X900+   X91+

w/ CHC Radios

RTK GPS Receiver
User Manual

This manual is for use with X900+ and X91+ CHC receivers sold by iGage Mapping Corporation. Receivers with similar model numbers typically will not match devices provisioned by iGage.

Revision N - 10 January 2015

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CHC is a Trademark of Shanghai Huace Satellite Navigation Technology Limited of Shanghai, China

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

FCC Notice: CHC X900+ and X91+ GPS receivers comply with the limits for a Class B digital device, pursuant to the Part 15 of the FCC rules when it is used in the Portable Mode.

Operation is subject to the following two conditions:

(1) This device may not cause harmful interference
(2) this device must accept any interference received, including interference that may cause undesired operation

FCC Compliance:

Function	FCC-ID	Module Type
Bluetooth	RFR-B2029	Stollman BlueMod+B20/AI/AP
3.75G WCDMA module	RI7HE910	Telit HE910-D
2.5 G GPRS module	RI7GL865Q	Telit GL865-QUAD
2.75 G EDGE module	N7NQ2687	Sierra Wireless Q2687
Satel TR-Radio	MRBSATEL-TA13G	Satel SATELLINE-M3-TR1

Table of Contents

Introduction

Thank you very much for choosing to purchase and use an X900+ or X91+ GPS receiver!

With a ground-breaking price, outstanding performance, field ready carry case and easy-to-use features, we know that a CHC GPS receiver will be a valuable tool that quickly pays for itself.

The X900+ and X91+ receivers are nearly identical. The only differences are the external case style and the internal GNSS Engine.

	X900+	X91+
GNSS Engine	Trimble BD970 GNSS Engine	Novatel OEM 6 (OEM 628)
Case Style		

This guide is designed to help you familiarize yourself with your new equipment and to put it to use in the field.

If you have questions or suggestions, don't hesitate to contact us:

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Salt Lake City UT 84105   USA

+1-801-412-0011
email x9@igage.com

Your input is extremely valuable to us and we will listen to your suggestions!

Software updates and news are available from:
www.x9gps.com

Training Videos

Training videos specific to setting up a X9x Base, Rover and Network Rover are available from the [Videos] link on the x9gps.com website.

If you are not familiar with any of these subjects:

US Survey Feet vs. International Feet (Video #1)
Grid vs. Ground Distance Measurements (Video #2)
Ellipsoid vs. Orthometric Heights (Video #3)
Setting up a Tripod/Tribrach (Video #66)

Check out the videos at www.igage.com/v

There are Carlson SurvCE specific videos that address scale factors and aligning measured and record data.

SurvCE Manual

An electronic copy of the manual for SurvCE can be found on the Carlson website:
www.survce.com
Click on 'Software Download' for version 3.0, then select product version 3.0 and click on 'Show Files'. A link to the latest manual version will shown:

In addition there are a variety of excellent SurvCE training videos available at the Carlson Software website:

www.carlsonsw.com

Click on the 'Videos' link on the right side of the page.
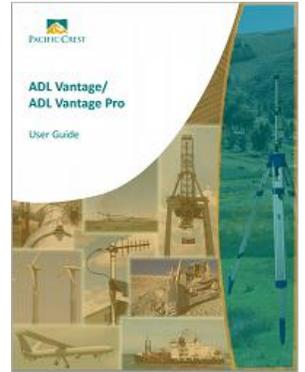
ADL Vantage Pro UHF Radio Manual

Your CHC receiver package may contain a high powered Pacific Crest ADL Vantage Pro radio or repeater.

The manual for Pacific Crest ADL Vantage Pro radios can be found online:

http://www.pacificcrest.com/library/User_Guide_ADL_VantagePro.pdf

This manual contains extensive warnings and operation information.

LT30 Data Collector

You can download the CHC Factory Getting Started Guide from

www.x9gps.com

On the LT30 linked page.

Please note that iGage preloads ALL software, activates SurvCE and your LT30 will be ready to use, out of the box.

Please don't reload the software, it should already be loaded.

Important things to remember:

- Set the data collector to turn off the *backlight* after 30-seconds of inactivity.
- Set the data collector to NEVER shutdown, it disrupts the Bluetooth connection.
- Store jobs on the SD Card, they will be easier to transfer and there is unlimited space available.
- Tapping the ON/OFF key puts the data collector in Standby
- Push and hold the ON/OFF key for two seconds to turn the data collector OFF

Be careful when charging the LT30 in your vehicle. It is possible to snap the USB mini connector if you sit on the data collector with the charging cable connected.

A software patch has been installed on your LT30 which allows the "F2" key to be used as an enter key, this allows for single button shots in SurvCE.

What's in the Box

Depending on your purchased configuration you will receive different accessories with your GPS head. Typically you will receive all of these:

Carrying Case	Power Adapter with Cord:
GPS Head	Lithium-Ion Batteries
GPS to PC Data Cable: Serial, USB and Ext. Power	Dual Battery Charger

In addition you may also receive:

A Data Collector

A Bracket to hold your Data Collector on a pole

A pole for the rover

A tripod for the base

An external radio for the base with cables and UHF antenna

External battery cables

Pole extension for elevating the GPS above a tripod head, allowing cable entry past a tribrach.

Safety Information

This manual describes the CHC X9x GNSS Receivers. Before you use your receiver, please make sure that you have read and understood these warnings and safety requirements.

Warnings and Cautions

An absence of specific alerts does not mean that there are no safety risks involved. Warning and Caution information is intended to minimize the risk of personal injury and/or damage to the equipment.

Use and Care

The X900+ and X91+ receivers are field ready instruments; however they are also delicate electronic instruments. Take suitable care to avoid damage to the instrument.

Avoid dropping the receiver as it can change the phase center of the antenna!

Avoid storing the receiver at excessive temperatures (hot or cold) as it will damage the internal batteries.

Avoid storing the batteries at temperatures less than -40° F (-40° C) and temperatures higher than 160°F (70°C) as it will permanently reduce the battery capacity and life

DO NOT leave the receivers or accessories inside a vehicle in the summer. Temperatures higher than 160°F will permanently reduce battery capacity and battery life.

Battery Safety and Disposal

The batteries are lithium-ion type cells.

Battery Warnings

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

To prevent injury or damage:

Do not use or charge the battery if it appears to be discolored, warped, or leaking battery fluid.

Do not expose the battery to fire, high temperature, or direct sunlight.

Do not immerse the battery in water.

Do not store the battery inside a vehicle during hot weather.

Do not drop or puncture the battery.

Do not open the battery or short-circuit its contacts.

Do not charge the batteries in chargers other than the supplied charger or a direct replacement.

Do not charge similar batteries in the supplied charger, even if they fit well.

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

If battery fluid gets into your eyes, immediately rinse your eyes with clean water and seek medical attention. Do not rub your eyes!

If battery fluid gets onto your skin or clothing, immediately use clean water to wash off the battery fluid.

Batteries

One or two Lithium-Ion batteries are supplied with your receiver.

Each battery, when new, will power the receiver for 4-hours at temperatures higher than 50 degrees F. At lower temperatures battery life is shortened.
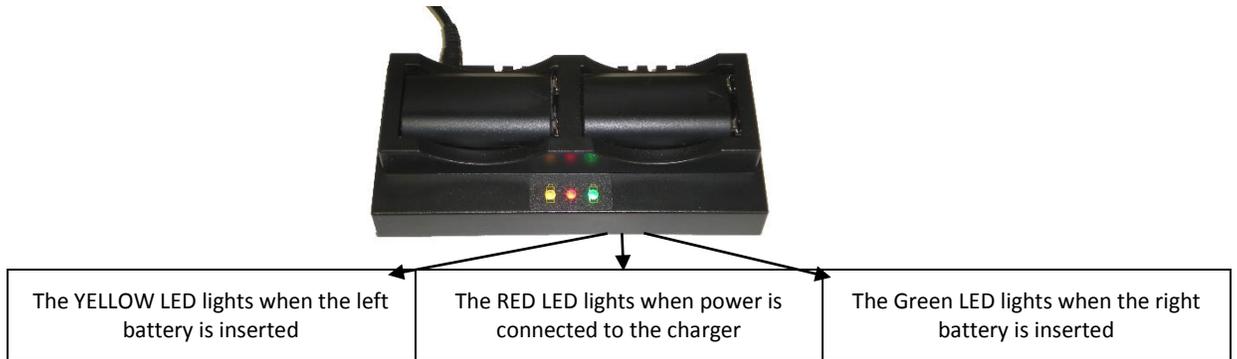
If you plan on running a base receiver for longer than 4-hours, it is suggested that you use a Battery Clip Cable to connect the auxiliary power connector to an external 12 volt battery.

If you are using a base receiver with an external radio, the radio cable supplies both the radio and the head.

Fully charge the batteries using the supplied charger before first use.

Battery Charger

Plug the charger into the supplied wall transformer or use the supplied alligator clip cable to connect to a 12 Volt battery.

The YELLOW LED lights when the left battery is inserted	The RED LED lights when power is connected to the charger	The Green LED lights when the right battery is inserted

-- -- -- -- --   When charging begins the
                        LED's blink quickly

--   --   --   As the batteries reach full
                        charge, the LED's blink slower

--------------------   When the LED's stop blinking,
                        the batteries are fully charged.

It is okay to leave charged batteries in the charger for extended periods of time.

TOO COLD: Do not leave charged or uncharged batteries in your vehicle at night if the temperature will be less than 20 deg F. Extreme cold battery storage will permanently reduce the capacity and lifetime of the batteries.

TOO HOT: Do not leave charged or uncharged batteries in your vehicle on hot days with the windows rolled up when temperature will be higher than 90 deg F. Hot temperatures will permanently reduce the capacity and lifetime of the batteries.

Radio Hazards:

Bluetooth Radio

Radiated output power from the internal Bluetooth radio is far below FCC radio frequency exposure limits. The Bluetooth radio operates within guidelines for radio frequency safety standards and recommendations, which reflect the consensus of the scientific community.

The level of energy emitted is far less than the electromagnetic energy emitted by wireless devices such as mobile phones. However, the use of wireless radios may be restricted in some situations or environments, such as on aircraft.

UHF Radios

The Pacific Crest ADL Vantage Pro 35-watt radio is used as a base radio. Consult the

When used in the transmitting mode, even though the broadcast power is relatively low, you should take these additional precautions:

Medical Devices - Pacemakers

The Advanced Medical Technology Association recommends that a minimum separation of 6 inches (15 cm) be maintained between a handheld wireless radio and a pacemaker. These recommendations are consistent with the independent research by, and recommendations of the U.S. Food and Drug Administration.

Persons with pacemakers should:

• ALWAYS keep the radio more than 6 inches (15 cm) from their pacemaker when

the radio is turned ON.

• Not carry the radio in the breast pocket.

• Use the ear opposite the pacemaker to minimize the potential for interference.

• Turn the radio OFF immediately if you have any reason to suspect that interference is taking place.

Safety and General Information

Medical Devices - Hearing Aids

Some digital wireless radios may interfere with some hearing aids. In the event of such interference, you may want to consult your hearing aid manufacturer to discuss alternatives.

Other Medical Devices

If you use any other personal medical device, consult the manufacturer of your device to determine if it is adequately shielded from RF energy. Your physician may be able to assist you in obtaining this information.

Blasting Caps and Areas

To avoid possible interference with blasting operations, turn off your radio when you are near electrical blasting caps, in a blasting area, or in areas posted: "Turn off two-way radio." Obey all signs and instructions.

