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# *GETTING STARTED GUIDE*

## *X900*



Shanghai HuaTuo Satellite Navigation Technology Ltd.  
Shanghai China

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## Trademarks

All product and brand names mentioned in this publication are trademarks of their respective holders.

## Replacing Radio Transmitter Power Fuse

Radio transmitter is protected by a 5-A fuse inserted in the power cable. This Y-shaped cable is used to connect the car battery to the HuaTuoSat Datalink.

Should you have to replace this fuse, please get a spare fuse, 5 A, ATO type, and then do the following:

- Unplug the battery end of the data/power cable
- Open the fuse holder located along the data/power cable
- Extract the damaged fuse
- Insert the new fuse and then push the holder lid back into place
- Connect the power cable back to the battery

## Where to Find Information

This manual is designed to guide you through the basic X900 procedures. You can find additional information in the X900 Reference Manual and also the HuaTuoSat Technical Training Video.

# FCC Statement

## Federal Communications Commission (FCC)

### Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1) this device may not cause harmful interference, and 2) this device must accept any interference received, including interference that may cause

undesired operation of the device. You are cautioned that changes or modifications not expressly approved by the part responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

### FCC RF Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must not be colocated or operating in conjunction with any other antenna or transmitter.

## Content

1. Introduction .....	1
1.1 Technical Assistance .....	1
1.2 Your Comments .....	1
2. Overview .....	2
2.1 Safety Information.....	2
2.1.1 Warning and Cautions .....	2
2.1.2 Regulations and Safety .....	2
2.1.3 Use and Care .....	3
2.2 Features.....	3
2.3 Specifications .....	3
3. Preparation.....	5
3.1 Equipment Description.....	5
3.2 Batteries and Power .....	11
3.2.1 External Power and Internal Battery .....	12
3.2.2 Charging the Battery .....	13
3.2.3 The Battery Usage and Disposing Notices.....	13
3.3 Parts of the Receiver (Control Panel) .....	14
3.3.1 Front Panel View .....	14
3.3.2 Bottom View.....	15
4. Setting up the Receiver .....	17
4.1 RTK Base Setup.....	17
4.2 RTK Rover Setup .....	18
5. Configuration.....	19
5.1 Establishment of Bluetooth® Connection with the Receiver .....	19
5.2 Static Configuration.....	21
5.3 RTK Configuration.....	22
5.3.1 RTK Software Package .....	22
5.3.2 Radio Mode Configuration .....	23
5.3.3 GPRS Mode Configuration.....	26
5.3.4 PDA CORS Configuration .....	31
6. RTK Surveying.....	32
6.1 Creating New Job .....	32
6.2 Start Base Station (if you used the Auto Base function, please skip this step) .....	33
6.3 Carrying out Survey Project.....	36
6.3.1 Measuring Points .....	36
6.3.2 Site Calibration Function and Reset the Grid .....	37
6.3.3 Staking out Points.....	39
6.3.4 Downloading RTK Results to PC .....	40
Appendix A.....	41
1. General specification.....	41
2. Connection .....	41
3. Control panel.....	42
4. Configuration.....	42

Appendix B .....	44
Appendix C .....	47

## 1. Introduction

- Technical Assistance
- Your Comments

Thank you for choosing HuaTuoSat X900 GNSS receiver.

This Getting Started Guide is designed to help you rapidly familiarize yourself with your new equipment. Only a selection of the many HuaTuoSat X900 GNSS functions is presented in this guide.

### 1.1 Technical Assistance

If you have a problem and cannot find the information you need in the product documentation, contact your local Dealer. Alternatively, please request technical support using the HuaTuoSat Website at ([www.chcnave.com](http://www.chcnave.com)) or HuaTuoSat technical support email [support@chcnave.com](mailto:support@chcnave.com).

### 1.2 Your Comments

Your feedback about the supporting documentation helps us to improve it with each revision. E-mail your comments to [feedback@chcnave.com](mailto:feedback@chcnave.com).

## 2. Overview

- Safety Information
- Features
- Specification

### 2.1 Safety Information

This manual describes HuaTuoSat X900 GNSS Receivers. Before you use your receiver make sure that you have read and understood this publication, as well as safety requirements.

#### 2.1.1 Warning and Cautions

An absence of specific alerts does not mean that there are no safety risks involved.

A Warning or Caution information is intended to minimize the risk of personal injury and/or damage to the equipment.



**WARNING-**A Warning alerts you to a likely risk of serious injury to your body and/or damage to the equipment.



**CAUTION-** A Caution alerts you to a possible risk of damage to the equipment and/or loss of data.

#### 2.1.2 Regulations and Safety

The receivers contain integral Bluetooth® wireless technology, and may also send radio signals through an externally-connected data communication radio. Regulations regarding the use of the datalink vary greatly from country to country. In some countries, the unit can be used without obtaining an end-user license. Other countries require end-user licensing. For licensing information, consult your local dealer. Bluetooth® operates in license-free bands.

### 2.1.3 Use and Care

The receiver can withstand the rough treatment that typically occurs in the field. However, the receiver is high-precision electronic equipment and should be treated with reasonable care.

## 2.2 Features

The X900 GNSS receiver provides the following features:

- Centimeter-accuracy, real-time positioning with RTK/OTF data.
- Submeter-accuracy, real-time positioning using pseudorange corrections.
- Automatic OTF initialization while moving
- Single Lithium-ion rechargeable battery
- Cable-free Bluetooth® communications with the data controllers
- One 10-Pin Lemo port for:
  - RTCM 2.X input and output
  - CMR input and output
  - NMEA outputs
- One TNC radio antenna connector
- Internal Memory for data storage

## 2.3 Specifications

### Real Time Kinematic (RTK)

Horizontal:  $\pm (10\text{mm}+1\text{ppm})$  RMS

Vertical:  $\pm (20\text{mm}+1\text{ppm})$  RMS

Initializing Time: 10S

Initialization Reliability: Typical >99.9%

### Static

Horizontal:  $\pm (5\text{mm}+1\text{ppm})$  RMS

Vertical:  $\pm (10\text{mm}+2\text{ppm})$  RMS

### Data Format

RTCM2.1, RTCM 2.3, RTCM 3.0, CMR, RTCA, input and output



## Overview

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NMEA0183 outputs, GSOFF outputs

### Physical Reference

Size (H×D): 200mm×85mm

Weight: 1.4Kg (Without Battery)

### Electrical Reference

Power Consumption: 2.8W

Battery Volume: 2400mAh

Battery Life: 6 Hours (Static)

4.5 Hours (RTK)

1000 Recharges

External Power: 9-18VDC

### Environment

Working Temperature: -30 °C — +65 °C

Storage Temperature: -40 °C — +75 °C

Humidity: 100% condensation

Waterproof and Dustproof: IP67, protected from temporary immersion to depth of 1 meter, floating.

Shock and Vibration: Survive from 2 meters drop onto concretes

### Characteristics

Buttons and Display: 2 buttons/4 LED lights

I/O: RS232, USB, Bluetooth®

Channel: 54 Channels\*

### Datalink

Power (UHF): 1W-20W Adjustable

Internal (Optional): 1W

Band Width: 450-470MHz

\*Channel Configuration: 14 L1, 14 L2 P(Y) or L2C Channels, 12 GLONASS L1, 12 GLONASS L2, 2SBAS

### 3. Preparation





- Equipment Description
- Batteries and Power
- Parts of the Receiver (Control Panel)

#### 3.1 Equipment Description









The tables below provide an overview of the different items composing the HuaTuoSat X900 GNSS.

Depending on the different purchase, you may have some of the listed items. Basic Supply is the standard accessories for each kit. Transportation Cases Option and Accessories Options are depending on different orders requirements.



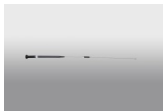

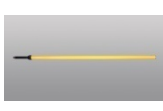

#### Base Kit Basic Supply

Item	Picture
X900 GNSS Receiver Base	
Lithium Battery	
H.I. Tape	
Connector	






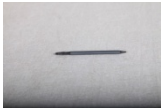
**Rover Kit Basic Supply**

Item	Picture
X900 GNSS Receiver Rover	
Lithium Battery	
Battery Charger	
Power Adapter with Cord	
GPS to PC Data Cable	
Receiving Radio Antenna	
Connector	
2M Range Pole	







**Datalink Kit Basic Supply**

Item	Picture
DL3 Datalink	
GPS to Datalink Cable	
Standard Datalink Antenna with 5 Meter Cable	
External Power Cable	
Datalink Antenna Mounting Pole Kit	
Pole Mounting	

**Recon 400 Controller Kit Basic****Supply**




Item	Picture
Recon Survey RTK Controller	
USB Data Cable of Controller	
Charging Cable and Adapter of Controller	
Controller Mount for Range Pole	
Protection Film	
Click Pen	

**HuaTuoSat LT Controller****Kit Basic Supply**




Item	Picture
LT Series Survey RTK Controller	
USB Data Cable of Controller	
Charging Cable and Adapter of Controller	
Controller Mount for Range Pole	
Protection Film	
Click pen	

## Transportation Cases Options

### Preparation

Item	Picture
Transport Case	
Carry Pouch	
Metal Transport Case for Poles and Antenna	

## Accessories Options

Item	Picture
Double Bubbles Tribranch with High Adapter	
Single Bubble Tribranch with Lower Adapter	
External Power Cable	

### 3.2 Batteries and Power



**WARNING**—Charge and use the rechargeable Lithium-ion battery only in strict accordance with the instructions. Charging or using the battery in unauthorized equipment may cause an explosion or fire, and result in personal injury and/or equipment damage.

