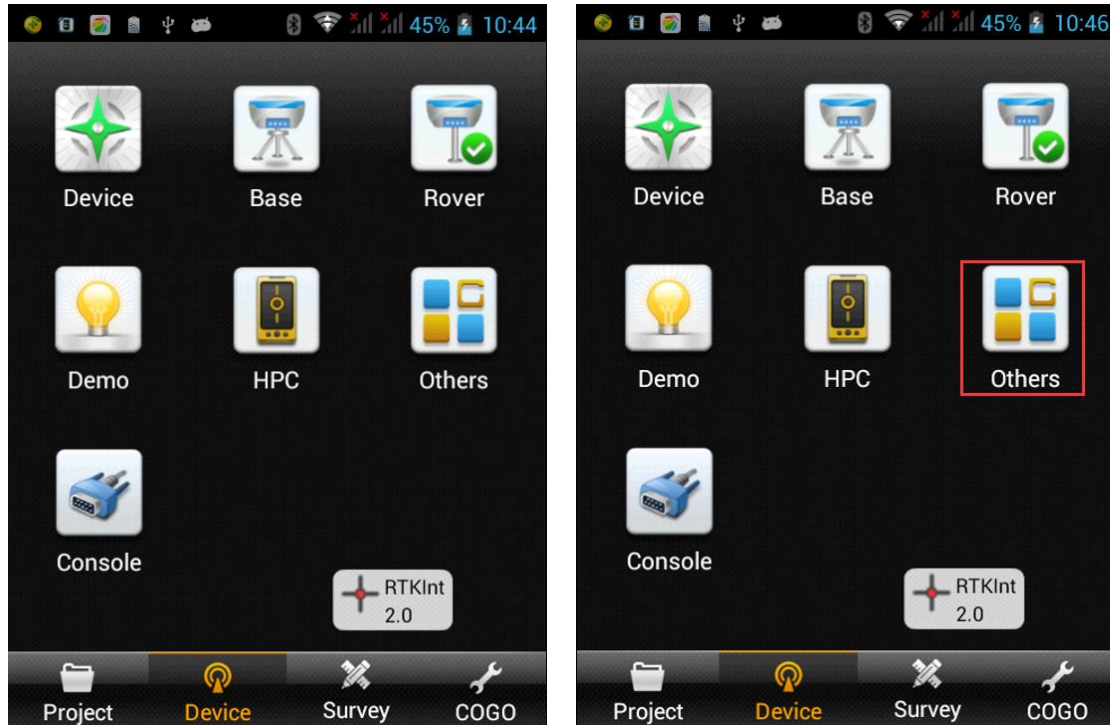


Tilt Survey Getting Started

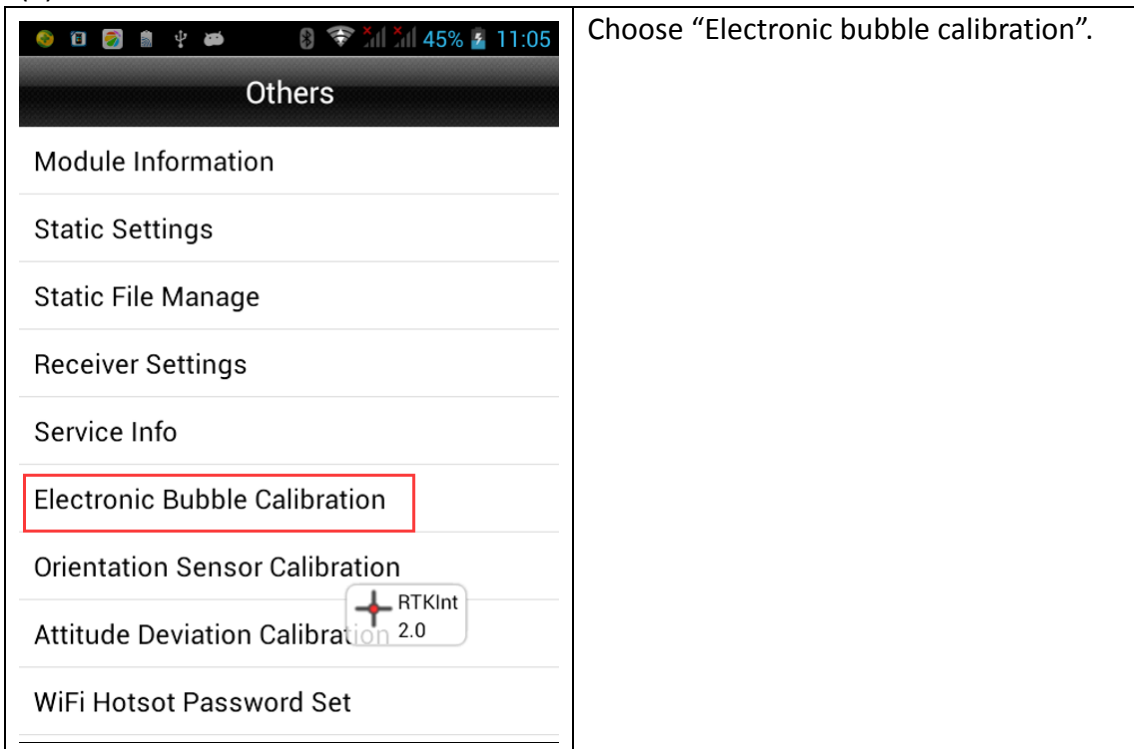
1. Electronic bubble calibration

Before do a Tilt survey , please set Base and rover with UHF mode or GSM mode and connect rover with Hi-Survey OK.

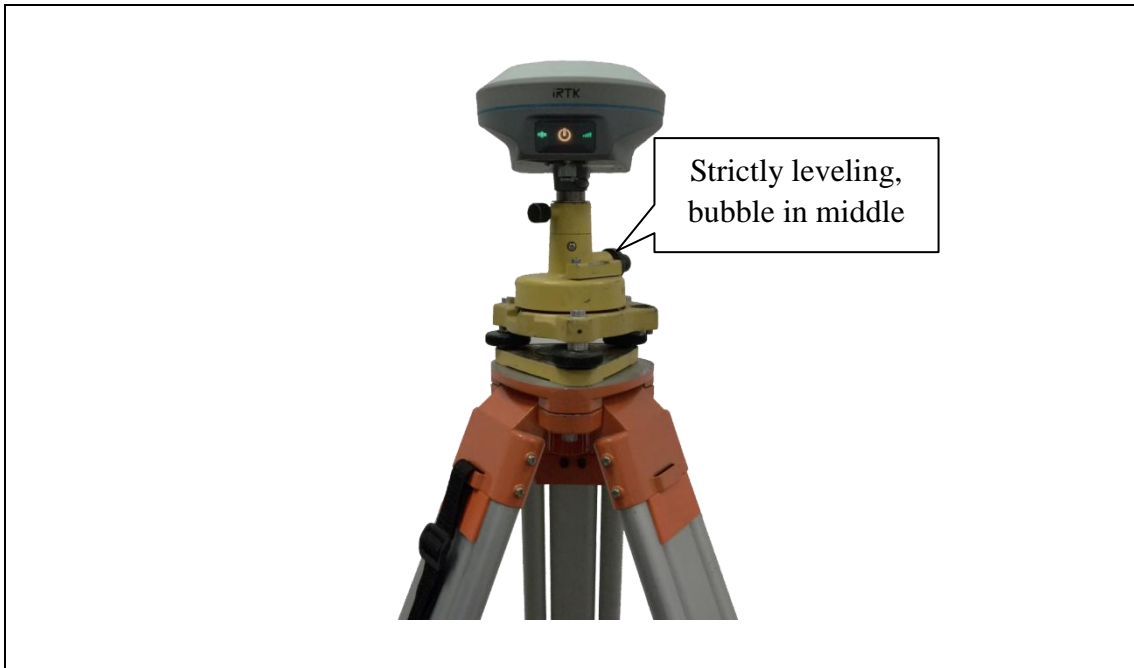
(1)Connect V90 Plus(With Tilt survey function) as rover->Click “Others”



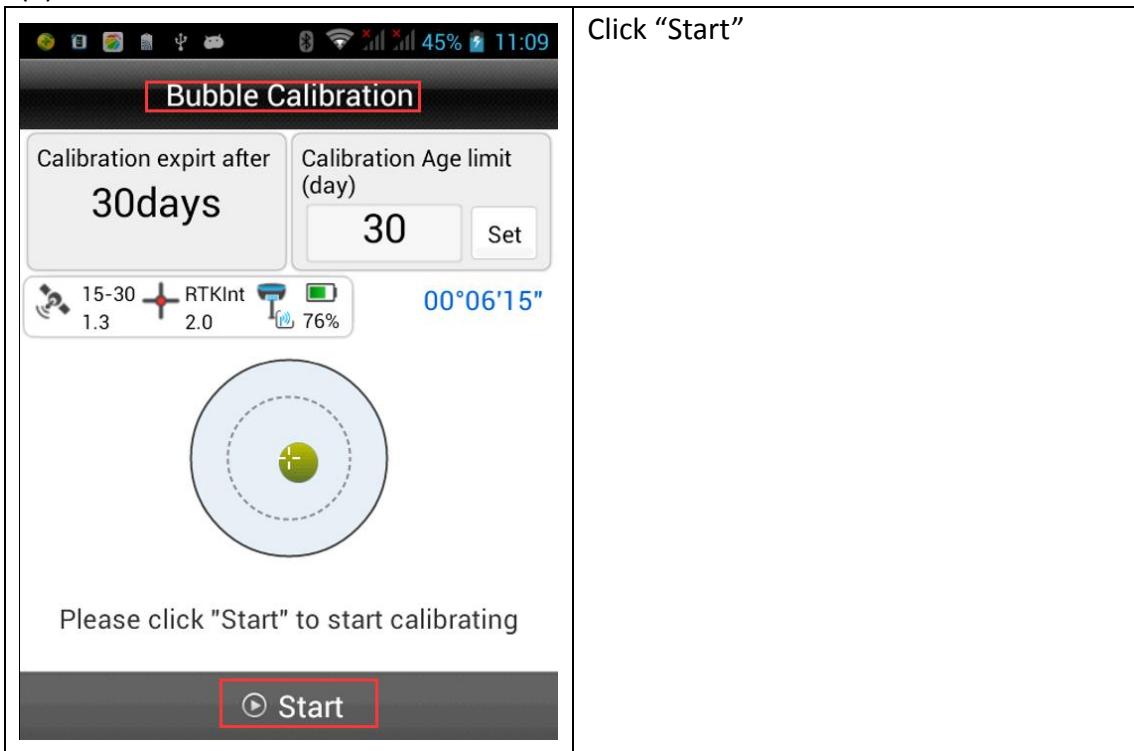
(2) Choose “Electronic bubble calibration”.

