TKO GNSS RTK System Manual

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Manual

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CHAPTER

1

Preface

Chapter Instruction

- Instruction
- Relative Information

Instruction

Welcome. This manual shows the installation, set up and usage of the TKO GNSS RTK system. If you have used other GNSS RTK systems, eGPS Solutions suggests you read this manual carefully to easily understand our TKO GNSS RTK system.

Relative Information

This manual comes on a complimentary CD when purchasing a TKO GNSS Receiver.

CHAPTER

2

Summary

Chapter Introduction

- Introduction
- Products Features
- Usage and Notes

Introduction

The TKO GNSS RTK system has a modern design, enabling users to change into different differential transmission modules such as radio transmission, GPRS and 3G communication functions. The designed self-rectify function automatically checks the working status of all hardware and software of the TKO receiver, and signals any issues through its intelligent voice messenger.

The data collection controller can be connected to the receiver mainframe via Bluetooth or cable. The built-in high-capacity battery is suitable for several hours of field work. Static data can be stored in the built-in memory card of the receiver and downloaded via USB port to your PC.

Note: 1. The TKO GNSS RTK system has several modules. This manual does not represent a standard configuration. Users should assess their own requirements for different configurations due to different applications.

2. Before using, we suggest users check whether the package box is damaged and that inner items match with the order list. If there are some missing or damaged parts and accessories, please contact your local distributor or eGPS Solutions immediately.

3. Carefully read this manual before carrying, handling and using!

Product Features

1. BD970 mother board of Pacific Crest, a Trimble Company, multi-satellite, multi-system kernel.
2. Built-in transmit-receive UHF, exchangeable Base and Rover.
3. The radio power is adjustable to 0.1w, 0.5w or 1.0w.
4. 1+X multi-module communication units.
5. PCC Radio module (optional) compatible with Trimble, Leica, Satzel and other 450-470 mHz radios.
6. Double battery capacity of 4400mAh for 12 hours of RTK continuous operation.
7. The highest performance in waterproof, dustproof and anti-drop protection.

Usage and Notes

Although the TKO receiver is made of impact resistant material, caution should be used with chemical agents. Proper care and maintenance is still required for such a precise instrument.

Warning: The receiver must be used and stored at the specified temperature. See Chapter 7: Technical Parameters / Environment for details.

To ensure the quality of continuous tracking of satellites and signals, surveying work should be in open areas with no obstacles above a 15 ° mask angle. In order to reduce all kinds of electrical interference to the GNSS satellite signals, there should be no strong electrical interference within 200m, such as television towers, microwave stations or high voltage transmission lines. In order to avoid or reduce the occurrence of multi-path, stations should be clear of terrain or geographical objects that will adversely affect the electrical signals, such as high-rise buildings or large bodies of water.

CHAPTER

3

Receiver Introduction

Chapter Introduction

- Introduction
- Receiver Appearance
- Control Panel
- Upper Cover
- Lower Cover
- Communication Module
- Battery
- Environmental Requirement
- Electric Interference

Introduction

This Chapter introduces the TKO receiver appearance, buttons and indicator leds.

Receiver

The receiver includes four parts: upper cover, lower cover, guard collar and control panel; see Figure 3-1:

Figure 3-1 Receiver

Control Panel

The control panel is located in the red frame of Figure 3.2. The control panel contains the F1 key (function key 1), F2 key (function key 2) and the power button. The three indicators include a satellite led, status led (dual-color) and power led (dual-color). These three buttons include all of the features and settings of the TKO receiver and are listed below.

Figure 3-2 control panel

satellite led (green)

status led (red-green dual-color)

power led (red-green dual-color)

Function Key: sets working mode, UHF radio transmitting power, satellite elevation angle, base, rover and static modes and resets receiver.

Function Key: sets data link, UHF radio channels, collection interval and back to original setting.

ON-OFF power key: settings confirmation and automatic base setting.

Upper Cover

Figure 3-3 shows the upper cover of the TKO receiver for anti-drop and anti-scratch protection.

Figure 3-3 Top Cover

- Raised Point: anti-wear point to avoid instrument scratches
- Raised Plate: Five raised plates for wear and fall protection

Lower Cover

Figure 3-4 shows the lower cover of the TKO which includes the communication module slot, SIM card slot, battery groove, five-pin port, eight-pin port and speaker.

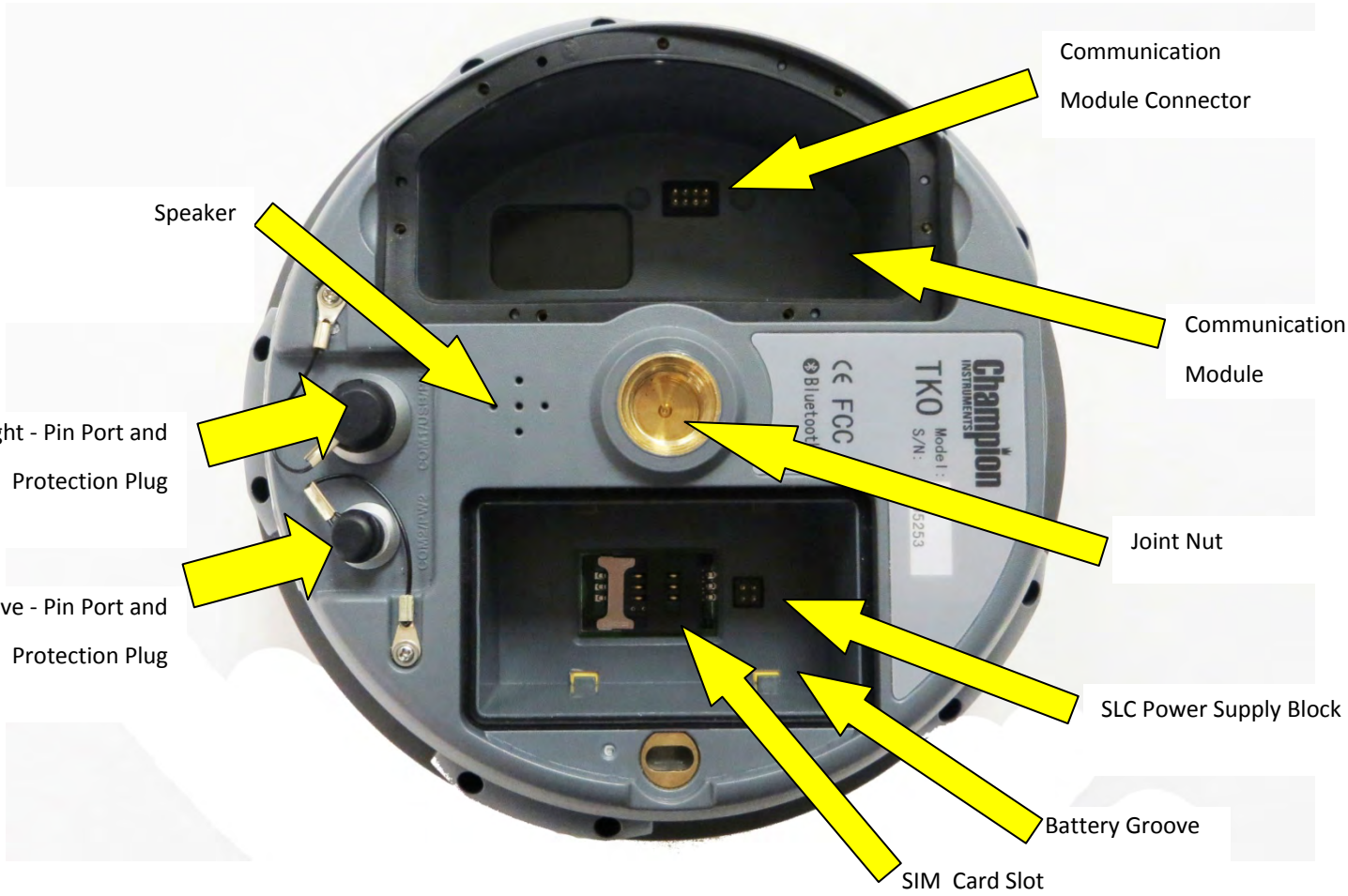


Figure 3-4 Lower Cover

- Communication Module: A traditional UHF radio, GPRS or 3G communication module can be chosen
- Communication module connector: connect communication module and mainframe
- Battery Groove: for a 4400mAh li-ion battery
- SLC Power Supply Block: connects li-ion battery and mainframe
- Five-pin port: connects mainframe with external data link or with external power supply

- Eight – pin port: connects TKO receiver with computer or controller for data download
- Protection Plug: anti-dust and waterproof for ports
- SIM card slot: used for GSM communication
- Joint Nut: affixes instrument with tribrach and centering pole.
- Speaker: voice broadcast for real-time operation and status.

Note:

1. For waterproof and dustproof protection, affix rubber plugs on the five-pin, eight-pin and differential antenna ports when not in use.

2. The speaker may become silent or sound hoarse in cases of excessive moisture. This will return to normal after drying.

Communication Module

Figures 3-5 and 3-6 show the communication module. The TKO receiver can be installed with a traditional UHF radio, GPRS or 3G communication module.

Figure 3-5 Communication Modem

Figure 3-6 Communication Modem

Battery

Figures 3-7 and 3-8 indicate the appearance of the 4400mAh li-ion Battery.

Figure 3-7 Battery Front

Figure 3-8 Battery Back

Environmental Requirement

Even though the TKO receiver uses waterproof materials, proper care and maintenance is important. In order to improve the stability and duration of the receiver, avoid exposing it to extreme environments such as:

- Moisture
- temperatures higher than 65 degrees C
- temperatures lower than -40 degrees C
- corrosive liquid or gas

Electrical Interference

Do not place the GNSS receiver near a strong power interference signal source such as:

- television or computer monitors
- generators
- electric motors
- DC-AC power conversion equipment
- fluorescent lights
- power switches

CHAPTER

4

General Operations

- Introduction
- Button Functions
- Led Status Instructions
- Turn On/Off Receiver
- Static Data Storage
- RTK Data Storage
- Reset Receiver
- Back to Original Settings
- Format Receiver
- Power Supply System
- Communication Module
- SIM Card/ USIM Card
- Firmware

Introduction

Most of the operations of the TKO receiver are achieved by the three buttons on the mainframe panel.

Buttons on the panel:

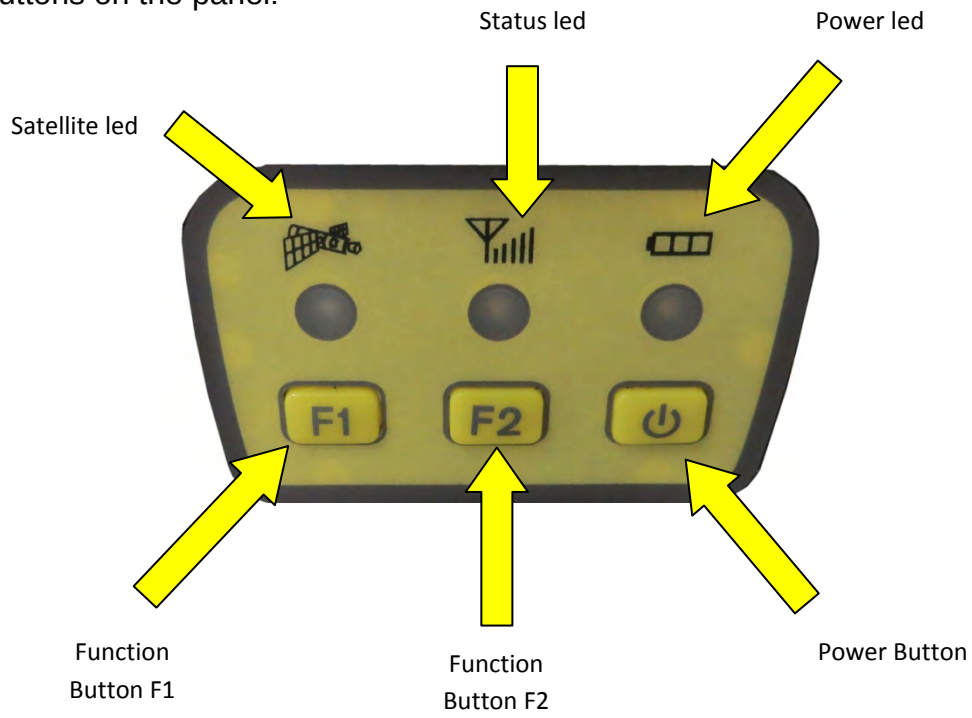


Figure 4-1 Mainframe Panel

Button operation and leds:

Operation	Explanation
Single click	Press a button less than 0.5 seconds
Double click	Double click the button with the clicking interval between 0.2 to 1 seconds
Long press	Press button more than 3 seconds until “ding dong”
Super long press	Press button more than 6 seconds until 2nd “ding dong”
Slow flash led	Flashing interval more than 0.5 seconds
Fast flash led	Flashing interval less than 0.3 seconds

Button functions

Setting		Button operations	Introduction
Work mode		Double click F1	Then single click F1 to choose the receiver work mode "base", "rover" or "static"
Data link		Double click F2	Then single click F2 to choose the data link between "GSM", "UHF" or "External"
UHF mode	Power	Long press F1 until "ding dong"	Then single click F1 to set the transmit power to high, middle or low
	Channel	Long press F2 until "ding dong"	Then single click F1 to choose channel by minus 1; or you can long press F1 to choose channel by minus 10;or single click F2 to choose channel by plus 1; or you can long press F2 to choose channel by plus 10
Static	Elevation angle	Long press F1 until "ding dong"	Single press F1 to set elevation angle to 5 degrees, degrees,10 degrees or 15 degrees
	Collection interval	Long press F2 until "ding dong"	Single press F2 to set collection interval to 1s,5s or 10s
Confirm setting		Single press power button	Then receiver will state its current work mode, data link, radio transmit power or channel; meanwhile the power led will flash to indicate its power status
Auto-set base		F1+Power button to turn on receiver	Press F1 and power button together to turn on receiver until hearing "Dingdong". Receiver then speaks its current status.
Reset receiver		Long press F1 until "ding dong"	Reset the mother board
Back receiver to original settings		Long press F2 until "ding dong"	Then it will automatically rectify, correct and reset to the original settings.
Check correct work status		Single click any button in non-settings status	**For static mode:** receiver speaks out "static", collection interval, elevation angel; at the same time the power led flashing times indicate the power status while the satellite's led flashing times show the number of tracked satellites.

		For base in external mode: receiver speaks out "external, base"; at the same time the power led flashing times indicates the power status **For rover in external mode** : receiver speaks out "external, rover"; at the same time the power led flashing times indicates the power status **For base in internal UHF:** receiver speaks out "UHF, base, channel **, power *"; at the same time the power led flashing times indicates the power status **For rover in internal UHF:** receiver speaks out "UHF, base, channel"; at the same time the power led flashing times indicates the power status **For base in GSM mode**: receiver speaks out "GSM, base"; at the same time the power led flashing times hints the power status **For rover in GSM mode:** receiver speaks out "GSM, rover"; at the same time the power led flashing times indicates the power status
Upgrade mother board	Super long press the power button until 2nd "ding dong"	Enter mother board upgrading

Led Status Instructions

Led	Instruction	
Power led (yellow)	Always on	In normal power pressure: inner power supply >7.6V, outer power supply>12.6V
Power led (red)	Always on	In normal power pressure: 7.2V < inner power supply ≤7.6V, 11V < outer power supply ≤12.6V
	Slow flash	Low power-pressure: inter ≤7.2V external ≤11V
	Fast flash	Power status hints: once or four times per minute
Status led (F2) (green led for status)	Off	In external data link, UHF mode, and static mode
	Always on	GSM module has been connected to internet server successfully
	Slow flash	GSM module has been connected to internet successfully
	Fast flash	GSM module is trying to connect to internet server
Data led (F2) (red led for status)	Slow flash	1. getting correction data via GSM or radio (only receiving corrections for rover while transmitting for base) 2. collection of static data in static mode
	Fast flash	Error in static mode (typically for no more flash memory)
	Always on	Communication module data collection error resulted by problem in module so that no data output
Satellite led (F1) (green)	Always on	Tracking more than 4 satellites successfully
	Slow flash	Loss of satellites and try re-track
	Off	1. mother board error resulting in no data output while resetting receiver 2. mother board error resulting in no data output while in static mode

Led displays in different modes:

1. **Work Mode** (double click F1 to enter work mode setting, then single click F1 to choose work mode among static, rover and base. Single click the power button to confirm the current setting. If no confirmation is given within 10 seconds, the receiver will automatically confirm the current settings.

●on ❍off

Mode	Satellite led (F1) (green led)	Status led (F2) (green led of the dual-color led)
Base	●	❍
Rover	❍	●
Static	●	●

2. Data Link (double click F2 to enter the data link setting, then single click F2 to choose from GSM, UHF or external. Single click the power button to confirm the current setting. If no confirmation is done within 10 seconds, the receiver will automatically confirm the current settings.

●on ❍off

Data link	Satellite led (F1) (green led)	Status led (F2) (green led of dual-color led)
UHF/GSM/External module	●	❍
Internal GSM	❍	●
External	●	●

3. **Transmitting Power** (must be set in UHF mode) Long press F1 until the “ding dong” to enter the power transmitting setting, then single click F1 to choose among high, middle and low. Single click the power button to confirm. If no confirmation is done within 10 seconds, the receiver will automatically confirm the current setting.

●on ❍off

Choice	Satellite led (F1) (green led)	Status led (F2) (green led or dual-color led)
low	●	❍
middle	❍	●
high	●	●

4. Radio Channel (must be in UHF mode). Long press F2 until the “ding dong” to enter the radio channel setting. Then single press F1 to choose a channel by minus 1; or long press F1 to choose a channel by minus 10. Single click F2 to choose a channel by plus 1; or long press F2 to choose a channel by plus 10. Single click the power button to confirm. If no confirmation is given within 10 seconds, the receiver will automatically confirm the current settings.

●on ❍off

Channel	Satellite led (green led) (F1)	Status led (green led of dual-color led) (F2)	Data led (red led of dual-color led) (F2)	Power led (red led of dual-color led)	Power led (green led of dual-color led)
0	❍	❍	❍	❍	❍
1	●	❍	❍	❍	❍
2	❍	●	❍	❍	❍
3	●	●	❍	❍	❍
4	❍	❍	●	❍	❍
5	●	❍	●	❍	❍
6	❍	●	●	❍	❍
7	●	●	●	❍	❍
8	❍	❍	❍	●	❍
9	●	❍	❍	●	❍
10	❍	●	❍	●	❍
11	●	●	❍	●	❍
12	❍	❍	●	●	❍
13	●	❍	●	●	❍
14	❍	●	●	●	❍
15	●	●	●	●	❍
more	❍	❍	❍	❍	●

5. Elevation Angle (must be in static work mode). Long press F1 until the “ding dong” to enter the elevation angle setting. Then single click F1 to choose the elevation angle. Single click the power button to confirm. If no confirmation is done within 10 seconds, the receiver will automatically confirm the current settings.

●on ❍off

Choice	Satellite led (green led)	Status led (green led of dual-color led)
5	●	❍
10	❍	●
15	●	●

6. Collection Interval

(must be in static work mode). Long press F2 to enter the collection interval setting. Then single click F2 to choose the collection interval. Single click the power button to confirm. If no confirmation is done within 10 seconds, the receiver will automatically confirm the current settings.

●on ❍off

Choice	Satellite led (green led)	Status led (green led of dual-color led)
1	●	❍
5	❍	●
10	●	●

Turn On/Off Receiver

Turn on	Press power for 1 second	All leds on	Music sounds and the receiver speaks out the last settings of work mode, data link, etc.
Turn off	Long press power button for 3 seconds	All leds on	Music Sounds

Static Data Storage

The GNSS static data collected by the TKO receiver will be stored in its 64M memory in *.ZHD format.

You can connect the TKO receiver to a PC via USB port of the Y cable included in the package and copy the static data to your PC.

Note:

In case of no more memory, the (F2) data led (red led) will be flashing fast while current static data collection is stopped.