To prevent injury or damage:

- Do not charge or use the battery if it appears to be damaged or leaking.
- Charge the Lithium-ion battery only in HuaTuoSat products that is specified to charge it. Be sure to follow all instructions that are provided with the battery charger.
- Discontinue charging a battery that gives off extreme heat or a burning odor.
- Use the battery only in HuaTuoSat equipment that is specified to use it.
- Use the battery only for its intended use and according to the instructions in the product documentation.



**WARNING** —Do not damage the rechargeable Lithium-ion battery. A damaged battery may cause an explosion or fire, and result in personal injury and/or property damage.

To prevent injury or damage:

- Do not use or charge the battery if it appears to be damaged. Signs of damage include, but are not limited to, discoloration, warping, and leaking battery fluid.
- Do not expose the battery to fire, high temperature, or direct sunlight.
- Do not immerse the battery in water.
- Do not use or store the battery inside a vehicle under hot weather condition.
- Do not drop or puncture the battery.
- Do not open the battery or short-circuit its contacts.



**WARNING**—Avoid contact with the rechargeable Lithium-ion battery if it appears to be leaking. Battery fluid is corrosive, and contact with it can result in personal injury and/or property damage.



To prevent injury or damage:

- If the battery leaks, avoid with the battery fluid.
- If battery fluid gets into your eyes, immediately rinses your eyes with clean water and seek medical attention. Please do not rub your eyes!
- If battery fluid gets onto your skin or clothing, immediately use clean water to wash off the battery fluid.

### 3.2.1 External Power and Internal Battery

The receiver can be powered by its internal battery or by an external power source connected to Receiver Lemo Port. If an external power source is connected to Port, it is used in preference to the internal battery. When there is no external power source connected, or if the external power supply fails, the internal battery is used.

#### External Power



**Figure3.2-1**

There are two methods to provide the external power to the receiver by the HuaTuoSat GPS to PC cable. The HuaTuoSat GPS to PC cable has one Power port.

- In the office, the Power Adapter is connecting with AC power of 100-240V, the output port of the Power Adapter connects with the Power Port of the GPS to PC cable, shown as **Figure3.2-1**.
- In the field, the external power cable is connecting with the Car battery, the output port of the external power cable connects with the Power Port of the GPS to PC cable, shown as **Figure3.2-2**.



**Figure3.2-2**

#### Internal Battery

These receivers use a rechargeable lithium-ion battery. Make sure the battery is fully charged for each HuaTuoSat X900 being used in the field.

### 3.2.2 Charging the Battery

The receiver is supplied with two rechargeable Lithium-ion batteries, and a dual battery charger for each RTK kit. The two batteries charge sequentially and take approximately three hours each to be fully charged.

The battery charger comes with a separate universal AC Power Adapter with a 1.5 meter output cable. Follow the instructions below to operate the charger.

- Connect the two parts of the Power Adapter and the Power Adapter output with the Battery Charger. The red LED on the Battery Charger is on, which means the whole charger system is ready.
- Put battery on the battery charger in right orientation (the battery terminals should come into contact with the two sets of connectors on the charger). When the battery is placed in the right place, the Green/Yellow LED will start to flash or turn on.
- There are three LED on the Battery Charger, shown as C. The middle red LED means the power condition of the Charger. The other Green and Yellow LED represent the working condition of two charger slot respectively. When the Green/Yellow LED is flashing, it means the battery is on charging, and the slower tells the less battery is going to be charged in, in other words, when a full charged battery put on the battery slot, the Green/Yellow LED will be turn on and no flashing.

### 3.2.3 The Battery Usage and Disposing Notices

The rechargeable Lithium-ion battery is supplied partially charged. The following recommendations provide optimal performance and extend the life of your batteries:

- Fully charge all new batteries prior to use.
  - Do not allow the batteries to discharge below 5 V.
  - Keep all batteries on continuous charge when not in use.
- Batteries may be kept on charge indefinitely without damage t the receiver or batteries.

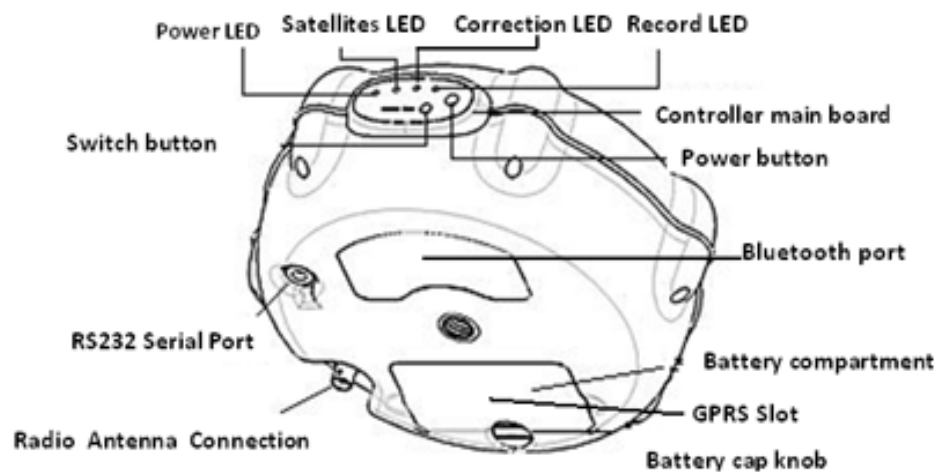
- Do not store batteries in the receiver or external charger unless power is applied.
- If you must store the batteries, fully charge them before storing and then recharge them at least every three months.

### Disposing of the Rechargeable Lithium-ion Battery

Discharge the lithium-ion battery before disposing of it. When disposing of the battery, be sure to do so in an environmentally sensitive manner. Adhere to any local and national regulation concerning battery disposal or recycling.

## 3.3 Parts of the Receiver (Control Panel)

### 3.3.1 Front Panel View



#### Power Button

To turn on X900 GNSS, hold the power button press and don't release until the power LED lights up.

#### Switch Button

The function of switch button is to switch X900 GNSS from RTK mode to static mode. The procedure can be divided into 2 steps.

##### Step 1: Switching

Hold the switch button press and don't release until you see the Record LED off.

##### Step 2: Check

Press the switch button, if the correction LED turns on, it means the switching succeed.



**CAUTION:** When you are doing check, if you press and hold the switch button again, it will be back to RTK mode.

### Power LED

This indicator is on when X900 GNSS is on, and off when it is off.

### Satellite LED

This LED indicates how many satellites the receiver is tracking on, if the LED flashes 5 times and then stops, it means the receiver is tracking 5 satellites.

### Record LED

The record LED only flashes in 2 situations

#### A. In the static mode

The interval of flashing shows the sample interval you set in the HC-Loader or HCGPSet.

#### B. RTK mode

When you are using PDA to send commands to set the receiver's configuration or just communicating with the receiver.

### Correction LED

The Correction LED only flashes once per second when

#### A. Base station successfully sends out difference data in RTK mode.

#### B. Rover station successfully gets difference data from Base station.

## 3.3.2 Bottom View

### RS232 Serial Port

RS232 serial port is a 9 pin 0-shell Lemo connector that supports RS-232 communications and external power input.

### Bluetooth® Port

Bluetooth® port is an integrated port allowing X900 GNSS receiver to communicate with a Bluetooth®-enabled field terminal.

### Radio Antenna Connection (only for Rover)

It allows you to connect a radio whip antenna to the X900 GNSS. There is only one type of HuaTuoSat radio antenna connection --- TNC.

### Adaptor

The 5/8" adaptor is used for setting up the receiver on the tripod.

### Battery Compartment



#### **WARNINGS:**

- Do not store batteries in the receiver unless it is applied.
- Do not charge or use the battery if it appears to be damaged or leaking.
- Do not damage the rechargeable Lithium-ion battery. A damaged battery may cause an explosion or fire, and may result in personal injury and/or property damage.
- Do not expose the battery to fire, high temperature, or direct sunlight.
- Do not immerse the battery in water.
- Do not use or store the battery inside a vehicle under hot weather condition.
- Do not drop or puncture the battery.
- Do not open the battery or short-circuit its contacts.

### GPRS Slot (Optional)

Insert SIM card into the slot, then use GPRS net as data communication way between base and rover. The premise is that you have already gone to local Mobile service center asking for net traffic and make sure the area where you are doing surveying has strong GPRS signal.

## 4. Setting up the Receiver

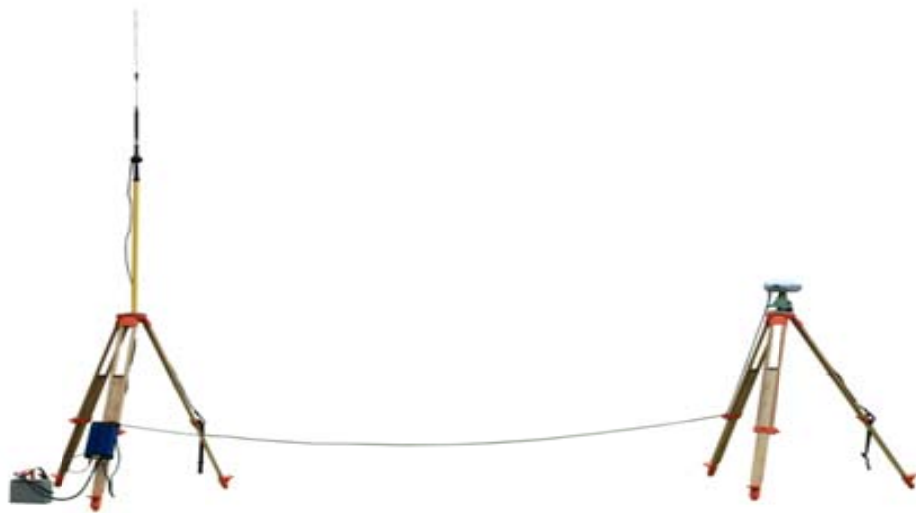
### 4.1 RTK Base Setup

Prerequisites:

- You need a tripod and a tribrach to install the base.
- To power the radio, you need a standard 12-V DC battery.

