point ID E	Input file type: EGStar3.0 Original Survey File(*.RTF User Defined Edit Delete
Coordinate Library	Input file type: EGStar3.0 Original Survey File(*.RTF ▼ User Defined Edit Delete Open file \EGrtk\Infn\EGBaseCoord RTK
Coordinate Library	Input file type: EGStar3.0 Original Survey File(*.RTH User Defined Edit Delete Open file\EGrtk\Info\EGBaseCoord.RTK
Coordinate Library × Pt ID Pt ID OK Cancel Index Point ID E Save Yellow:Lat/Lon Blue:space	Input file type: EGStar3.0 Original Survey File(*.RT) User Defined Edit Delete Open file \EGrtk\Info\EGBaseCoord.RTK

3. Unselect points in the current picture.

If you want keep some points in the current picture out of forming a closed area,

you can click the left frame of "Ponint ID" to remove ", then the point won't connect with other points to form a closed area.

4. All points selected and cancel selected.

When you want to selected all points or cancel choice, please select the button

". When click the button once, all points in the picture will be selected.



When click the button again, all points will be canceled choice. Then you can select points over again.



§2.5.4 Data Processing

If there is an error in calculate parameter due to the input wrong parameters, it will lead incorrect result in the following steps, you can rectify the wrong data by using this function.

This function is the parameter correction and adjustment in batches to the survey coordinates. You can use control point library and data process to recalculate the adjustment parameter and process survey points in batches when there are some errors during coordinate input or adjustment operation. Thus effectively avoid the repeated work. There are two ways of data process:

1. Export plane coordinate result file, this way is used more often.

2. Export Lat/Lon result file. It's used for calculating average Lat/Lon in average value.

Steps for the first type: Tools->Data process->export plane coordinate result file,



Data Process Wizard 🛛 🗙	Output Result File
	Dpen survey file(*.RTK)
Export plane coordinate result file Export Lat/Lon result file	New result file(*.dat) The way of using paramters Use parameter file(*.cot) Use the paramters in current job Filter Single Filter
	Output Cancel

- 1. Open survey file (*.RTK)
- 2. Choose New result file (*.dat) to create a file to save new result.

3. Choose transformation parameters. You can select a *.cot file from folder, or just use the parameters in current job.

4. Filter setting. You can filter some points through this option.

Open File OK ×	Output Result File
🔍 File type: 🔭 💌	\EGJobs\11111\Data\11111.RTK
\Flash Disk\EGJobs\11111\Data\11111.R	Open survey file(*.RTK)
□- 🗁 \Flash Disk\EGJobs\11111\Data	🖶\EGJobs\11111\Data\11111.dat
11111.RTK	New result file(*.dat)
	The way of using paramters
	Use parameter file(*.cot)
	O Use the paramters in current job
	[Filter
	Single Diff 3D
	Float Fixed
	Output Cancel

5. Press **Output** button to process and save the result file.



Output Result File 🛛 🗙		
\EGJobs\11111\Data\11111.RTK		
Open survey file(*.RTK)		
EGlobs\1111\Data\11111.dat		
EGstar 3.0 OK 🔀		
Output successfully, the result file name: \Flash Disk\EGJobs\11111\Data\1 1111.dat		
rFilter		
🔽 Single 🔽 Diff 3D		
✓ Float ✓ Fixed		
Output Cancel		

For the way, you just need select the raw *.RTK file, and press **Output** button, it will create the result file automatically.

Lat/Lon Result File	Lat/
\EGJobs\11111\Data\11111.RTK	۲
Open survey file(*.RTK)	EG
	4
Output Cancel	
Note: 1.In survey file, it will calculate the average of survey point's lat,lon, and height. 2.The result file name of lat/lon is "survey file name+Result.RTK"	not 1.Ir ave hei(2.T "su





§2.6 Help Menu

"Help" displays some information of software and system. The menu contains **Receiver Register, Receiver information, Software infomation** and **About**

§2.6.1 Receiver Registration

Steps: Help→Receiver Register

You can use this function to register the RTK receiver, prolong the service time or apply permanent code. You can register the code with cable or bluetooth, and the software must stay in connection status with receiver.

Usually the code is 20 digits, if you get a code with 31 digits, the first 11 digits is the receiver no, you can delete it, just keep last 20 digits.

🔌 11111		Register OK 🗙
		Registration Code(20 chars):
Job	Input Config	
ÍÅ	Receiver Register Receiver Information Software Information	Receiver ID: 8000W1119733782
Survey	About	Expired date: 2011-05-30
S P:Single	H:0.848 V:1.476 G	
I S: 10+6 ExitGJobs ^v	Y4 11:23:38 M \11111\1111.eg OK	Regist

Enter "**Receiver Register**" menu to type in appropriate registration code in the screen above, then click **regist** button. If the registration code is incorrect, you must register again, then you may use the instrument as soon as this operation is finished.