FCC Licensing Information

These devices:

X91+Satel(1191806826)

X900+Satel(1192507826)

ADL Vantage Pro (82218-10)

Include transmit – receive UHF radios and require FCC Licensure for operation in the United States. It is illegal to operate these devices in Transmit mode without the appropriate license. In addition these devices must have CSMA and Call Sign broadcast enabled when operated in transmit mode.

This link:

http://www.amerisurv.com/PDF/TheAmericanSurveyor_Silver-PirateSurveyors_Jan2014.pdf
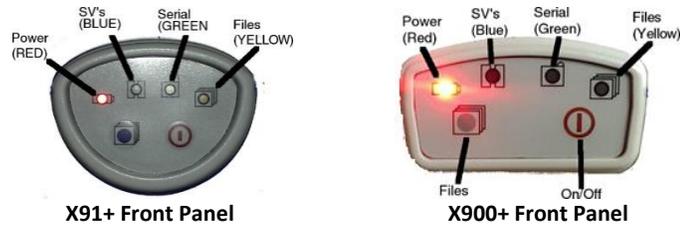
Describes the pitfalls of broadcasting without a license. This link:

http://ashgps.wordpress.com/2014/01/08/exactly-how-do-i-get-a-fcc-license-for-my-rtk-radio/

Describes how to obtain an FCC License.

Front Panel Operation

X91+ Front Panel   **X900+ Front Panel**

Pushbuttons

The front panel has two pushbuttons **On/Of**f and '**Record Files'**:

On/Off Pushbutton

Press the On/Off button for 1-second and release to turn ON the receiver.

'Record Files' Pushbutton

When the Record Files button is pressed for one second the receiver toggles from collecting data, to not collecting data. The yellow Files LED will stop flashing when recording stops.

When the receiver is not recording, pressing the record button again for one second will open a new observation file and begin collecting observation data (in a new file) again.

You can also use the Record button to check the current mode: recording or not recording.

> Tapping the Record button will cause either the Serial or the Files button to flash:

> > Serial green   receiver is recording

> > Files yellow   receiver is NOT recording

LED Indicators

There are four LED indicators on the receivers:

Power

> Red   Power ON. If flashing, the battery charge is low and the receiver will turn off soon

SV's (Satellite Count)

> Blue   Blinks once for each tracked satellite, waits 5-seconds, repeats.

Serial

> Green   Blinks when RTK correction data is received by the serial port. Blinks when the 'Record Files' button is pressed if the receiver is storing to a static file.

Files

> Yellow   Blinks each time data is stored to the static file. Blinks when the 'Record Files' button is pressed if the receiver is NOT storing a static file.

When the receiver turns on:

All LEDs will flash.

The receiver will automatically begin searching for satellites. As satellites are found, the Blue LED will indicate the number of tracked satellites.

To turn the receiver off, press and hold the On/Off button for one second. All four LED's will quickly flash three times and the receiver will power down.

Setting Up an RTK Base Receiver

Choosing a Good Location for the Base

The location of your base greatly impacts the success of your survey. There are two primary concerns:

1. Minimizing multipath and obstructions between the base and the sky
2. Maximizing the effective range of the UHF radio which is broadcasting corrections to the rover

Any multipath or obstructions at your base will affect every single shot at your rover, just as if they existed at the rover. Your primary concern should be finding an open location for the base that minimizes multipath (via GNSS signal reflections on hard surfaces.)

A clear view of the sky above a 10 degree mask is also important. Partially obstructed/masked satellites (through tree branches) are worse than fully obstructed satellites. Clearance to the South, East and West is most important. Obstructions directly to the North have the least effect on your RTK and static solutions.

When using a UHF radio, your ability to place the UHF antenna in a high location with the minimum of obstructions to your working area is also important.

Configuring a UHF Base With External ADL Vantage Pro Radio

Base Radio Battery

iGage does not provide a battery for use with the Base. A suitable battery can be sourced locally. Most deep cycle 'Marine' battery or closed cell battery will work well.

There may be some advantage to a closed cell marine battery like the Optima series:

However at three times the price of a standard Marine deep cycle battery:

The standard wet-cell battery may be a better value.

The duty cycle of the radio in normal operation is about 50% and the radio draws about 8 amps at full output power. So a 9-hour day requires about 40 amp hours. However the battery requirement is greatly increased for operation in cold weather and the battery's capacity is reduced after several discharge cycles.

The less the battery is discharged as a function of its maximum capacity, the more charge cycles the battery will accept.

For these reason, when purchasing a battery for the base: **big**-is-certainly-better.

iGage includes both alligator clips AND lug connectors for the battery. A solid lug connection is best. You will not be able to broadcast at full power with the alligator clips and you run the risk that the clips will overheat. Deep cycle marine batteries include terminals that will directly accept the lug connectors and you should use them.

Before plugging in the UHF radio, always insure that the antenna has been connected. Double check that the polarity (RED = +; BLACK = -) is correct before attaching the power connector.

Setting Up an ADL Vantage Pro Radio with Cable Connection to Base

1. Place the GPS receiver on the tripod.

   Set the UHF radio antenna to the North of the GPS receiver.

   Raising the UHF antenna's height will greatly increase the range for a given radio output power. Height trumps output power.

   NOTE: The radio automatically drops the output power as required to keep the case at a reasonable temperature. In hot weather fashion a shade (as simple as a piece of cardboard) over the top of the radio to keep direct sunlight from heating the case.

   For operation in extreme heat, a fan cage:

   is available to force cool the fins on the radio back.

2. Connect the UHF Radio antenna to the radio mast, connect to the antenna port on the ADL Vantage Pro.

   DO NOT plug power into the ADL radio until the UHF antenna has been connected and placed on the mast.

   DO NOT hold the antenna or touch the antenna when power is applied or turned on to the ADL radio. The radio can output sufficient power to burn you.

   DO NOT place the UHF antenna to the South of the receiver. The UHF antenna will block the GPS antenna's view of satellites to the South. (There are very few SV's to the North of your GPS receiver so the impact is minimized.

3. Connect the GPS/PCC serial cable to the GPS receiver and to the radio.

   WARNING! The Y-Cable has two ends that have the same diameter, however one side has 10 pins (GPS) and the other side has 5 pins (RADIO)! If you interchange the cable ends, you will ruin the cable. This failure is not covered by warranty.

   The Y cable end with the flat SAE connector and the round cable plugs into the radio:

   The simple cable end plugs into the Base GPS:

4. Connect the Y connector power cable to the battery. DOUBLE CHECK THE POLARITY (RED to +) (BLACK TO -) and then plug in the radio Y connector.

The radio will turn on when power is applied.

NOTE: The radio will always turn on when power is applied. So make sure the UHF antenna is connected prior to attaching power to the radio!

IMPORTANT: Before you remove power from the radio, ALWAYS turn the radio off with the power switch. Push and hold the Power ON/OFF button for five seconds, then wait for the radio to power down:

Alternatively you can disconnect power at the SAE (the flat two-pin connector.)

5. After 5 minutes, the LCD display is placed in sleep mode. Press and hold the ON/OFF button for 1-second to turn the LCD display back on.
6. Verify the radio settings if they might have been changed:

NOTE**: If you change a value, be sure to press the center Enter button to store the change.**

a. When you turn on the receiver, the device status will be shown. Check to insure the battery charge level is 'Normal'.
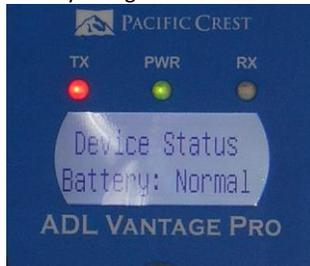
b. Press the 'right-arrow' to move the next screen. The current transmit channel will be shown. The RX LED should not be on or flickering. If it is, then another person is using the selected channel. You can use the up and down arrow buttons to choose an alternate channel/frequency, then **press the Enter button to select the new channel**. The current channel is indicated by an asterisk as

shown below:

You MUST set the Rover radio frequency to match this setting.

c. Press the 'right arrow' to view the 'Data Protocol'. "Trimmark 3" is the correct setting and corresponds to the 'CHC' setting on the data collector:
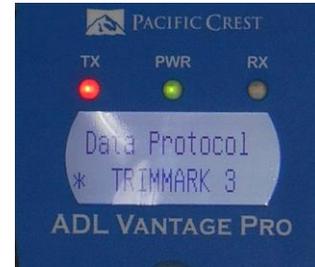
d. The Radio Link Rate is the 'over the air' baud rate. The correct value is 9600.

NOTE: 50% of all RTK Radio Problems are due to incorrect Radio Link and Serial Baud Rate settings. To reduce the chance of bad configurations we have forced all of the baud rates to be 9600. (In other words, the answer is always 9600 for the Internal CHC radio.)

If your head has an internal Satel radio, the answer may be 4800 for some applications.

e. Set the Operation Mode to Base/Rover:

f. Set the RX Sensitivity (for the base) to Low. This prevents the base radio from listening to

distant users.
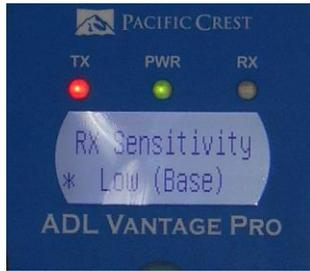
g. Set the Transmit Power to the lowest power that will cover your job. Use the up and down arrow keys to select, press enter when the proper selection is made.
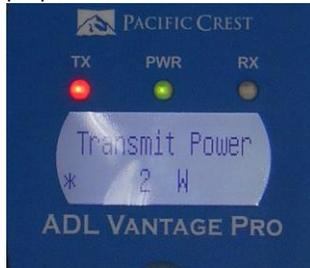
h. Set RX LED to Signal Received:
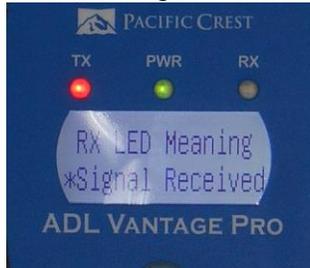
i. The Serial Baud is the baud rate over the serial cable to the GPS receiver. This is fixed at 9600 baud on the receiver.
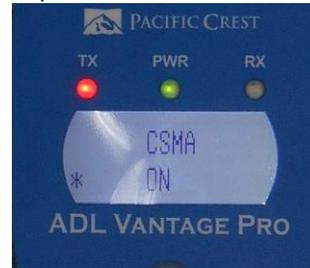

j. Press the 'right-arrow' to skip Signal Strength:
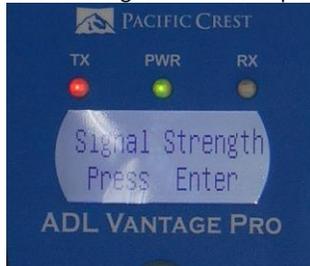
k. Press the 'right-arrow= to skip Advanced Menus Show:

l. CSMA (Collision Sense Multiple Avoidance) must be left ON in the USA to meet FCC requirements:

When CSMA is turned ON, the radio will listen for other data or voice users on the programmed frequency. The radio will wait until they stop broadcasting before transmitting.

m. Click the 'right-arrow'- to skip the Edit Config screen:

n. Choose the appropriate language:

o. Leave 'Antenna Detect' set to ON. If you power the radio up without an antenna or your antenna is damaged, then the radio will detect this error and turn the output power down to 2 watts. This will prevent the output amplifiers from burning up:
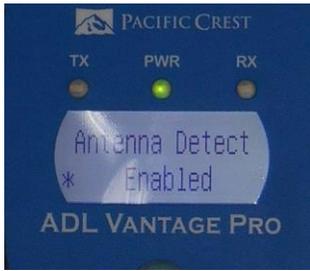
If you know the attached antenna will always be good, you can disable antenna detection. This will prevent the radio from down-powering and the radio will always output the selected power. (Assuming the radio is cool enough.)