**Datalink P/N DL3B\*\*\*\***

Mount the different items as shown on the picture.



**GSM/GPRS Model**

Mount the different items as shown on the picture.



## 4.2 RTK Rover Setup

### Prerequisites:

- If a radio link is used with the base, your rover should normally have been fitted with the radio module that matches the reception band covered by the radio transmitter used at the base.
- If a GPRS connection is used, the rover should normally have been equipped with the SIM card that will allow it to perform a network connection. Removing the rear cover that gives access to an electronic card on which you can insert the SIM card as shown on the picture.



**Figure4.2-1**

Mount the different items as shown on the picture, including the X900, the radio antenna, the range pole, and the field terminal with its mounting bracket.



**Figure4.2-2**

As a standard feature, the X900 incorporates a built-in GSM modem. Mount the different items as shown on the picture, including the X900, the range pole, and the field terminal with its mounting bracket.

## 5. Configuration

- Establishment of Bluetooth® Connection
- Static Configuration
- RTK Configuration

### 5.1 Establishment of Bluetooth® Connection with the Receiver

Prerequisites:

- The HuaTuoSat RTK software can install in Windows CE and Windows Mobile system PDA. Here the Windows Mobile is set as an example to show how to establish Bluetooth® connection to Receiver.
- Use the Bluetooth® manager program of the PDA to associate a COM port for Receiver, and then establish connection between the Bluetooth® and Receiver through the selected COM port.



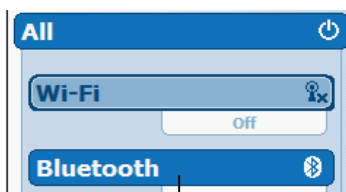
Figure5.1-1

#### Assigning a COM Port to Bluetooth® for Receiver

First, turn on the GNSS receivers you want to work with.

Second, turn on the PDA and activate Bluetooth® connection of PDA.

Check the Bluetooth® status on the start screen. If it is already on, skip this step; if it's off, tap on the Bluetooth® button to change status from off to on. Then tap **Done** to back to the start screen.



Tap here to change the Bluetooth® status



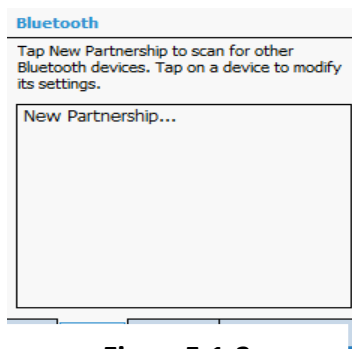
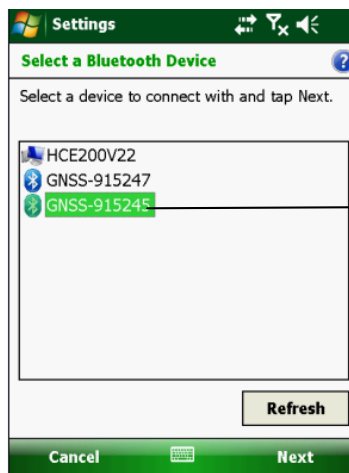


Figure5.1-3

Tap **Start** -> **Settings** -> **Connections**-> **Bluetooth®**

Tap on the Bluetooth® icon. This will open the Bluetooth® Settings window, which is on the **Device** tab.



The SN number of Device

Figure5.1-4

Tap **Devices**-> **New Partnership**. Then the PAD will start to search for nearby Bluetooth® devices. For each device PAD detected by PDA, the Bluetooth® name is returned in the search window (e.g.GNSS-915245). The **Refresh** button can be used to resume the search if necessary.

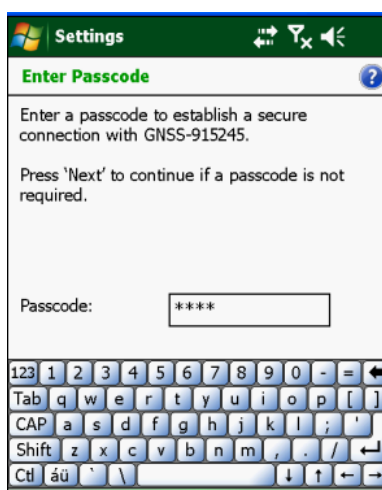


Figure5.1-5

Select the Bluetooth® name corresponding to the receiver you want to communicate with and then tap **Next** to key in the Passkey "1234".



Figure5.1-6

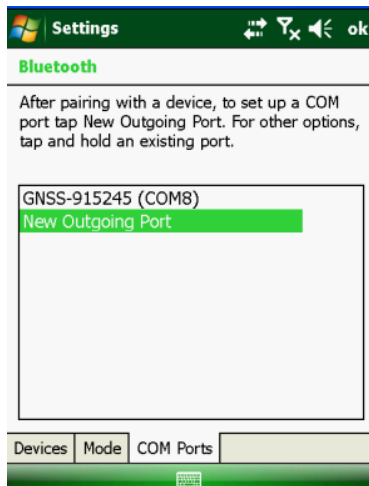


Figure5.1-7



Select Serial Port and tap **Finish** to activate the Serial Port service. Back to the Bluetooth® Settings, and then choose a receiver to communicate with.

Click **COM Ports**, then select the **New Outgoing Port**. The selected Bluetooth® name (corresponding to your receiver) now appears highlighted, then tap **Next** button.

Choose a COM port to connect Bluetooth® with the GNSS receiver. Choose **Com8** or **Com9**, then select the **Secure Connection** and tap **Finish**. **Com8** is suggested to be linked with Base and **Com9** with Rover.

Tap **OK** to the start screen and finish the Bluetooth® connection setup.

**CAUTION:** If you want to delete the Bluetooth® connection with GNSS Device, the receiver name in the **COM Ports** should be deleted first. Please do not delete the receiver name in the **Device** first.

## 5.2 Static Configuration

There are 3 ways to configure the receiver in Static Mode.

A. Using RS232 Port and HCLoader Software in the Office  
First, connect X900GNSS to your computer through RS232 line.

## Configuration

Second, run the software HCLoader and click icon **Link** to make the receiver connected with computer.

Third, click icon **Setup** to set the sample interval (15S is recommended) and mask angle of the receiver (13 is recommended) and choose the **Data Log** mode as Auto, then click **Apply** to make the configuration work and click **Exit**.

Fourth, restart the receiver.

### B. Using PDA and Software HCGPRSSet in the Field

First, use RS232 or Bluetooth® port connecting PDA with receiver.

Second, tap the icon **HCGPRSSet** on the PDA, choosing the right com and click icon **Bluetooth®** if you are using Bluetooth®.

Third, click **Open** then you will see this picture, set the sample interval (15S is recommended and mask angle of the receiver (13 is recommended) you want and choose the data log mode as Auto, then click **Apply** to make the configuration works.

Fourth, restart the receiver.

### C. Switch Button in the Field

The information has been introduced in Chapter 3.3.1



Figure5.1-8

## 5.3 RTK Configuration

Prerequisites:

- Base and Rover are properly set up and power on
- Bluetooth® connection has already been configured with Base (com 8) and Rover (com 9).

### 5.3.1 RTK Software Package

#### 5.3.1.1 Introduction of Software

Main function of HuaTuoSat RTK software:

**HCGPRSSet** is the field software for the Receiver setup.



**CAUTION:** The setting can work only after the Receiver being turn off and turn on.

**HcGPSce** is the field software for Radio and built-in GPRS module setup.

**RTKCe** is the RTK Surveying software.

### 5.3.1.2 Installation of the HuaTuoSat RTK Software

HuaTuoSat RTK software Landstar is installed in CAB format, copy the installation file to PDA, double click the file, the software will install automatically.



**CAUTION:** Since Version 3.40 Landstar has started to use the \*CAB for the installation.

According to different communication modes, we separate the RTK configuration into Radio mode and GPRS mode.

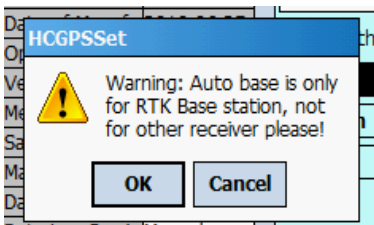
### 5.3.2 Radio Mode Configuration

#### 5.3.2.1 Radio Mode Base Configuration

After having successfully installed the Landstar, tap shortcut of **HCGPSset** and select a communication port. **Com1** is for cable connection, **Com8** and **Com9** is for Bluetooth® connection. Select **Com8** and tap **Open Port**, and then the software will read the parameter about Receiver. Please set the Base as **Table5.3-3**. After setting all the information, tap **Apply**, there is a warning information show as: "**Warning: Auto base is only for RTK Base station, not for other receiver please**".

Click **OK** to finish the setting. Turn off the base station and then turn on it to active the setting. After searching enough satellites, the base station will send CMR data automatically.

**HCGPSset**



**Figure5.3-2**



**CAUTION:** If the user wants to start Base manually, please set the work mode as **No Auto Base**.

COM1 is for cable connection, COM8 and COM9 is for Bluetooth® connection.

Select the **BTtooth** connection, Open the connection port.

After setting all the parameters, tap Apply button.

Tap this button, the GNSS will recover to default setting.