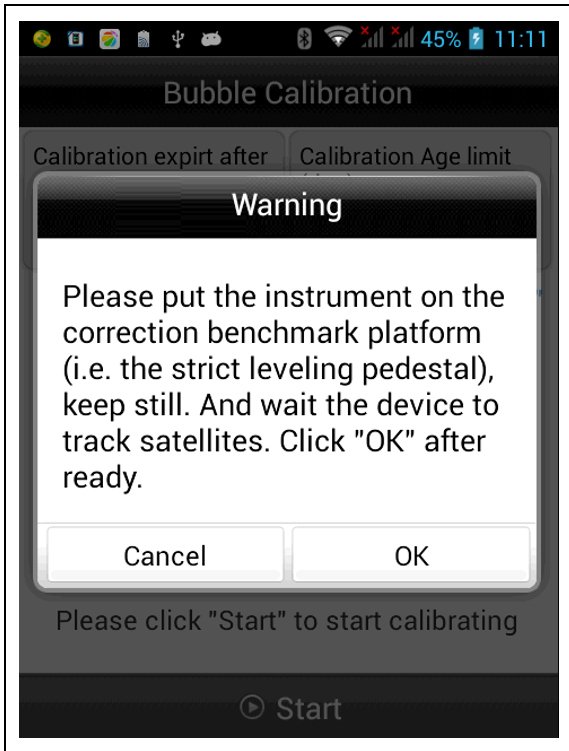


(3) Before you start calibration, put the instrument on the tribrach and leveling strictly first (This step is necessary, no matter base or rover. If rover, leveling like that first then put it on the pole).

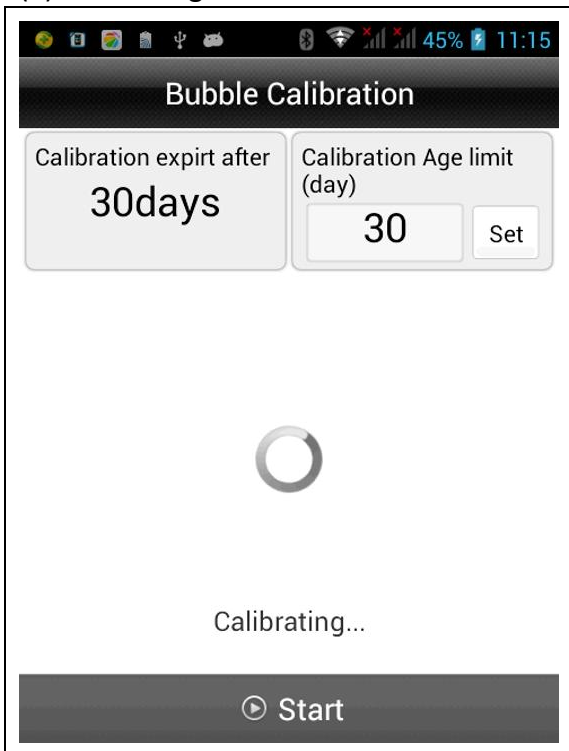


(4) Bubble calibration interface.

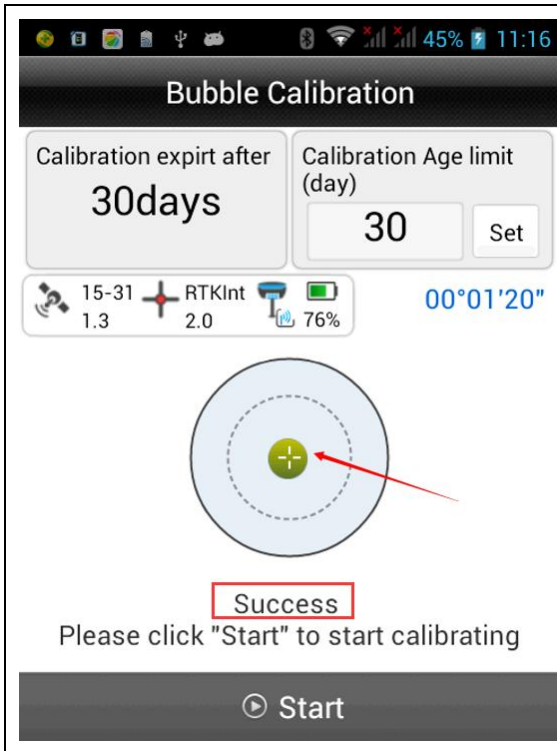


	<p>Here inform a message warning that whether the instrument is placed OK and tracked.</p> <p>If all ready please click "OK"</p>
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(5) Calibrating

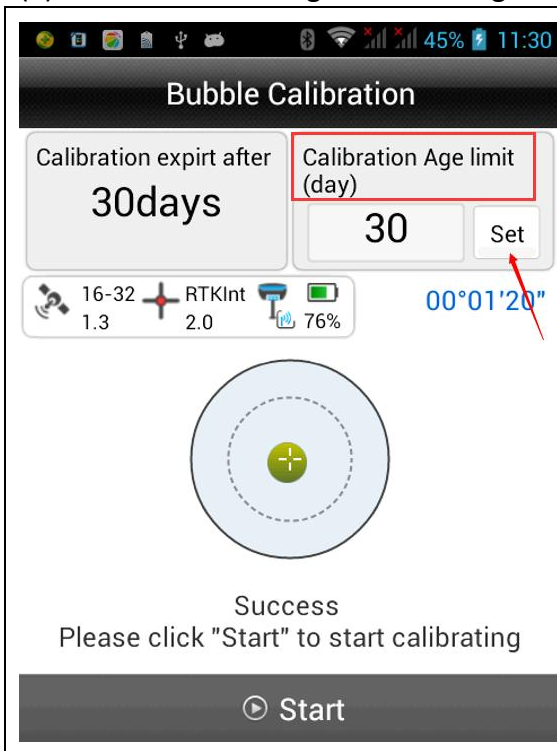
	<p>Calibrating</p>
---	--------------------

(6) Bubble calibrating success.



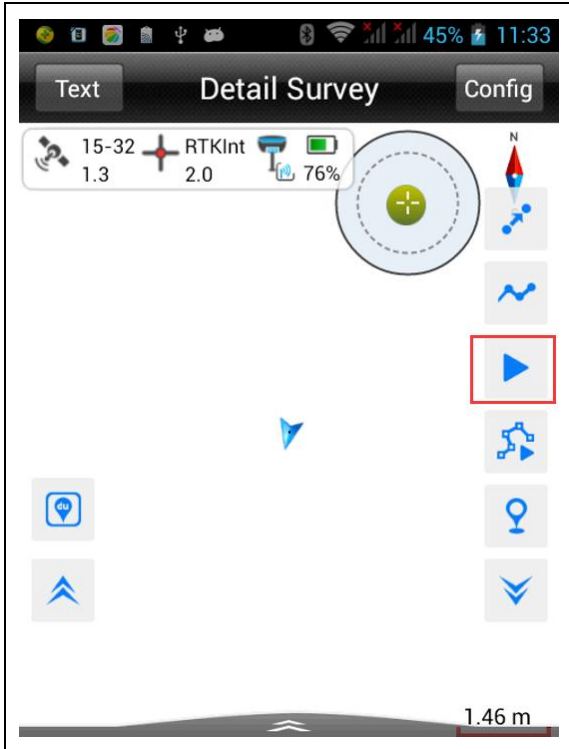

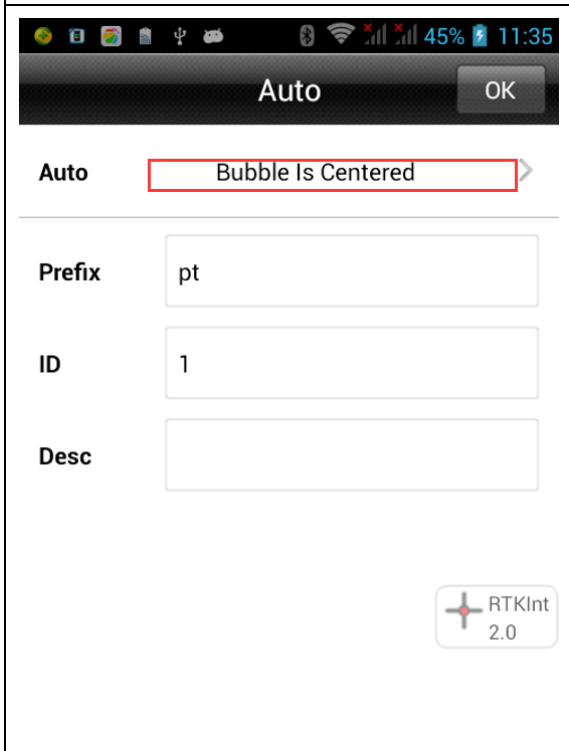
Bubble calibration success.
At this time **both electronic bubble** and the **pole bubble** are in center at the same time.