p. The Antenna VSWR displays the Standing Wave Ratio. Any value less than 4:1 is reasonable. The lower the number, the better:
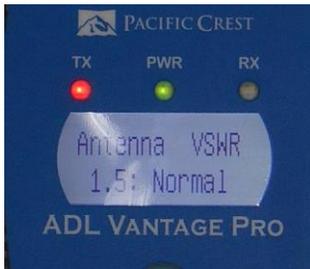
Values higher than 8:1 result in a 'no antenna connected message.'

q. One last right click and you are back to the Device Status:

r. Clicking the 'down-arrow' will display the owner name:
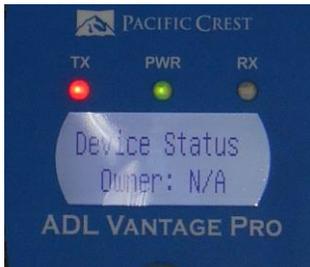
s. Down arrow to the FCC ID which is transmitted in Morse Code every 15 minutes:

t. The modulation type is GSMK:

u. In almost all cases for all current FCC licenses in the United States, the channel bandwidth must be 12.5 KHz or less to meet current FCC requirements:

v. This screen indicates if the transmitter is enabled and what the output power is:

On hot days, it is possible that the radio power setting is higher than the enabled value. Power will also be reduced if Antenna Detect is enabled and a fault is detected.

w. This is the internal temperature of the receiver:

Power management becomes active when this temperature is higher than 85 deg C.

x. 30 seconds after you switch to the DutyCycle screen, the transmit duty cycle of the receiver is shown:
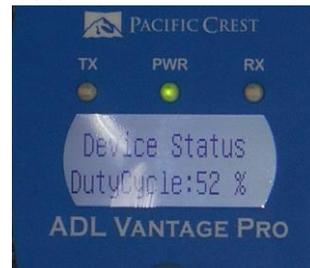
y.   This is the firmware revision currently running in the radio:
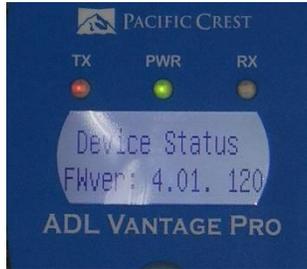
z.   Finally the regulatory region code is displayed:

7.   Turn on the data collector and start SurvCE from the Start Menu. Click on the Equipment tab:

8.   Click on the "2. GPS Base" button:

9.   Select the correct manufacturer (CHC) and device (X900+ or X91+):

10. Click on the Comms (tab):

11. Click on the Hammer/Wrench to the right of the 'BT Type':

12. Click on the 'Find Device' button and the data collector will look for every available Bluetooth device:

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y.   This is the firmware revision currently running in the radio:

z.   Finally the regulatory region code is displayed:
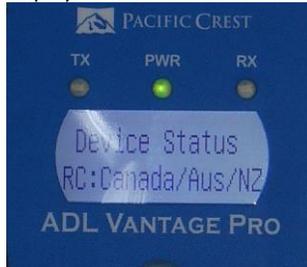
7.   Turn on the data collector and start SurvCE from the Start Menu. Click on the Equipment tab:

8.   Click on the "2. GPS Base" button:

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10. Click on the Comms (tab):
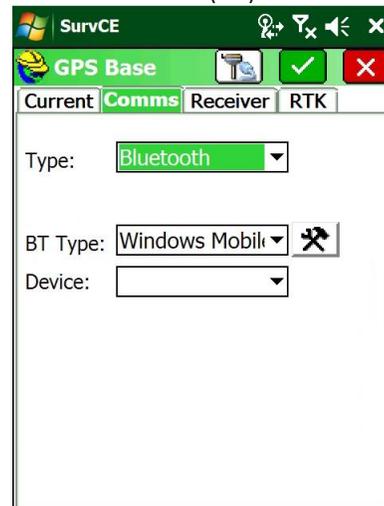
11. Click on the Hammer/Wrench to the right of the 'BT Type':
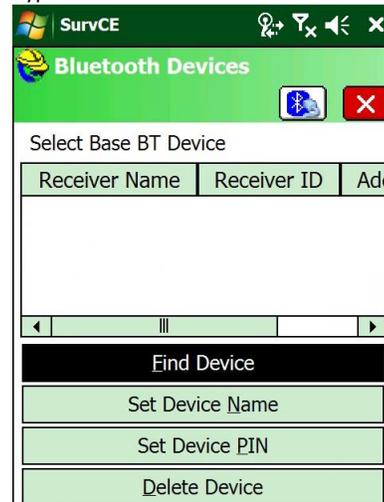
12. Click on the 'Find Device' button and the data collector will look for every available Bluetooth device:
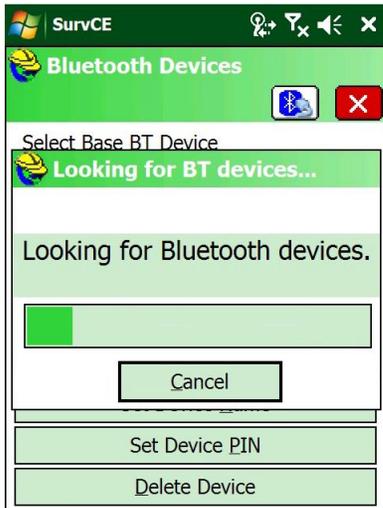
NOTE: If you choose to manually setup a Bluetooth connection to a CHC base or rover, then you may need a passcode. The default passcode is '0000'.

Using SurvCE to establish the Bluetooth connection (the preferred method) will automate the process and no code is needed.

13. Select the correct receiver, the listed name matches the device serial number:

14. Click on the green check mark:

15. Click on the blue and white Bluetooth icon button to the left of the red X:
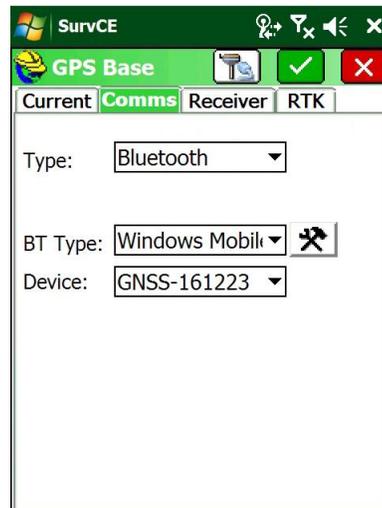
16. Select the Receiver tab:
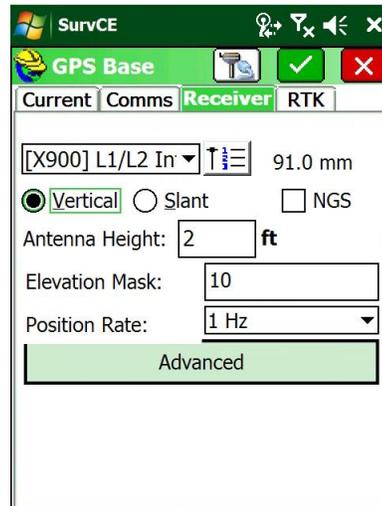
NOTE: for most applications 1Hz is preferred on the Base. With 1 Hz on the base, it is still possible to select 2 or 5 Hz on the rover.

Make sure the 'Antenna Height is correct for your tripod configuration. You can type "2M":

iGage CHC
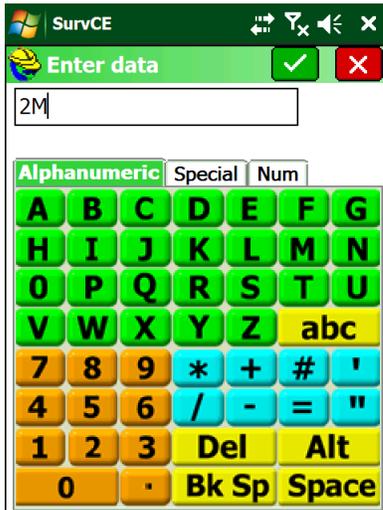
SurvCE will convert to your job's units as appropriate:
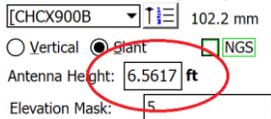
17. Next select the RTK tab.
Set the Device to 'Cable or Generic Device' and choose CMR+, RTCM3.0 or RTCM3.2 for the message type.

NOTE: You may choose CMR+ or RTCM3 for the message type, **however the Base and Rover MUST Match Exactly**!

Typically   X900+   = RTCM3.2
                    X91+   = CMR+
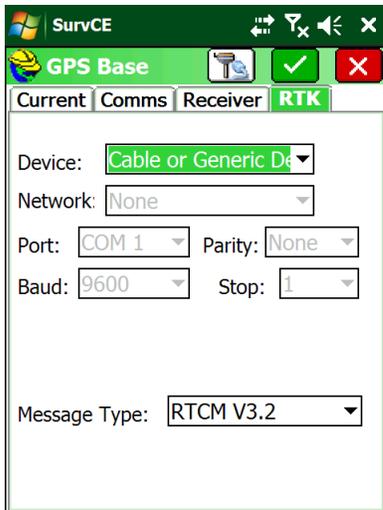
18. Click on the green check mark (upper right) and SurvCE will configure the receiver:
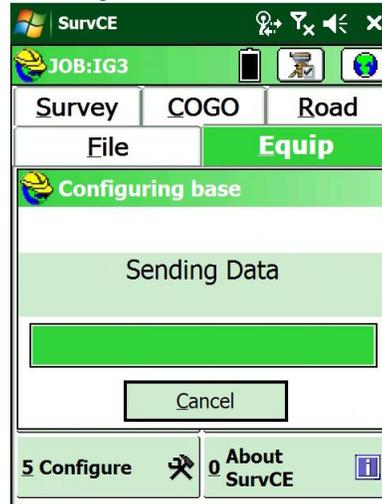
19. After 10 seconds, you are prompted to enter a position or read the GPS. Select the correct option for your job:
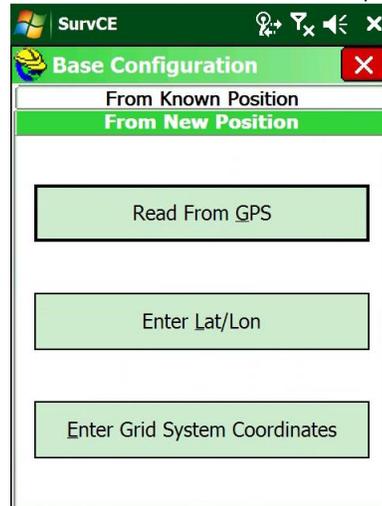
20. If you choose to 'Read From GPS':
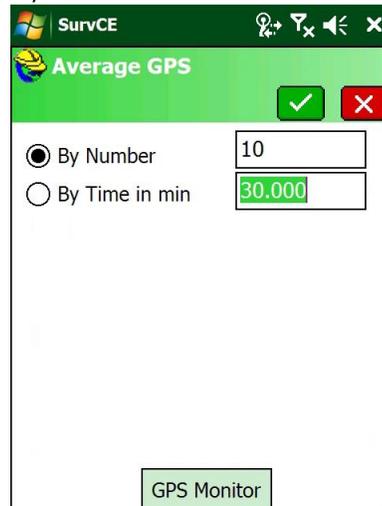
21. Select an appropriate number of samples to average, then click on the green check mark:

SurvCE

Average GPS

Taking Reading #4 of 10

4 Valid readings recorded.

SATS:5/6 STATUS:FLOAT

HSDV:47.217 VSDV:37.828

Stop Averaging and Store

Cancel Averaging
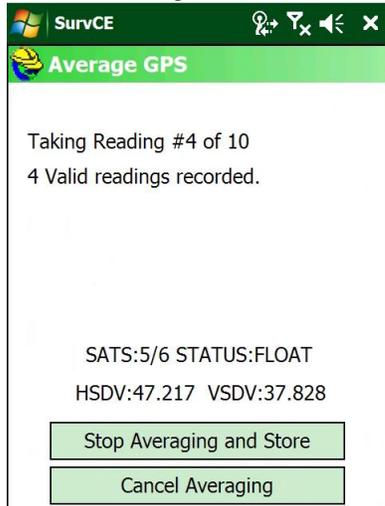
22. Let the average complete:
Enter a unique broadcast ID to differentiate your receiver:

SurvCE

Base Configuration

Broadcast ID: 23

Latitude: N 40°44'10.25014"

Longitude: W 111°51'33.83559"

Ellipsoid Hgt: 4313.789

Continue with Base Setup?