Setup Information	Explanation
Receiver NO.	The SN NO. of Device
Date of Manufacture	The time of being made up
Version	The hardware version of Device
Memory	The total Memory of Device
Sample interval	Only active in static mode, the recording static data interval
Mask angle	The cutoff Degree to prevent the satellites signal
Data log	For recording static data, Manual mode stands for switch static mode manually, Auto mode stands for recording static data automatically when turning on the Receiver
Data log Session	Only active in static mode, for the file session
Work mode	<b>Auto Base Mode:</b> Base station will automatic sending the CMR data <b>Auto Rover:</b> set the device as Rover mode <b>No Auto Base:</b> the base station will not sending difference data automatic
Correction Port	The differential data output port. If the Base has the Built-in GPRS Module, select <b>Port2+GPRS/CDMA</b> . If the Base does not have Built-in GPRS, select the <b>Port2</b> .

### Configuration

Auto base format	Only CMR for X900 GNSS
Remain battery	The power of the internal battery

**Table1: The Explanation for HcGPSset Setup Parameters**

### HCGPSset

Work Mode	Auto Rover
Correction Port	Port2+GPRS
Auto Base Form	CMR
Default	

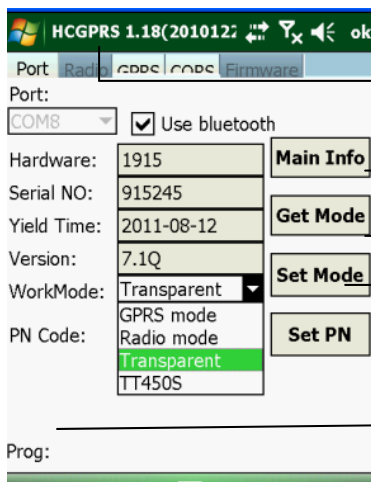
**Figure5.3-4**

### 5.3.2.2 Radio Mode Rover Configuration

Tap the **HCGPSset** to connect with Rover via Bluetooth®. Set Rover work mode as **Auto Rover**, then turn off and turn on Rover.

Tap shortcut of **HcGPSset** and select the communication port. Then tap **Get Mode** to get the current setting in the **HCGPSset** software.

### HcGPSset



**Figure5.3-5**

Change the frequency of the Rover

**Main Info** and **Get Mode** are used to get the current setting parameter.

After changing the work mode, click **Set**.

When you click **Set Mode**, the **Prog Bar** is moving as it is accepting the order.

The Work Mode	Explanation (Band Rate is 9600)	Other Settings
Radio mode	The HuaTuoSat Radio protocol	On <b>Radio</b> tab ,change the frequency of Rover
TT450S	Not active	
Transparent	Not active	
GPRS mode	Set the communication mode for Built in GPRS Module	Tap <b>GPRS</b> and <b>CORS</b> option set the server IP and other parameters

**Table2: X900 Rover work with only HuaTuoSat Radio**

### HCGPSset

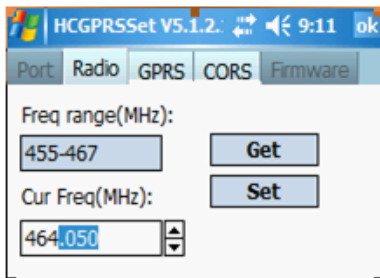


Figure5.3-6

After changing the Radio protocol on **Port**, go to **Radio** to change the Rover frequency.

### 5.3.3 GPRS Mode Configuration

If the HuaTuoSat Receiver has the Built-in GPRS module, the GPRS module can be used as the communication between Base and Rover.

According to different Protocol of log on internet, the GPRS mode is separated into UDP mode and TCP mode.

UPD mode (Base +Rover): Use Base and Rover to log on the APIS server, and then they match as one unite.

TCP Client mode (one Rover log on CORS): Use Rover to log on the CORS server by keying in user name and password. After logging, the CORS center will send the differential data to the Rover.

#### HCGPSSet

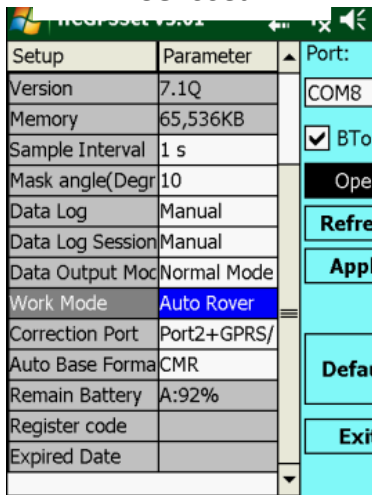


Figure5.3-7

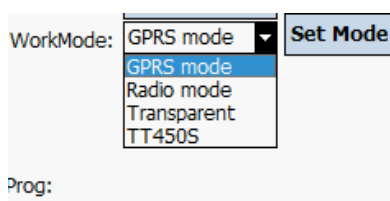
#### 5.3.3.1 UDP Mode Configuration

##### Base configuration:

-Use the **HCGPSSet** set the work mode as **Figure5.3-7**

-Set the IP of Base station: use the **HcGPRScce to** set the Server IP and log on internet information

#### HCGPSSet



First, set the work mode as **GPRS Mode** in the **HcGPRSc**, and then tap **Set Mode**.

Figure5.3-8

**HCGPSSet(GPRS)**

Server IP and Port is provided by local APIS Server provider.

The APN Name and the Mobile Server NO. is provided by your local Mobile Server provider.

The user name and password is provided by Mobile server. In some countries there is no user name or password

Figure5.3-9

### HCGPSSet

Work Mode	Auto Rover	Default
Correction Port	Port2+GPRS	
Auto Base Form	CMR	

Figure5.3-10

### Rover configuration:

-Use the **HCGPSSet** to set the work mode as left. Then power off and power on again.

### HcGPRSc

WorkMode: GPRS mode Set Mode

GPRS mode  
Radio mode  
Transparent  
TT450S

Prog:



-In the **HcGPSce**, set the work mode as **GPRS mode**.

Figure5.3-11

### HcGPSce(GPRS )

Then on **GPRS** option, tap **Get** to get the current setting and then key in all the parameters. Click **Set** to set necessary parameters in the Built-in GPRS Module.

Mode: Rover mode.

Key in the SN number of the corresponding Base station

Figure5.3-12

### 5.3.3.2 TCP Mode Configuration

TCP mode (CORS mode): users have to key in the user name and password when logging on the CORS center. For the Rover working as CORS mode, the CORS Mode Configuration also needs to use both **HCGPSset** and **HcGPSce** software.

### Built-in GPRS Module CORS Configuration

Use the built-in GPRS Module as the Datalink.

Use **HCGPSset** to set the work mode as **Figure5.3-13**.

### HCGPSset

Work Mode	Auto Rover	Default
Correction Port	Port2+GPRS	
Auto Base Form	CMR	

Figure5.3-13

TCP Client

The server IP of CORS center

Figure5.3-14

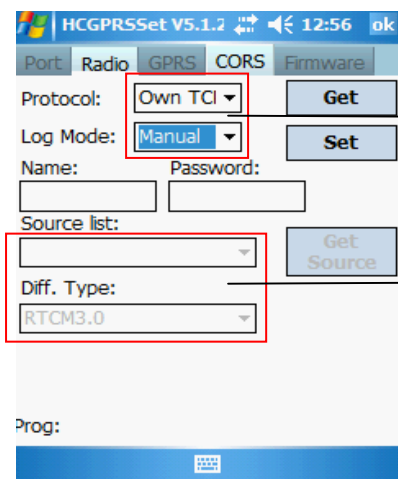
Use **HCGPSSet** to set protocol and Server information of CORS, then tap **CORS** option and set the log mode of CORS center as auto mode or manual mode.

·**Manual Mode**- key in the user name and password in Landstar and it will send the GPGGA information to CORS center manually.

·**Auto Mode**-after setting the Receiver as Auto Mode, the Receiver will try to log on CORS center automatically. And when the correction LED flashes once each second, it means that the receiver has successfully logged on CORS center.

### Log on CORS Manual Mode

### Log CORS Manual Mode



Tap **CORS** option and set the parameters as **Figure5.3-15**.

Manual Mode

Delete all the information

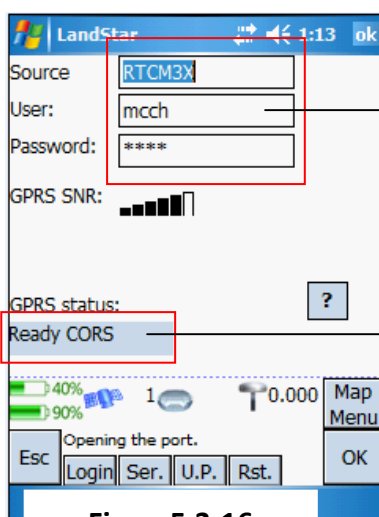
Figure5.3-15



**Caution:** If you want to use the Manual mode, delete all the Name information, Password information and the Source list, then select the Manual mode.

Set the Users Name and Password in Landstar.

Tap **Landstar**-> **Configuration**-> **Rover par.** ->**Inner VRS**, then key in the source, user name and password as **Figure5.3-16**.



Key in the Source list, User name and Password.

When shows **Ready CORS**, tap **Login** to send the GGA information to CORS center. Then the CORS center will send the differential data to Rover.

Figure5.3-16



Figure5.3-17

After tapping **Login**, a toolbar will show as “Success to land to VRS”.

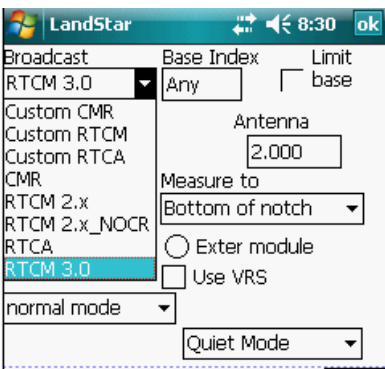


Figure5.3-18

And tap **Config->Rove par. ->Rove options** to select the right **Broadcast** type according to the Source list keyed in. Then go to **Survey ->Start rover receiver**.