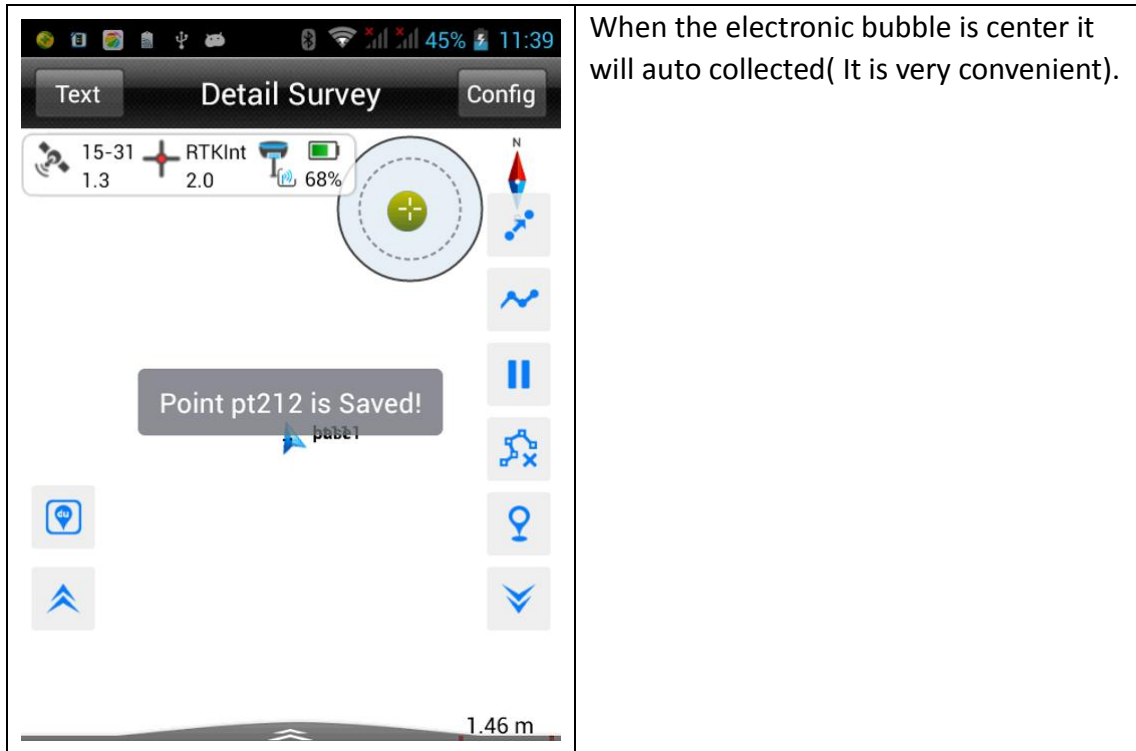
(7) Notice: Calibrate Age limit no longer than 30(day) will be better.



Click "Set" for setting.

Auto collecting by "bubble is center":

	<p>Go to survey interface and choose “Auto collect ”</p>
	<p>Bubble Is Center chosen and click “OK” start collecting.</p>

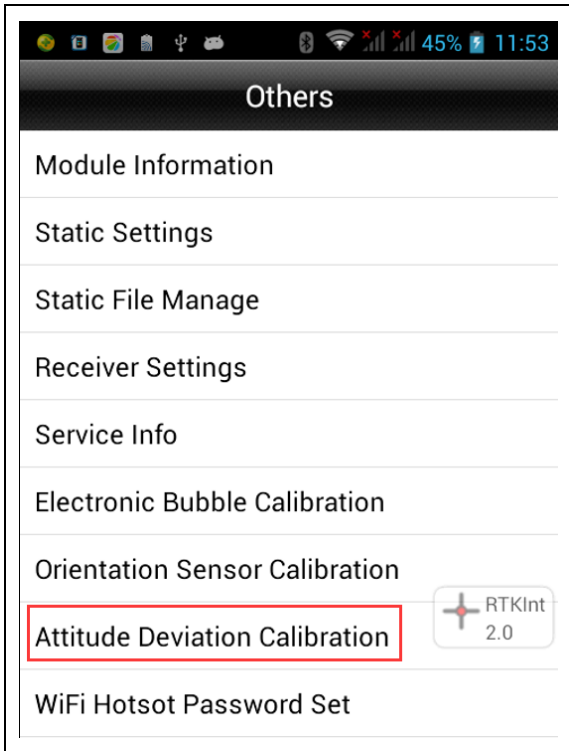
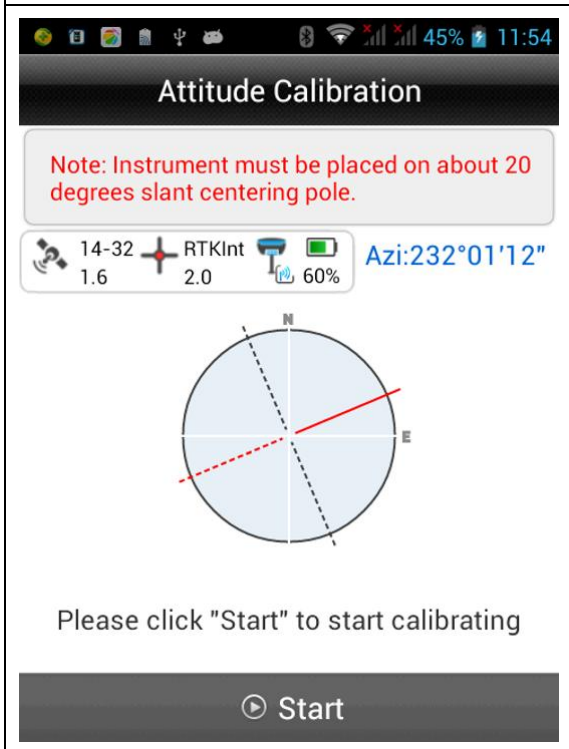


2. Tilt survey and its calibration process

2.1 Tilt survey module verification

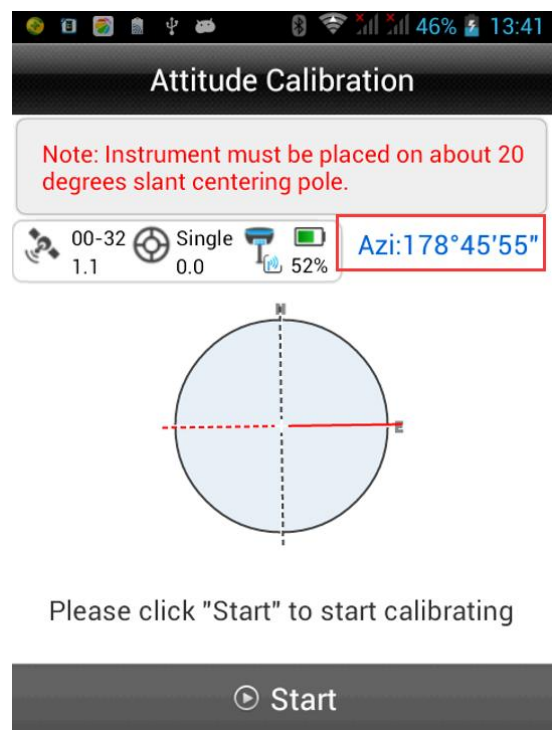
Due to the high sensitivity and direction sensor depends on the consistency of the magnetic field around the environment, in order to ensure the accuracy of measurement, the instrument Tilt survey module need to be verified before surveying.

(1) Open "Attitude Deviation Calibration" interface;

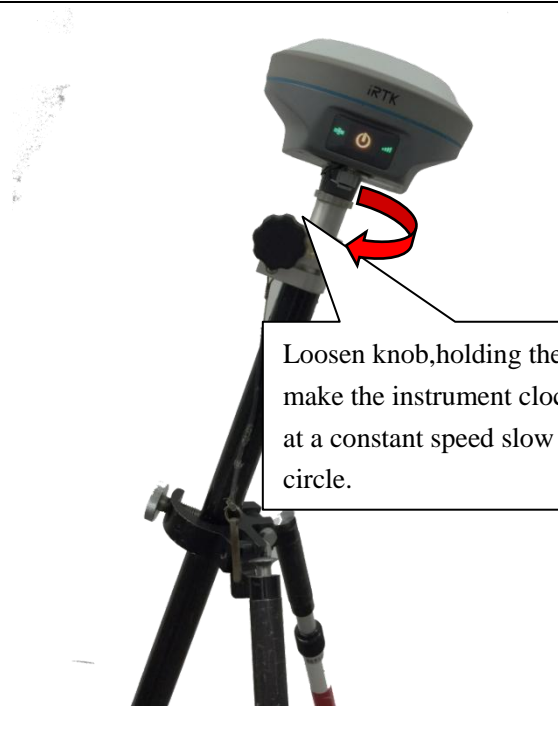
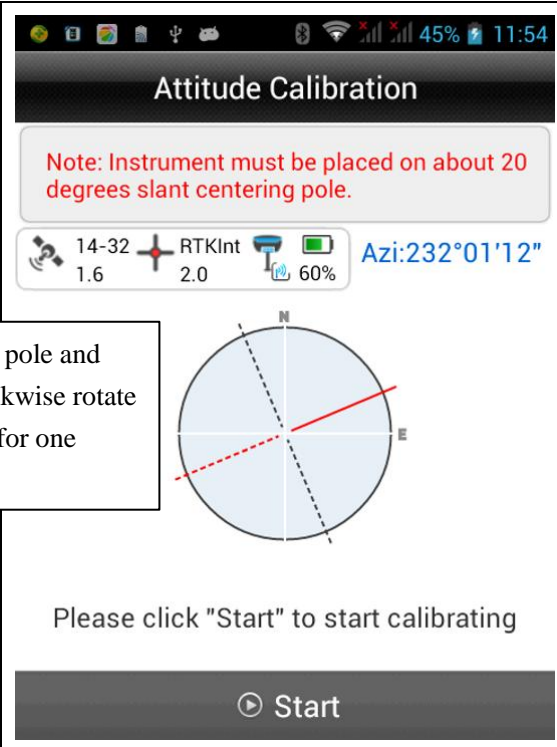
	<p>Click "Others" -> Open "Attitude Deviation Calibration"</p>
	<p>Attitude Deviation Calibration interface</p>