Yes   No
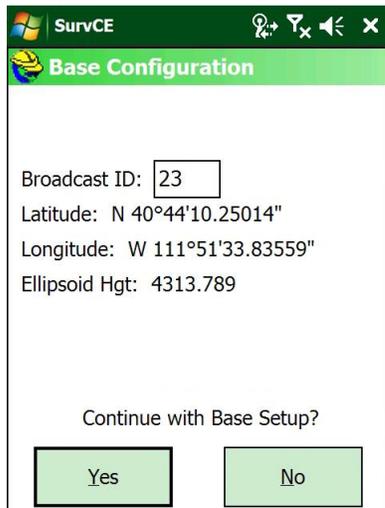
Note: The Broadcast ID should be in the range of 0 to 64 for CMR. Once a rover locks on to a correction stream with a specific Broadcast ID, the rover will not listen to another ID without being rebooted or reset.

23. Click on Yes, then after a few seconds:

SurvCE

JOB:IG3

Survey   COGO   Road

File   **Equip**

Configuring base

Configuring base

Cancel

5 Configure   0 About SurvCE
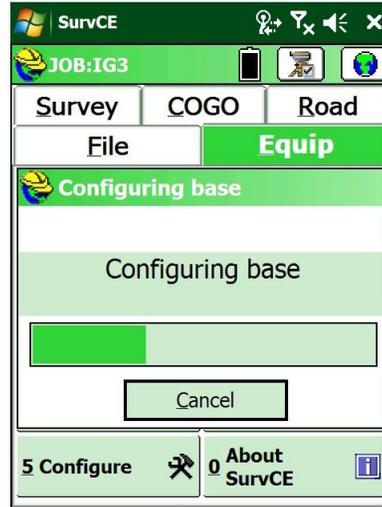
24. After a moment, SurvCE asks:

SurvCE

JOB:IG3

Survey   COGO   Road

File   **Equip**

1 Total Station   6 Localization

SurvCE

Base Configuration Successful. Save Settings to File?

Yes   No

4 GPS Utilities   9 Peripherals

5 Configure   0 About SurvCE

25. Answer Yes to complete the base configuration.
26. At this point, check the red TX LED on the radio, it should blink once every second.

The base is set and is broadcasting corrections to rovers.

27. After starting the base, check if the Yellow files LED is blinking once each second. If not, click and hold the Files button on the receiver front for one second to begin storing carrier phase data. You may want to have this data to submit an OPUS solution or to process static shots taken with the rover.

IMPORTANT NOTE:

If you click on 'Equip: Monitor Skyplot' after configuring the base, the base may be disconnected from the radio and corrections will no longer be broadcast.

Once the base has been configured and is broadcasting corrections, don't enter the monitor skyplot screen.

Configuring a UHF Rover

1. Attach the head to a range-pole, attach the data collector to the pole.
2. Turn on the head, then turn on the data collector.
3. From the main screen on the data collector:
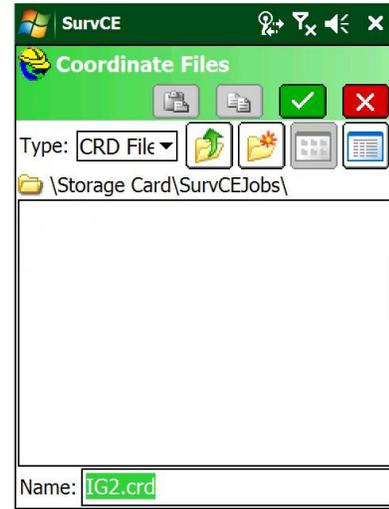
    click on 'Start', then SuvCE.

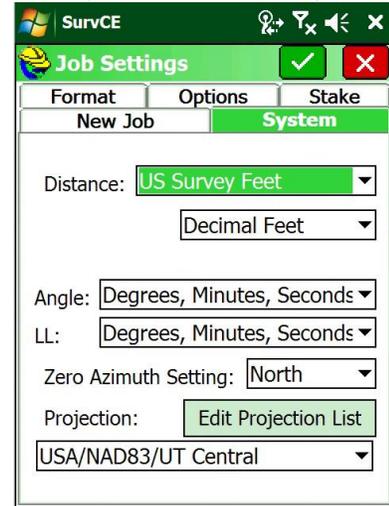4. After a moment, click on "Select New/Existing Job"
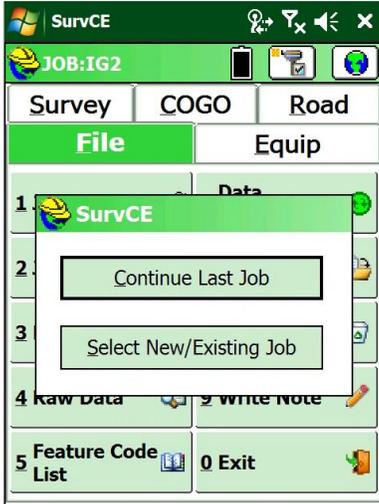
5. Navigate to the Storage Card and make a folder (or select an existing folder) to hold your job.

    HINT: If you keep your job on the Storage Card (SD) you may be able to mount the GPS as a Disk Drive and avoid using Windows Mobile Device

Center.

6. Enter a job name and click the green check mark.

7. Choose an appropriate projection and distance units. Then click the green check mark at the top, next click on the Equip tab:

8. Choose the correct manufacturer and device type:

9. Select the Comms tab:

10. Click on the 'hammer/wrench' button to the right of BT Type:

11. Click on 'Find Device':

…
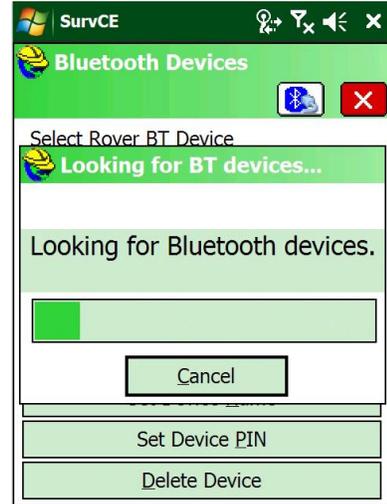
12. Highlight the correct receiver (the number is the serial number of the device, if you have your Base AND Rover powered up, make sure you are connecting to the Rover!)
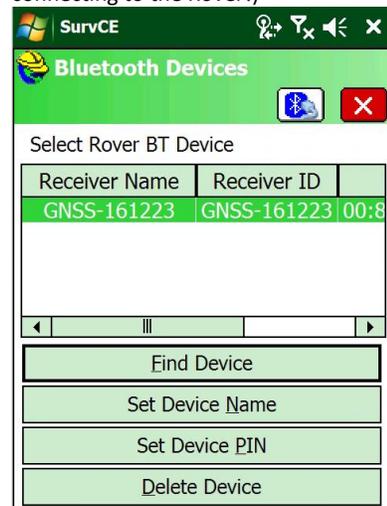
13. Click on the Bluetooth button, just to the left of the red X:

...
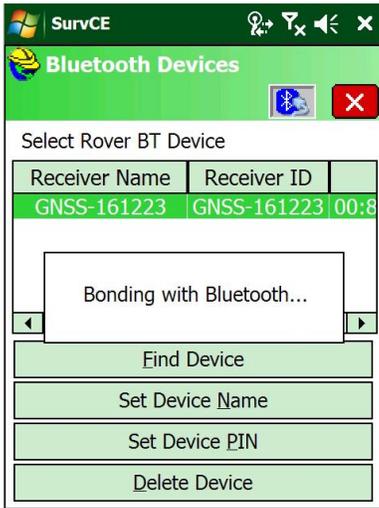
14. Click on the Receiver tab:
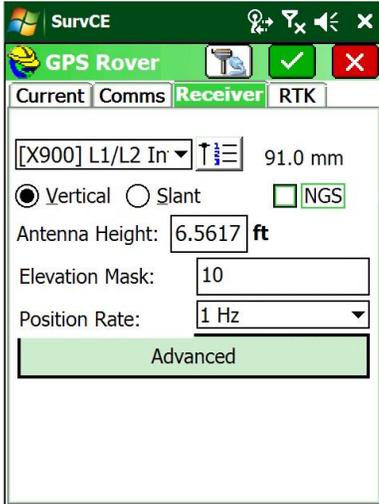
Enter the correct Antenna Height. If you have a metric pole, you can enter 'M' after the number and SurvCE will convert the measurement automatically.

Check the antenna L1 offset carefully.

If you have a matched pair of receivers, you don't need to worry about it. But if you are connecting to another base, you need to match the L1 offset

carefully. Pay attention to Relative vs. Absolute antenna calibrations.

15. Click on the RTK tab:
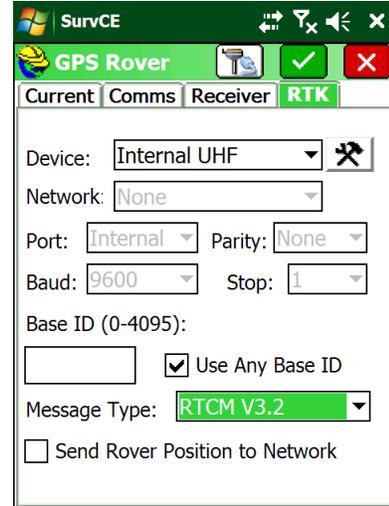
NOTE: You may choose CMR+ or RTCM3 for the message type, however the Base and Rover MUST Match Exactly!

Typically

X900+	=RTCM3.2
X91+	= CMR+

If you uncheck 'Use Any Base ID' then the entered base ID must EXACTLY match the base.

16. Select the Internal UHF device, click on the 'hammer/wrench' button to change the radio frequency and over-the-air protocol:
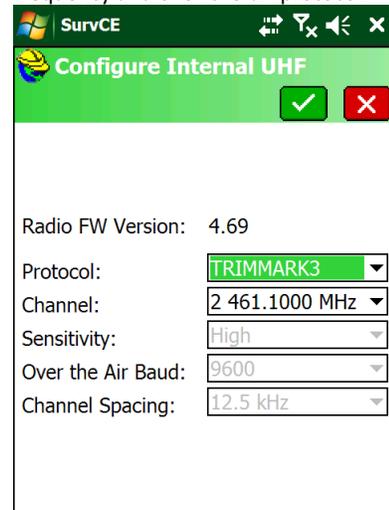
Set the Protocol to Trimmark3.
Set the Channel to match the Base transmitter channel:

The rover frequency must match the frequency selected on the base. Noted that the rover

channels are 1 based, while the base frequencies may be 0 based. Match the FREQUENCY, not the channel.