RTK Data Storage

The Scepter data collector can be connected with the TKO RTK receiver via bluetooth. RTK data will be stored in the controller.

After the fieldwork is finished, connect the controller to the PC with the Scepter cable to download. eGPS Solutions recommends Carlson SurvCE and Microsurvey Field Genius software for RTK surveys.

Reset Receiver

Super long press the F1 button until the 2nd “ding dong” to reset the mother board.

Warning:

Resetting the receiver will lengthen the next time it takes to track satellites. Additionally, the receiver work mode will need to be reset.

Back to Original Settings

Super long press F2 until the 2nd “ding dong” to go back to the original settings. Below are original settings in different modes:

Work mode	Original settings
Static	Elevation angle: 10° collection interval: 5 seconds
Data link mode	External
GSM	APN: CMNET Network: ZHD communication mode: GPRS IP: 202.96.185.34 Port: 9000 User group: 0020001 User ID: 001

Warning:

Changing back to original settings will erase all of your current settings.

Format Receiver

Format the TKO receiver using TKO Receiver Management Software:

1. connect the TKO with a PC by serial port of the Y data cable
2. turn on the TKO receiver
3. choose the correct serial port and open port
4. after the connection is successful, the S/N will be shown – see Figure 4-2
5. click “Format/Delete All” to format the receiver.
   After this operation, all current data will be deleted forever.

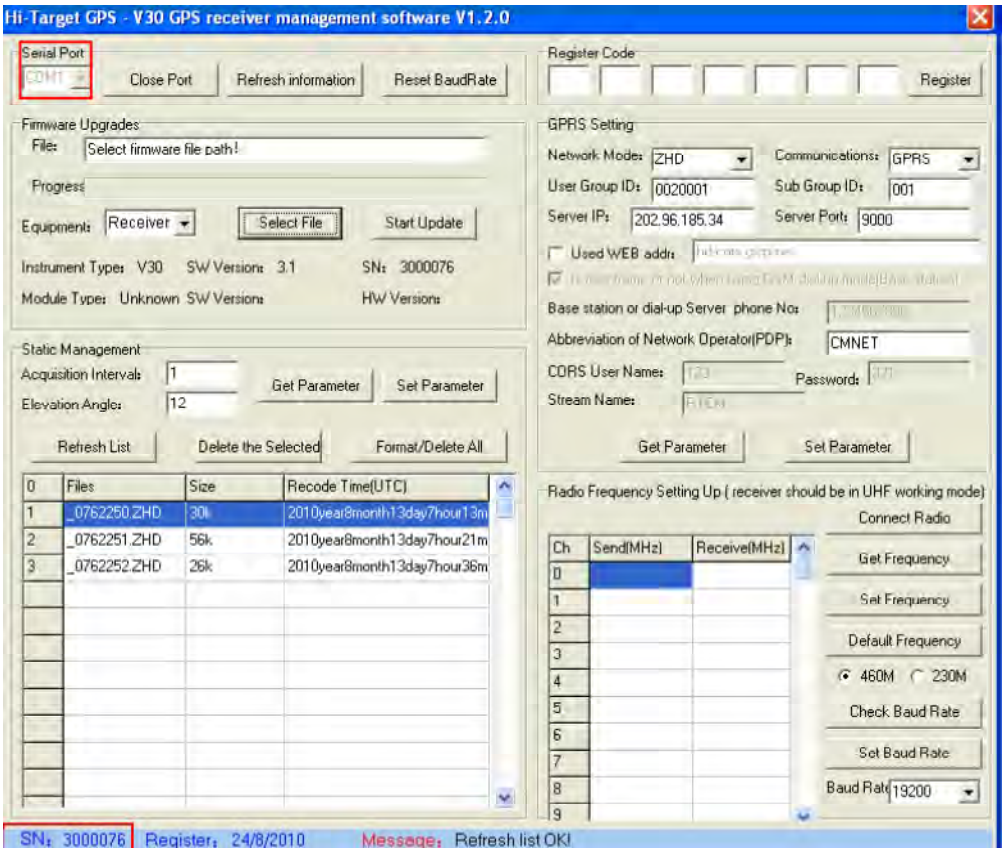


Figure 4-2

Warning:

Backup all useful data before formatting the receiver because all data will be deleted forever .

Power Supply System

- **Assembly and Disassembly of Battery Cover**

  Assembly:

  1. First insert tab side

Figure 4-3

  2. Turn the metal lock by 90° to the panel side and press it to lock.

Figure 4-4

Disassembly:

1. Pull the metal lock up and turn counterclockwise 90°

Figure 4-5

2. Pull the metal lock to open the battery cover

Figure 4-6

- **Install and Uninstall the Battery**

  Battery Install:

  1. Match with the in the battery slot to insert the battery.

Figure 4-7

2. Slide the battery toward the “Close” end (see red arrow) to install.

Figure 4-8

Uninstall:

Slide the battery toward the “Open” end and then pull out the battery.

Figure 4-9

- **TKO Receiver Battery Name and Model**

Name	Model
4400mAh lithium battery	BL-4400
TKO lithium battery charger	CL-4400

- **Power Supply**

Power supply	Type	1. lithium battery 2. eight-pin port and five-pin port on the mainframe for external power supply
	Range	6V ~ 36V

If using an external power supply for the TKO via the eight-pin port or five-pin port on the mainframe, the power supply should be 6 ~ 36V with at least 500 mAh of current.

When using both li-ion and external power supplies, the receiver will choose the higher one.

Use the specified external power supply from eGPS to avoid any damage to the receiver power.

Note: Typically one TKO li-ion battery lasts 8 hours for static at 5 second epochs, 8 hours for network RTK with an external modem, 6 hours RTK with an internal modem and 3 hours for base transmission mode at 1 watt output. The internal UHF radio is 1 watt maximum. It can be set for 100 milliwatts, 500 milliwatts or one full watt of power. Times will decrease in very low temperatures or as the batteries age.

- **Charging batteries**

The BL-4400 li-ion battery must be charged in the specified CL-4400 Champion charger for about 6 hours. The charger indicator led will be red while charging, then green and finally off when charging is finished.

Figure 4-10

- **Charging Operations**

1. Insert the battery matching the end of battery with of the charger.

Figure 4-11

2. Slide the battery toward the “Close” end (see above arrow) until the battery is locked.
3. After connecting the charger with the power supply, the “Charging” led becomes red.

Warning:

1. **Use only the eGPS specified charger. Do not put batteries into fire.**
2. **Stop using the battery if overheating, leaking or bad smells occur while charging or using the battery.**

Communication Module

- Module type:

Module type	Instruction
GM-46V/ GM-46F	460MHz radio, compatible with V9 UHF
GM-46PV/ GM-46PF	430MHz ~470MHz radio, compatible with Trimble, Leica
GM-46XV/ GM-46XF	460MHz radio
GM-200V/ GM-200F	GPRS, dual-band in 900/1800MHz
GM-200GV/ GM-200GF	GPRS, four-band of 850/900/1800/1900MHz
GM-300V/ GM-300F	3G WCDMA, dual-band in 900/1800MHz
GM-300GV/ GM-300GF	3G WCDMA, four-band of 850/900/1800/1900MHz

- **Install and Uninstall Communication Modules**

  Communication modules include the radio module and GPRS/3G module.

Figure 4-12 Radio module

Figure 4-13 GPRS/3G module

Install:

1. Put the module into the module slot.

Figure 4-14

2. Screw in the 7 screws with the Champion specified screw driver.

Figure 4-15

Note:
Please use only the specified screw driver from eGPS Solutions!

Uninstall:

Unscrew the module slot and pull out the module.

- **Radio Channel Setting**

  For the GM-46V/ GM-46F radio of 455~465MHz or 440~450MHz, which is compatible with V9, there are 100 available channels for the GM-46PV/GM-46PF radio of 430~470MHz, which is compatible with Trimble/ Leica, there are 32 available channels; for the GM-46XV/ GM-46XF radio of 400~470MHz, there are 40 available channels.

  There are two methods to set the radio frequency:

  1. long press the F2 button on the TKO mainframe until the “ding dong” or;
  2. use the Hi-Target software while connected to the controller

Note:

1. The rover channel must be the same as the base channel.

2. For less interference, use the channel in a good environment.

   The following is recommended to find a good channel:

   - set the rover radio channel
   - check the data led on the rover mainframe. A flashing red led indicates there is some other transmission data on the channel. Use another radio channel until you find one with no flashing red led.
   - set the base to the same radio channel and start your work

SIM Card/ USIM Card

A SIM card or USIM card can be used in the TKO:

USIM Card	WCDMA (Champion/VRS)
	GPRS (Champion /VRS)
	GSM
SIM Card	GPRS (Champion /VRS)
	GSM

- **Install Wireless Communication Card**

For a built-in GPRS SIM card:

1. Take off the battery cover and remove the battery to see the SIM card slot.

Figure 4-16

2. Pull up the metal fix for the SIM card

Figure 4-17

3. Insert the SIM card:

Figure 4-18

4. Press the metal SIM card fix down and lock it

Note:

A 3G card can also be installed here, but only for 2G application.

Firmware

- **Firmware upgrade**

There are two kinds of upgrades for the TKO:

1. mainframe upgrade

2. communication module upgrade

Except when choosing “upgrade device”, all other operations are the same. The different choices are shown below:

Figure 4-19

Steps for upgrade:

1. connect the TKO with the PC by serial port of the Y data cable
2. turn on the TKO receiver
3. choose the correct serial port and open port
4. after the connection is successful, the S/N will be displayed below
5. choose the upgrade device “receiver” or “module” and click “select file” to find the firmware file on your PC

Warning:

The firmware file must be named *.98.htb or the upgrade will fail.

1. Click “upgrade” and then refer to the software hints: turn off receiver and turn on again.
2. The upgrade is in progress while the three leds on the mainframe panel are flashing.
3. The software will state successful upgrading. Restart the receiver to complete the firmware upgrade.

CHAPTER

5

Configuration of Fieldwork

Introduction

- Introduction
- Diagram of base setup
- Diagram of rover setup
- Fast Operation Guide

Introduction

In this section, ease of use and TKO RTK GNSS working setups are introduced.

Diagram of base setup

Figure 5-1 Base setup with built-in GPRS/3G

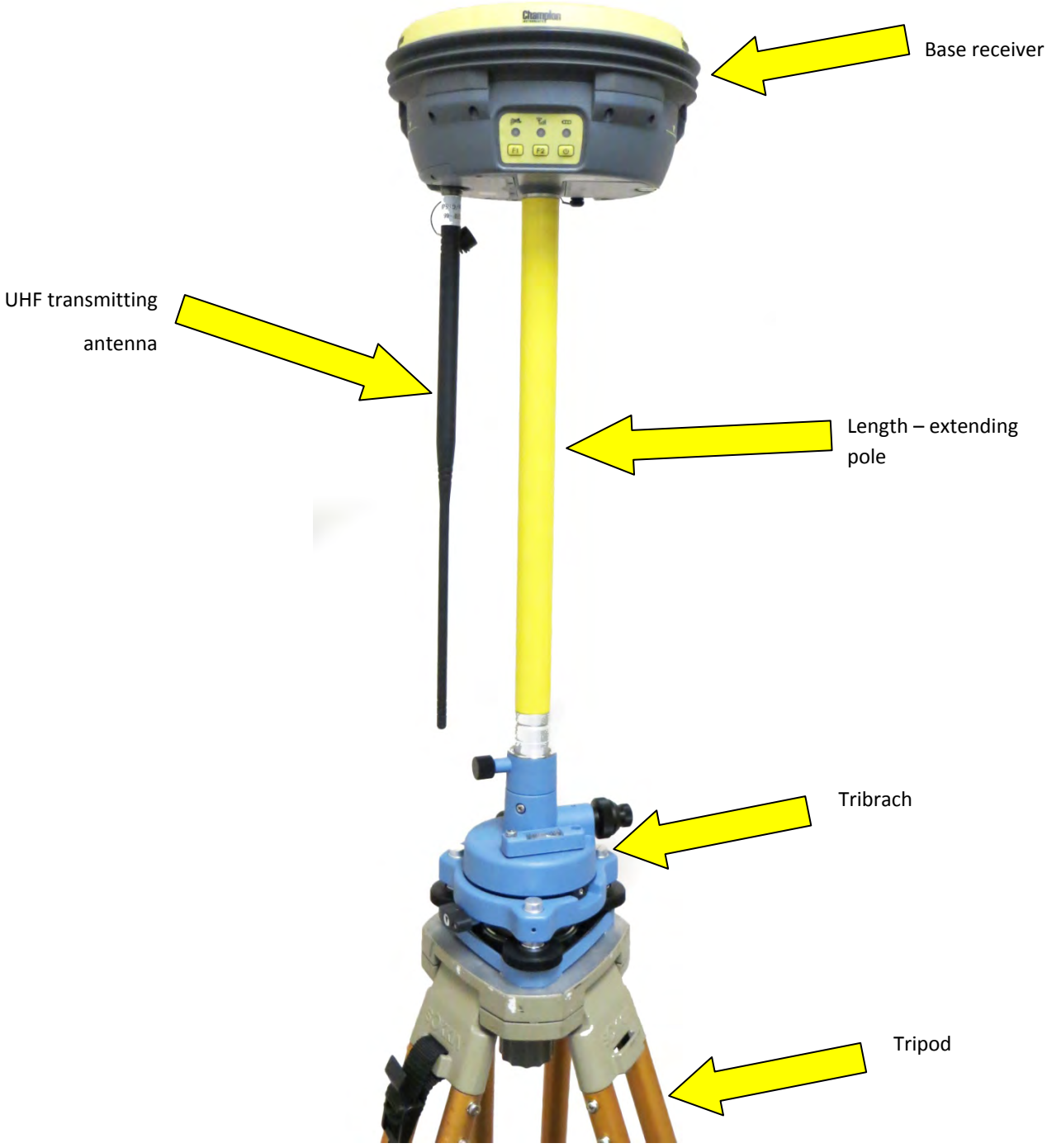


Figure 5-2 Base setup with built-in UHF Radio

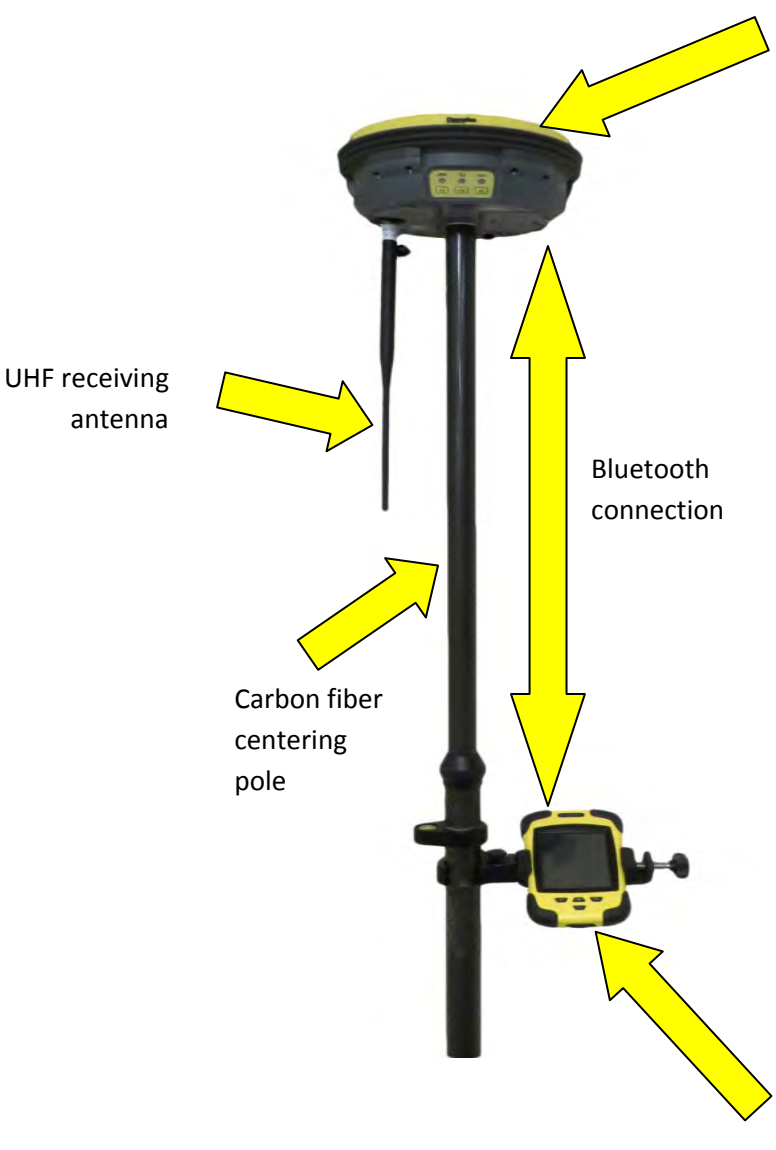


Figure 5-3 UHF rover

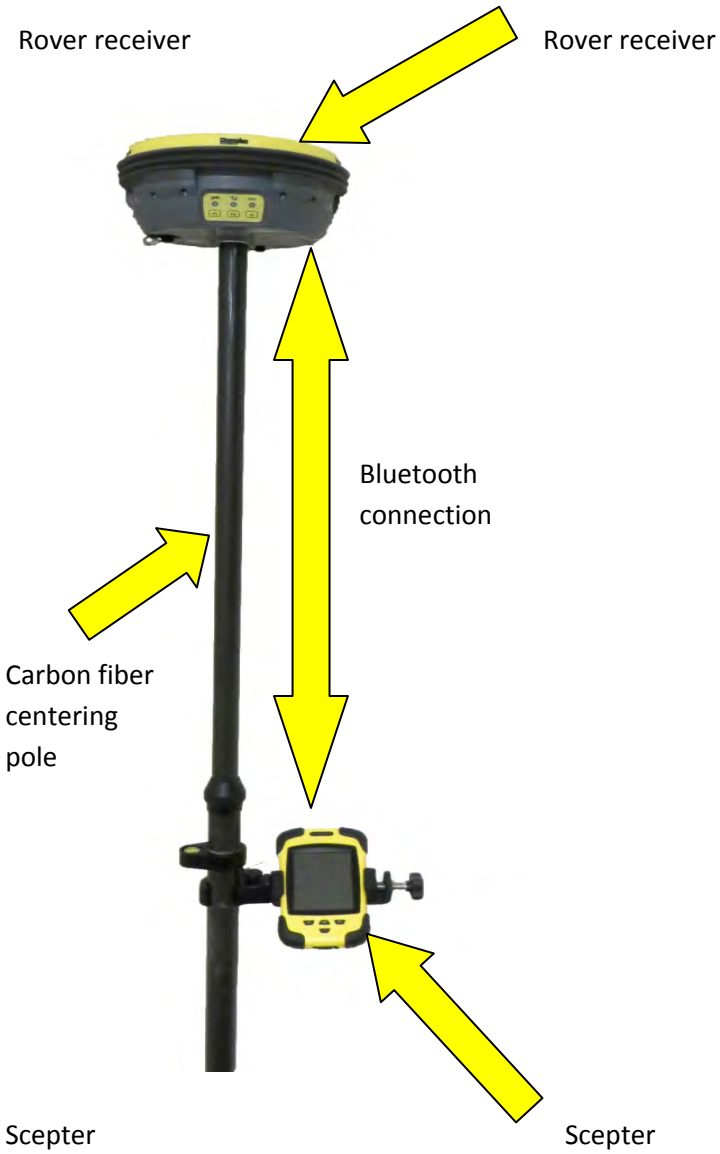


Figure 5-4 GPRS/3G rover

Quick Setup

- **Rover or base mode with built-in GPRS/GSM or GPRS/3G module.**

1. Set base/rover

   Double click F1 with the voice prompt “base”, “rover” or “static” and choose the working program. Press the power button to finish the setting.

2. Set GSM data link

   Double click F2 with the voice prompt to choose the data connection mode: UHF, GSM, external radio. Choose GSM mode and press the power button to set it.

3. Set GPRS

   Please refer to the “Preparing SIM for TKO How-to–Guide in the appendix of this manual.