Note: Make sure the registration code matches the receiver number. Please check the valid period of registration code to make sure it is the temporary type or permanent type.





§2.6.2 Software Information

Steps: Help→software information

Display the copyright of the software and the contact of developer, on the below is PDA ID and device ID.





§2.6.3 Receiver Information

Steps: Help-> receiver information

Display receiver information, including firmware information, Data link, antenna parameters and so on.

🔍 R	eceiver inform	iati 🗾 🔳
7		
Re	ceiver model:	H82
Re	ceiver ID:	8000W11197337
E×	pired date:	2011-05-30
w	ork status:	Rover
Da	ita link:	Radio
Re	ceiver	F100526T_1.2
Ar	nt. H:	0.0884 m
Ar	nt. Radius:	0.0950 m
S	P:Single H:0.	834 V:1.435 🧕 🔒
Ι	S: 10+5 ₹4	11:24:59 M
С	GJobs\111:	11\11111.eg OK

§2.6.4 About

Steps: About.

Display the software version.



Chapter Three: Instructions for Field survey

§3.1 Instrument connection

The first step of Field survey is to connect your controller with Rover via bluetooth. If you want to use a mobile phone to transmit differential data, you should connect your controller with the mobile phone via bluetooth too.

Bonding bluetooth device.

Enable Bluetooth in "Power Properties", then scan Bluetooth in Bluetooth Manager, then bond bluetooth of controller and receicer (if you need cell phone differential mode, you need bond mobile phone with the handheld PC, too).

To connect receiver by bluetooth, please select **Config->port config** option, and input relevant com port no. (how to connect receiver via blue tooth, please refer to RTK user manual.

§3.2 Acquire differential data

After instrument connection, it's time to acquire differential data from Base receiver or CORS, etc. We can use internal Radio, internal SIM card with GPRS/GSM function, or cell phone differential to transmit differential data. You can refer to page 26-35 of this Estar3.0 Manual to learn how to set these 3 modes to get differential data.

§3.3 Setup a job

After that, you can set up a new job to start field survey. If you want to go on with your pervious work, you can choose to open job.





New Job: In general, you need to create a new job and input some parameters of ellipsoid and projection before you start your surveying work. A job consists of a number of file such as survey parameters, transformation parameters and result coordinates file etc.

Open Job: Opens an existing job.

🔊 New Job 🔲 🔲	💊 Job setting 📃 🔲
路	Coord. Antenna Save Display 🔍 🕨
	Coordinate system:
Project 123	China/BJ54/38
Project \Flash Disk\EGJobs\	Edit Browse
Copy Mode Select Copy Job	real ER Parameter
	This is not ER Job ER List
S P:NodataH: V: G	S D:Nodatau: 1/: G
I _{S:} Y M	
Csk\EGJobs\123\123.eg OK	CDisk\EGJobs\12\12.eg OK



Add Parameters	System OK ×	Add Paramet	ers System	OK ×
Projection Level	Altitude 🛛 7 pa 💶	Projection L	evel Altitude	7 pa 🔹 🕨
Coord. system:	China/BJ54/38	[Altitude fit	ting paramete	rs
Ellipsoid para	Poijipg54	Use a	Ititude fitting pai	rameters
Ellipsoid name:		A0:		
a _, 0378245 - Drojection nara	I/T J298.3	A1:		
Method:	Gauss Projection 🔻	A2:		
Central meridian:	114	A3:		
Ealse porthining:	0	A4:	0	
False easting:	500000	A5:	0	
Scale factor:	1	XO:		
Drojection H	0	YO:	Jo	
Projection H.		Geoid mode	el parameters -	mata
Lat. of origin:	0	Method:	Double-spline	interni 🖵
Parallel 1:			, boable spilline	
Parallel 2:	Ju j			
Add Darameters	Suctom OK 🖂	Add Daramat	ore Custom	
Rui Parameters :		Auu Paramet	ers aystem	
Projection Level	Altitude / pa	Level Altitud	le / paramete	ers VIII
r4 parameters —	Use 4 parameters	_[7 paramete	rs	
N offset:			Use 7 param	ieters
E offset:		ΔX(m):	0	
Bot 0		ΔY(m):	0	
Scale: 1		Δ7(m):	0	
		Δα(s):		
Listeria D		Δu(s).		
E Origin: JU		др(s):		
		ΔV(s);	U	

Correction parameters ————		
	Use correction para.	
N	0	
E	0	
н	D	

81

Ο

Scale(ppm):