Click the green check mark when you have matched the base frequency to return to the RTK tab:
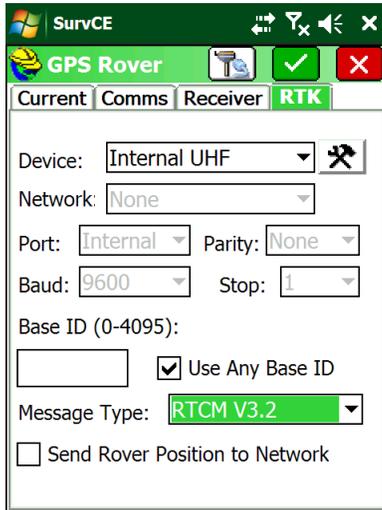
17. Click on the green check mark to configure the receiver:
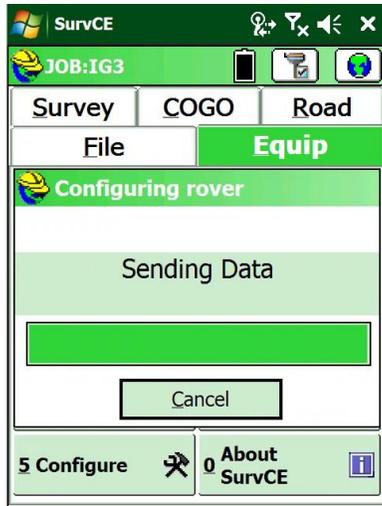
18. Click on 'Monitor Skyplot' to check the status of the rover:

19. The status of the receiver will be shown:
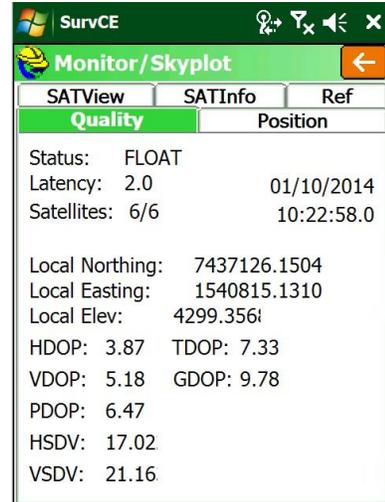
20. IMPORTANT!
Always select the 'Ref' tab and store the base location! A good rule is to store the base position twice in consecutive point numbers:

21. Your rover should go to FLOAT and then to FIX. Once it fixes, you are ready to survey!

Troubleshooting a UHF Base / Rover Pair

1. Is the base broadcasting? Check the green LED on the base, check the Tx LED on the base radio.
2. Do the frequencies match on the base and rover?
3. Does the radio protocol match? "Trimmark 3, 9600 baud" on base and "Trimtalk" on the Rover.
4. If the Rover reports 'Float' then corrections are being received.
5. If the Rover is FLOAT, but never fixes, the base position could be way different than the actual base location. Or there could be high multipath or canopy at the base or rover.
6. Is someone else broadcasting on the same frequency? If so, it will keep your base radio from transmitting.
7. Make sure the protocol matches on the base and rover "CMR+" or "RTCM3" are best, but must match exactly (Warning, there is an RTCM2 and RTCM3.) If they are unmatched, you will probably have to cycle the power on the Rover (or use 'Equip: GPS Utilities: Reset Receiver' to get the rover to switch to a new base. (This is a feature, not a bug!)

Provisioning GSM SIM Card in Data Collector

A network connection is required to use an X9x receiver in an RTK Network. You can use many methods to connect a rover to the network:

- MiFi Wireless Hotspot
- cell phone Hotspot
- GSM SIM card directly the head
- CDMA modem in the data collector
- GSM SIM card in the data collector

This section describes the last method: "GSM SIM card in the data collector."

If you choose to install the SIM card in the data collector, you will need to do a one-time provisioning to get the data collector 'on the internet.'

Step-by-step instructions follow.

1. Procure an activated GSM SIM card.
2. Turn off the data collector, remove the battery and insert your SIM card:

   Note the gold contacts are down and the clipped edge goes in last on the LT30. Other data collectors may have a different card orientation.

3. Click on the 'Connections' icon (1):
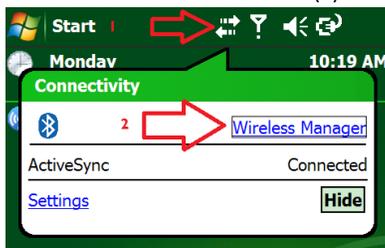
   then on the 'Wireless Manager' link (2).

4. Make sure the Phone is enabled (On or Open):

5. Click on 'Menu', then 'Phone Settings':
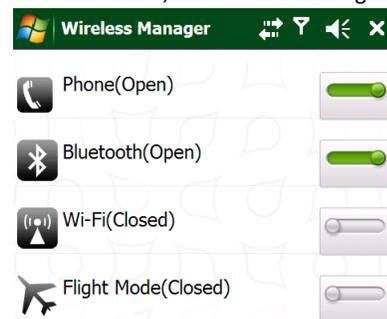
6. Click on the 'Band' tab (at the bottom) then set the GSM band as shown and press 'Set':
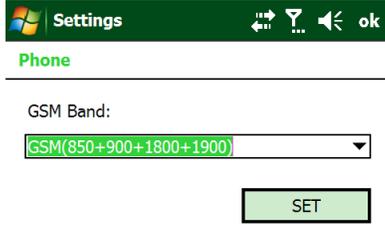
7. Click on 'OK' after you see 'Parameters set success!':
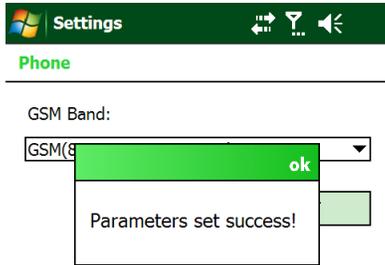
8. Wait (for up to 1-minute) for cell connectivity:

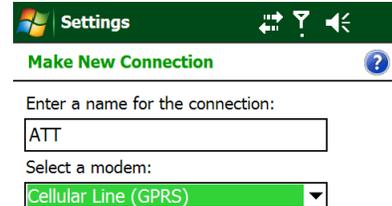Click on the 'X' in the upper right hand corner to close the 'Wireless Manager'

9. From the main menu click on 'Start: Settings: Connections (tab)':
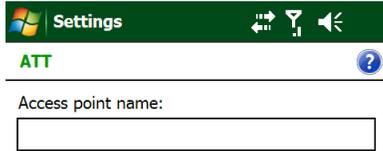

10. Click on 'Connections':
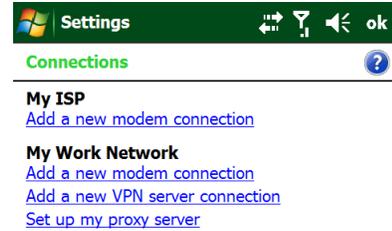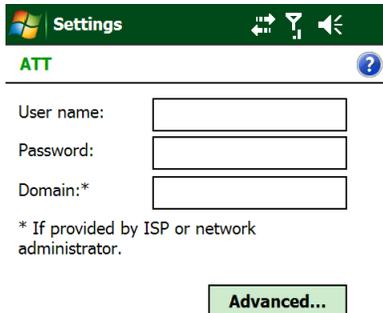

11. Click on 'My ISP, Add a new modem connection':

Set the connection name to roughly match your carrier ('ATT' in this case), set the modem to 'Cellular Line (GPRS)' as shown. Then click on Next.

12. The 'Access point name' is shown:

Leave it blank and click on 'Next'.

13. The 'User Name', 'Password', 'Domain' are shown:

Leave them all blank and click on 'Finish'.
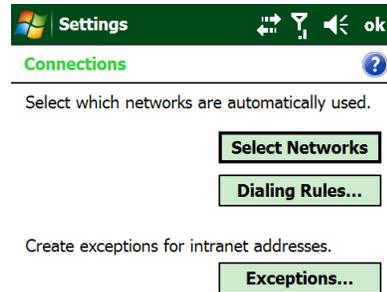
14. Click on the 'Advanced' tab (bottom):
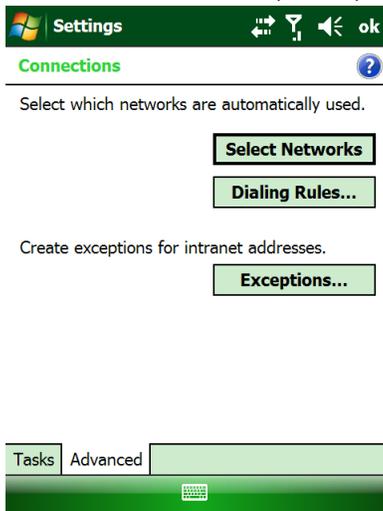
15. Click on 'Select Networks':
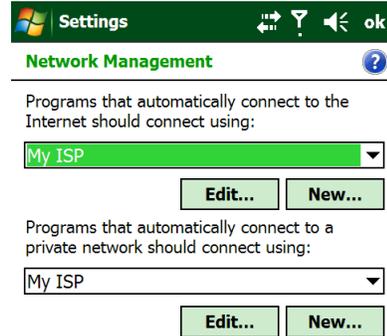
Set both to 'My ISP'. Click on OK.

16. From the Connections screen:

click on 'ok' to return to 'Settings', then 'X' to return to the main menu.

Your data collector should be connected to the internet.

17. To check your connection, click on 'Start: Internet Explorer':

Type in an address and accept.

18. If you see the web page, then your configuration effort was successful:

NOTE: This procedure needs only performed once. After the LT30 is setup, it will automatically make the GSM connection.

# Connect to Every Wi-Fi Access Point, NOT!

One of the annoying features of Windows CE is the automatic suggestion that you connect to Wi-Fi hotspots.

Even if you are connected to your own Wi-Fi hotspot, the data collector by default will continuously suggest that you connect to new ones as you pass them.