- **Base or rover mode with UHF radio module**

1. Set base/rover

   Double click F1 with the voice prompt “base”, “rover” and “ static” and choose the working program. Press the power button to finish the setting.

2. Set UHF data link

   Double click F1 with the voice prompt “UHF”, “GSM” and “External radio” to choose the mode of data link (both base and rover are UHF mode). Press the power button to finish the setting.

3. Set UHF radio channel

   Hold the F2 button until the “ding dong” to choose the channel and press the power button to set it.

Note:
The base and rover must be set to the same channel in order to receive the signal.

The differential signal is being transmitted when the red led is flashing once per second. The rover has received the signal when the red led on the rover is flashing synchronously once per second. RTK work can now be started. If the rover led (red) does not flash, it has not received the differential signal.

4. Set the radio power:

   When the working distance becomes farther, the radio power of the base can be changed through the control panel. Use the UHF data link mode at the base station. Hold the F1 button until the “ding dong” and with voice prompts: high, medium or low.

- **Base or rover mode with external data link.**

1. Set base/rover:

   Double click F1 with the voice prompt “base”, “rover” and “static” and choose the working program. Press the power button to finish the setting.

2. Set GSM data link:

   Double click F2 with the voice prompt “UHF”, “GSM” and “External” and select the mode of data link. Choose external mode for the base and UHF for the rover. Press the power button to finish the setting.

3. Setting the base radio channel to external data link:

   Set the external UHF radio to the correct channel.

4. Setting the UHF rover radio channel:

   Hold the F2 button until the “ding dong” and voice prompts to choose the channel. Press the power button to finish the setting.

CHAPTER

6

Static Collection and Data Transmission

Introduction

- Introduction
- The procedure of TKO static survey
- Download data with pan drive
- Management software operation for Static Survey

Instruction

The TKO receiver can be used as a dual-frequency static surveying instrument. Double click F1; when the satellite led and status led are on, press the power button to finish the setting. The red status led flashes once while collecting an epoch (depends on the sampling interval setting). The collected static survey data is saved on the memory card in the receiver. The static survey data have to be downloaded to the PC with post-processing software to be processed.

The procedure of TKO static survey

1. Level up the instrument over a control point.

2. Measure the height of the instrument three times, taking the average of the three. The height of the instrument is defined from the control point to the bottom of the antenna mount. The antenna radius of the TKO receiver is 0.087 meter; the height of the phase center is 0.101 meter.

Figure 6-1 Instrument height measure point

3. Record point name, instrument S/N, instrument height and observed initiated time.

4. Turn on the instrument and set the main frame to static mode. A satellite flashing led means the instrument is searching for satellites. The position is fixed once the satellite led turns solid. The status led flashes due to the set collection interval. The default collection interval is 5 seconds, which means an epoch will be collected every 5 seconds. In static mode, the receiving led is off.
5. Power off the instrument after the static survey is done and record the turn-off time.
6. Download and post-process the data.

Note:

Do not move the tribrach or change the collection set while the instrument is collecting data.

Download data with a pan drive

The TKO saves the files within a pan drive in file management so you can download the files by dragging and dropping them. Only static survey data can be downloaded.

The data of the TKO receiver can be downloaded with a pan drive using the Y data cable, by connecting one side to the PC USB port and the other to the 8-core jack of the main frame. Once connected, the RTK TKO new disk symbol shows up in the PC as the pan drive and you can copy the files directly.

Note:

The serial port cannot be downloaded in the pan drive, in order to delete static data from the TKO receiver.

Management software operation for static survey

Main functions of the TKO receiver static file management software:

- Delete original data
- Delete and format the entire memory
- Get parameters
- Set parameters
- Refresh information

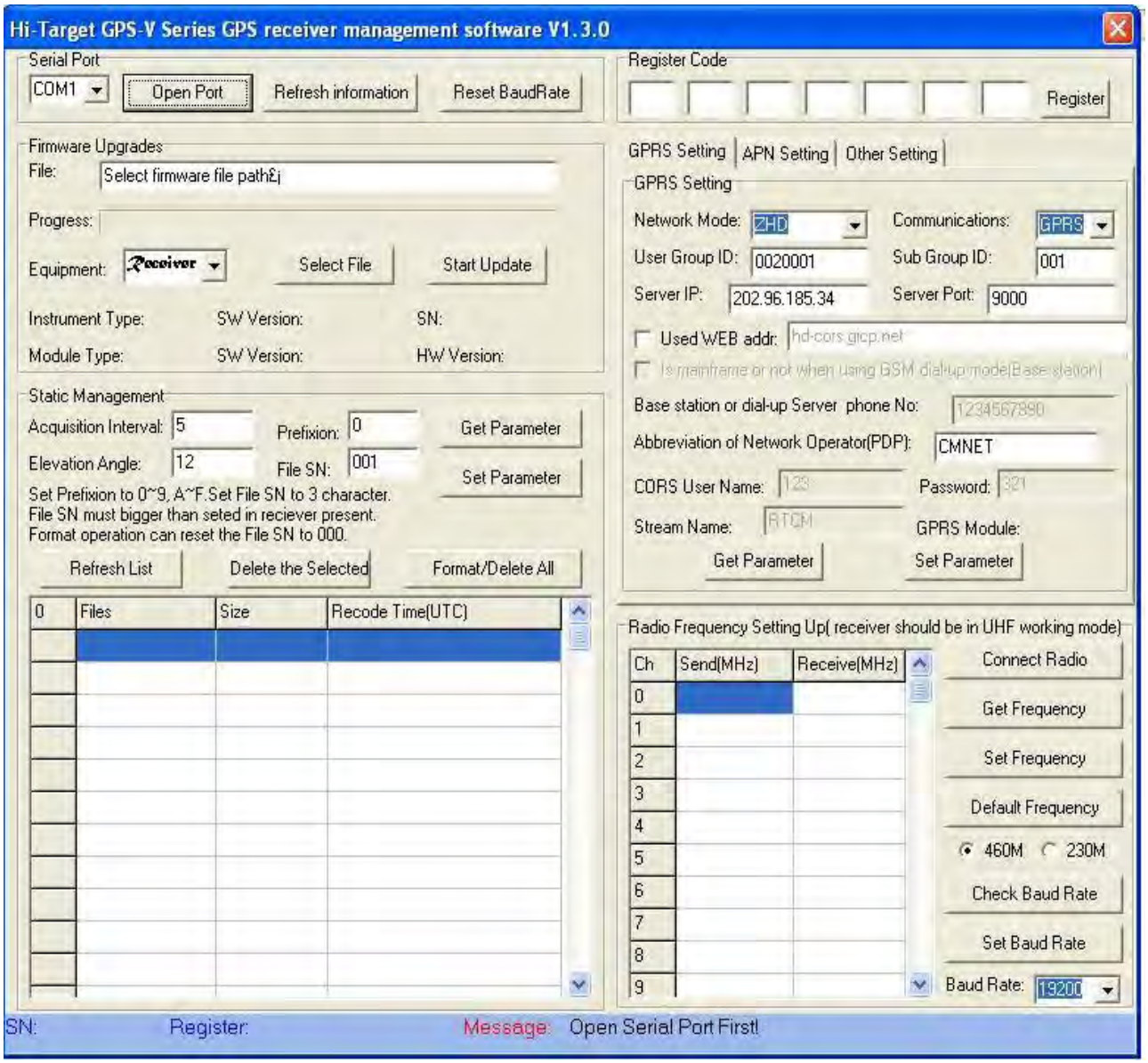


Figure 6-2

Operating steps:

1. Connect the Y type data cable to the 8-pin port of the TKO receiver and the serial port of PC.
2. Choose the correct PC port and click “open port”
3. Refresh information; the observation data files will be in the list
4. File name: 8 digit character: the first chart is replaced by an underline; the second, third, and fourth are the last two numbers of the receiver’s S/N from which the data is collected; the fifth, sixth and seventh are the year-accumulated-date; the last chart is the collection period of the day.
5. Set up time: GNSS time.
6. Delete data: choose the data to delete, click delete files.
7. Change collection interval and satellite cutoff/elevation angle: input value and click set parameters. Click read parameters to view the original collection interval and satellite cutoff angle.

Data processing procedures:

1. Run “HGO data processing software package”, create new and set the project, and then set the coordinate system of the control network.
2. Import data, modify the antenna height, antenna type and antenna height measuring way of each observing file.
3. Process the base lines. For those baselines whose ratios are less than 3, observe the residual plot of the base line. Delete bad satellites, part of the observing data, or set the sampling interval and elevation mask angle in “static base line process setting.”
4. Search for repeated base lines, closing error of base lines and closing ring. For big differences, change the setting of the base line and delete satellites or delete part of the observing data and re-process. If errors still exceed tolerances, choose delete base line. Re-search repeated base lines closing.

error of base lines and closing ring until the closing error meets the tolerance.

5. Check network map, set adjustment parameters.
6. Input the coordinate of the known point, process network adjustment.
7. Open “adjustment report” in the processing report manual and print the surveying result.

Please refer to the “HGO Data Processing Software Manual” to find more details on data processing.

CHAPTER

7

Technical Parameters

Introduction

- Introduction
- Receiver
- UHF Radio Communication
- 3G/GPRS/GSM/CDMA/Internet Communication
- Ports
- Function Key and Indicator Led
- Intelligent Voice Module
- Accuracy
- Physical Features
- Working Environment

Introduction

This section lists all the Technical Parameters of the TKO GNSS RTK SYSTEM.

Receiver

- Pacific Crest DB970 GNSS 220 channel OEM board
- GPS: Synchronous tracking L1 C/A, L2E, L2C, L5
- GLONASS : Synchronous tracking L1 C/A, L1 P, L2 C/A(only for GLONASS M) and L2P
- SBAS: Synchronous tracking L1 C/A, L5
- GIOVE-A: synchronous tracking L1 BOC, E5A, E5B and E5AltBOC (optional)
- GIOVE-B: synchronous tracking L1 CBOC, E5A, E5B and E5AltBOC (optional)
- GALILEO: (Upgrade)
- Multiple high precision correlator for GNSS pseudorange measurements
- Very low noise GNSS carrier phase in Surveying, Accuracy < 1 mm within 1 HZ wide band
- Unprecedented low elevation-angle tracking technology
- Initialization time < 10 seconds
- Initialization Reliability > 99.9%
- 1 Hz, 2 Hz, 5 Hz, 10 Hz, 20Hz and 50 Hz output (default 10Hz)
- Differential data format: CMR, CMR+, CMRx, RTCM 2.1, 2.2, 2.3, 3.0, 3.1

- **Navigation Output Format:** ASCII: NMEA-0183 GSV, AVR, RMC, HDT, VGK, VHD, ROT, GGK, GGA, GSA, ZDA, VTG, GSTPJT, PJK, BPQ, GLL, GRS, GBS.

  Binary system: Trimble GSOF

PCC Radio Module

- Compatible with Trimble/Leica RTK Radio
- With differential transmit-receiver function the transmit power is adjustable to 0.1 w, 0.5w or 1 w
- Radio Frequency bands 430 MHz~470MHz with 32 flexible switching
- channels and the baud rate of each channel can be customized.
- With top 19.2 Kbps wireless transmit speed
- Supports the following protocols:
  - Transparent EOT Timeout
  - Transparent EOC Character
  - Packet Switched
  - TRIMTALK 450S
  - TRIMMARK II/IIe
  - TRIMTALK 3

- TT450S
- SATEL

External PCC Radio

- Original import PCC radio
- Input power: DC 9~30 V
- Transmit-receiver radio, adjustable power function. The top transmit power has 4W or 35 W options.
- Radio Frequency bands 430 MHz~ 470MHz with 32 flexible switching channels and with customized baud rates.
- Top 19.2 Kbps wireless transmit speed

  Supports the following protocols:

  - Transparent EOT Timeout
  - Transparent EOC Character
  - Packet Switched
  - TRIMTALK 450S
  - TRIMMARK II/IIe
  - TRIMTALK 3
  - TT450S
  - SATEL

3G/GPRS/GSM Network Communication

- Default Configuration with built in GPRS Internet Communication, with GPRS module in GM-200 and 3G Module in GM-300 options.

Ports

- 2 RS-232 serial ports

- 1 USB port
- 1 port for wireless blue-tooth communication
- 2 ports for external DC power supply (Multiplex)
- 1 SIM card slot for GSM
- 1 built-in communication module port

Function Key and LED

- 3 Panel buttons to set all the functions: 1 power switch key and 2 functional keys
- 3 LEDs: 1 Satellite LED (Single color), 1 Communication LED (Dual Color) ,1 Power LED (Dual Color)

Intelligent Voice Module

- Broadcasts functions for each operation and status checks

Accuracy

- Static, Fast Static: Horizontal: ± 3mm + 1ppm RMS

  Vertical: ± 5mm + 1ppm RMS
- RTK Accuracy: Horizontal 1cm + 1ppm RMS

  Vertical: 2cm + 1ppm RMS

Physical Features

- ARM9 CPU with 64 M Flash Memory

- Size: Diameter: 7.68 in Height: 4.09 in
- Weight: 3.8 lbs (Incl. li-ion battery)
- Anti-impact from 2 meters, waterproof to 2 meters and completely dust-proof
- 2 Internal Li-ion batteries with 1400 mAh each, Voltage:7.4 V;

  Single battery working continuously: 8 hours in static mode (at 5 second epochs), 6 hours in GPRS mode, and 3 hours in 1 W transmitting power
- 6~36V external DC power
- Receiver Power Consumption: 2.5 W

Environment

- IP Standard: IP67, waterproof, completely dust-proof and anti-impact from 2 meters.
- Working temperature: -45C ~ 65C, storage temperature: -55C ~ 85C
- 100% Humidity non-condensing

CHAPTER

8

Ports and Main Accessory

Introduction

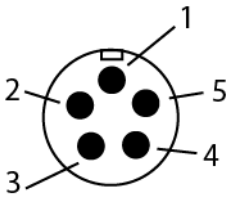
- Introduction
- Five-pin Port and Eight-pin Port
- Differential Antenna
- Y Style Data Cable

Introduction

This section will introduce the outlook and operation of the main ports and accessories for the TKO GNSS RTK SYSTEM.

Five-pin Port and Eight-pin Port

Figure 8-1 Five-pin Port and Eight-pin Port



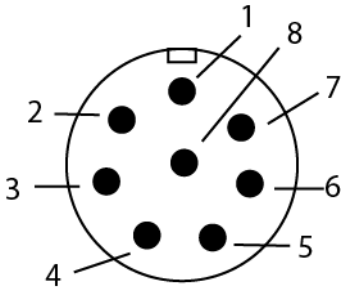


Figure 8-2 Five-pin Port Sketch Map Eight-pin Port Sketch Map

1. **Five-pin port:** COM2/PW2 is used for the connection between the receiver mainframe and the external data link or the external power supply.

   Eight-pin port: COM 1/USB/PW1 is used for the connection between the receiver mainframe and the computer or controller. It is also used for data download and data delete.

Signal Definition

Small Five-pin Signal		Larger Eight-pin Signal	
1	GND earth	1	RXD Data input
2	GND earth 2	2	USB D-
3	Vin Power Input	3	USB D+
4	RXD Data input	4	USB V+
5	TXD Data output	5	Vin Power input
		6	GC-2 Cable insert Mark
		7	TXD data output
		8	GND earth

1. The cable Insert Mark GC-1,GC-2 signal works with the cable connect earth internal only.
2. All the round pluges from Hi-Target are named the pin by positive counterclockwise; round pluges are named the pin by welding face counterclockwise.
3. All above output data (TXD) and input (RXD) signals are based on the receiver. TXD is a signal transmit line for the receiver and RXD is a receive line for the receiver.
4. The connection signals for the PC serial port DB9 are: 2 (RXD computer data signals to receive) 3(TXD computer data signals to transmit) and 5(GND earth).

Note: All the above are for facing the main frame, it's the face icon for the socket of bottom main frame (The plug welding surface)

Differential Antenna

Figure 8-3 Differential Antenna for rover

The differential antenna is an essential part both to the Base and Rover with internal UHF radio. The UHF radio transmits the UHF differential signal from the Base to the Rover.

- Differential Antenna Installation

Refer to Figure 8-4 and hold the bottom of the differential antenna and assemble it in a clockwise rotation. Disassemble the differential antenna using a counterclockwise rotation.

Figure 8-4 Installing the differential Antenna

Warning:
When installing the differential antenna, rotate the bottom fixed nut of the differential antenna. Do not grip the top parts of the differential antenna, because it will cause a poor connection and reduce the working distance.

Y Style Data Cable

Figure 8-5 Y Data Cable

- Eight-pin Port: connect with the eight-pin port of the TKO receiver
- USB port: connect with the PC USB for data downloading from the TKO
- Serial port: connect with the PC serial port for TKO firmware upgrades, receiver settings, managing static data files and setting radio parameters.

Warning:

1. **When connecting plugs in the TKO GNSS RTK system, (see below) be sure to align both red dots. Otherwise, it will bring damage to both the socket and plug. (See Figure 8-6)**
2. **When you finish your work, unplug the cable without spinning.**
3. **In order to protect the plug, carefully store the cable.**

Figure 8-6

Attachment 2: Default Frequency list

The default frequency list is as follows:

Channels	460 M Transmit Frequency	460 M Receiver Frequency
1	464.5000	464.5000
2	464.5500	464.5500
3	469.5000	469.5000
4	469.5500	469.5500

eGPS Solutions

How-To Guide

Table of Contents

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Chapter 1	**TKO Configuring**	**Pg. 2 - 4**
Chapter 2	**Collecting Static Data**	**Pg 4-5**
Chapter 3	**Downloading/Converting to RINEX.**	**Pg. 5-9**
Chapter 4	**Submitting to OPUS**	**Pg. 9-14**

Introduction:

Welcome to eGPS Solutions. This guide will show you how to set up the TKO for static surveying, log the data, download the .ZHD file, convert it to RINEX and submit the RINEX file to the National Geodetic Survey (NGS) Online Positioning User Service (OPUS).