(2) Calibration method

① Put the device on the pole (about 20 degrees Tilt) and clockwise rotating itself for one circle at a slow speed. View azimuth changes at the top right corner.

	<p>Azimuth changes</p> <p>If maximum and the minimum difference within 5°, means module state is normal and can Tilt survey directly. Or must carry on the module calibration.</p>
---	---

- ② How to rotate :
- The pole position can't be moved;
 - Attitude calibration must rotate as clockwise;
 - About 2 / s rotational speed, rotating **one circle takes about 3 min**;

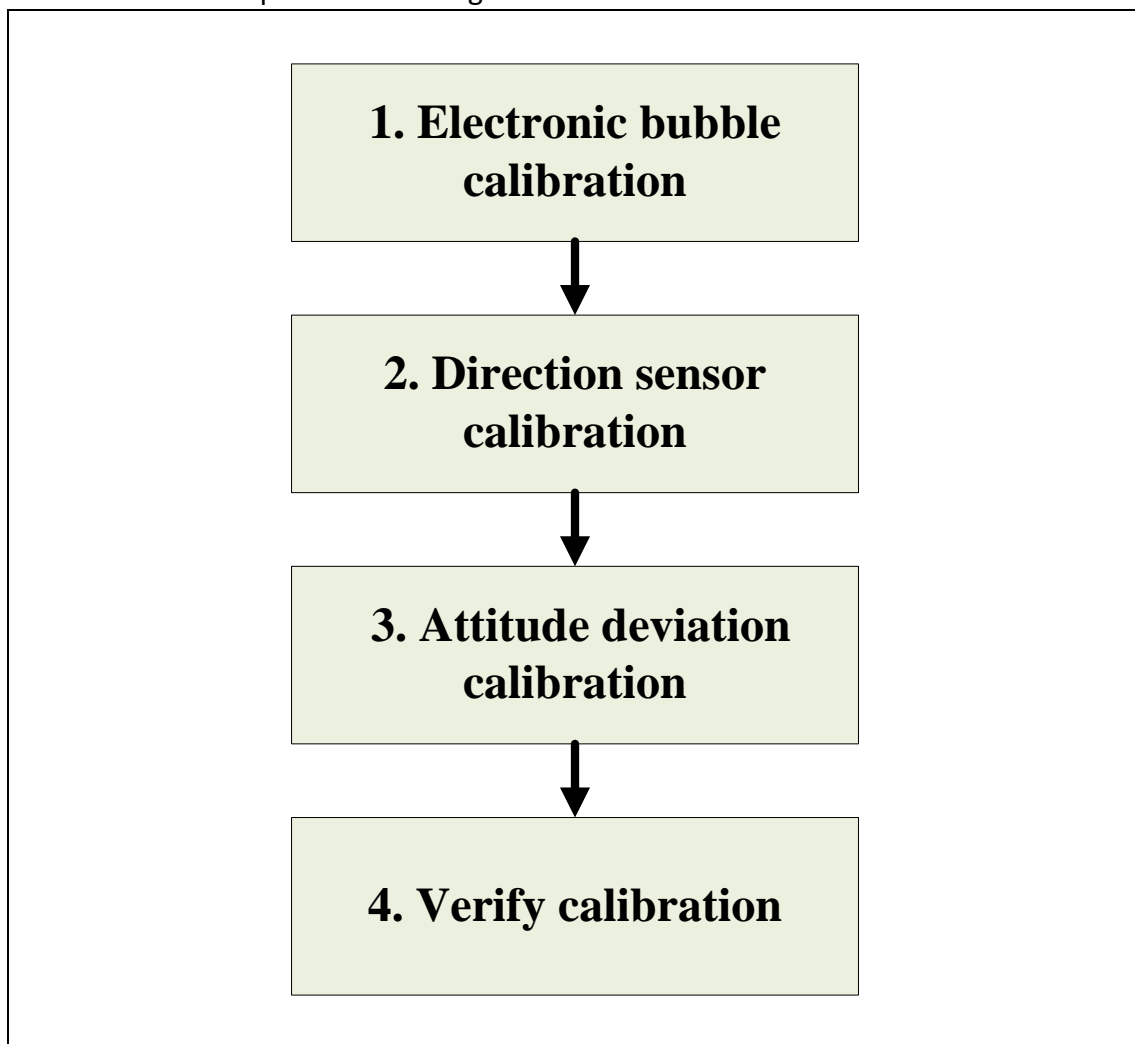
	
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Note: When it need to calibrate?

- When change to new measurement area or the measurement area environment change a lot or there is a complex terrain with the measurement area, it need a verification with Tilt survey module.
- When use the Tilt survey for the first time, it need this calibration;
- When replace or change the battery calibration needed.

2.2 Tilt survey calibration

Whole calibration process including:



Note:

- Low magnetic disturbance environment, empty part of the surveyed area for calibration, not rooftop or high floor roof, etc.
- Calibration must under the external UHF mode(No internal UHF) to avoid the magnetic disturbance.
- Don't change buttry in the whole calibration process.

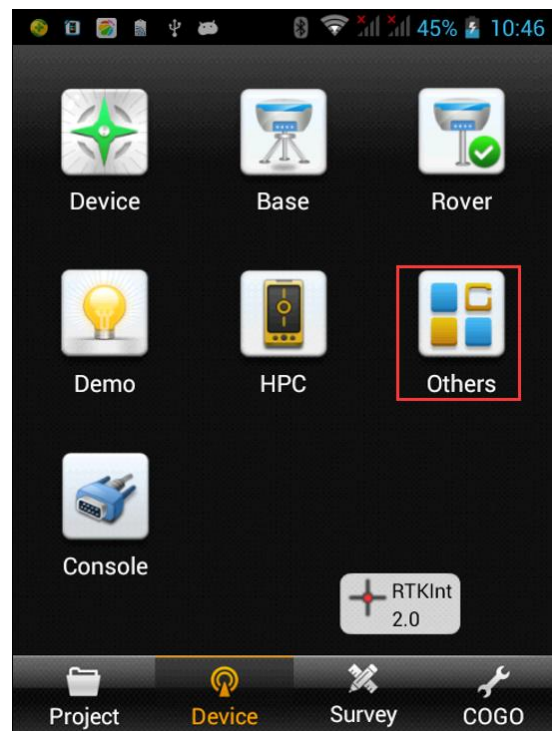
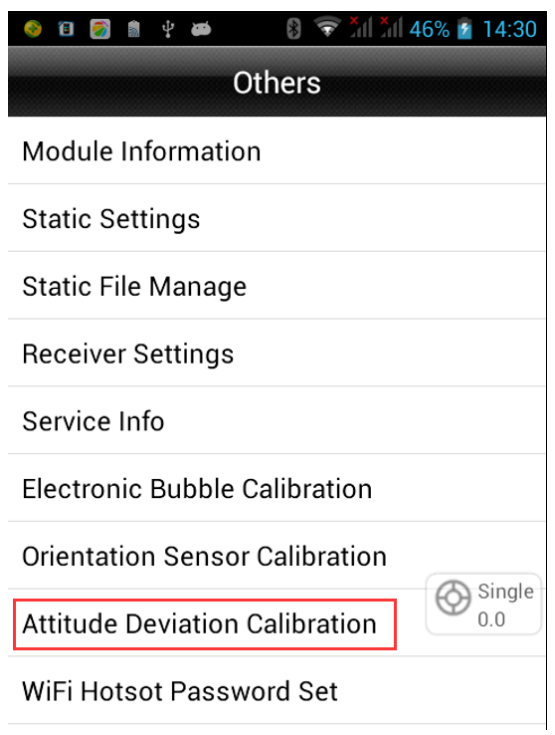
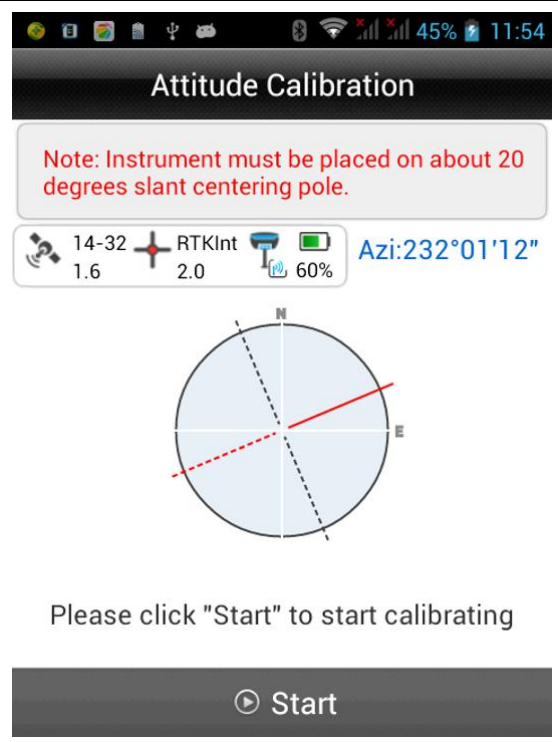
Operation Steps:

1. Electronic bubble calibration

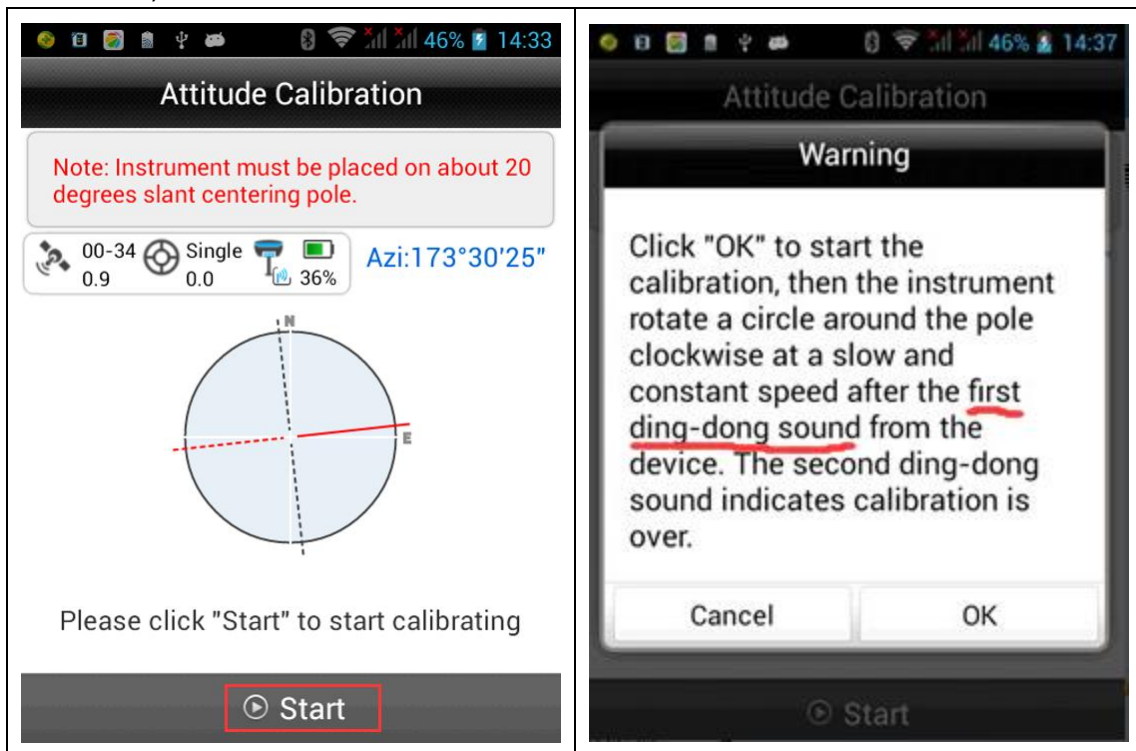
Reference to "1.Electronic bubble calibration"above;

2. Direction sensor calibration

(1) Click"Other"->Attitude Deviation Calibration;

 <p>The screenshot shows the main application menu with several icons: Device, Base, Rover, Demo, HPC, Others (highlighted with a red box), and Console. At the bottom, there are navigation tabs for Project, Device, Survey, and COGO. A status bar at the top shows 45% battery and 10:46.</p>	 <p>The screenshot shows the 'Others' menu with options: Module Information, Static Settings, Static File Manage, Receiver Settings, Service Info, Electronic Bubble Calibration, Orientation Sensor Calibration, Attitude Deviation Calibration (highlighted with a red box), and WiFi Hotspot Password Set. A 'Single 0.0' button is visible next to the Orientation Sensor Calibration option. The status bar at the top shows 46% battery and 14:30.</p>
 <p>The screenshot shows the 'Attitude Calibration' interface. It includes a note: "Note: Instrument must be placed on about 20 degrees slant centering pole." Below the note, there are status indicators: 14-32 1.6, RTKInt 2.0, 60% battery, and Azi:232°01'12". A circular diagram with a red line and a dashed line is shown. At the bottom, there is a 'Start' button. The status bar at the top shows 45% battery and 11:54.</p>	<p>Attitude Deviation Calibration interface</p>

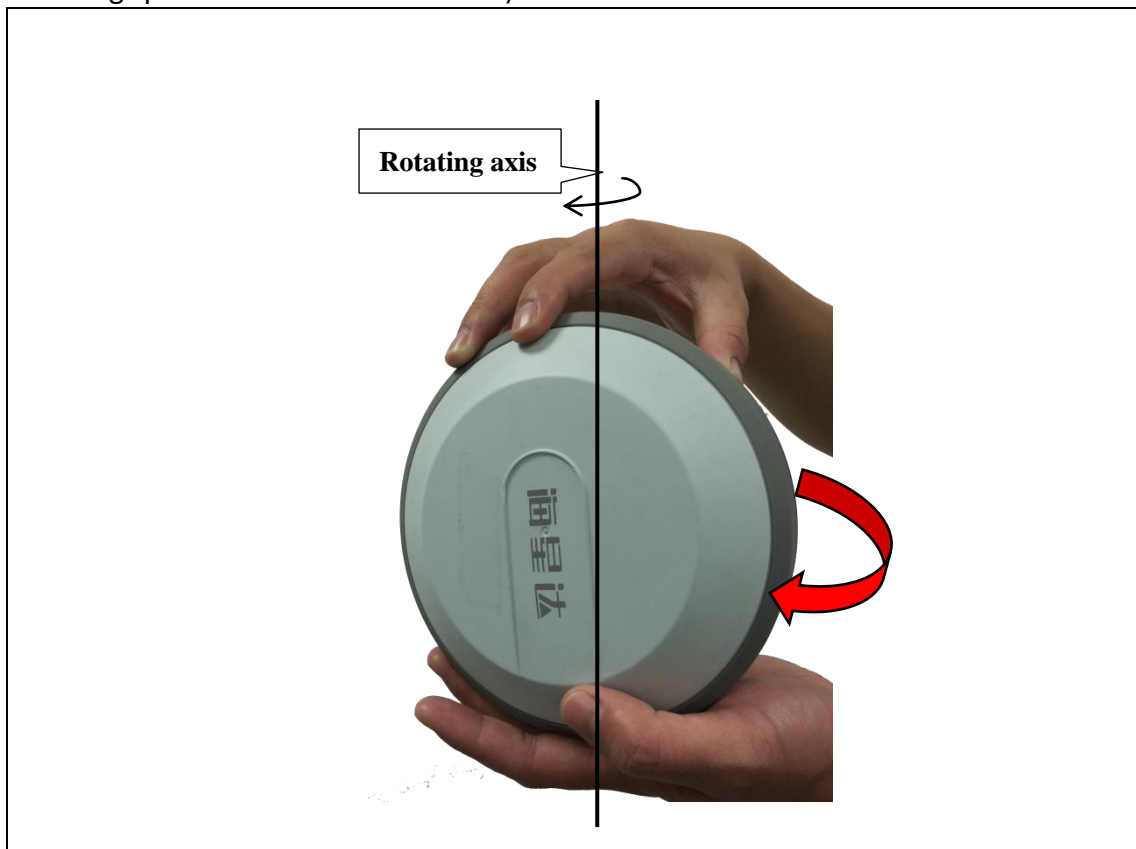
(2) Click "start" button and start calibration, the instrument needs to be rotated in horizontal, vertical and horizontal three directions for calibration.



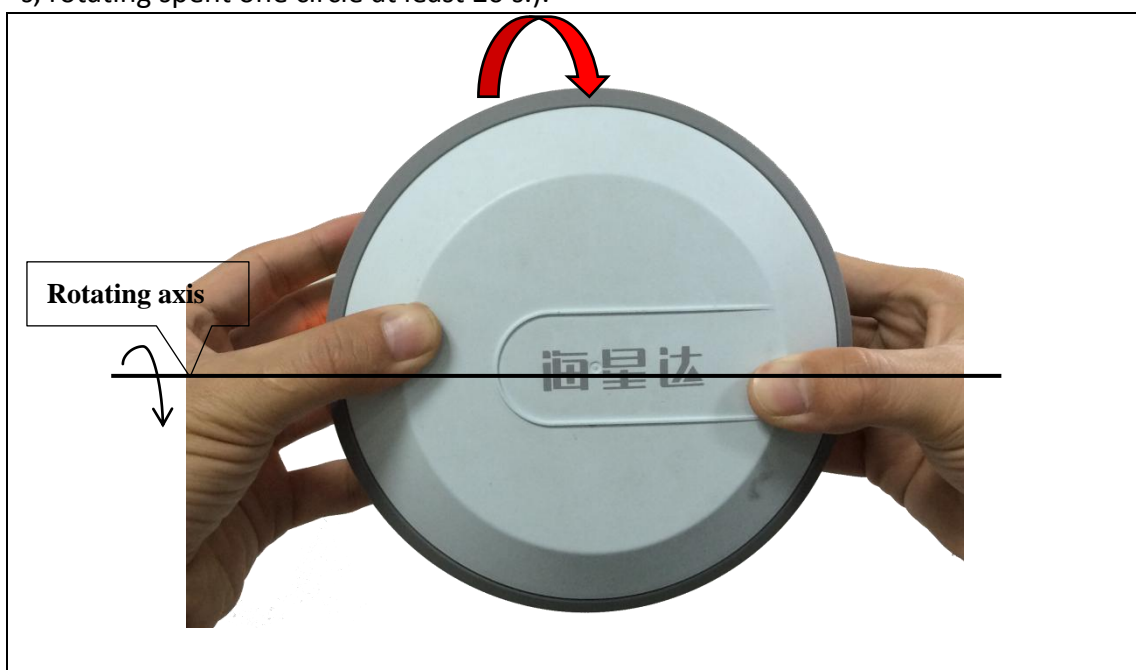
a. **Horizontal direction:** Put the receiver in horizontal, take the vertical direction as rotating axis, slowly rotates as clockwise (Rotating speed suggest no more than $20^\circ / s$, rotating spent one circle at least 20 s.).