Not only is it annoying, but it can sometimes interfere with a network correction source.
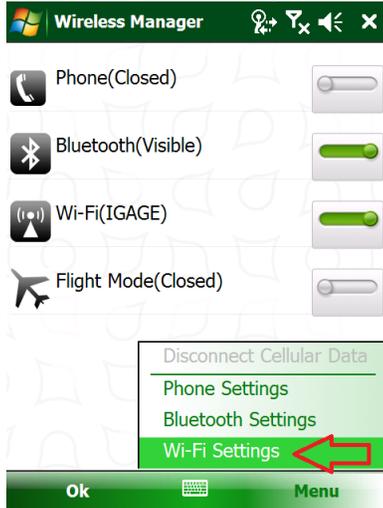
Luckily there is a simple solution:

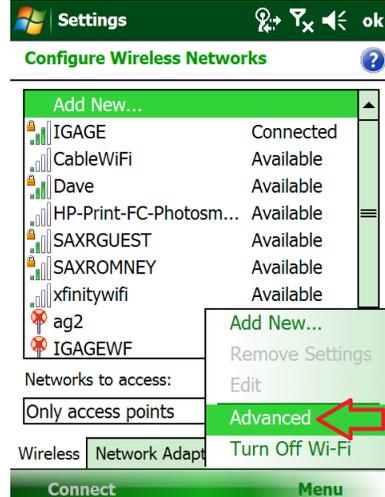1. From the main screen, click on the 'Wireless Manger' icon on the top line:
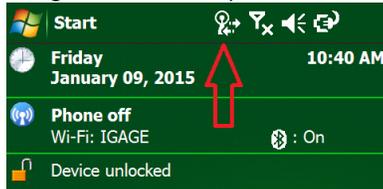
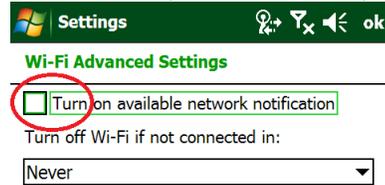2. Next click on the "Wireless Manager" link:
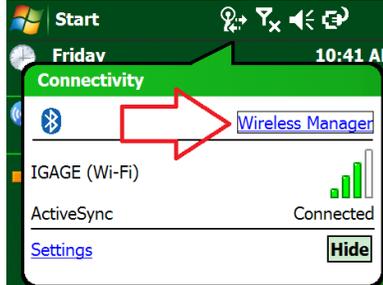
3. Click on Menu: Wi-Fi Settings:

4. Click on "Menu, Advanced":

5. Uncheck the 'Tuyrn on available…' option:

6. Click OK

Configuring a NTRIP Network Rover

Using a network rover requires either a DIP (Direct IP) or NTRIP source of corrections. The most common network source is NTRIP which is shown here.
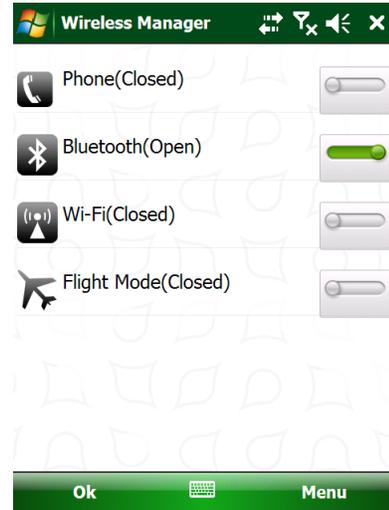
1. Attach the head to a range-pole, attach the data collector to the pole.
2. Turn on the head, then turn on the data collector.
3. Connect data collector to MiFi and verify there is internet connectivity. Click on the Connectivity Button:
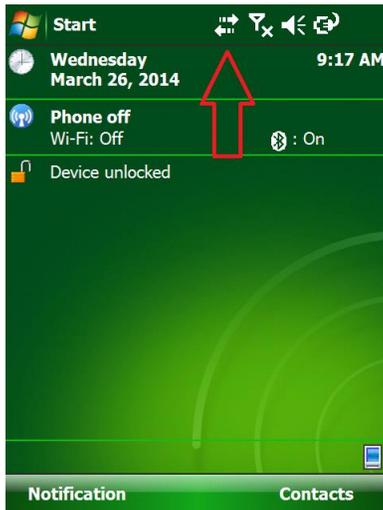

4. Click on 'Wireless Manager':

5. Enable (Turn ON, OPEN) the Wi-Fi connection by clicking on the slider to the right of Wi-Fi:


6. If you have connected to the hotspot before, waiting 30 seconds usually allows the data collector to automatically reconnect.
   If not, then you may need to manually connect or setup a new access point.
   Connect to the Wi-Fi Hotspot. The demo hotspot name is "Elevate-A5FF" (yours will be different):
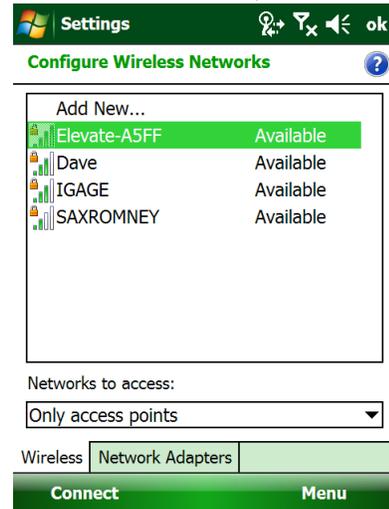

7. Highlight 'Elevate-A5FF' (the hotspot's name) then click on connect in the lower left corner. Enter the passcode, it may be displayed on the hotspot's front screen.

8. Once connected, click on OK to return to the main screen off the data collector:
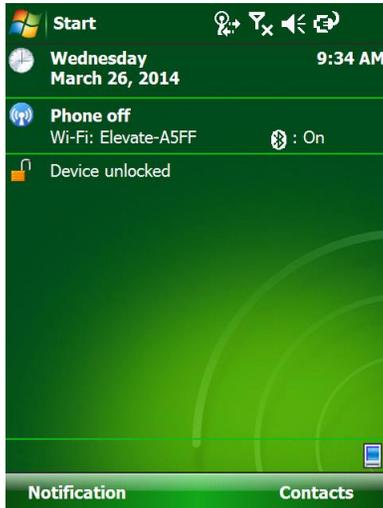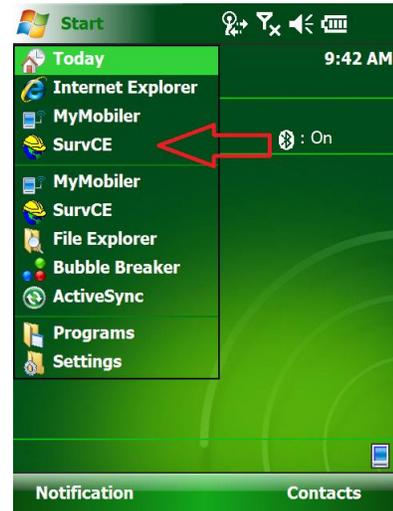

9. You can quickly verify that you are connected to the internet. Click on the 'Start' icon in upper left corner, then click on Internet Explorer:
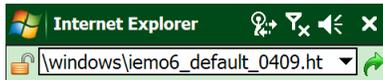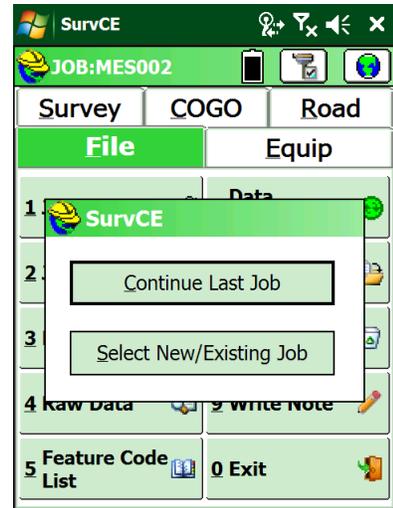

10. Enter a destination address like 'www.igage.com' and browse to it.
11. With Internet connectivity verified, we are ready to connect to the NTRIP server.
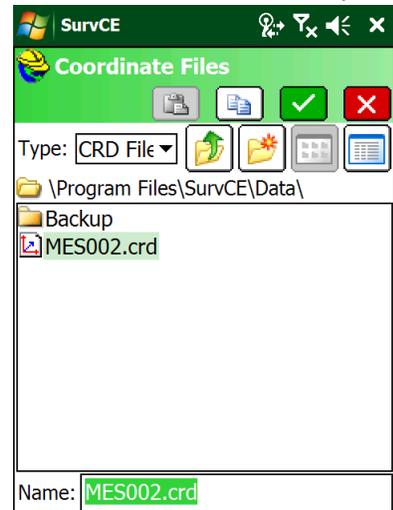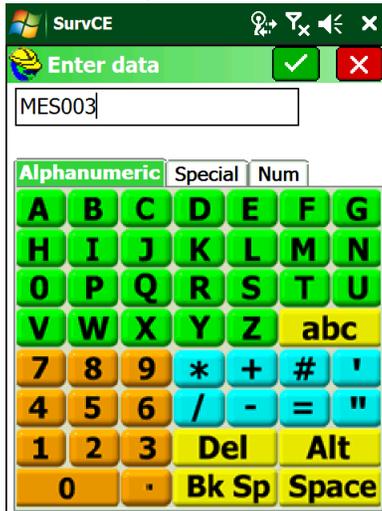   From the main menu, start SurvCE by clicking on

'Start: SurvCE"

12. If you want the same job, click on 'Continue…' otherwise click on 'Select New/Existing Job':

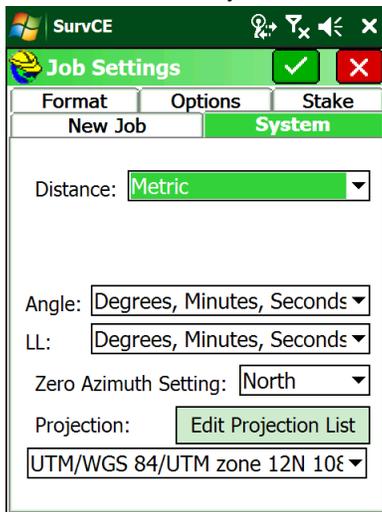13. Click on the Name to enter a new job name:

14. Enter the new job name:
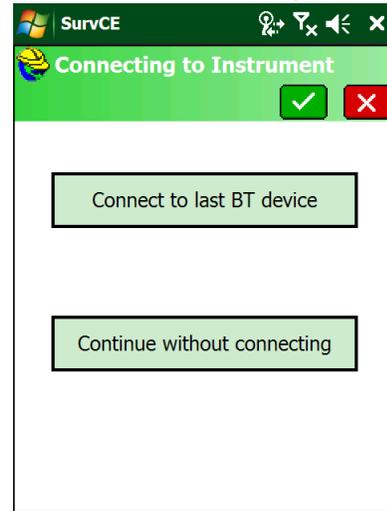
MES003

Click on the Green Checkmark

15. Choose the correct Projection and distance units:

Job Settings

Distance: Metric

Angle: Degrees, Minutes, Seconds
LL: Degrees, Minutes, Seconds
Zero Azimuth Setting: North
Projection: Edit Projection List
UTM/WGS 84/UTM zone 12N 108

Click on the Green checkmark to accept the Job settings. If you have previously been connected to the network, with the proper mount point, you should be able to click on 'Connect to Last BT device' and automatically connect and configure the rover. (If so, you are done!)