The items you will need are:

- ✓ **TKO**
- ✓ **Y-Cable**
- ✓ **Computer**
- ✓ **Rover Pole with Bi Pod**
- ✓ **Software**
    a. **Hi Target GPS-V Series GPS receiver management Software v1.3.0**
    b. **Hi-Target Geomatics Office (HGO)**
- ✓ **Internet connection.**

Abbreviations and Symbols:

- = Intelligent Voice

- NGS = National Geodetic Survey

- OPUS = Online Positioning User Service
- HGO = Hi Target Geomatics Office
- ARP = Antenna Reference Point
- APC = Antenna Phase Center
- HGMS = Hi Target GPS-V Series GPS receiver management Software v1.3.0

Chapter 1 Configuring TKO

Steps:

1. **Power on computer.**
2. **Power on TKO.** ***"Single Press"***

3. ***"Double Press"***

4. **Listen to**

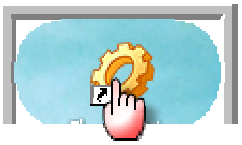
for "MODE"
5. **Scroll rough the "Modes" by** ***"Single Press"***

until

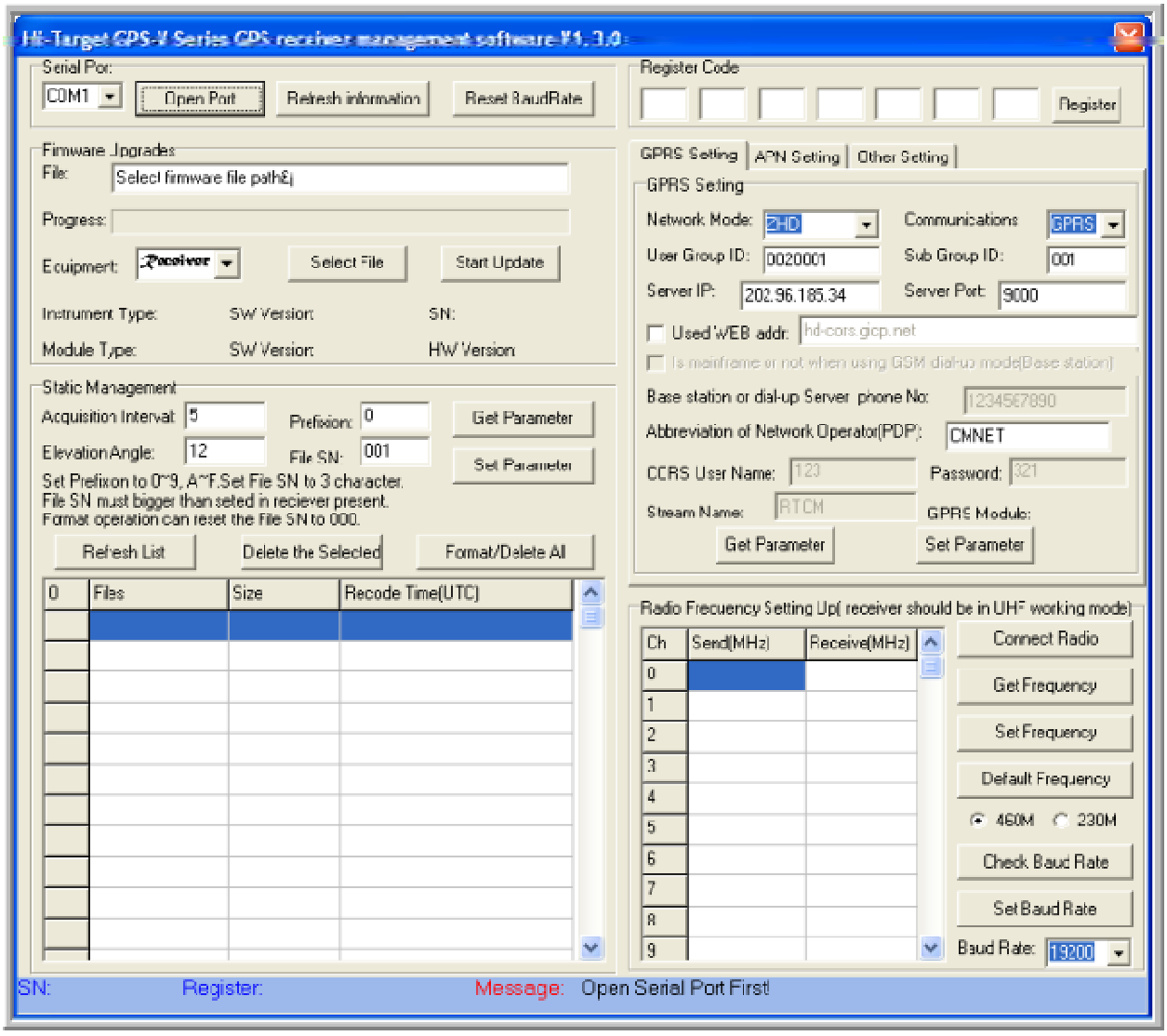
states "Static".
6. ***"Single Press"***
7. **Plug in Y-Cable into bottom of TKO** ***"COM1/PW1"***

8. **Plug in *“COM”* end into *“COM 1”* on computer.**

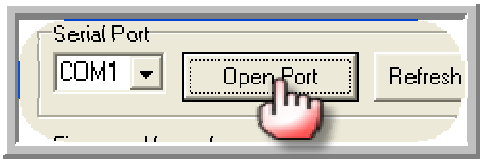
9. ***“Double Click”:* “HGMS”**



10. **This is what should appear:**

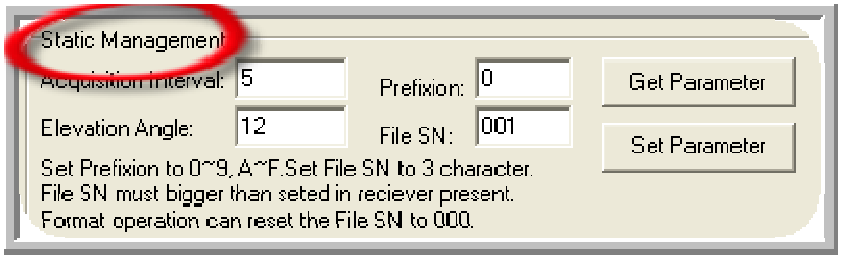


11. ***“Single Click”* the “Open Port”.**



12. **Check the message.**

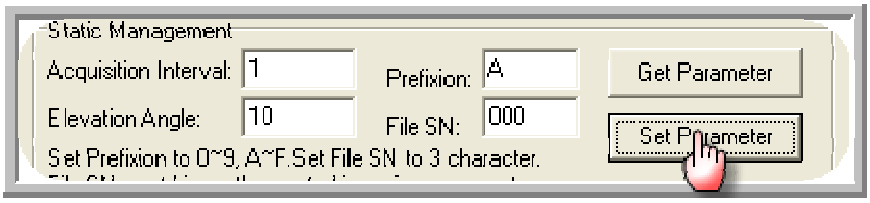
13. **Go to the "STATIC**



MANAGEMENT" area of the software.

14. **Set the appropriate settings in the:**
    a. **Acquistion interval = what epoch rate you desire to collect at.**
    b. **Elevation Angle = Elevation Mask (Usually set to 10°).**
    c. **Prefixion = is the leading Character at the beginning of the file.**
    d. **File SN = this will designate the session and naming convention.**

15. ***"Single Click"***



    a. **Check Message: If message states:**

b. *"Single Click"* **"Close Port":**

16. **Power Down TKO.** *"Single Press and Hold"*

Chapter 2 Collecting Static Data

1. **Head to the field and Set up over desired Point.**

2. **Power on TKO.** *"Single Press"*

3. **Listen for** **to say "TRACKING" then "Tracked".**

4. *"Double Press"*

You should hear 2 dings!!

   a. **Then it will begin to Beep for every epoch of data the TKO is logging.**

5. **To Stop the Logging:**
   a. *"Double Press"*

6. **Power Down the TKO:** *"Single Press and Hold"*

Chapter 3 Downloading/Converting to RINEX

1. **Return to office and Power on computer and verify Internet connection.**

2. **Power on TKO:** ***"Single Press"***

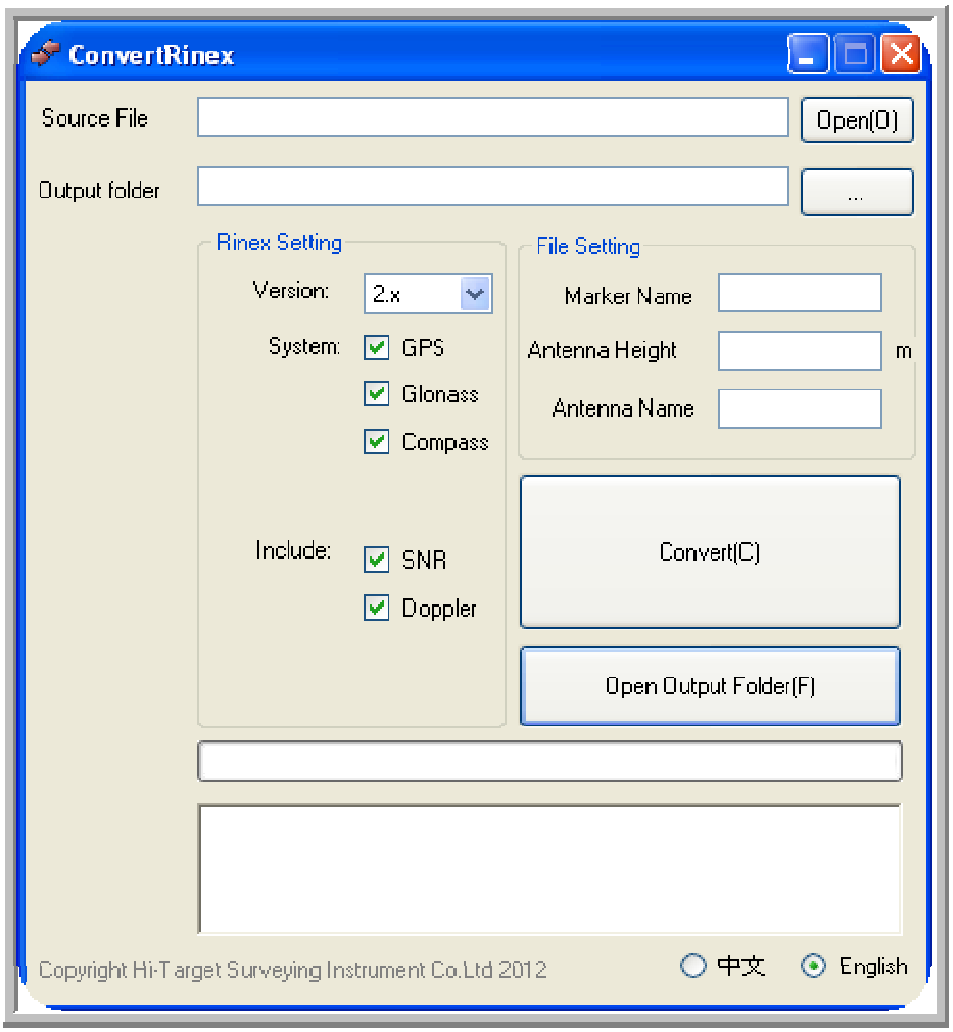
3. **Plug in the Y-cable to the bottom of TKO "*COM1/PW1*" and utilize the USB connection from the Y-Cable to connect to PC.**
4. **Once connected:**

   a. **Navigate to the**

   b. ***"Double Click" "GNSS Folder"*** **Select and copy your .ZHD file and place on your PC in desired location.**

5. **Navigate to the HGO Software and select ConvertRinex.exe through Start menu on your PC under all Programs.**

6. ***"Single Click"*** **the ConvertRinex.exe. This should appear:**

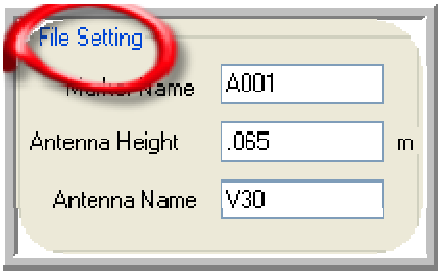


7. ***"Single Click"***: **in the <u>"Source File"</u> section and Navigate to your .ZHD static file and select it.**

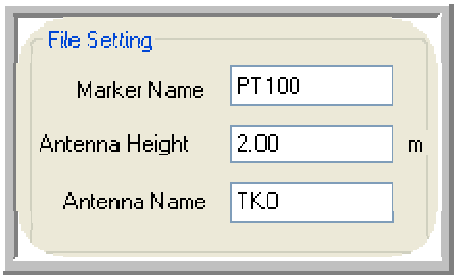
8. ***"Single Click"***: **under the "Output Folder" section and Navigate to where you want the RINEX file stored.**

9. **You should now see the paths of the .ZHD file in the Source file section and the path of the file to be stored in the output folder section as shown below:**

10. You can now move to the: File Settings section.



11. Edit Settings:

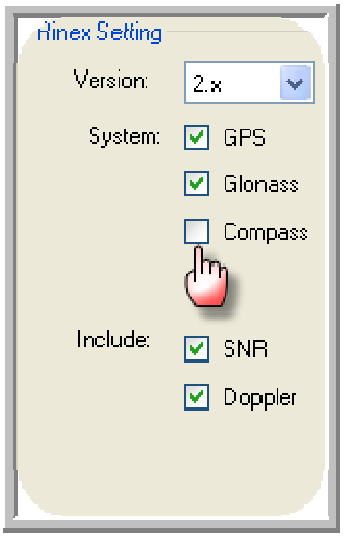


Marker Name = what Point Number or Point Name you desire to have stored in the RINEX Header

Antenna Height = what antenna height you used to the Bottom of antenna mount ARP in meters.

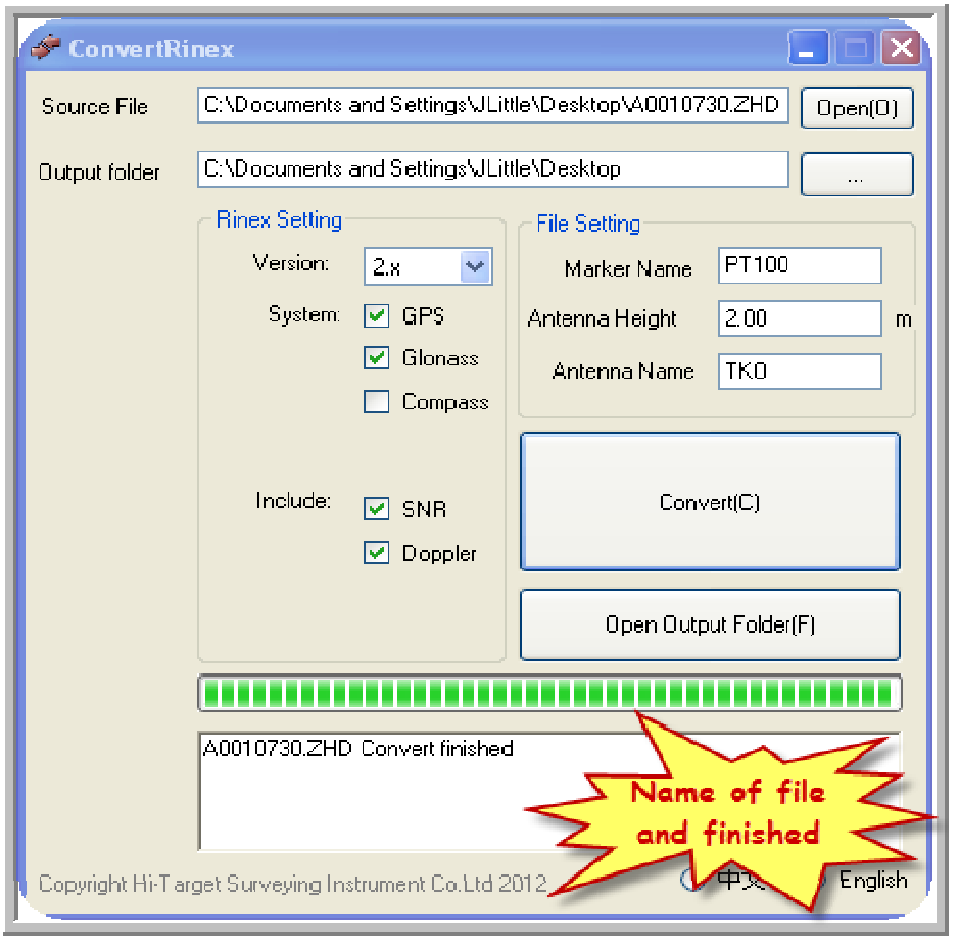
Antenna Name = TKO so that it is correctly stored in the RINEX header.

12. Go to the RINEX Settings section: and UN-CHECK Compass:



13. ***"Single Click"*****:**

You should see this on your screen:



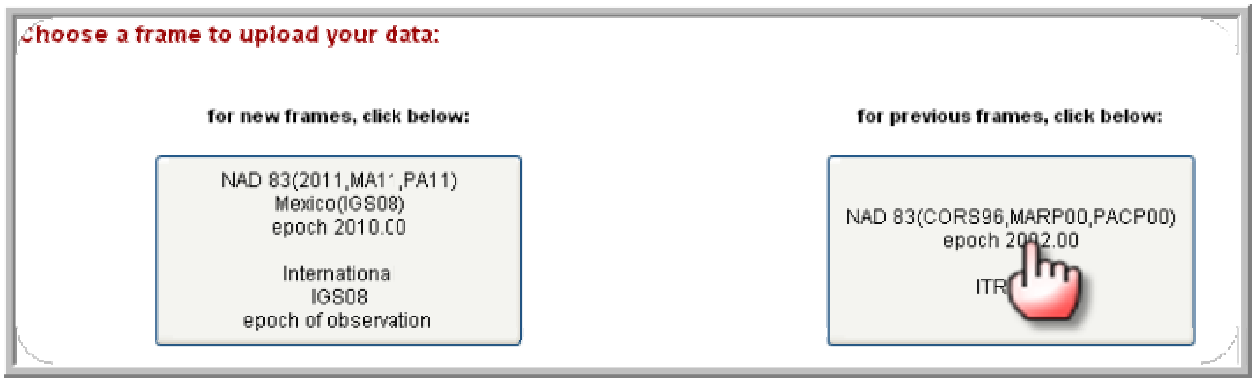
Chapter 4 Submitting to OPUS

1. **We are now ready to send RINEX file to OPUS:**
    a. **Open internet browser**
    b. **Go to: http://www.ngs.noaa.gov/**
    c. ***"Single Click"*****:**

www.ngs.noaa.gov
NOAA
NGS Home
About NGS
Data & Im
Most Popular
Contact Us
CORS
Survey Mark Datasheets
Geodetic Tool Kit
NA2011
OPUS
Storm Imagery
UFCORS

2. **You should be redirected to the OPUS Home Page.**

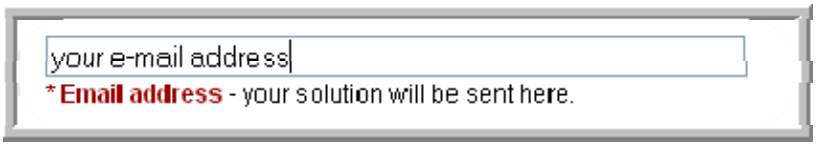
3. ***"Single Click"*** **which reference frame your data should be processed in.**



4. **Your page should look like the below:**

OPUS: Online Positioning User Service
National Geodetic Survey
NGS Home
About NGS
Data & Imagery
Tools
Surveys
Science & Education
Search
maintenance impacts SPCS, publishing: Monday, 02 April 2012
use " Options> State plane coordinates" to add SPCS to your solution report. Publishing and datasheets may be unavailable throughout the day.
Upload your data file.
Tie your GPS observation to the National Spatial Reference System.
What is OPUS? FAQs
You selected 96 frame for processing your observation.
OPUS Menu
Upload
About OPUS
Projects
Published Solutions
Contact OPUS
* Email address - your solution will be sent here.
Browse..
* Data file of dual-frequency GPS observations. sample
NONE no antenna selected
Antenna type - choosing wrong may degrade your accuracy.
0.0 meters above your mark.
Antenna height of your antenna's reference point.
Options to customize your solution.
Upload to Rapid-Static
Upload to Static
for data > 15 min. < 2 hrs.
for data > 2 hrs. < 48 hrs.
This page should be visible!!!
Sample Solutions

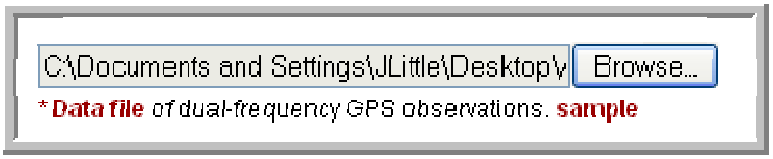
5. **Type in your e-mail address: This is what e-mail your results will be sent to.**



6. ***"Single Click"*** **and navigate to and select your RINEX file.**

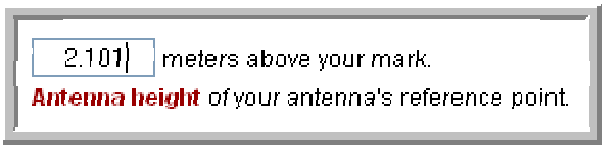
It will have the 0 for observation in the end of the extension as shown here:

7. **The file path should now be filled like this:**



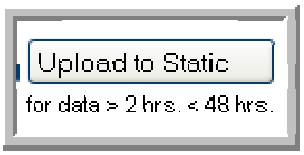
8. **Chose CHATKO antenna type.**

9. **Enter Your Antenna Height from the bottom of antenna ARP + APC offset which is currently 101mm. For example 2 m rod + 101mm = 2.101m as shown below:**



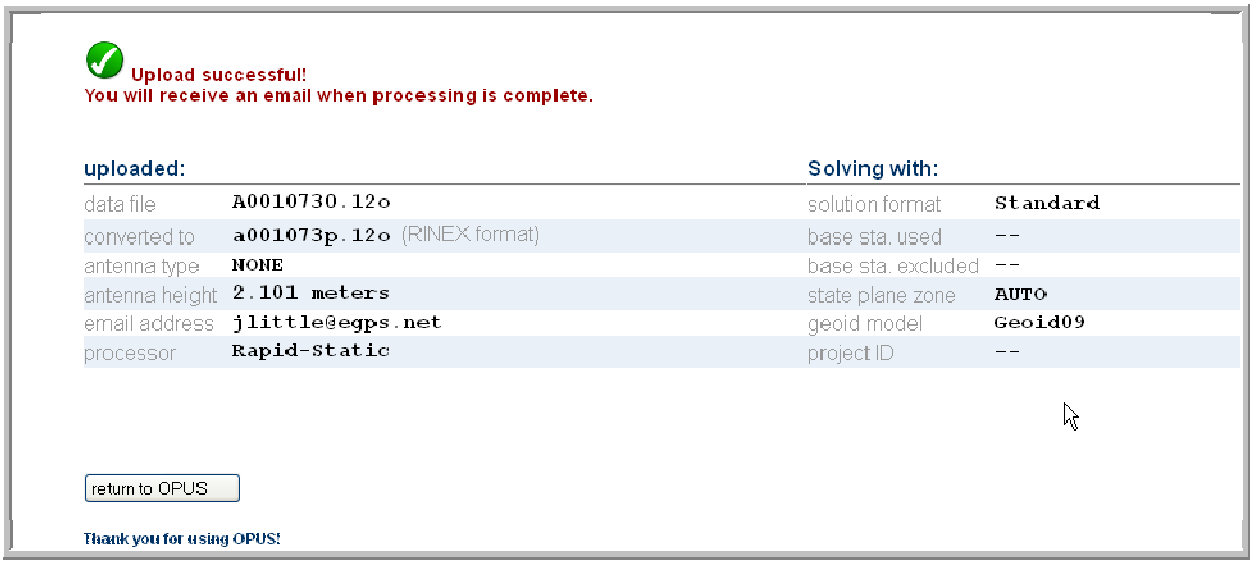
This will get you to the correct position from APC to your mark on the ground correctly in the OPUS results.