b. **Vertical direction:** Put receiver in vertical, take the vertical direction as rotating axis, slowly rotates as clockwise(Rotating speed suggest no more than $20^\circ / s$, rotating spent one circle at least 20 s.).



c. **Flip horizontal:** Put the receiver in horizontal, take the horizontal direction as rotating axis, slowly rotates as clockwise(Rotating speed suggest no more than $20^\circ / s$, rotating spent one circle at least 20 s.).



(3) After calibration in all direction, instrument issued a second "ding-dong" tip "operation successful", calibration is complete.

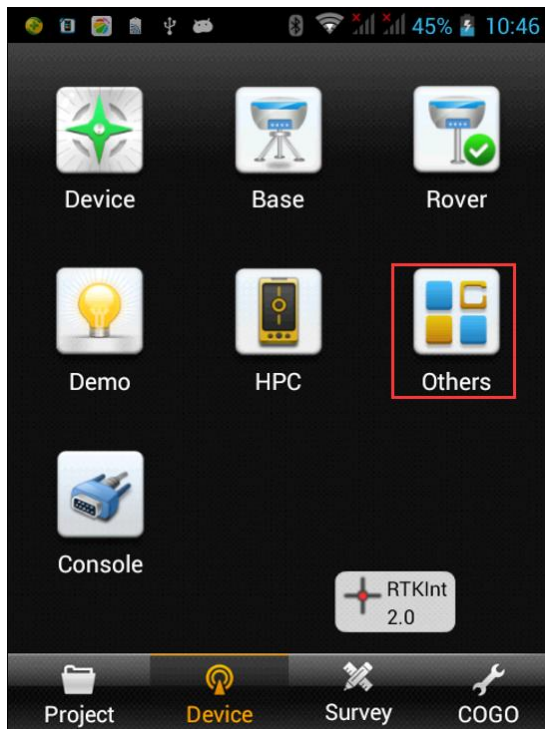
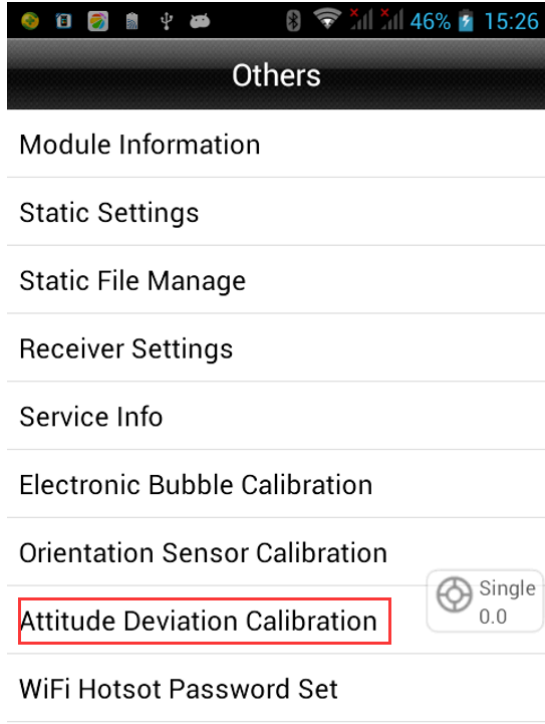
	<p>Calibration success.</p>
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3. Attitude deviation calibration

(1) In the attitude deviation calibration, place the instrument on the pole (About 20°Tilt, can check in "Bubble Calibration" interface)

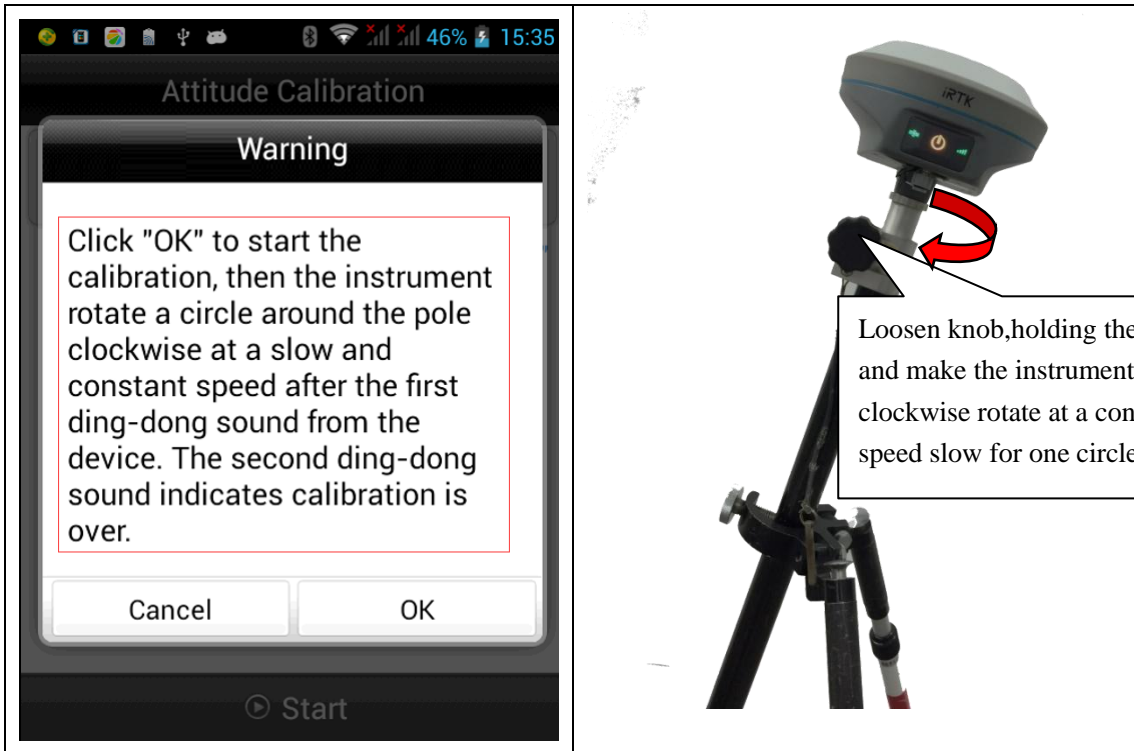
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(2) After place the instrument OK, go to "Attitude Deviation Calibration"

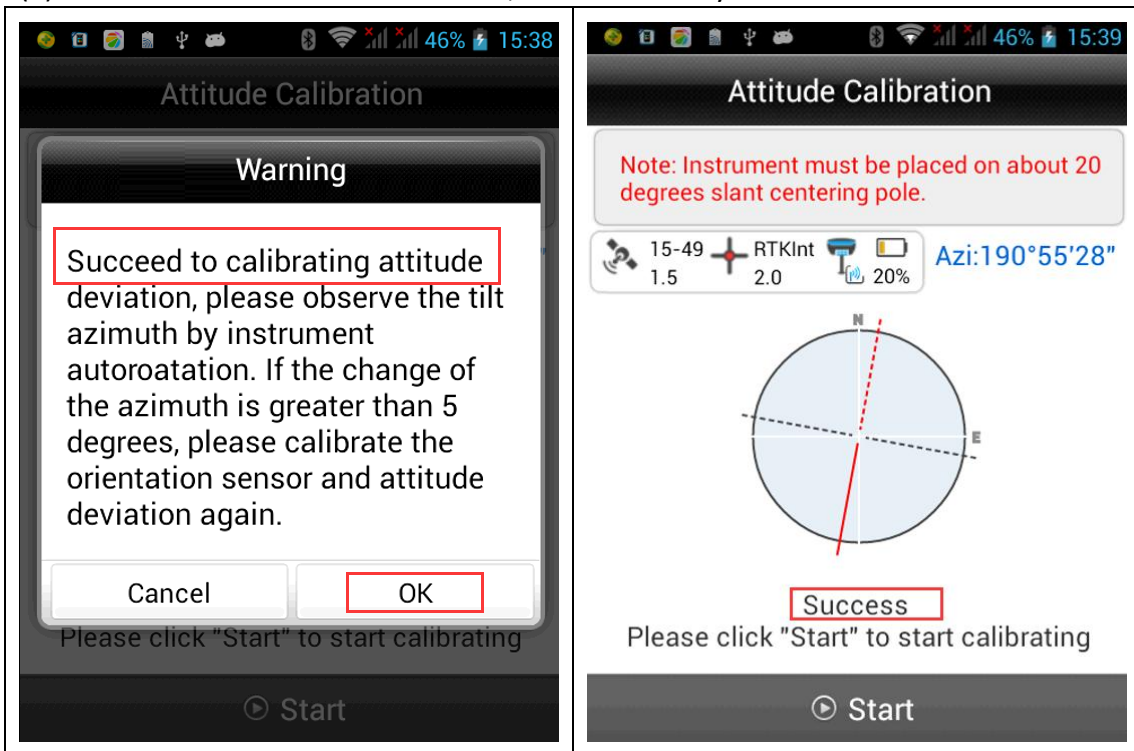
	<p>Click "Others"</p>
	<p>go to "Attitude Deviation Calibration"</p>

(3) Click "Start" begin to calibrate.