### Log CORS Auto Mode

Click **HCGPRSSet** to set CORS IP. Tap **CORS**, then key in user name and password to apply for CORS center. Meanwhile, select the **sourcelist** and differential type.

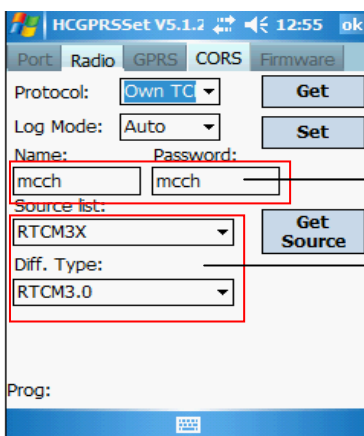


Figure5.3-19

After setting parameters, power off and power on the Receiver. Then the Receiver will log on CORS automatically.

The user name and password apply for CORS center.

The Source List and Different Type

### 5.3.4 PDA CORS Configuration

If the user wants to use a CDMA or 3G cell phone, the user can make the PDA and cell phone communication. First establish and then pair a Bluetooth® link between the cell phone and PDA, using Bluetooth® Manager. Then use the Network and Dial-up connection utility in your PDA to connect it to the internet (more information please see **Appendix C**).

Launch **Landstar** and link Bluetooth® with the Rover. Then tap **Configuration** -> **Rover par.** -> **PDA VRS**.

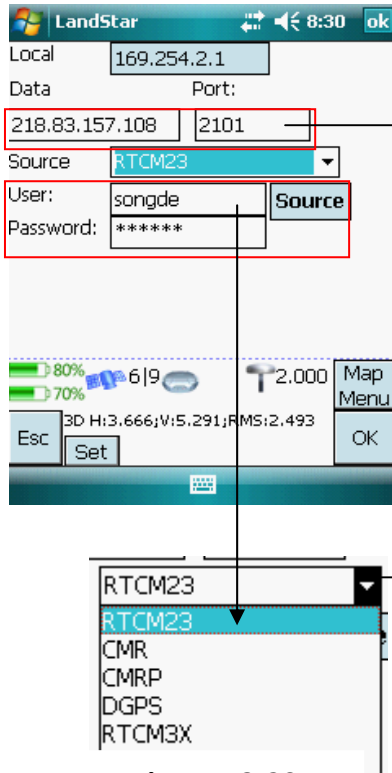


Figure5.3-20

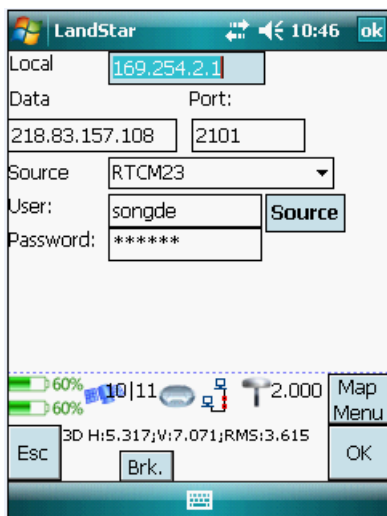


Figure5.3-21

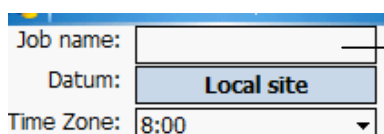
Click **Set** and tap **Config**->**Rove par.** ->**Rove options** to select the right **Broadcast** type according to the Source list keyed in. Then go to **Survey** ->**Start rover receiver**.

## 6. RTK Surveying

- Creating New Job
- Starting Base Station
- Carrying out Surveying Project

### 6.1 Creating New Job

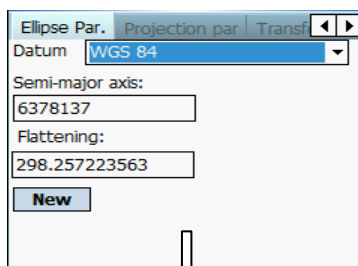
Launch landstar first. Then tap **Files**→**New job** to key in the Job name and select the right Time Zone.



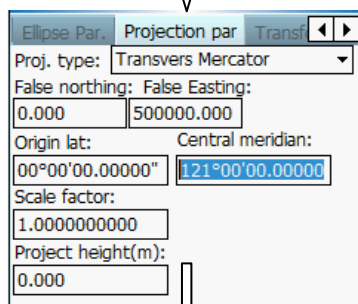
Key in the Job name

Click **Local site** to set the Job name and coordinate system parameters.

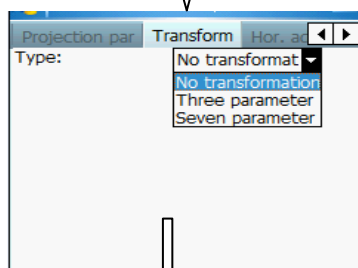
Figure6.1-1



Select the Ellipse Model or key in the new Ellipse Model.



Select the Projection type, and key in the local Projection parameters.



Transformation: if using the 3 or 7 parameters, please key in the parameters here.

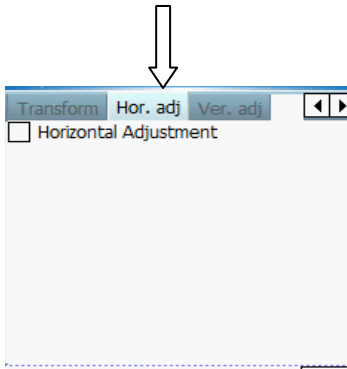


Figure6.1-2

After doing **Sit Calibration**, the Hor.adj and Ver.adj information will appear.



**CAUTION:** After key in all the parameters of the local coordinate system information, tap **Files->Save Job** to save the Job.

## 6.2 Start Base Station (if you used the Auto Base function, please skip this step)

Prerequisites:

- Fix the Base on the known point.
- Use the Bluetooth® or cable connected with the Base. If use Bluetooth®, launch Landstar and tap **Configuration->Com configuration** ->select the Bluetooth® port of the Base station.

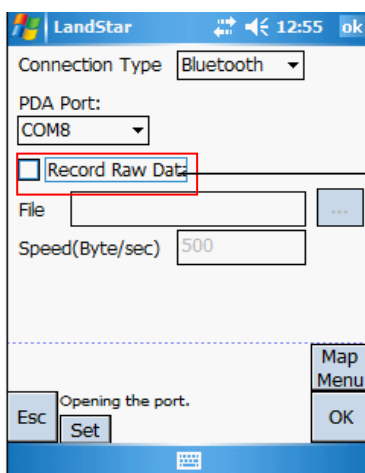
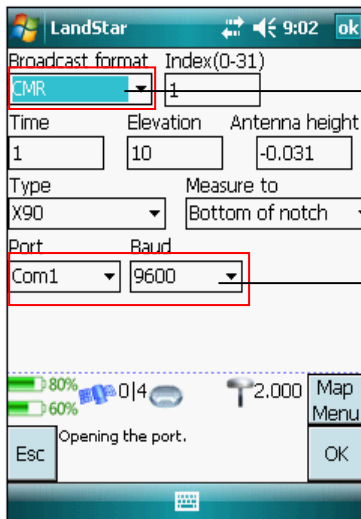


Figure6.2-1

Not used for X91 GNSS, only for X90 GPS

### Radio Mode: Start Base Station

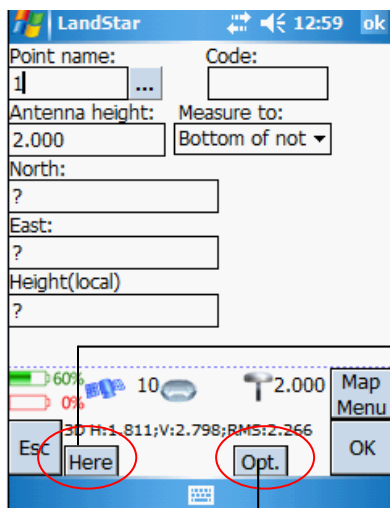
Go to **Configuration->Base Options**, and then select the options as Figure6.2-1.



The format of differential data type (CMR or RTCM)

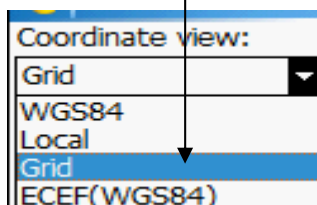
The correction data output port and baud rate, Com1 is for Radio Mode

Figure6.2-2



In **Survey**->**start the base receiver**-> key in the base coordination.

**Here**: get the current position as the base station coordination.



Start the base station in different kind of coordinate.

Figure6.2-3

Key in the coordinates of Base station, then tap **OK** to start Base station.

Tap **OK** to continue, when dialog box **Setted base station** shows up.

After successfully started the Base, please break the connection with Base and link with the Rover.

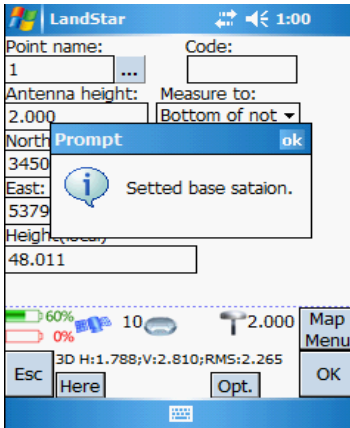
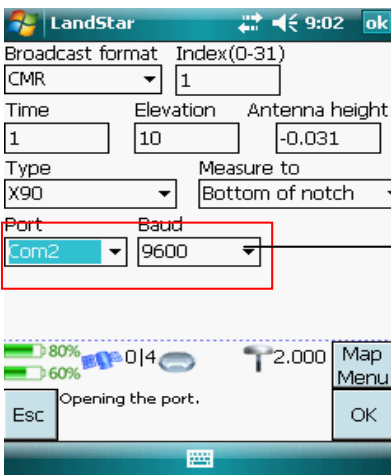


Figure 6.2-4

### GPRS Mode: Start the Base Station

Tap **Configuration** -> **Base Options**, and then select the options as Figure 6.2-5.