10. **Now select either**

OR 

depending on collection time and or desired precision. Please read the OPUS information to choose correctly.

11. **Now you will receive conformation that your file has been sent:**



12. Check e-mail

a. **Open and review results: As per the NGS guidelines.**
b. **Choose your coordinates from correct reference frame.**

You are Finished!!!

eGPS Solutions

How-To Guide

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Chapter 3	**Setting up SurvCe**	**Pg. 12-29**

Introduction:

Welcome to eGPS Solutions. This guide will show you how to set up the TKO for Real Time Network (RTN) operations utilizing a SIM card from AT&T in the head of the receiver. This can be used for dialing up into the RTN with Carlson SurvCe version 2.58.

The items you will need are:

- ✓ **TKO**
- ✓ **Scepter**
- ✓ **USB Cable**
- ✓ **Y-Cable**
- ✓ **Computer**
- ✓ **Rover Pole with Bi Pod**
- ✓ **Software**
    a. **Hi Target GPS-V Series GPS receiver management Software v1.3.0**
    b. **Carlson SurvCe 2.58**
    c. **Active Sync**

Abbreviations and Symbols:

- **= Intelligent Voice**

- **HGMS = Hi Target GPS-V Series GPS receiver management Software v1.3.0**

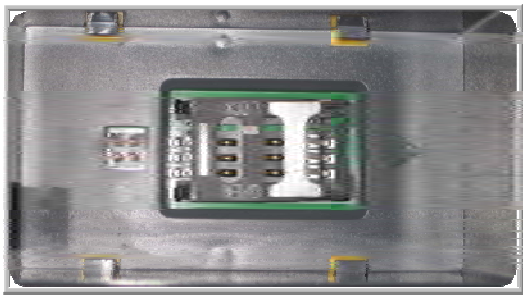
Chapter 1 Preparing SIM for TKO

Steps:

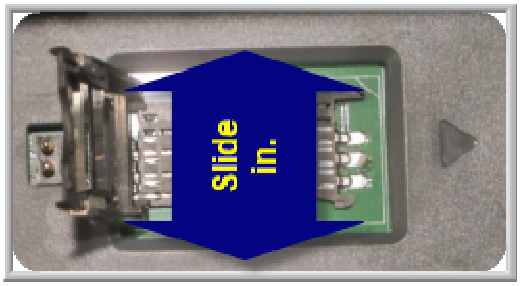
1. **Power on computer.**
2. **Remove Battery cover.**

3. **Remove battery**

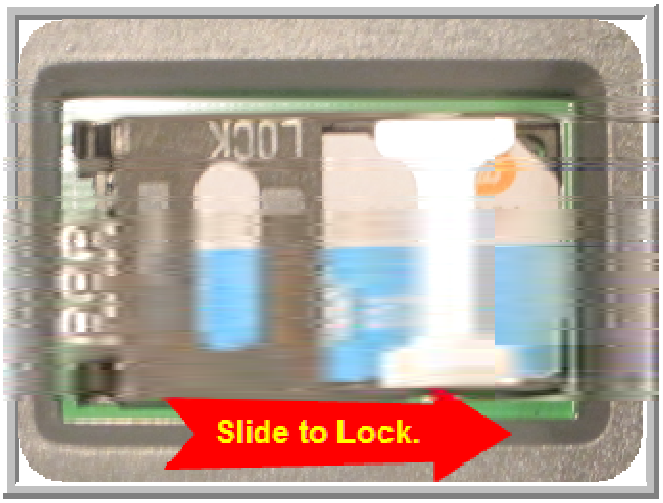
4. **Unlock SIM Card Holder.**



5. **Insert SIM Card in slot by sliding between silver and black casing.**



6. **Close SIM Card casing and Lock into place.**



7. **Insert Battery and Replace battery cover!**

8. **Power on TKO.** ***"Single Press"***

9. ***"Double Press"***

10. **Listen to**

for <u>"MODE"</u>

11. **Scroll rough the <u>"Modes"</u> by** ***"Single Press"***

until

states <u>"Rover"</u>.

12. ***"Single Press"***

13. ***"Double Press"***

14. **Listen to** **for "Communication".**

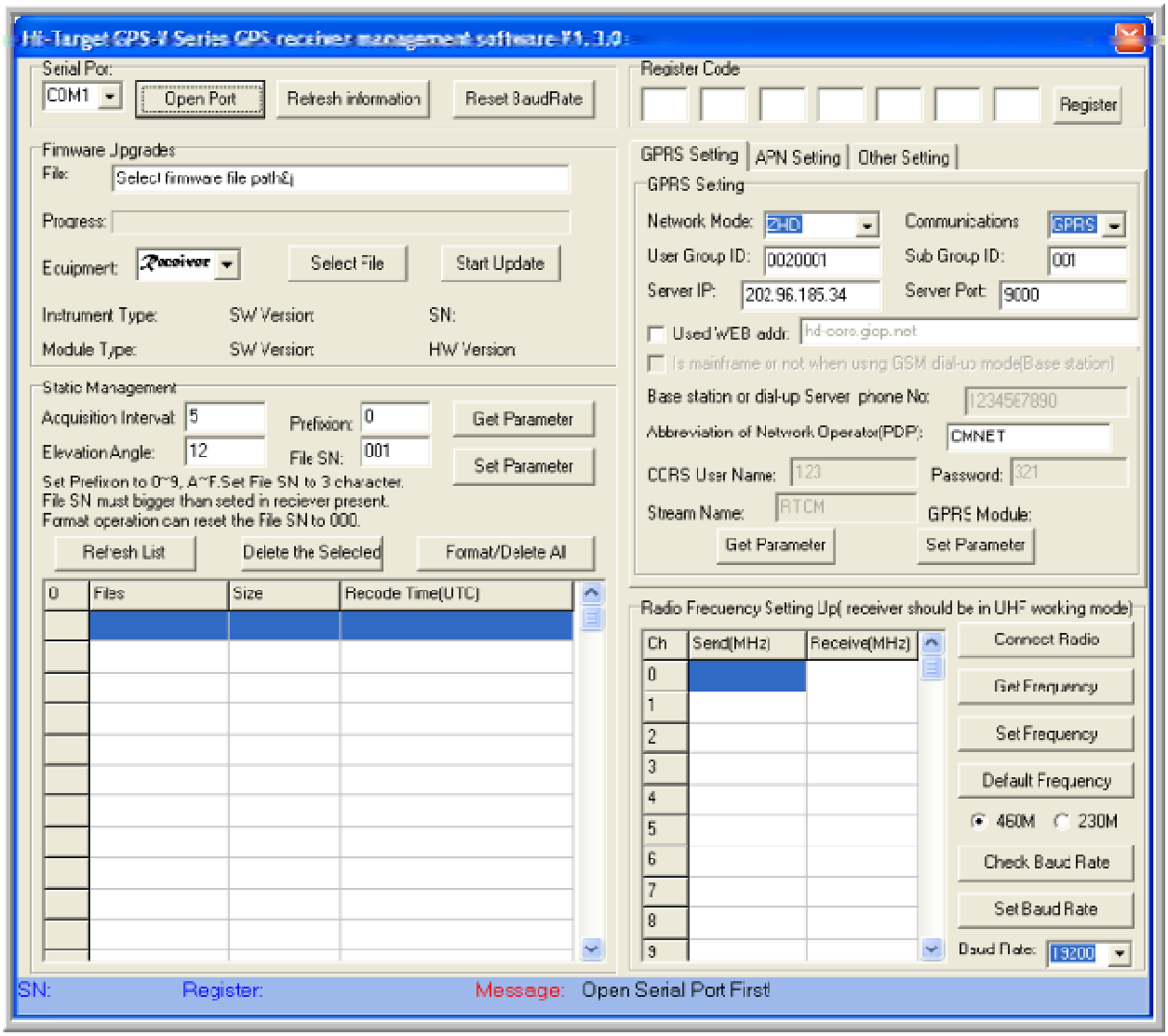
15. **Scroll through** ***"Single Press"*** **until** **Sais "GSM Rover".**

16. ***"Single Press"***

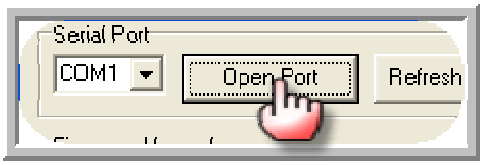
Chapter 2 Configuring TKO

1. **Plug in Y-Cable into bottom of TKO** ***"COM1/PW1"***
2. **Plug in** ***"COM"*** **end into** ***"COM 1"*** **on computer.**
3. ***"Double Click":*** **"HGMS"**

4. **This is what should appear:**

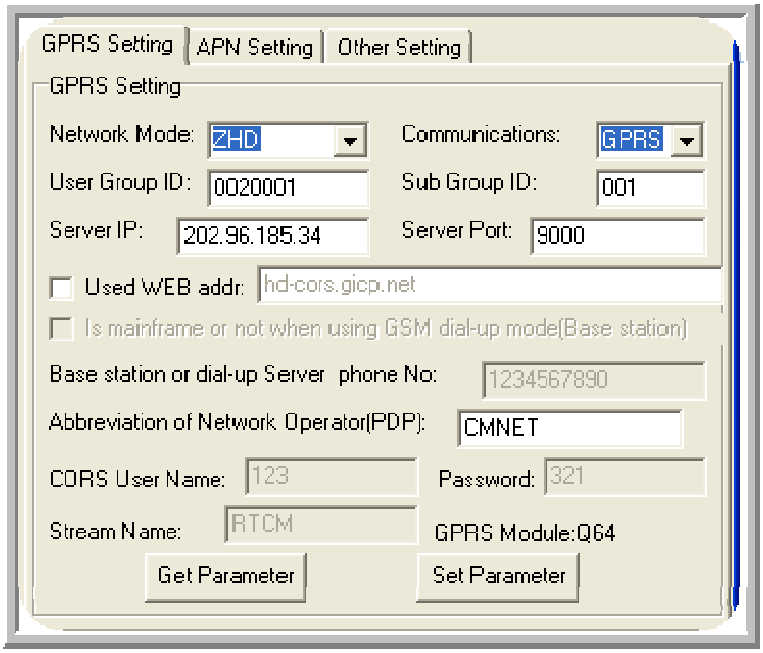


5. ***"Single Click"*** **the** **<u>"Open Port"</u>.**

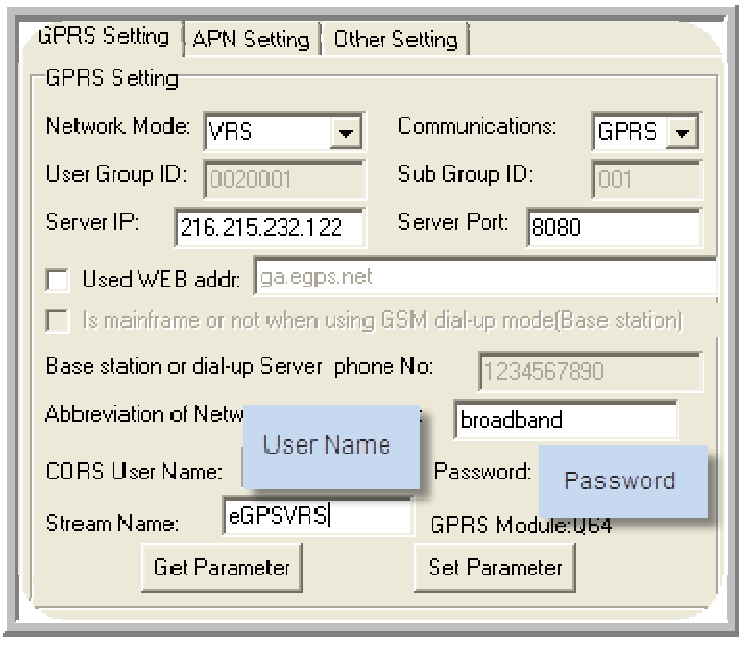


6. **<u>Check the message.</u>**

7. **Go to the "GPRS Settings" area of the software.**



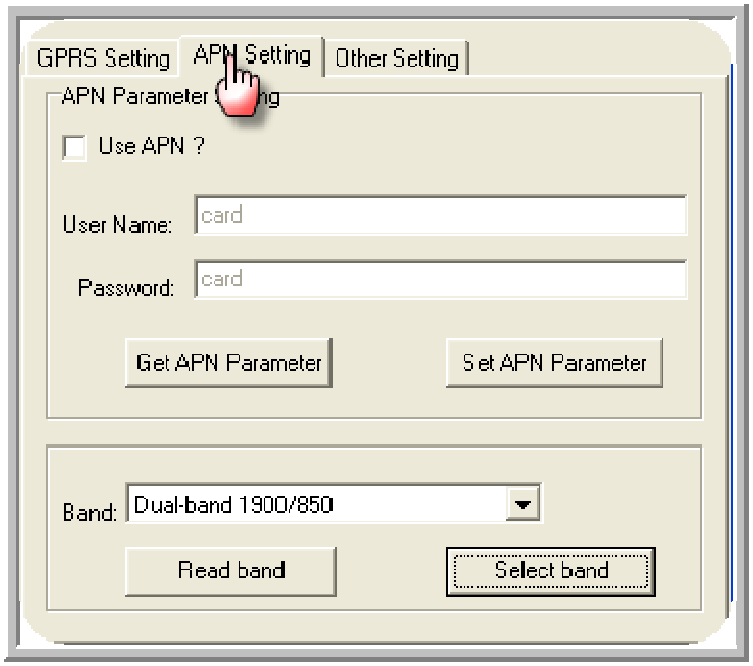
8. **Set the appropriate settings:**
    a. **Network Mode = VRS**
    b. **Communications = GPRS**
    c. **Server IP= RTN Providers IP Address.**
    d. **Server Port = RTN Port number.**
    e. **Abbreviation of Network Operator (PDP) = this should be obtained from AT&T. Here I have a Q64 type of SIM so I set it to : "broadband"**
    f. **CORS User Name: =RTN provider should give you an NTRIP User Name.**
    g. **Password = RTN provider should give you an NTRIP password.**
    h. **Stream Name: = the mounting point Name you desire to log into.**



9. *“Single Click”*

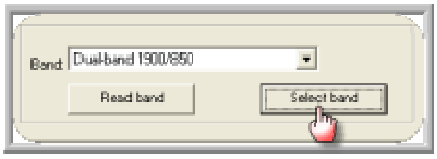
a. **Check Message: If message states:**

10. *“Single Click”*



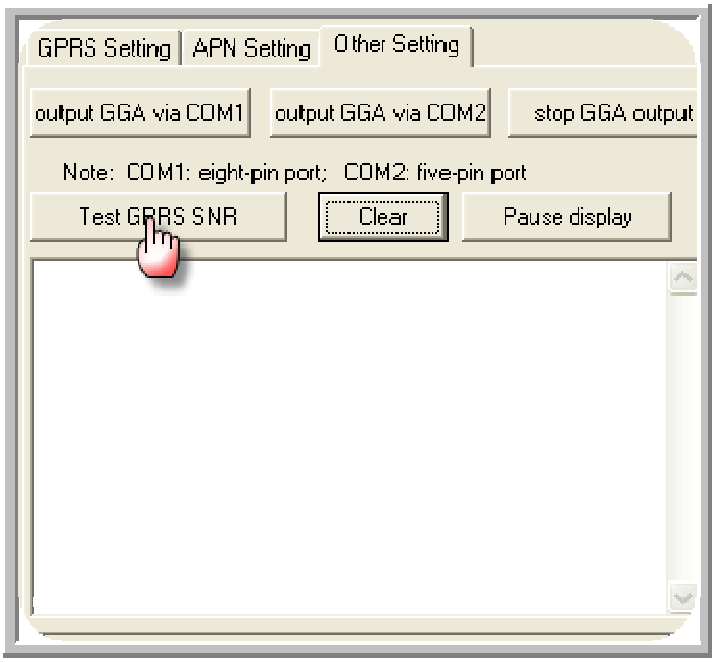
11. **Go to the “Band” section and choose “Dual- Band 1900/850”**

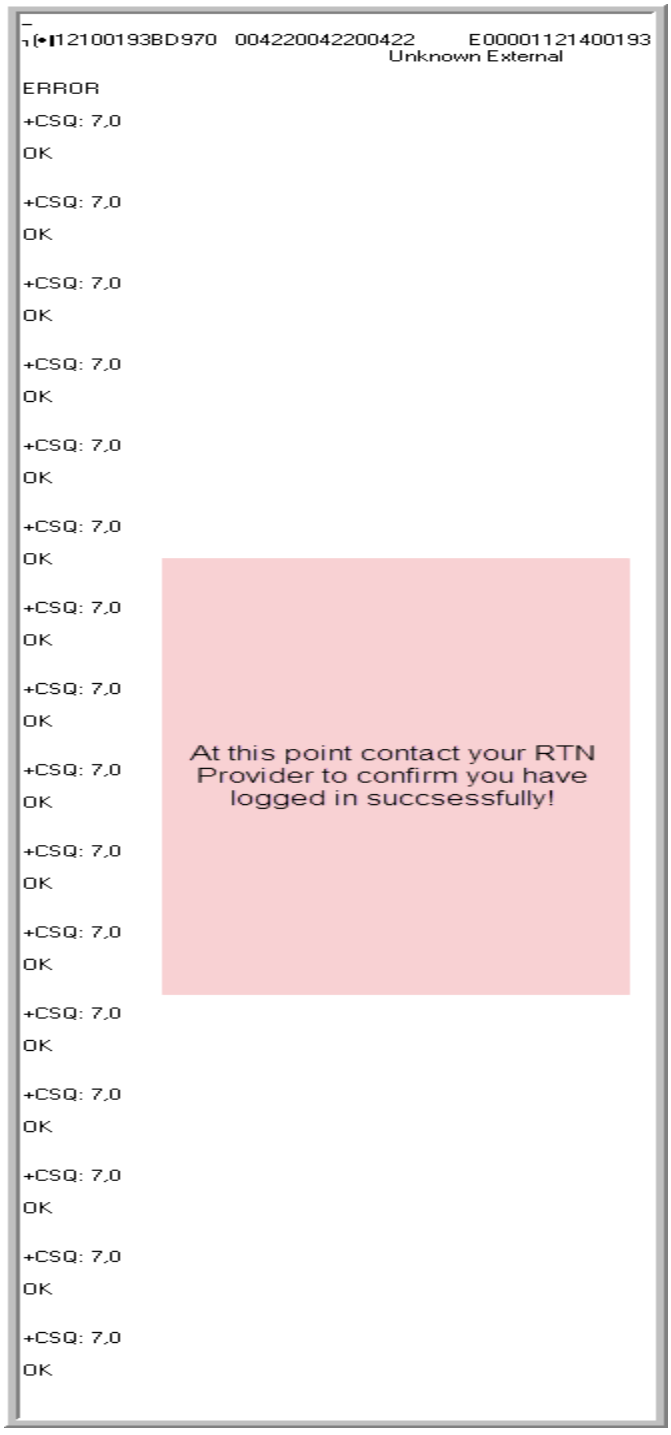
12. ***"Single Click"***



13. **Listen to** **say "Online".**

14. **Run test by choosing the "Other Setting" tab and** ***"Single Click"***





15. ***"Single Click"*** **"Close Port":**

16. **Power Down TKO.** ***"Single Press and Hold"***

Chapter 3 Setting up SurvCe

1. **Head to the field.**

2. **Power on TKO.** ***"Single Press"***

3. **Listen for** **to say "TRACKING" then "Tracked".**

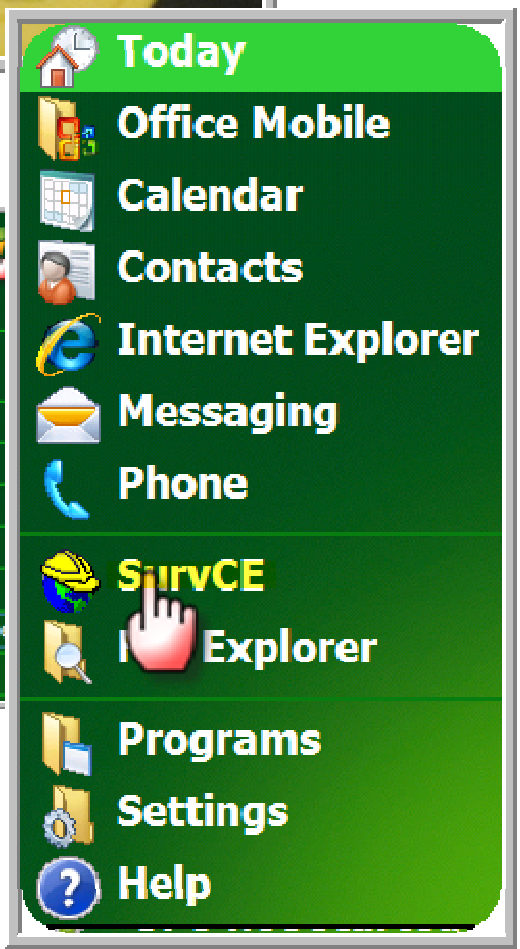
4. **Listen for** **to say "Online".**

You should hear 1 ding!!