16. If this is the first time connecting to the network, or you want to change the mount point, click on

'Continue without connecting':

Connecting to Instrument

Connect to last BT device

Continue without connecting

17. Configure the rover from scratch: From the main screen, select "Equip: 3 GPS Rover":

JOB:MES003

Survey | COGO | Road
File | **Equip**

1 Total Station
6 Localization
2 GPS Base
7 Monitor/ Skyplot
3 GPS Rover
8 Tolerances
4 GPS Utilities
9 Peripherals
5 Configure
0 About SurvCE

18. Select Manufacturer: CHC and Model: X90, X91+ or X900+ as appropriate for your receiver:

GPS Rover

Current | Comms | Receiver | RTK

Manufacturer:
CHC

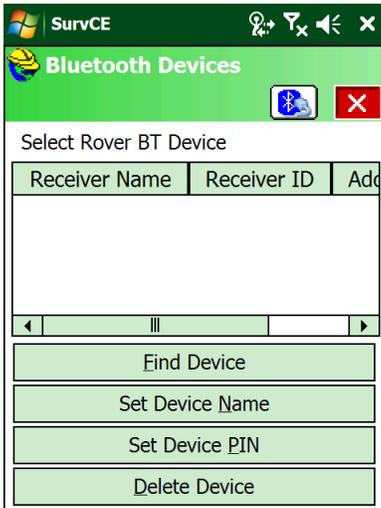Model: X91

Load | Save | Rename | Delete
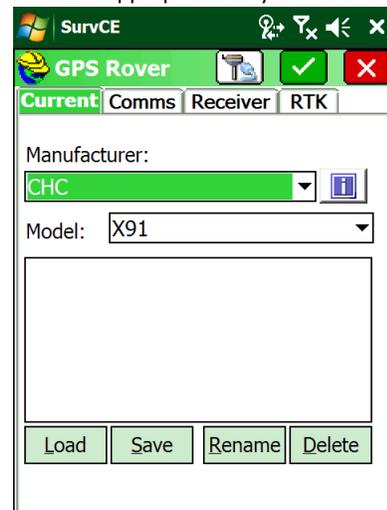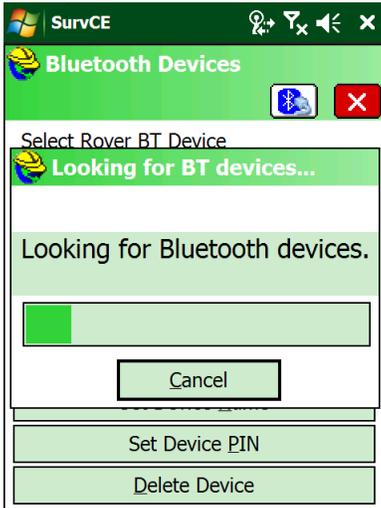
19. Click on the 'Comms' tab:
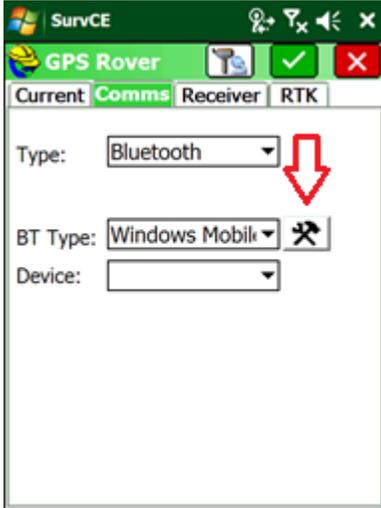
Choose Type = Bluetooth, BT Type = Windows Mobile as shown, then click on the Hammer/Wrench to the right of BT Type

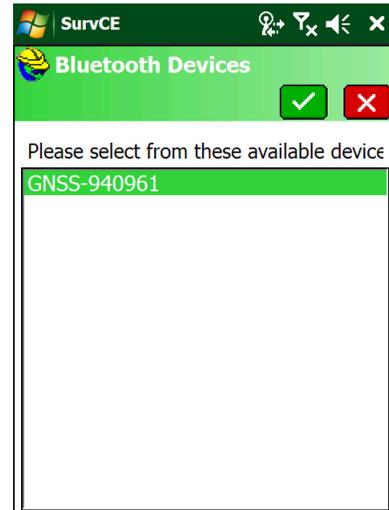20. Click on Find Device and wait:

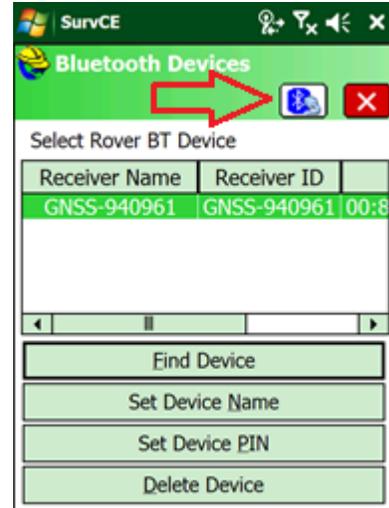21. Continue to wait until the data collector stops looking:

22. Select the correct device, the number is the device's serial number printed on the bottom of the receiver "GNSS-840961":
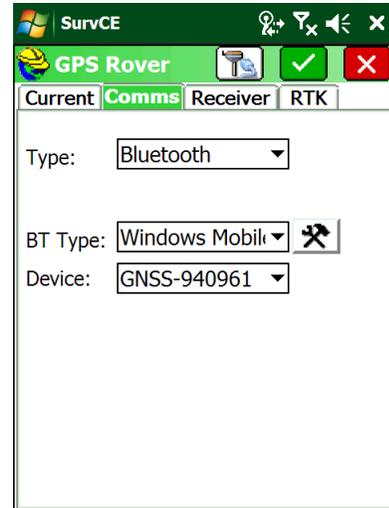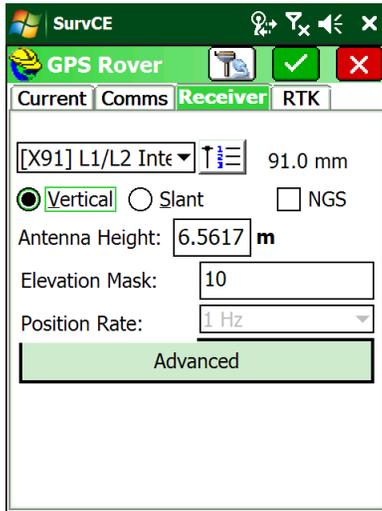

Click on the Green check mark

23. Click on the 'Bluetooth' button (looks like Bluetooth icon with cable pointing towards it':

24. You will return to the 'Comms' menu:

25. Click on the 'Receiver' tab:

SurvCE	
GPS Rover	
Current	Comms	**Receiver**	RTK

[X91] L1/L2 Inte ▼   91.0 mm
◉ Vertical ○ Slant   ☐ NGS
Antenna Height: 6.5617 **m**
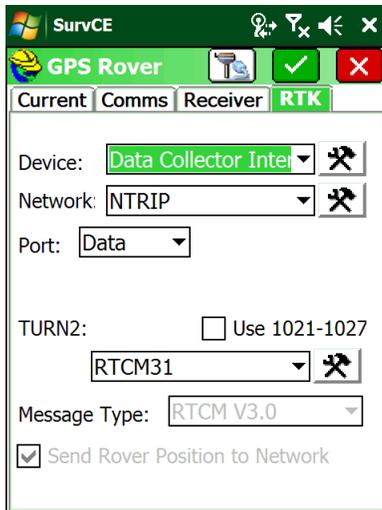Elevation Mask: 10
Position Rate: 1 Hz

Advanced

Configure as shown above.

Make sure the antenna height is correct. If you are using a 2 meter rod, you can enter "2M" for the 'Antenna Height', even if your projection is feet or survey feet.
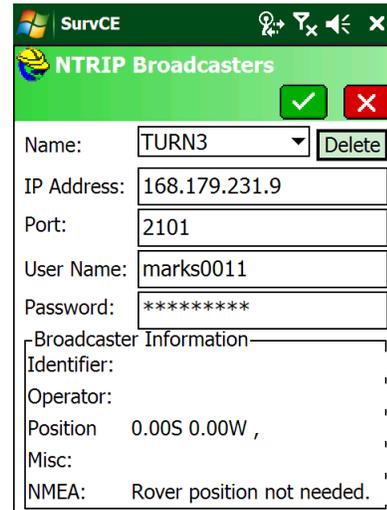
The 'Elevation Mask' typically is between 5 and 15 degrees. 10 is reasonable.

26. Click on the 'RTK' tab:

SurvCE	
GPS Rover	
Current	Comms	Receiver	**RTK**

Device: Data Collector Inter ▼
Network: NTRIP ▼
Port: Data ▼

TURN2:   ☐ Use 1021-1027
RTCM31 ▼
Message Type: RTCM V3.0 ▼
☑ Send Rover Position to Network

Configure as shown.

27. Click on the Hammer/Wrench button to the right of the 'Network':

SurvCE	
NTRIP Broadcasters	

Name: TURN3 ▼   Delete
IP Address: 168.179.231.9
Port: 2101
User Name: marks0011
Password: *********
┌Broadcaster Information─
Identifier:
Operator:
Position   0.00S 0.00W ,
Misc:
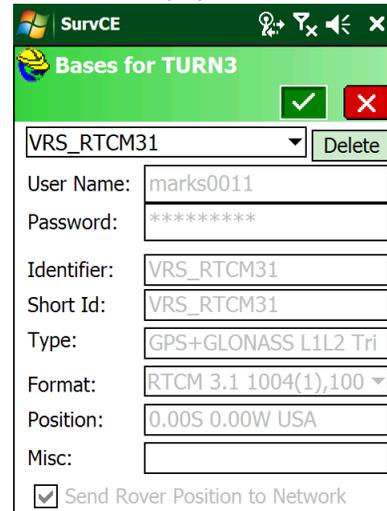NMEA: Rover position not needed.

Enter the correct service Name, IP Address, Port, User Name and Password fro your network. (The example above shows 'The Utah Reference Network' or TURN.

Both the 'User Name' and Password are case sensitive and must match your network credentials exactly.

Click on Green Checkmark.

28. The data collector will load the mount table via the internet and display the list of bases:

SurvCE	
Bases for TURN3	

VRS_RTCM31 ▼   Delete
User Name: marks0011
Password: *********
Identifier: VRS_RTCM31
Short Id: VRS_RTCM31
Type: GPS+GLONASS L1L2 Tri
Format: RTCM 3.1 1004(1),100 ▼
Position: 0.00S 0.00W USA
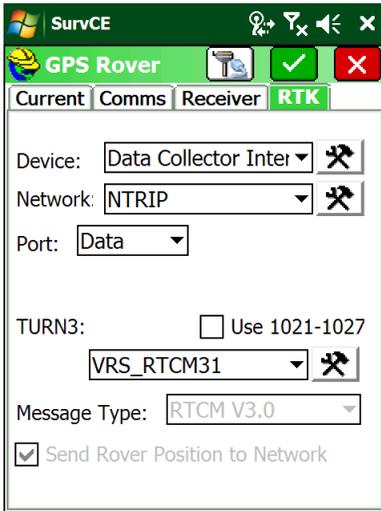Misc:
☑ Send Rover Position to Network

Choose the correct mount point for your area. Consult with your network provider for the best mount point.

Most of the time, a RTCM 3.0 VRS mount point is the best choice and will outperform a CMR+ mount point.

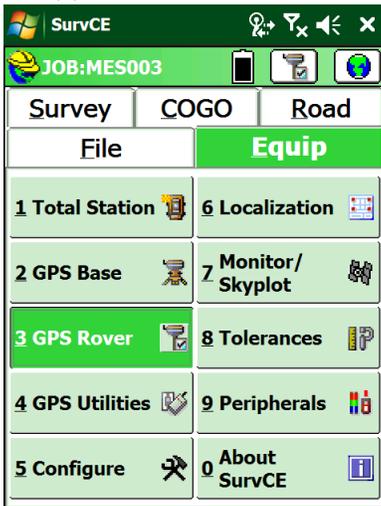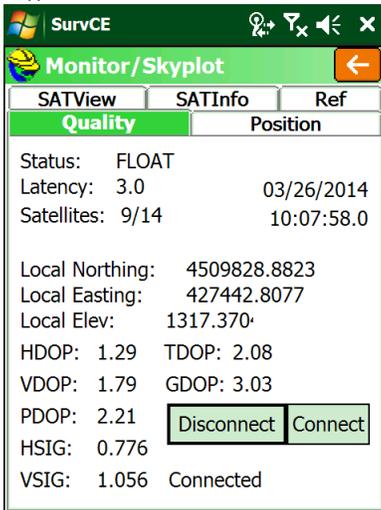After selecting the correct base, Click the Green checkmark.