Add Paramete	rs System		ок 🗙
7 parameters	Vertical E	llip	
_F Vertical ajust	ment para	amete	rs —
Use vertica	al ajustmen	t paran	neters
Method:	inclined p	olane	•
Ajust. const.	O		
N slope(ppm):	0		
E slope(ppm):	0		
N Origin:	0		
E Origin:	o		_

Add Paramet	ters System 🛛 🛛 😽 🗙
7 parameters	Vertical Ellip 🛛 🔸
_F Ellipsoid Tra	ans. Parameter ———
	Use
e2:	0.0066943800229
Height:	0
Undulation:	0
Latitude:	0

Appendix: Summarization of GNSS Survey

GPS System Brief Introduction

The Composition of GPS System

GPS, the worldwide, all-day running, high accuracy survey system, has been universally accepted in survey field. Date to the year 1973, American Department of Defense authorized Three Armies to invent a new military navigation system, we call it GPS, which is Global Position System. In February of 1978, the first testing satellite was launched, from the February of 1989 to 1993, 24 satellites were launched, which established the foundation of GPS running constellation. The running height of GPS satellite is 20200 kilometers. There are six orbits, on each dispersing four satellites. The structure contains 21 work satellites and three standby active satellites. The satellite serial is from 0 to 31, and numberless substitute satellites will be continuously launched when valid period of the old one expires to maintain the GPS constellation steady



Figure 1-1 GPS star graph

There are three elements to make up GPS System. The first is Satellite element, which is constituted by the constellation in the universe. The second is the control part on the earth, which is used to control the

satellite signal, correct the satellite state, adjust the distribution of the satellite and revise the orbit information. The third is customer detector, which also named GPS instrument.

GPS signal: Satellite Guide Telephonic Code, including Broadcast Star Calendar and Almanac. Satellite State: range code, including



- (1) C/A code (coarse code), Code Length: 1023bit, Cycle: 1ms, Distance: 293km;
- (2) P Code (Fine Code), Code Length: 2.35*10¹⁴, Cycle: 267 days, Distance: 29.3m.

All the code will be loaded on the carrier wave to project after process. There are two carrier waves, one is L1 wave band, with the frequency 1545.42MHZ and wavelength 19.05cm, the other is L2 wave band, with the frequency 1227.60MHZ and wavelength 24.45cm.

GPS Detector can be sorted to four styles according to the function; they are Guide Style, Survey Style, Time Style and survey gesture style. It can also be sorted to four styles according to moving state, they are Handheld Style, motor-carried style, vessel-carried style and plane-carried style. The survey geoid style has two styles, one is single frequency, which can only receive L1 carrier wave, and the other is dual frequency, which can contemporarily receive L1 & L2 carrier waves.

Military navigation was designed for the GPS System Establishment, but the testing result showed that not only can it meet the military use, it can also be used in static position in centimeter or even millimeter accuracy, dynamic position in sub-meter or meter accuracy, speed measurement and time measurement. Thus GPS was generally adapted from military use to daily use, thus the first commercial GPS receiver was born. With the development of over ten years, more and more GPS have been used in various units and enterprises to create plenty production value of high efficiency.

GPS position and phase measurement.

GPS position is acquired by backside cross method after measuring the off-ground distance of each visible satellite. The distance of satellite from ground is calculated by the C/A code on the carrier wave or phase. Thus the time difference will happen from the projection of information code to the satellite receiving by the GPS antenna. The note for the time difference makes the survey realizable. Multiply the time and the velocity of light to acquire the distance from antenna to the ground.

Survey-style GPS receiver can calculate the accurate distance from antenna to the ground by carrier wave phase. Add the number of full waves of each satellite to the phase decimal, you can acquire the distance of the satellite off ground (The wave length of L1 and L2 is known),. The integer of carrier wave between satellite and antenna is called full circle blur degree ambiguity. To the centimeter accurate process, full circle number can be acquired in the course of process. To the centimeter accurate real time survey, full circle number can be

acquired in the mean time of initialization.

The minimal amount required for the satellites is four, and for the GPS receiver is two in GPS survey. This manual is based on two receivers, one is base station, and the other is rover.

Set the base station on one known point, and the rover on the point to be measured or staked out. The carrier wave phase data on these two receivers is calculated by the software embed in the mainframe board, then the 3D vector between base station and rover can be acquired. You can measure the position of rover relative to the base station, and then classify the measure technique according to the time. Real time technique uses the radio to transfer the information to the rover, and calculate the result in the mean time of surveying. Process technique needs to save the data and acquires the result with the base line calculation software back to the office.

Generally, the measure technique is subjected to such elements as receiver standard, accuracy requirement, time limit and real time result requirement, etc.