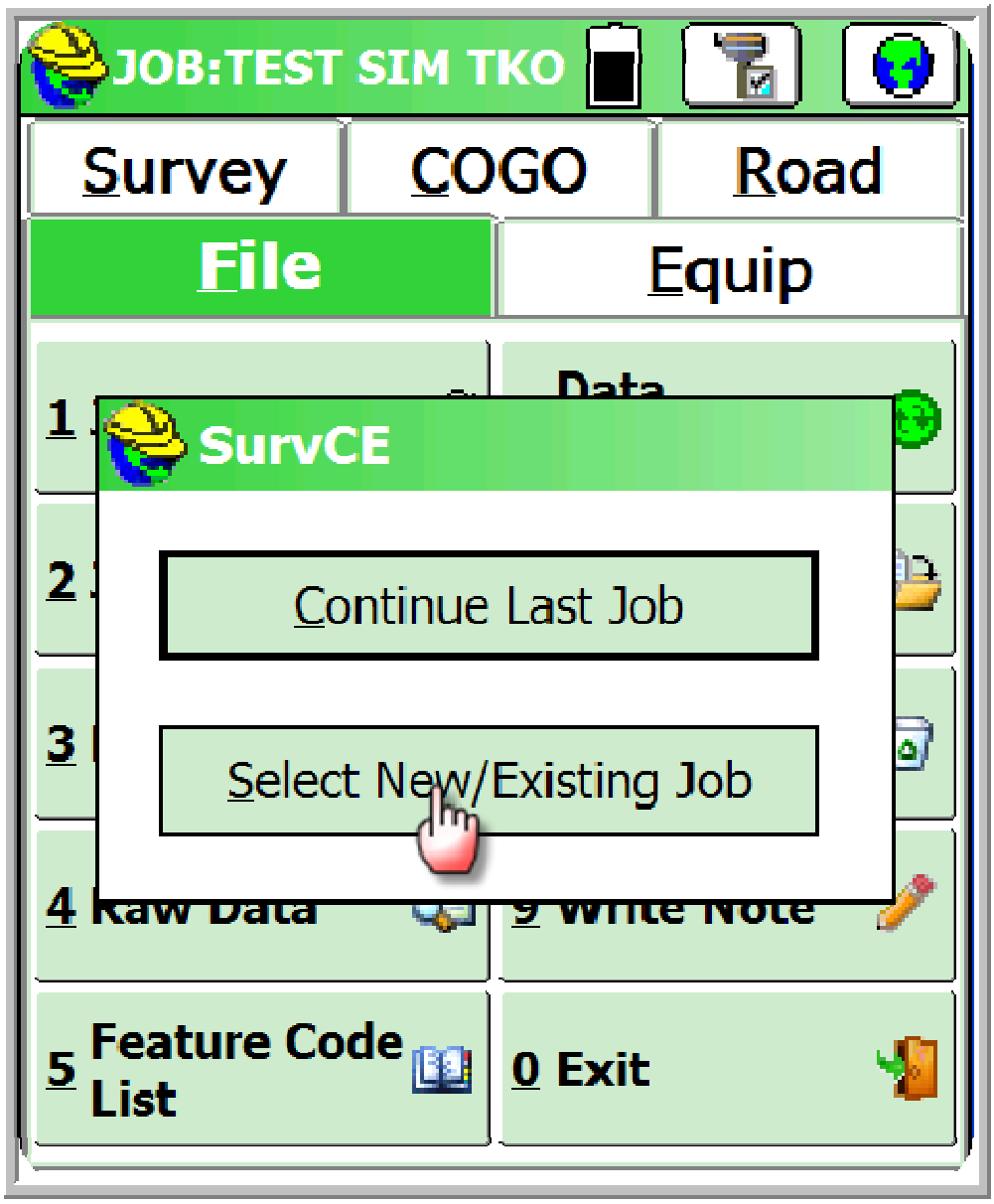
5. **Get Scepter and Power on.** ***"Single Press"***