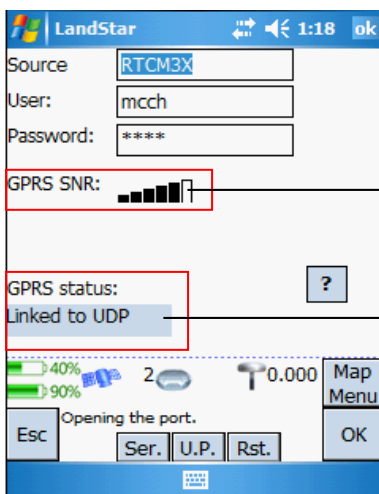


Port2 is for the GPRS output port

Figure 6.2-5

When use the GPRS mode, the differential data is transmitted through GPRS Network, please check the GPRS status before start the Base.

Click **Configuration** -> **Rover Par** -> **Inner VRS**, and then check the GPRS status of the Base.



The signal strength of GPRS

The GPRS status, link to the GPRS network

Figure 6.2-6



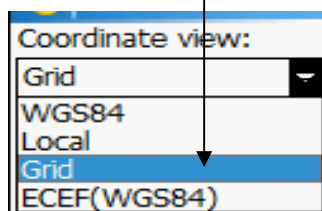
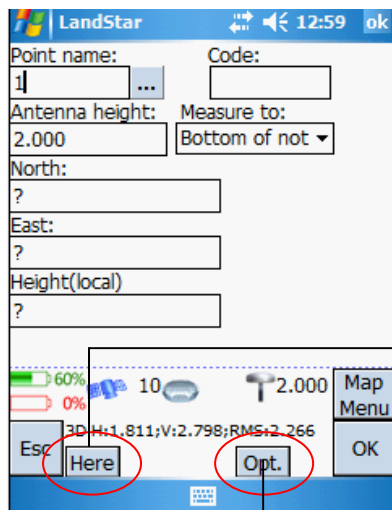


Figure6.2-7

On **Survey**->**start the base receiver**-> key in the base coordination

**Here**: get the current position as the base station coordination.

Start the base station in different kinds of coordinate.

After keying in the coordinates of base station, tap **OK** and dialog box **Setted Base** will come out. Then tap **OK** and link the Bluetooth® with Rover.

## 6.3 Carrying out Survey Project

After the Base start sending the differential data, switch the Bluetooth® connection to the Rover, and check the Correction LED (Green light) of Rover. If the green light continuously flashes (getting differential data), wait for the rover to get fixed; otherwise please check the DL3 radio and Base.

The rover then starts acquiring corrections data from the selected base, note that the rover will not automatically recognize the format of the received data, so every time please tap **Config**->**Rover par.**->**Rover options**, select the correct "broadcast" type, then click **Survey**->**Start rove receiver**.

### 6.3.1 Measuring Points

Tap **Survey**->**Measure Points**, then you can measure points. After setting all parameter, tap **Mea**. And the point coordinates will be saved in the Job.

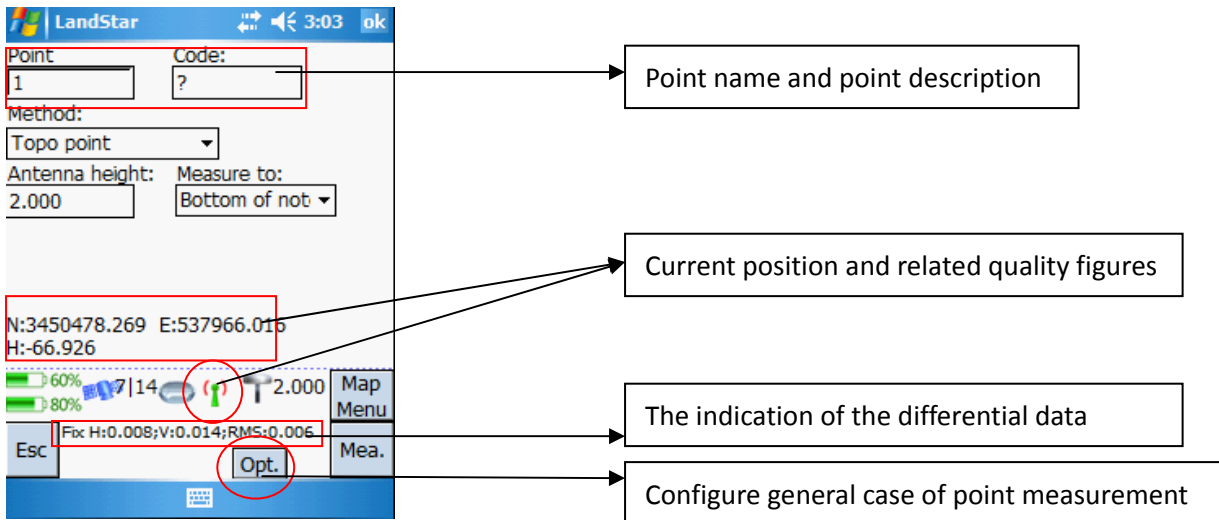


Figure 6.3-1

### 6.3.2 Site Calibration Function and Reset the Grid

#### 6.3.2.1 Site Calibration: Convert the WGS 84 to Local Coordinate

If key in the 3 or 7 parameters when building new job, please skip this step. Otherwise please do **Site Calibration** as follows:

First, measure all the control points, and then key in the local Control point coordinates.

Second, carry out site calibration work. Tap **Survey->Site Calibration** and then click **Add** to add the points being involved in the calibration.

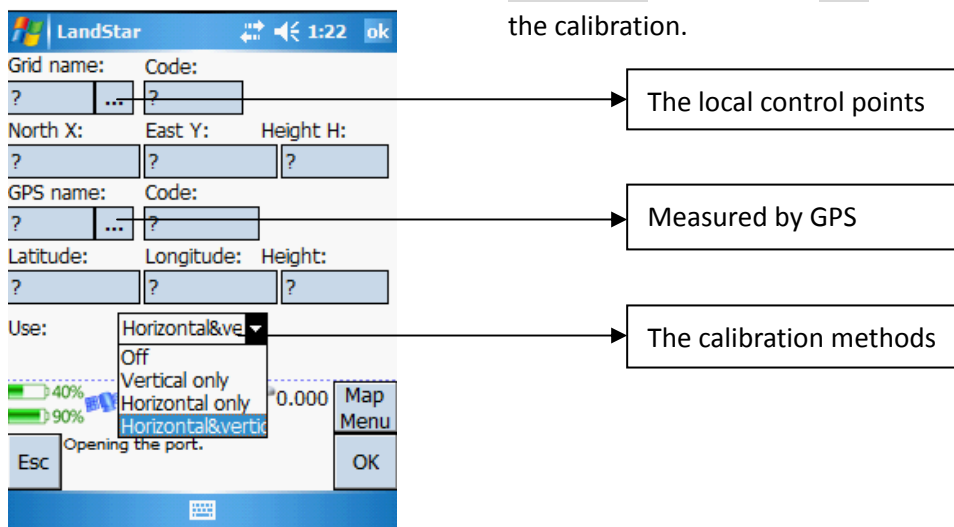


Figure 6.3-2

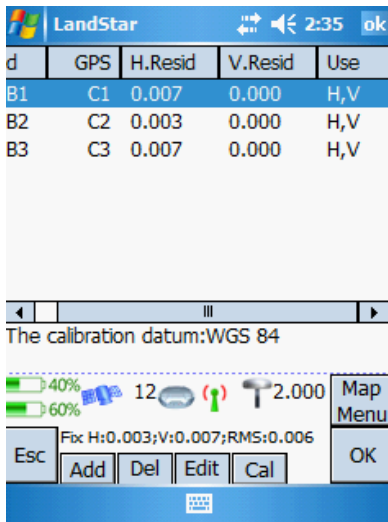


Figure6.3-3

After adding all the points, click **Cal** and the software will calibrate all the points, the "H.Resid" value (3 points appear this value) and "V.Resid" (4 points appear the value).



**CAUTION:** The Max value of H.Resid has to be less than 0.015m  
The Max value of V.Resid has to be less than 0.02m

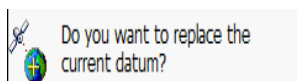


Figure6.3-4

If the Value of "H.Resid and V .Resid" matches the requirement of Max value, click **OK**. Then dialog box "**Do you want to replace the current datum?**" will show up. Click **OK** and finish the step.

### 6.3.2.2 Reset Grid Function

The idea for Reset Grid is to shift the coordinate system to make all the points you survey in the same coordinate system.

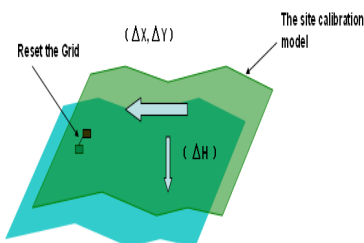


Figure6.3-4

After we do the site calibration or key in the 7 parameter, the relationship between the WGS84 and Local coordinate system is available. But each time when the Base is turned off and turned on, the local coordinate system will shift. For how to solve the problem, we are going to providing solutions based on two kinds of situation.