GPS Measurement Method

GPS and difference technique are used in real time and measurement after,

speed static technique is only used in measurement after.

Real time kinematics (RTK)

RTK usually need five or more than five satellite to measure the phase of base station and rover.

It is necessary to initialize before measuring in order to acquire centimeter accuracy.

If you use single frequent receiver, the early sub-kinematics required the rover to be placed on the known point to create a man-made base line to initialize the measurement. Now the single frequent RTK can realize auto initialization, only the time is longer compared with the dual frequent RTK, and more easy to miss lock.

If you use dual frequent receiver to do the kinematic measurement (that is RTK), the initialization time can be greatly shorten, what's more, the initialization can be processed during movement, (that is OTF, which means On the Fly)

If the satellites received are less than four during the measurement, you need to reinitialize when the satellite number increases to four or more than four.

Difference Globe Position System (DGPS)

DGPS technique uses GPS code (C/A code) to position. It is not necessary to initialize or continuously track the satellites. The measurement accuracy is only



one to three meter.

If the carrier wave added to the distance is smooth enough, the DGPS can reach to the sub-meter accuracy.

Static and quick static

Static measurement can be used in the highest accuracy measurement, but the time needed is usually from 30 minutes to 15 hours, according to the length of the line. Static and Quick Static both need process after to acquire the accurate result.

Quick static is one method of process after, the accuracy can reach to centimeter level. It takes at

Least 8 minutes (normally 8-30 minutes) to measure by carrier wave measurement, according to

The receiver type, base line length, available satellites units and geometry shape of satellite.

You can use single frequent and dual frequent receiver to do the static measurement and the quick

Static measurement

The elements related to the RTK measurement.

RTK measurement needs to avoid some disadvantageous elements; the reason to generate these elements is for the limit of the whole GPS system.

The radio signal used by GPS is received from the satellite about twenty thousand kilometers from

The ground, they are, relatively speaking, high frequency, low power, and not easy to penetrate the barriers which interfere the sight between the satellite and the GPS receiver. In fact, all the objects between the satellite and GPS receiver are the disadvantages to the system operation. Some objects, such as buildings, can entirely screen the satellite signal. Thus GPS cannot be used in rooms, channel or under water. Some other objects, such as tree, may partly screen the reflected or refracted signal. Thus GPS signal can hardly be received in the forest area, although sometimes there will be enough signal in the forest to approximately calculate the position, the definition of signal is far from the centimeter level position. So GPS has shortage when used in forest area, but this doesn't mean GPS can only be used in the relevant open side, it can still maintain its efficiency and accuracy in some impediment area. That is because GPS needs at least five satellites which distribute appropriately to realize the accurate position, in usual occasion, there will be seven to ten GPS satellite in most area, thus the GPS measurement can be used efficiently in the area where

you can receive five satellites. In the forest or around a building, you can make the GPS measurement as long s the open side is big enough to view at least five satellites.

Another disadvantages is the RTK transferring data chain, this chain has close relationship with the electromagnetism surrounding and operation distance.

RTK position require the base station transfer the measuring data, which includes fake measured value and phase measured value, and known data to the rover station in real time. The power of RTK station is 25 watt, so the barrier is now allowed between base station and rover.

Ideal distance is that in fine satellite, atmosphere and electromagnetism condition.

Concerning the elements mention hereinbefore, it is required to select the preferable known point position when setting the base station. Please make sure the base station meet the condition below:

1. There is not any barrier within 10 degree height end angle.

2. There should not be electromagnetic radiant point in the neighborhood, such as TV launch tower, radar TV and mobile signal antenna, etc, in order to avoid disturbing the RTK signal. The distance required is more than 200m

3. You'd better set the base station at the relatively high altitude place for the better station operation distance.

4. steady ground to save the point more convenient.

Note: If the user sets the station under the objects that have strong effect to the electromagnetism transmission, such as under the tree, the satellite signal received will become aberrant.

GPS Application in the Measurement

GPS can be used to control measurement, landform measurement, staking out and aquatic operation.

Controlling measurement

The area of controlling measurement is commonly large.

Landform measurement

Landform measurement is used to measure the change of landform, the result is usually used for

Graph making.

Real-time measurement, especially the dual frequent RTK, is most suitable to the landform

measurement.

Stake out

ESTAR manual



Stake out is to position the point designed in advance on the spot. Stake out point need to acquire

the result in real time.

RTK is the only way to provide the centimeter accuracy real-time resolving project with the measuring method.

Aquatic operation.

The category of aquatic operation contains water depth measurement, aquatic navigation, warehouse volume measurement, construction position and piling inspection, etc. It needs box and needle or sound instrument to match.