6. ***"Single Click"***

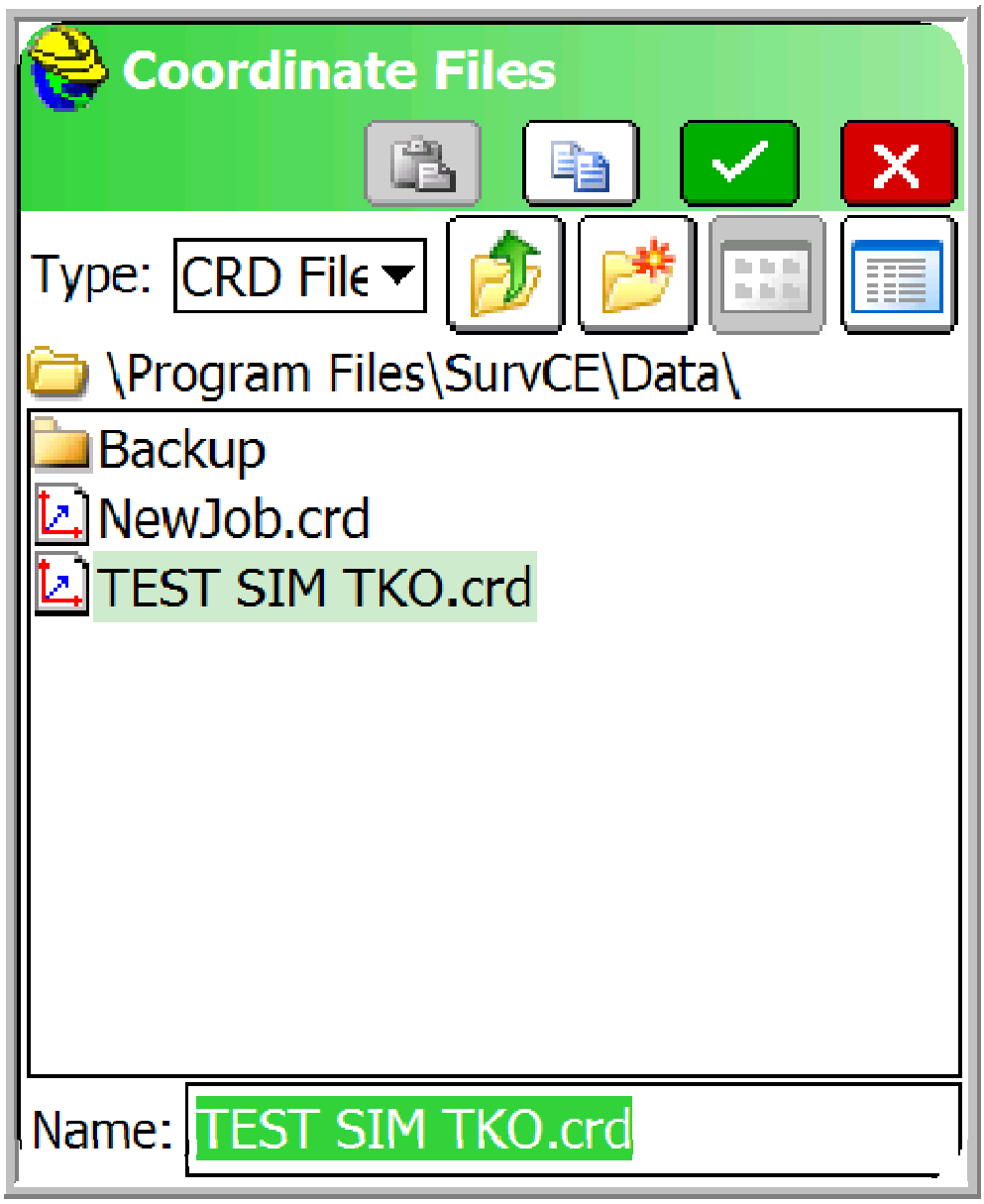
7. ***"Single Click"***



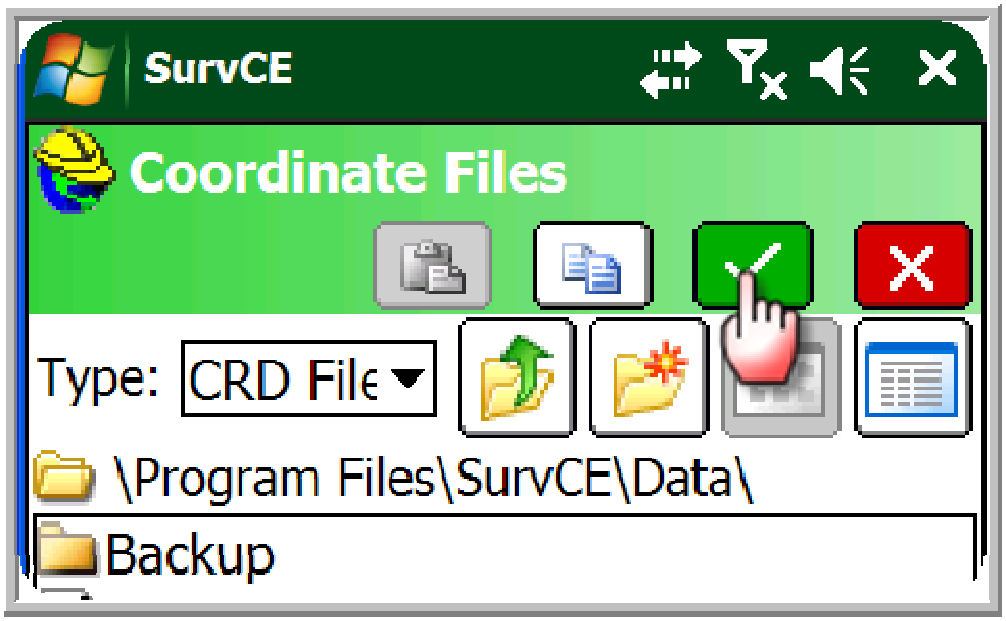
8. *"Single Click"*



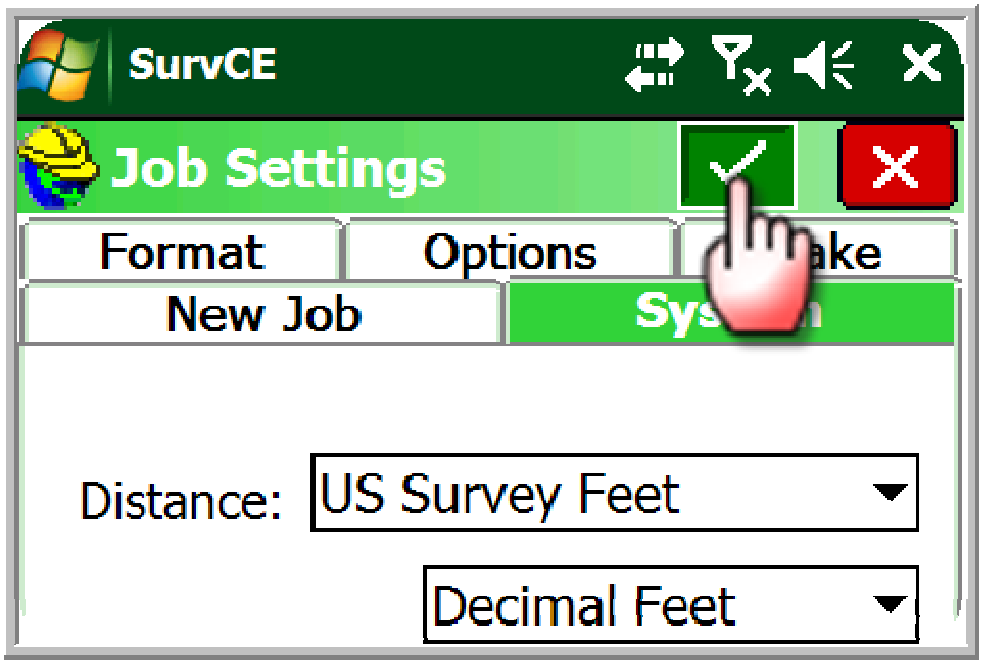
9. **Create a job Name:**



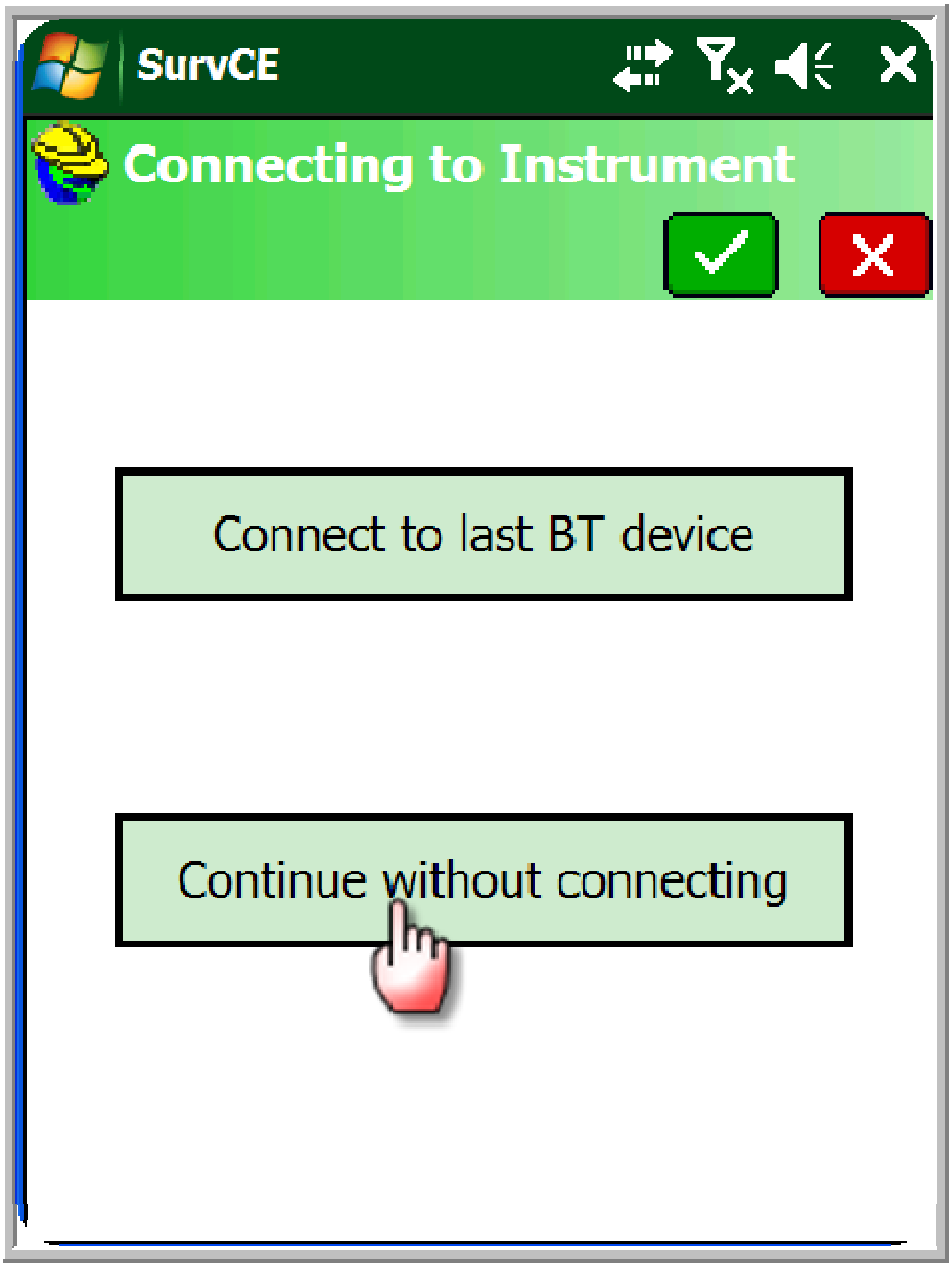
10. ***"Single Click"***

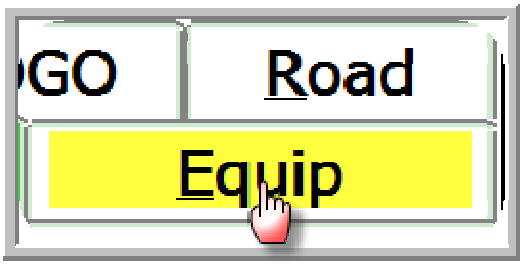


11. Choose correct job settings. ***"Single Click"***

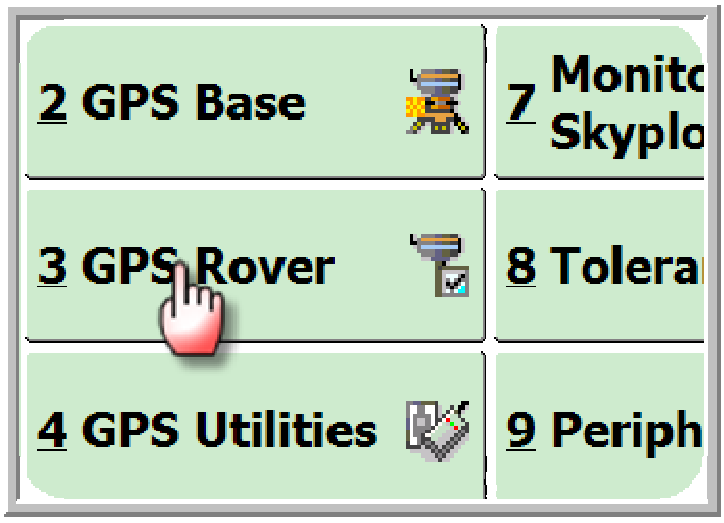


12. ***"Single Click"***

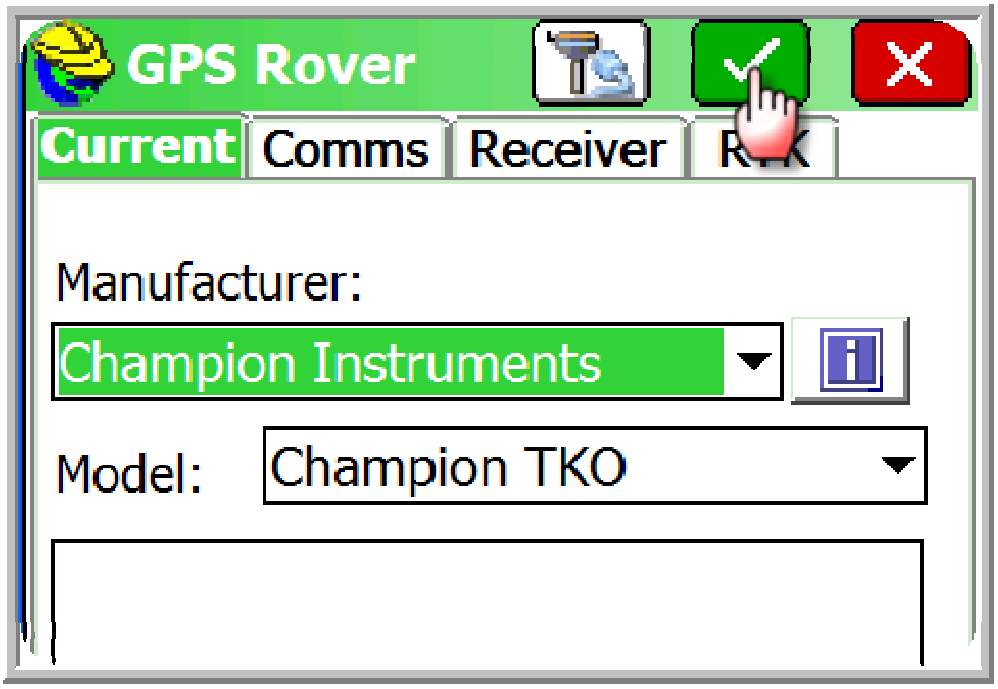


13. ***"Single Click"***  **tab.**

14. *“Single Click”*

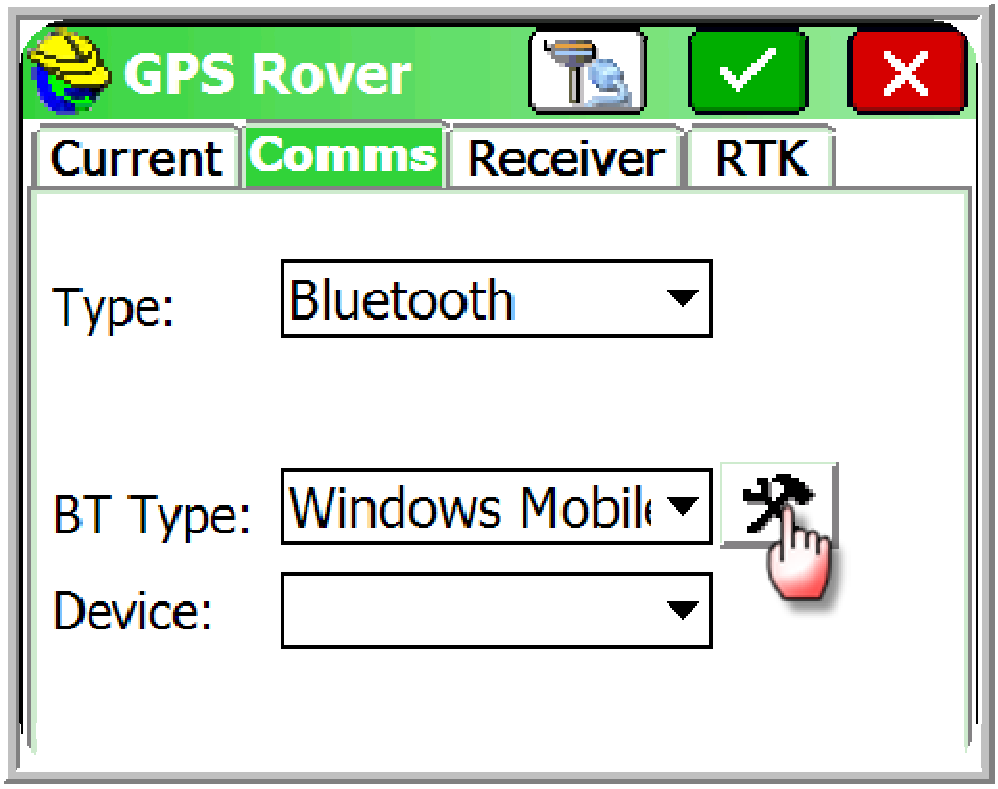


15. **Select Champion Instruments from the “Manufacturer” Drop Down Menu and Champion TKO from the Model Drop Down Menu. Then *“Single Click”***

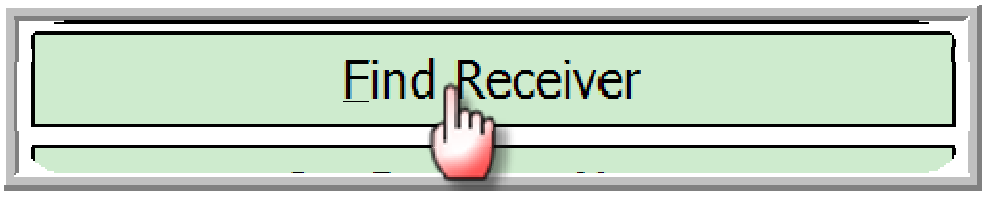


16. ***"Single Click"***

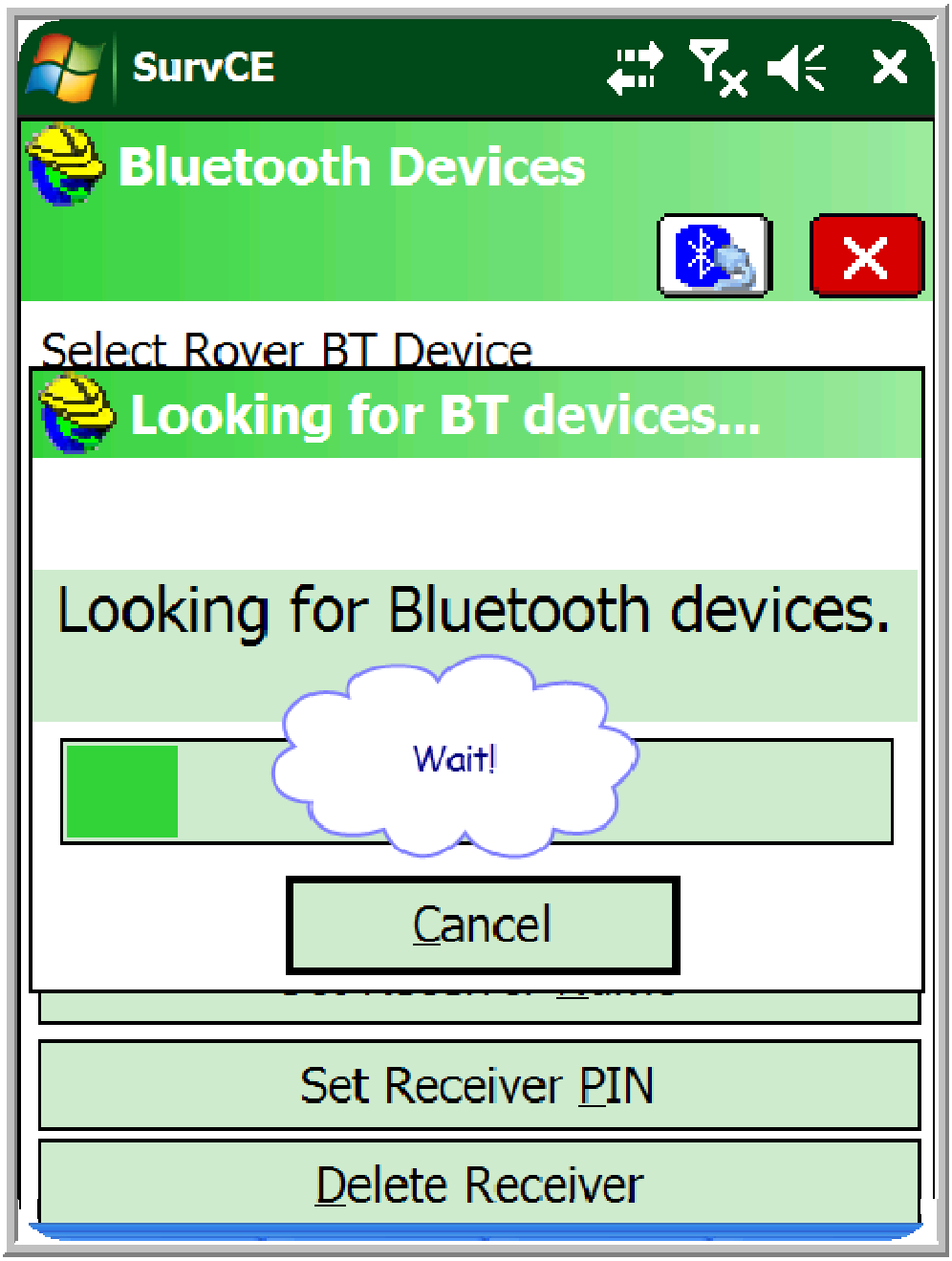
17. **Select Bluetooth from the Type drop down menu and Windows Mobile from the BT Type drop down menu. Then *"Single Click"***



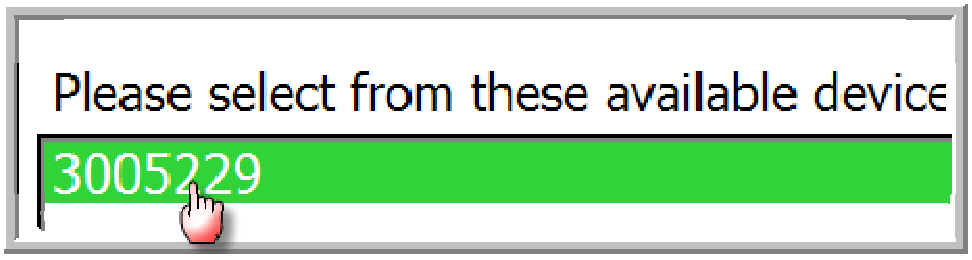
18. ***"Single Click"***



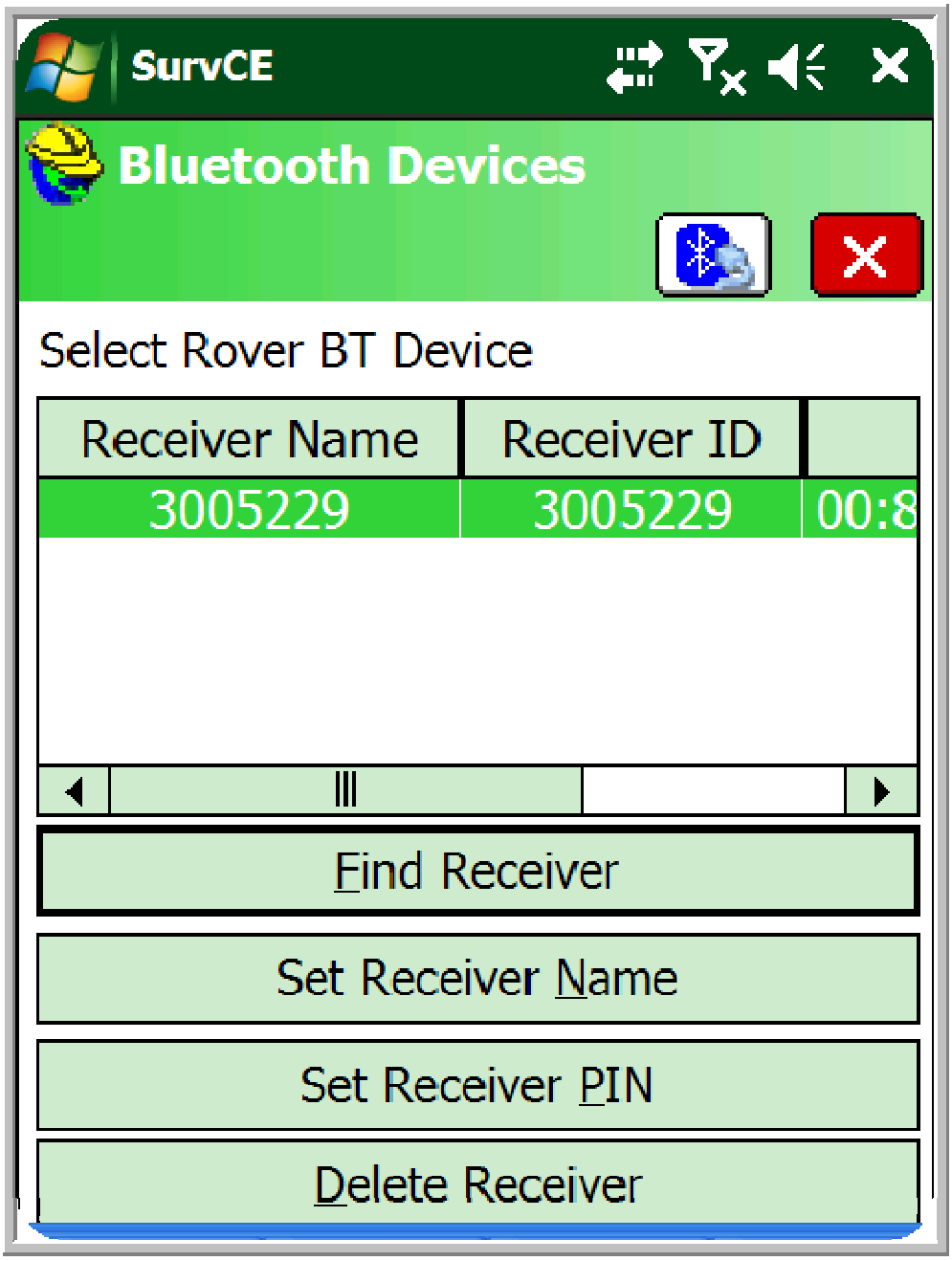
19.