- If start the Base Station Manually
  - On the Known point, the procedure is in **Survey**-> **Start the Base Receiver** -> Select the base

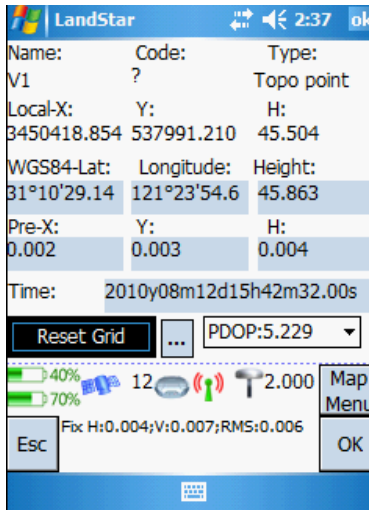


Figure6.3-5

- coordinate from the list, then by clicking **OK**, the Base will start to send differential data.
- On the Unknown point, when the Rover receives the Base correction data and Measure one point, there would be one New Base Coordinate in the Job.
  - In the **File-> Element Manager-> Point Manager**, choose the New Base Coordinate and tap **Reset Grid** Button.
  - Tap **...** button, and select the original Base coordinate.
  - Click **OK**, and then the present local coordinate system is the same as the original local coordinate system.
- If start the Base Station by AUTO BASE
  - Place the Rover on one Known point in the survey area, and Measure the point.
    - In the **File-> Element Manager-> Point Manager**, select the point you have measure (V1 as in the Table 6.3-6) , and double click this point, coming out the Table 6.3-6 page.
    - Tap **Reset Grid** Button.
    - Tap **...** button, and select the point you measured before.
    - Click **OK**. And the coordinate of V1 is the same as that of the located known point.

### 6.3.3 Staking out Points

Prerequisites:

- Uploading the stake out points to the current job (**Appendix D**), and do site calibrations.

There are two kinds of staking out modes, simple mode and complex mode. You can go to **Configuration -> stake type** to select the staking type. Here is the complex mode showing how to stake out points.

Tap **Survey**->**Stake out points**-> **Add** to add points to the points list. Then select the point name you want to stake and tap **Stake**.

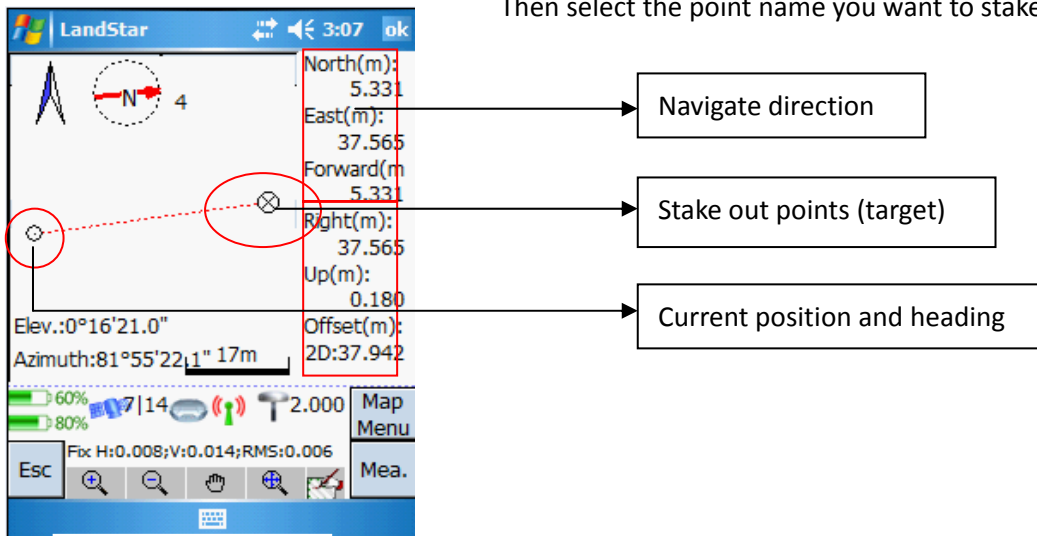


Figure6.3-7

**Near the target:** when you reached the target position exactly, the Landstar will make a sound to show that you are on the target position. If you want to measure this point, tap **Mea.** to log in the coordinates of the point.

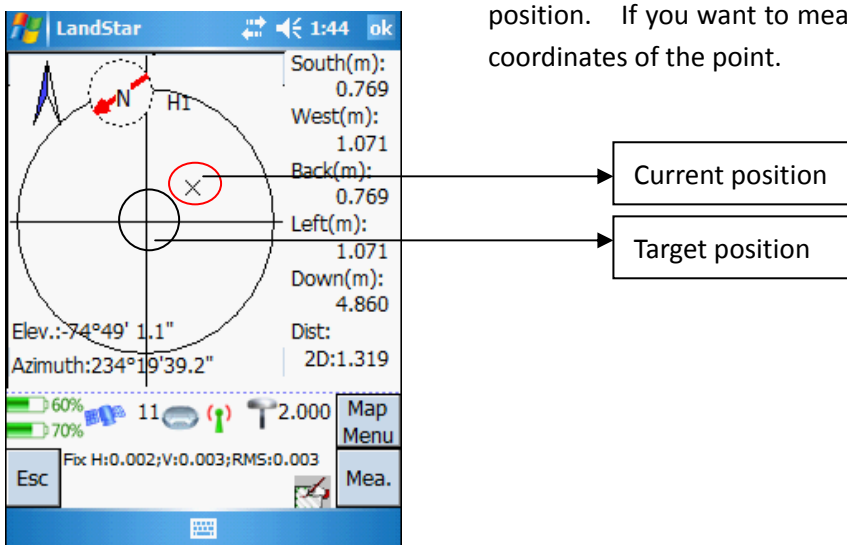


Figure6.3-7

### 6.3.4 Downloading RTK Results to PC

When going back to your office and getting result, please connect the PDA to your PC using the USB cable.

Launch Landstar and open your Job. Then tap **Files**->**Export**->**Grid points** and select the data format of your measuring. After exporting the data, copy the data from PDA to PC and import the data to map software

## Appendix A

### Configuration on DL3 Data Link

#### 1. General specification

Dimension: 23.5cmL X 13cmW X 6.5cmH

Weight: 1.9kg

Communication: RS-232 port

User interface: 1 LED Digital screen

4 Buttons

External power: 12V DC

Baud rate: 4800 9600 19200 bps

Protocol: HuaTuoSat

Frequency bands: 438-470 MHz

RF Transmitter output: 1-20W

Operating temperature: -40 °C -----+65 °C

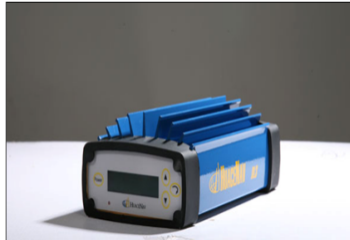
#### 2. Connection

**Radio antenna:** This socket is for fixing HuaTuoSat made antenna on the Radio.

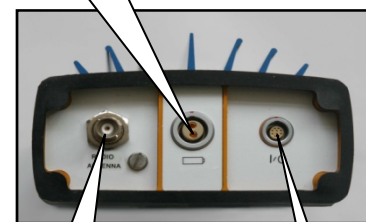
**Car battery:** This socket is for using HuaTuoSat made power cable to link the Radio to the Car battery (insuring the red point match the red point).

**Data:** This socket is for using HuaTuoSat made data cable to link the Radio to the receiver.

**WARNING:** There is sequence for the cables linking to DL3  
Second, please fix the Power cable to the radio  
Third, please fix the data cable to the radio



Appendix A-1

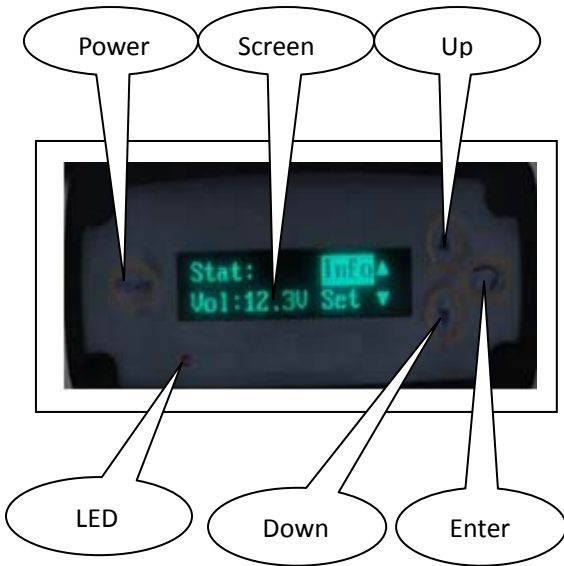


Appendix A-2

Car battery

Radio antenna

Data



Appendix A-3

### 3. Control panel

**Power Button:** When you press this button, the front page will show on the screen

**LED:** This LED will flash once per second when the radio successfully sends out the correction data.

**Screen:** The system information and setting information of the datalink would be showed in the LED screen.

**Up Button:** when you press this button, the cursor on the screen will move up

**Down Button:** when you press this button, the cursor on the screen will move down.

**Enter Button:** when you press this button, it will make the configuration work.

### 4. Configuration



Appendix A-4



Appendix A-5



Appendix A-6



Appendix A-7

When you switch on DL3, you will see this picture

1) Reading the current configuration of Radio

Choosing icon **info** and pressing **Enter**, you will see the current configuration Baud, Mode, P &F, Temp and Version of the Radio.