(Note: a. The pole position can't be moved; b. Attitude calibration must rotate as clockwise; c. About 2 °/s rotational speed, rotating one circle takes about 3 min;)



(4) If informed calibration is successful, can start survey.



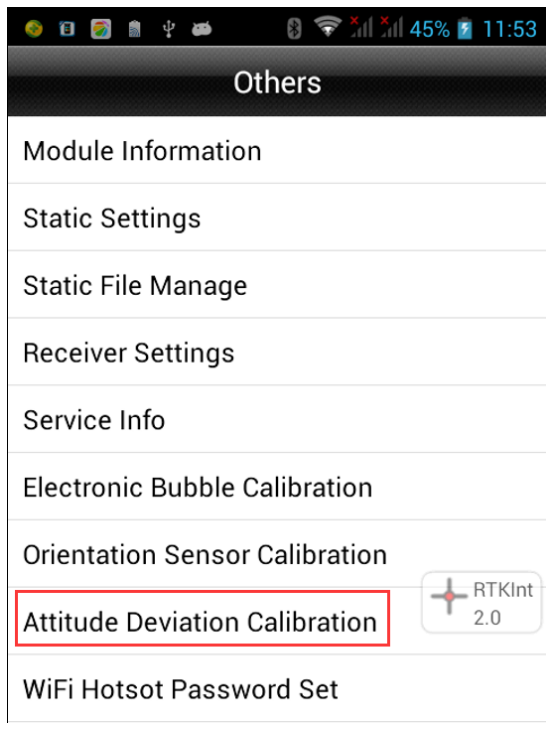
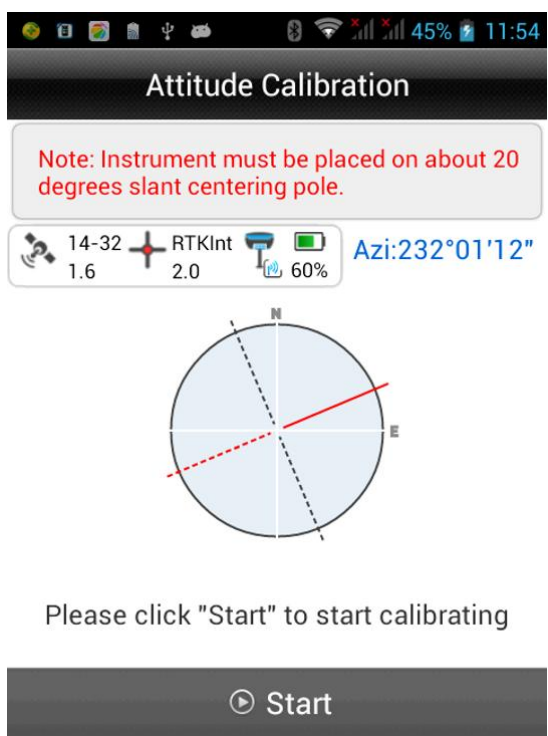
4. Verify calibration

Tilt survey module verification

Due to the high sensitivity and direction sensor depends on the consistency of the magnetic field around the environment, in order to ensure the accuracy of measurement, the instrument Tilt survey module need to be verified before

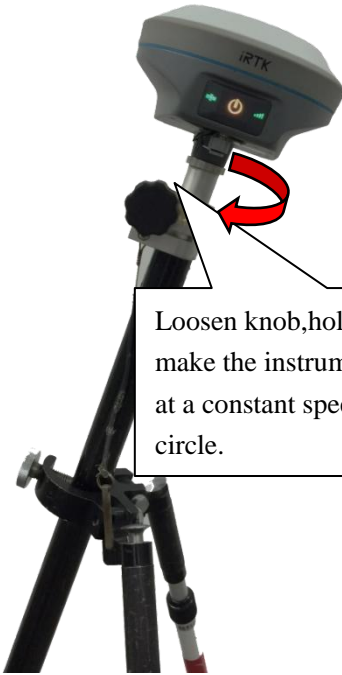
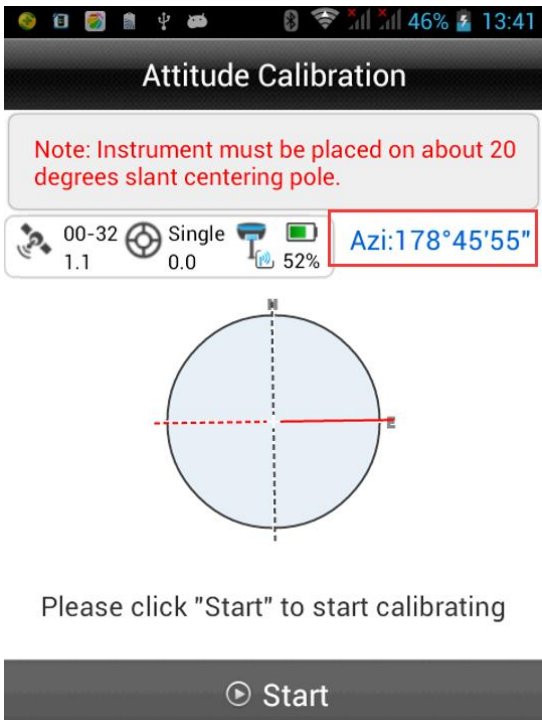
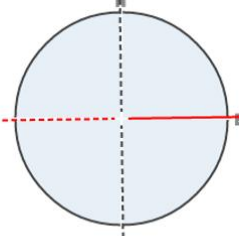
surveying.

Open "Attitude Deviation Calibration" interface;

	<p>Click "Others" -> Open "Attitude Deviation Calibration"</p>
	<p>Attitude Deviation Calibration interface</p>

(3) Verify method

Put the device on the pole (about 20 degrees Tilt) and clockwise rotating itself for one circle at a slow speed. View azimuth changes at the top right corner.

 <p data-bbox="507 526 954 683">Loosen knob, holding the pole and make the instrument clockwise rotate at a constant speed slow for one circle.</p>	<p data-bbox="865 199 1345 313">Put the device on the pole (about 20 degrees Tilt) and clockwise rotating itself for one circle at a slow speed.</p> <p data-bbox="810 739 973 772">Rotate note:</p> <ul data-bbox="865 779 1353 1019" style="list-style-type: none"> a. The pole position can't be moved; b. Attitude calibration must rotate as clockwise; c. About 2 % s rotational speed, rotating one circle takes about 3 min
 <p data-bbox="375 1131 646 1164">Attitude Calibration</p> <p data-bbox="268 1209 758 1265">Note: Instrument must be placed on about 20 degrees slant centering pole.</p> <p data-bbox="247 1288 774 1355">00-32 1.1 Single 0.0 52% Azi: 178°45'55"</p>  <p data-bbox="279 1668 742 1691">Please click "Start" to start calibrating</p> <p data-bbox="454 1747 566 1780">▶ Start</p>	<p data-bbox="810 1075 1037 1108">Azimuth changes</p> <p data-bbox="810 1153 1300 1355">If maximum and the minimum difference within 5°, means module state is normal and can Tilt survey directly. Or must carry on the module calibration.</p>

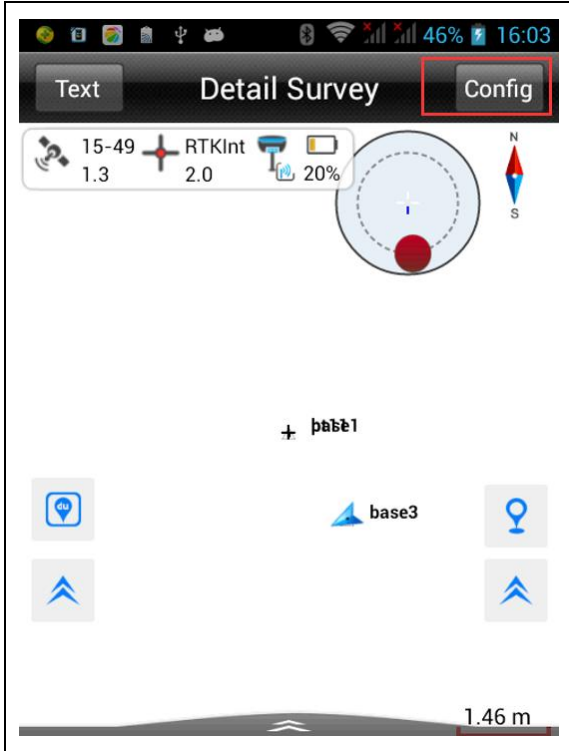
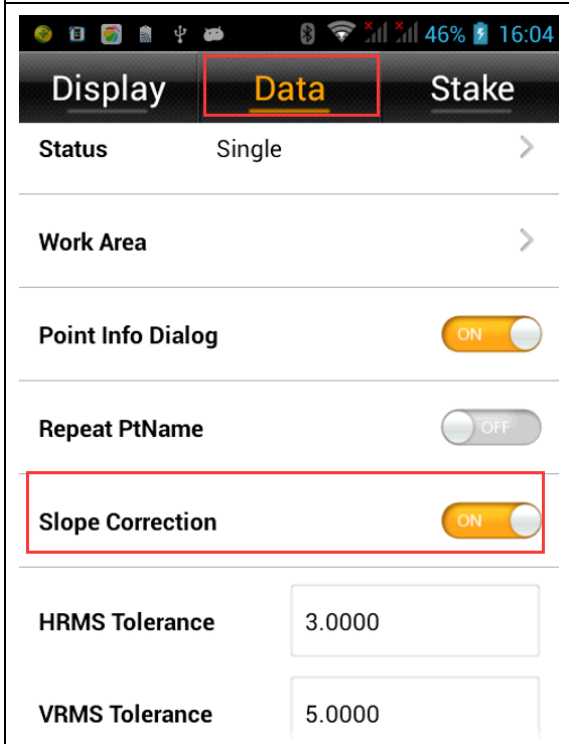
If maximum and the minimum difference of "Azi" above within 5°, means calibration OK and module state is normal and can Tilt survey directly. Or must carry on the module calibration once again.