20. **Select the correct receiver serial number.**

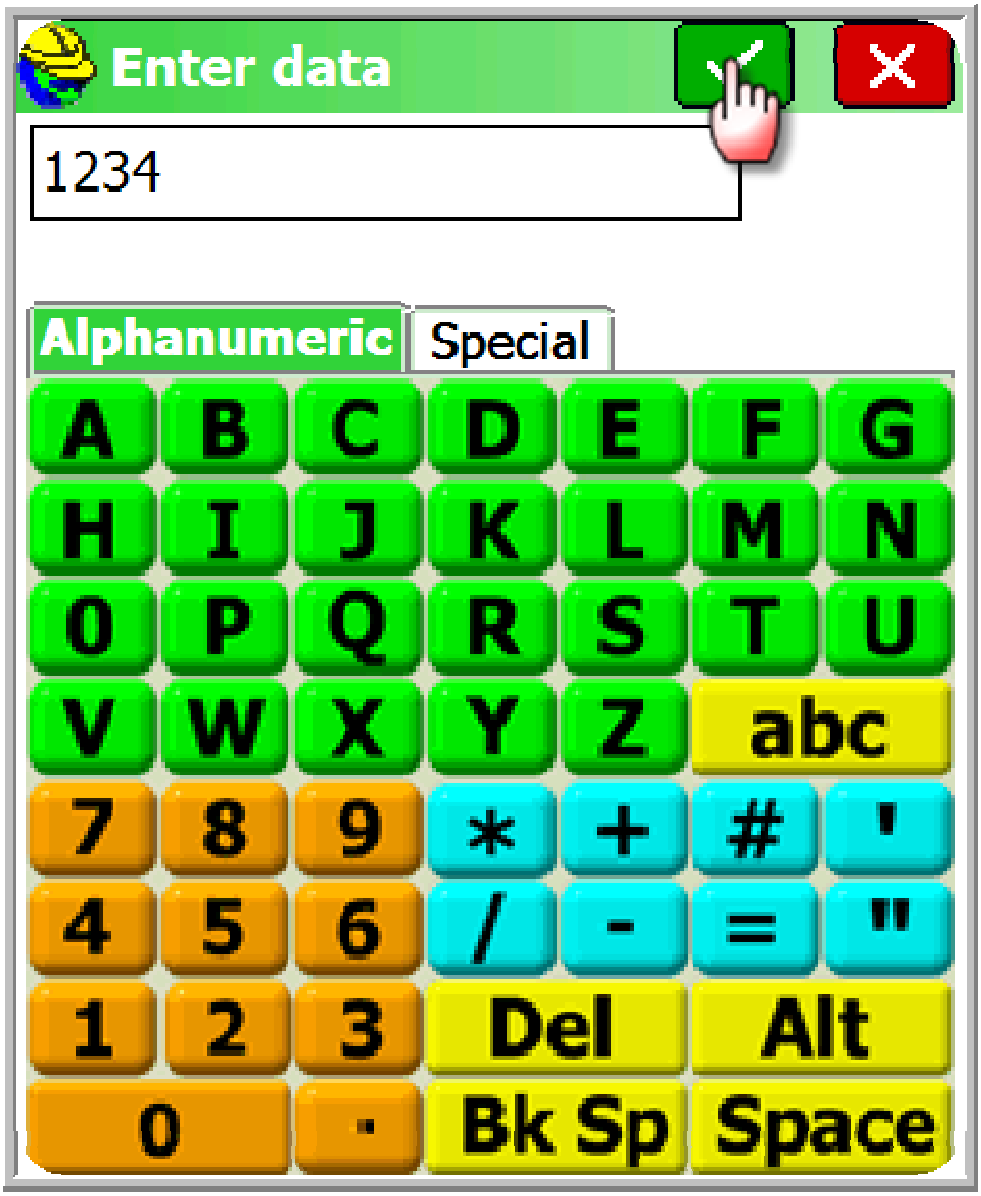


21. *“Single Click”*

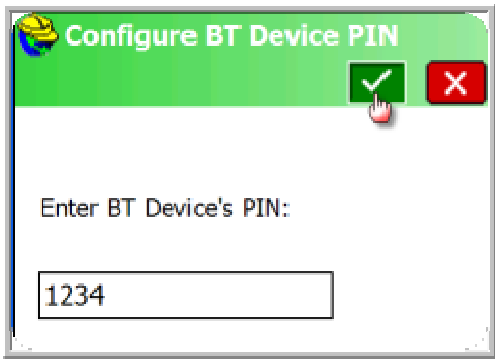


22. *“Single Click”*

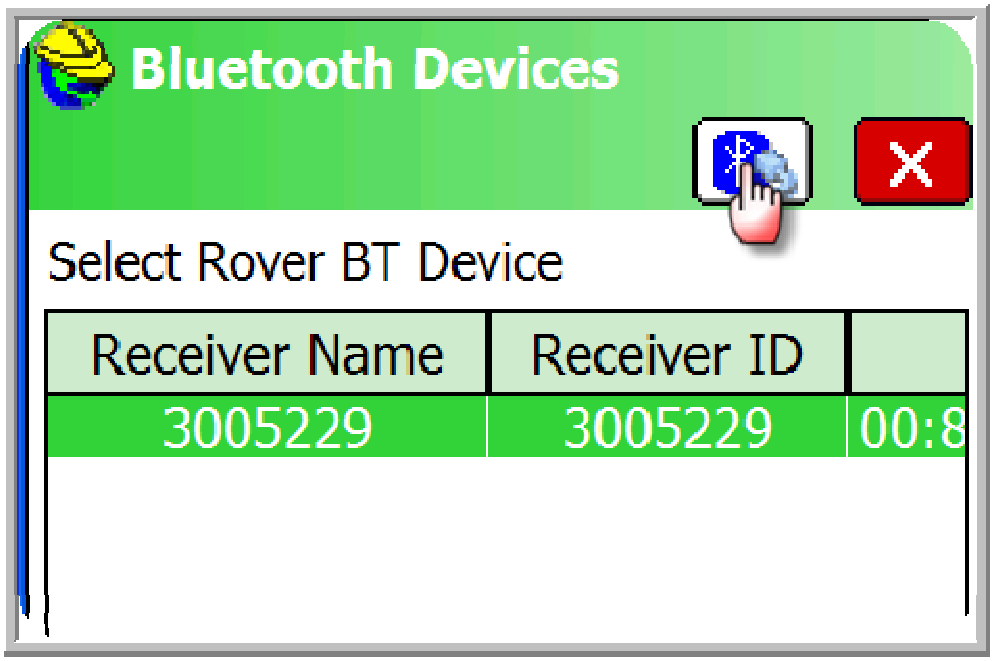
23. Type in 1234 and *"Single Click"*



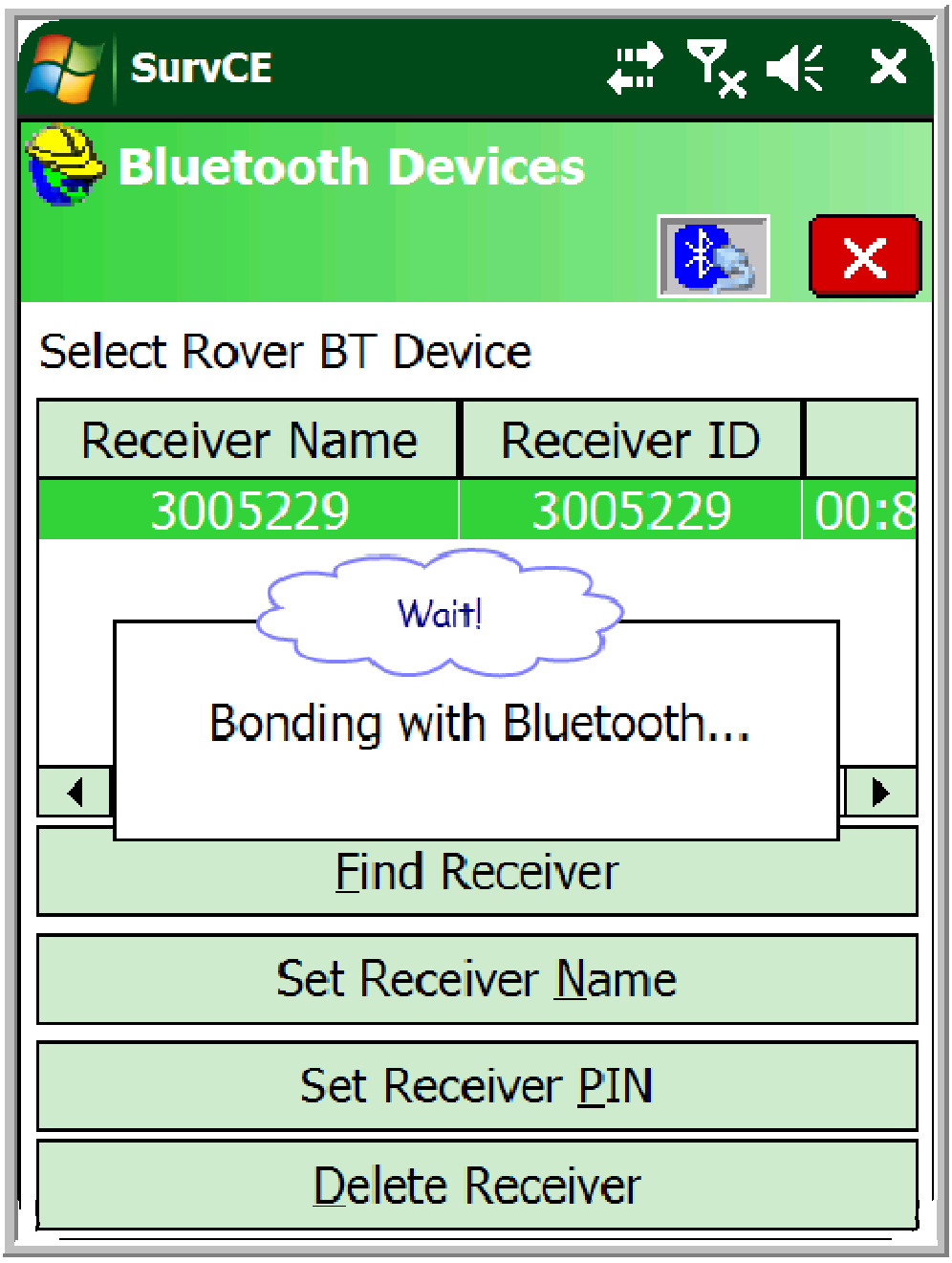
24. *"Single Click"*



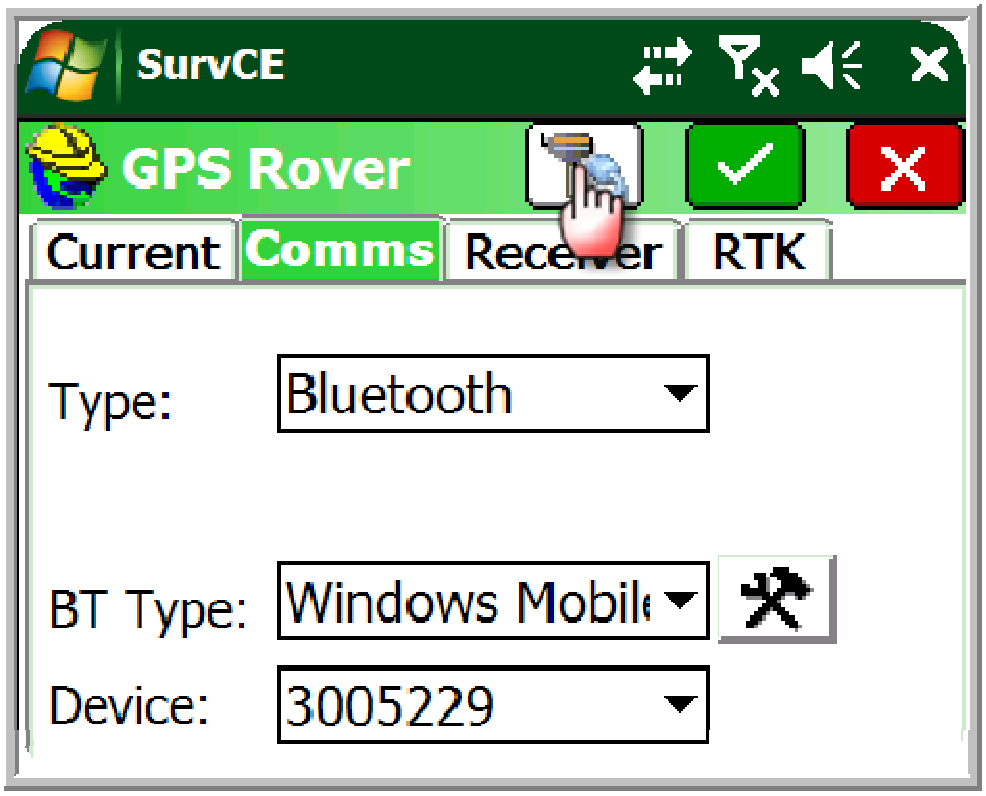
25. *“Single Click”*



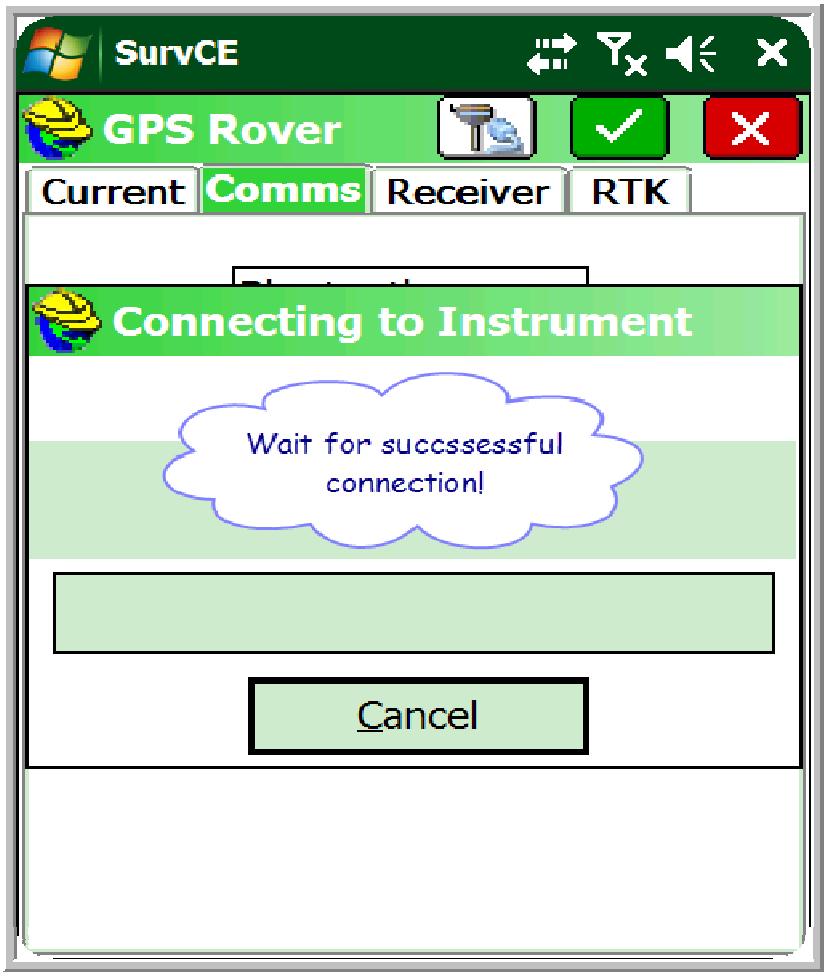
26.


SurvCE
Bluetooth Devices
Select Rover BT Device
Receiver Name
Receiver ID
3005229
3005229
00:8
Wait!
Bonding with Bluetooth...
Find Receiver
Set Receiver Name
Set Receiver PIN
Delete Receiver

27. *“Single Click”*



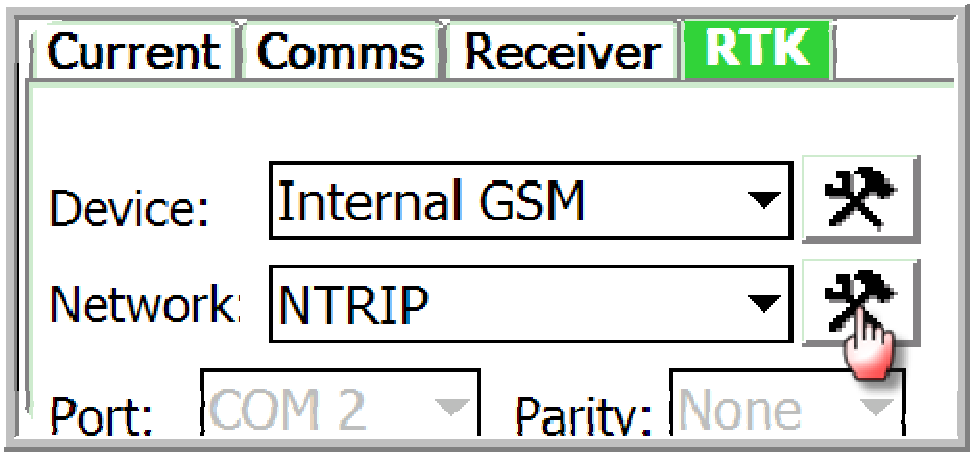
28.



29. *“Single Click”*

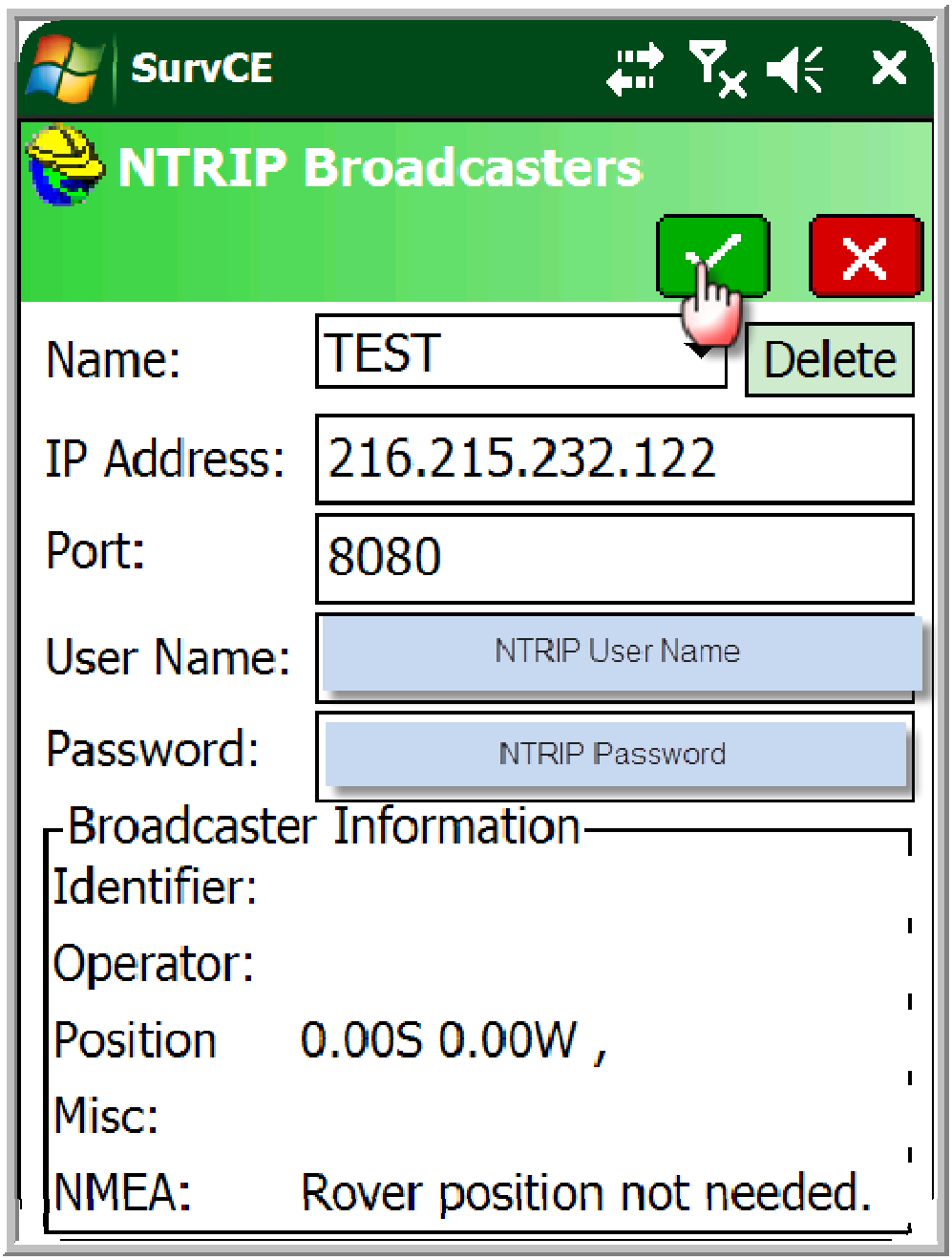
30. **Select Internal GSM from the Device: Drop down tab.**
    a. **Select NTRIP from the Network drop down tab.**

31. *“Single Click”*



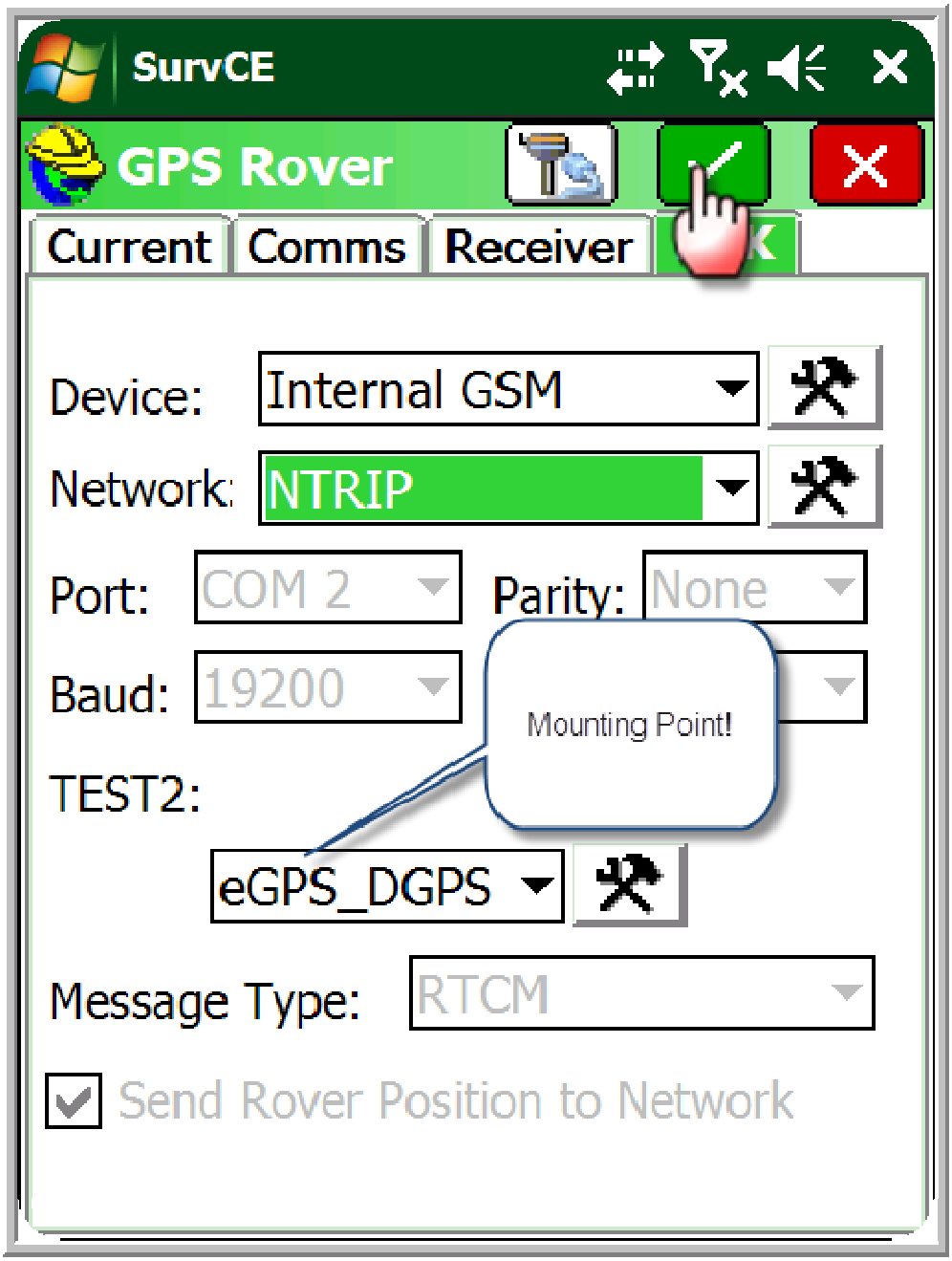
32. **Give a name to your connection for RTN.**
    a. **Type in IP. Address from RTN provider.**
    b. **Type in Port from RTN Provider.**
    c. **Type in User Name and Password from RTN provider.**

Note this information should be the same as you typed into the TKO receiver on step # 24 above. Chapter 1



Once the Broad caster loads all the mounting points you are ready to dial in for RTK corrections.

33. *“Single Click”*



You are Finished!!!