**CAUTION:** The **info** can be used in the checking after changing the Radio parameters.

2) Setting the configuration of Radio

Choosing icon **Set** and pressing **Enter**, you will see this picture, and then you can start to set up DL3



Appendix A-8



Appendix A-9



Appendix A-10



Appendix A-11



Appendix A-12



Appendix A-13



Appendix A-14



#### A. Baud

Choosing icon **Baud** and pressing **Enter**, you will see 3 Baud rate **4800**, **9600** and **38400**. For HuaTuoSat Rover station, please choose Baud rate **9600** and press **Enter** to make the configuration work.

#### B. Mode

Choosing icon **Mode** and pressing **Enter**, you will see 4 modes, they are **Receive**, **Transmit**, **Relay** and **R&T**, if using Radio to transmit the correction data from Base station to the Rover, please choose **Transmit** and press Enter to make the configuration work.

#### C. Noise

Choosing icon **Noise** and pressing **Enter**, you will see it asking you to find Noise YES or NO to detect where there is one radio station having the same Frequency.

#### D. P & F

Choosing icon **P&F** and pressing **Enter**, you will see **Powset** and **Freset**.

First, choosing **Powset** and pressing **Enter**, setting how much watt you want then press icon **Enter**. For HuaTuoSat DL3 power is from 1W to 20W, and each adding value is 1W.

Second, choosing **Freqset** and pressing **Enter**, please set frequency as xxx.050 then press icon **Enter**.

#### E. LED

Choose icon **LED** and press **Enter**, you will see icon **add** and **sub**, you can choose **add** or **sub** and press **Enter** to regulate the light of screen.

**CAUTION:** After changing the radio settings, please choose Enter to active the setting, otherwise the setting will not come into function.

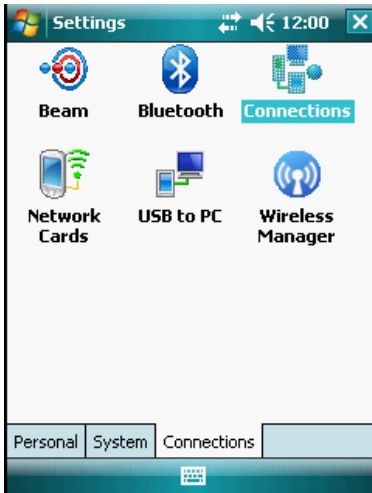


## Appendix B

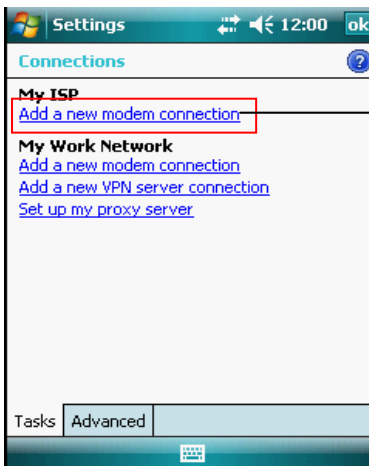
### Recon 400 Link with Cell Phone and Log on the internet

Turn on Bluetooth® of the PDA and cell phone.

Tap **Start**->**Settings**->**Connections**: select **Connections**.

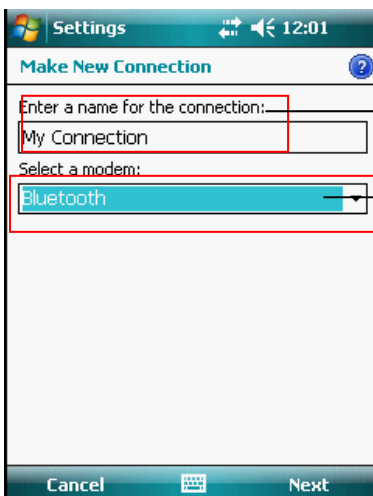


**Appendix B-1**



Tap **Add a new modem connection**

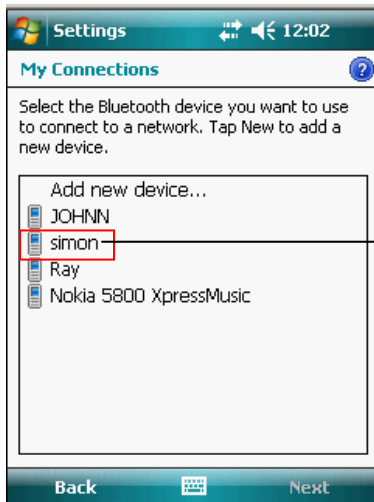
**Appendix B-2**



Key in the name of the Connection

Select the Bluetooth® option

**Appendix B-3**



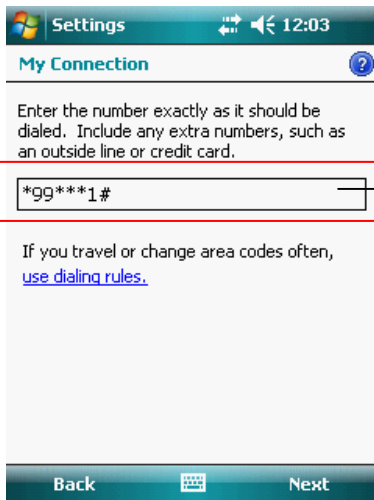
Appendix B-4

Tap **Add new device**, searching the Bluetooth® of cell phone.

After successfully search out the name of cell phone, tap the name and click **Next**.

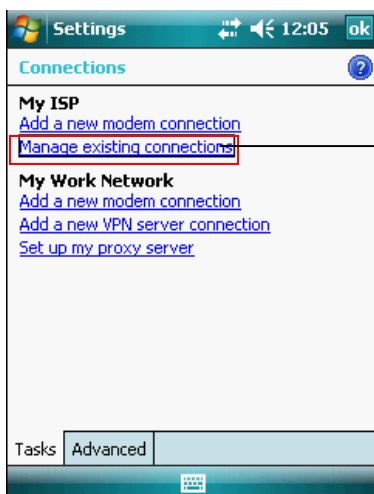
The PDA will inform to key in the password for the connection, so please key in the password for connection.

After keying in the password in PDA, cell phone will inform you to key in the connection password, please key in the same password as you set in your PDA.



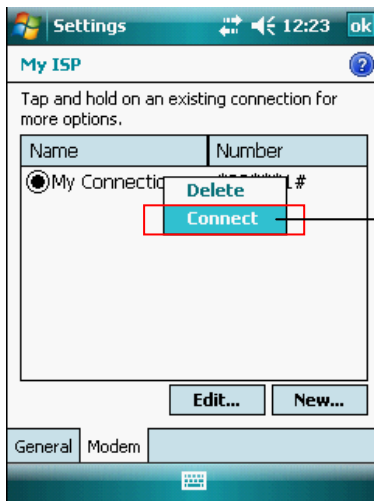
Appendix B-5

Key in \*99\*\*\*1#, click **Next**, tap **Finish** in the next page.



Appendix B-6

Tap **Manage existing connection** and select the connection.



Tap the connection name and select **Connect**. Then PDA will dial number automatically and log on the internet.

## Appendix B-7

## Appendix C

### Import Points to Current Job

In your office, do the following:

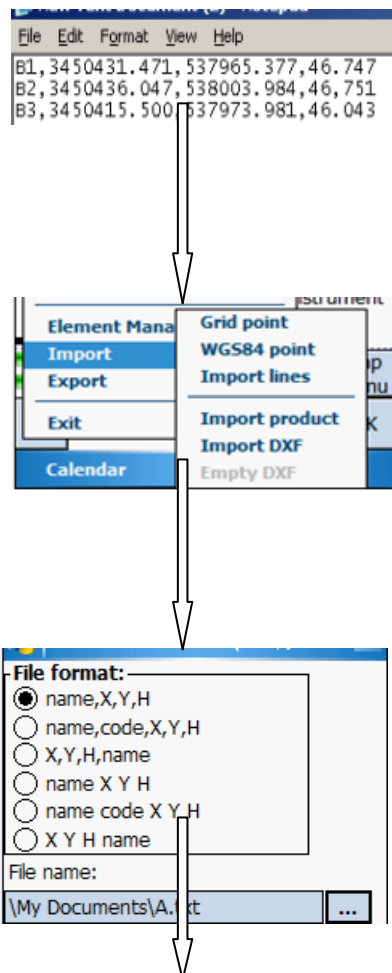
Connect the PDA to your office computer using the USB data cable. Make sure ActiveSync is installed in your computer and is allowed to perform USB connections. If you have not installed ActiveSync, download the latest version from the following web page:

<http://www.microsoft.com/windowsmobile/activesync/default.msp>  
X.

Copy the coordination of the points to your PDA and please copy the data to root directory of PDA.

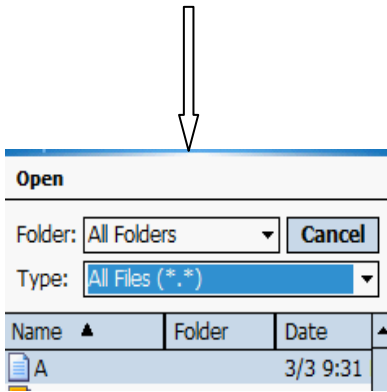
Tap **Survey**->**Import**->**Grid point** (local points coordinate) to select the right format of the points according. Choose the file copied to PDA and click **OK**. After importing the points, go to **Files**->**Elements Manager**->**points manage** and check the points have uploaded to the current Job.

Copy the file to the root fold of PDA.



Import the points.

Select the right format of the points.



**Appendix C-1**

Tap points file.

LandStar				
Name	Code	North	East	H
K...	—	—	—	—
H1		34504...	53799...	4
● B1	?	34504...	53796...	4
● B2	?	34504...	53800...	4
● B3	?	34504...	53797...	4

**Appendix C-2**

Click **Files->Element manager->Point manager**; Check the point in the current Job.