2.3 Tilt survey

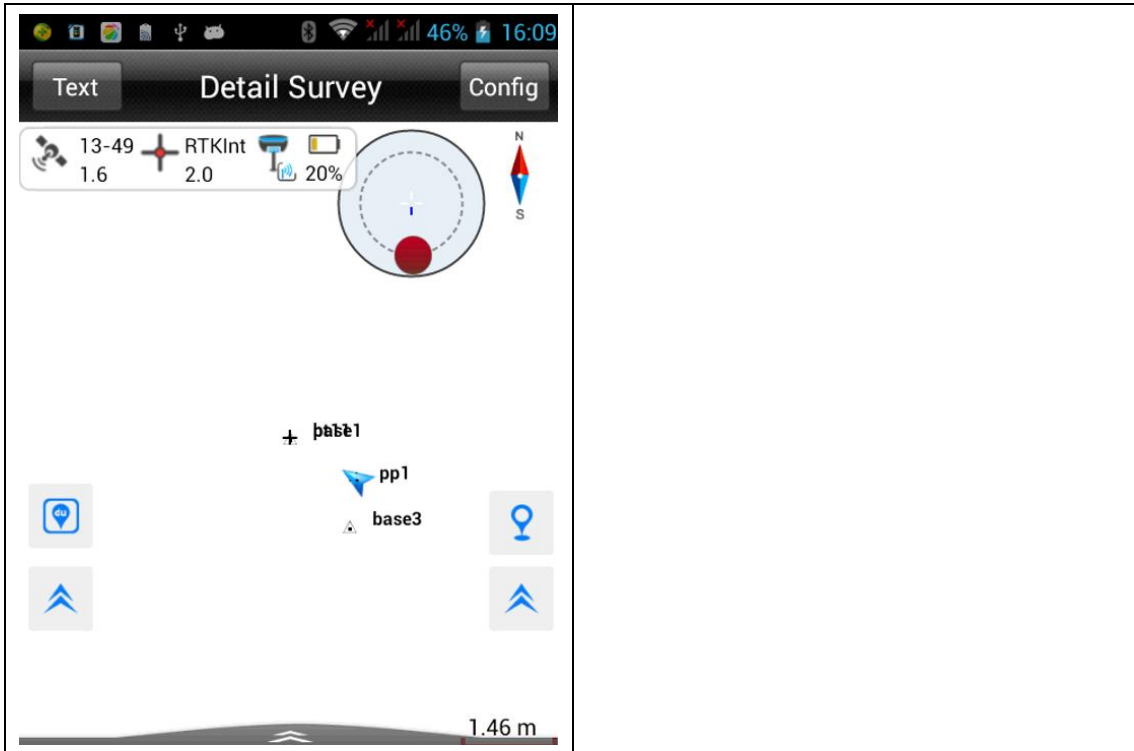
After Electronic bubble calibration, direction sensor calibration and attitude deviation calibration are successful, begin to do Tilt survey.

Tilt survey condition: Tilt within 20 degrees under motionless state.

1. Open "Slope correction"

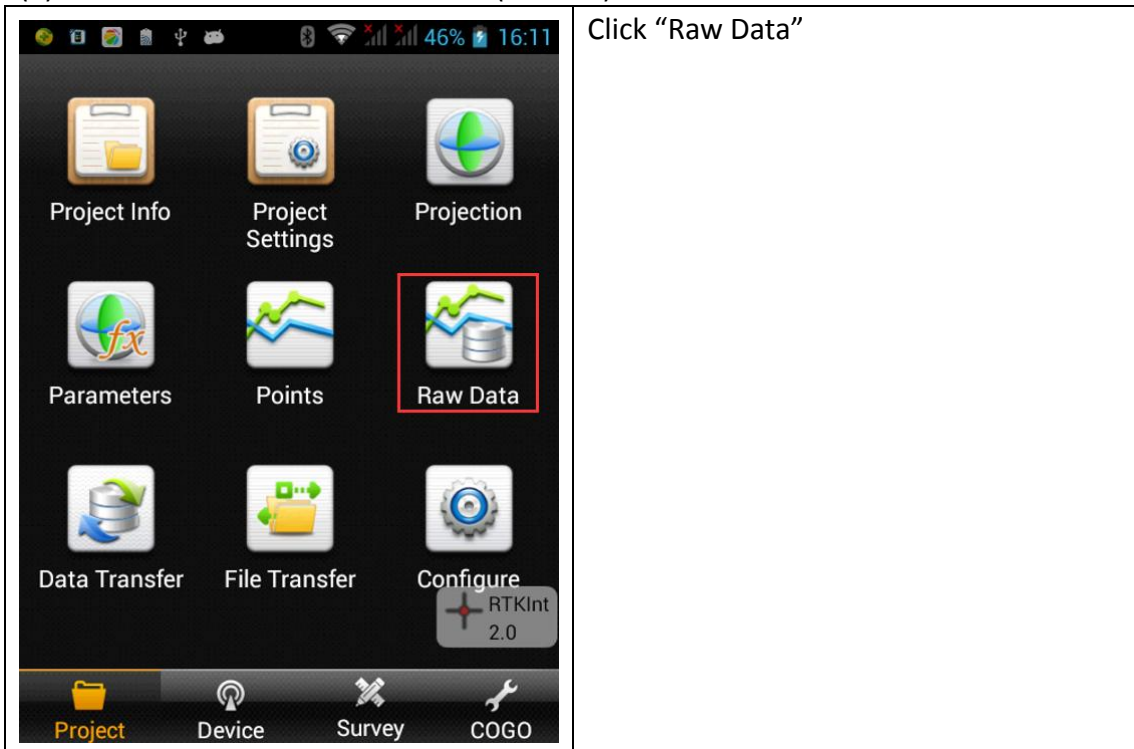
	<p>Detail Survey->Config</p>
	<p>Data -> open "Slope Correction"</p> <p>If "off" the "Slope Correction", software will not make slope correction.</p>

2. Start to record point



3. Add slope correction process.

(1) Click "Raw Data" -> Choose "Proce(Process)"



Click "Raw Data"

Raw Data		
Name	B	L
pp2	22:59:00.63482N	113:22:03.54331E
pp1	22:59:00.63483N	113:22:03.54339E
pt213	22:59:00.68004N	113:22:03.51021E
pt212	22:59:00.68034N	113:22:03.51014E
pt11	22:59:00.68039N	113:22:03.51025E

File Name: GPS.raw

New Open Search **Proce**

Choose "Proce"

(2)Choose "Slope Correction"-> Process, then make a correction and upgrade the coordinate points.

Process

Projection List BJ54 >

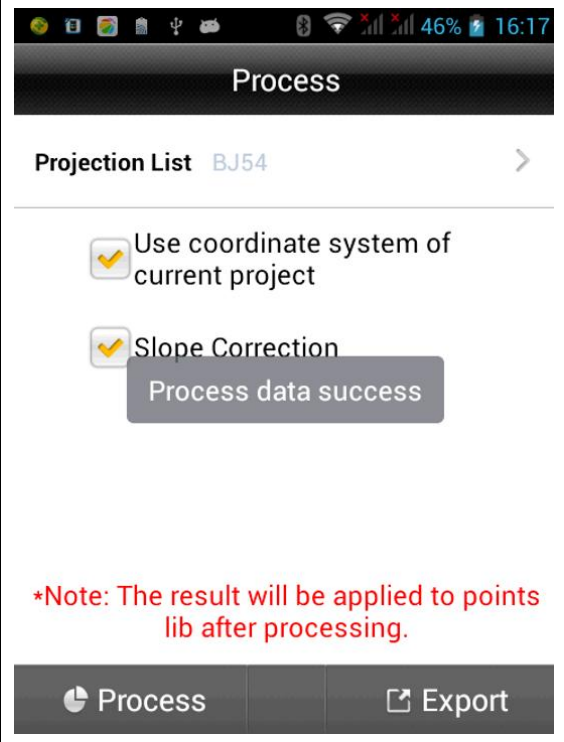
Use coordinate system of current project

Slope Correction

***Note: The result will be applied to points lib after processing.**

Process Export

Choose "Slope Correction"-> Process

 <p>Process</p> <p>Projection List BJ54 ></p> <p><input checked="" type="checkbox"/> Use coordinate system of current project</p> <p><input checked="" type="checkbox"/> Slope Correction</p> <p>Process data success</p> <p>*Note: The result will be applied to points lib after processing.</p> <p>Process Export</p>	<p>Process data success.</p>
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