29.

Click the Green checkmark again to configure the rover and connect to the network.

You will see "Waiting for Reading, Initialize Modem, Connect to Network".

30. Finally you will return to the main menu:

31. You can check if all is well using "Equip: 7 Monitor Skyplot":

within 20 seconds after the receiver makes a network connection, it should show "Status: Float."
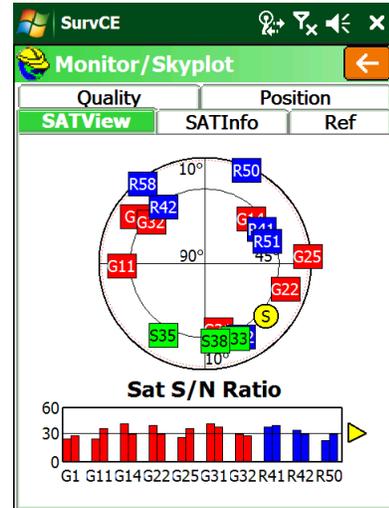
The Latency should be less than 5 seconds.

The Satellite count should be reasonable.

The HSig should be dropping.

After some period of time, the status will change to FIXED.

32. If fixing is difficult, check the SAT View screen:

There should be a US SV (red) in every quadrant; there should be a GLONASS SV (blue) someplace.

33. You can verify that the GEOID is loaded and in use on the Position tab:

The Geoid Shift should be negative and the Local (orthometric) elevation should be above the Ellipsoid elevation as shown above.

Using the Internal GSM Modem in a X91+ or X900+ Receiver

When using the X91+ or X900+ receiver with an NTRIP network, you can make a connection to the internet:

1. Using a MiFi Hotspot (or your cellphone Hotspot) connected by WiFi to the data collector.
2. By placing a GSM SIM Card in your data collector (described earlier in this document in "Provisioning SIM Card in LT30")
3. By placing a GSM SIM Card in the receiver head

This chapter shows how to implement the third method.

1. Remove the battery from the GPS receiver and install an activated SIM card:
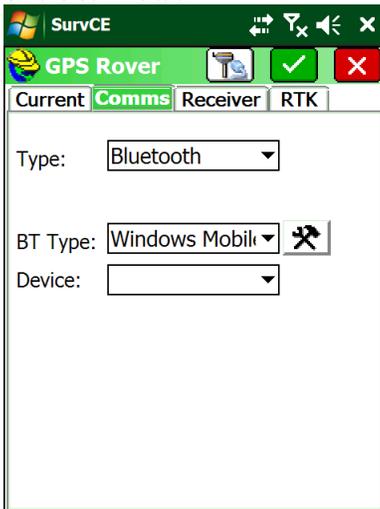
2. Replace battery and turn on head.
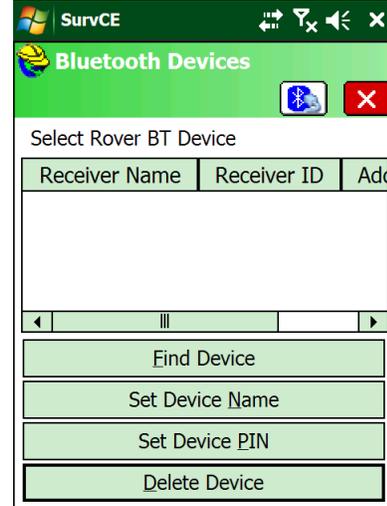3. From the main SurvCE menu, select 'Equip: GPS Rover':
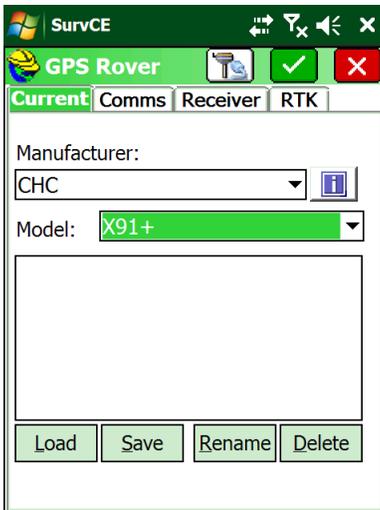
Set the Manufacturer to 'CHC' and set the Model to match your receiver (X91+ or X900+).
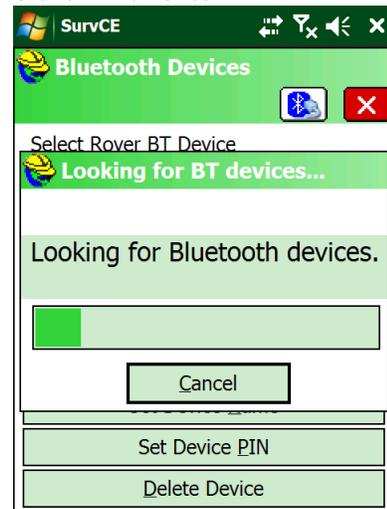
4. On the Comms tab:
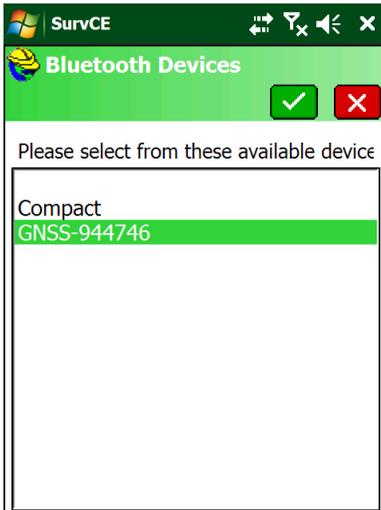
Click on the 'Configuration (hammer/wrench)' button.

5. If the GPS receiver is not already listed:

Click on 'Find Device':

Highlight the correct device:

Click on the green check mark.

6. With the proper device highlighted in the grid:
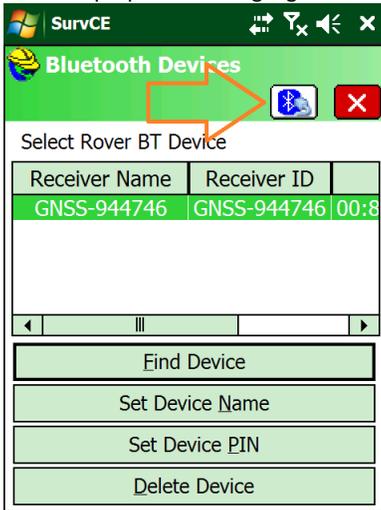
click the 'Bluetooth Connect' button (see orange arrow above).

7. Click on the 'Receiver' tab:
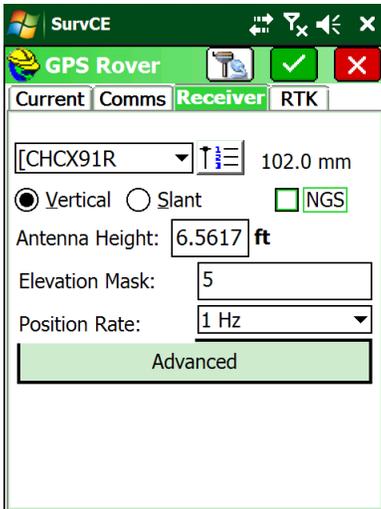
Configure reasonable values for antenna height (HI) and mask angle.

8. Click on the 'RTK' tab, set the Device to 'Internal GSM':
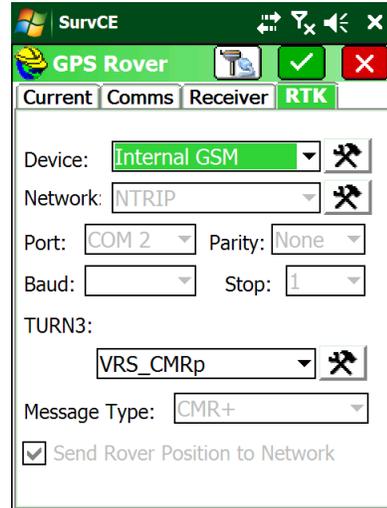
9. Click on the 'Hammer/Wrench' to the right of the Device:
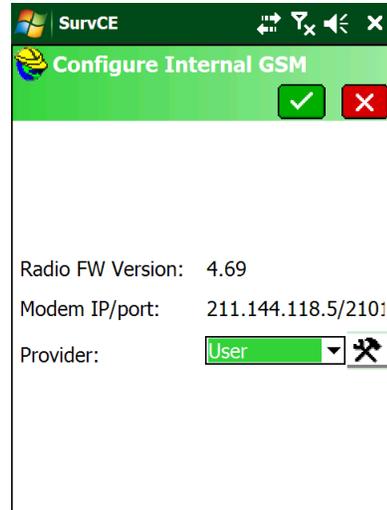
10. Select Provider = 'User' and click on the 'Hammer/Wrench' to the right of the Provider:
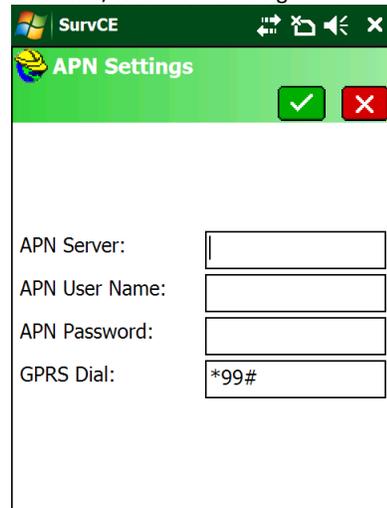
For our (Salt Lake City) ATT Wireless market, these settings work perfectly and it is suggested that you use them if possible.

11. Click on the green check mark to return to the main 'Configure Internal GSM' screen, then the

green check mark again to return to 'GPS Rover: RTK':
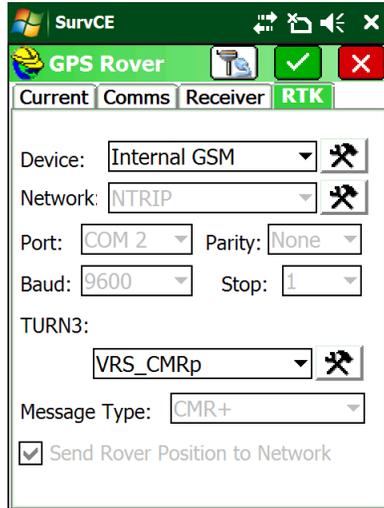
12. The 'Network' will be fixed to 'NTRIP', click the 'Hammer/Wrench' button to the right of the Network:

Configure as required for your network and user name. Click on the green check mark.

13. The GPS will load the available mount points from the internet:

Choose the correct mount point and click the green check mark.

14. From the RTK menu:
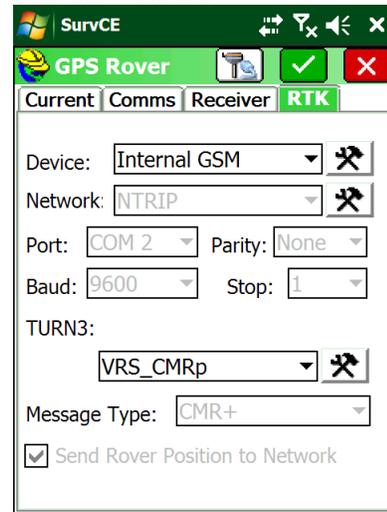
Click the green check mark again. The rover will connect to the correction source, the green 'radio' led on the receiver will start to flash.

Troubleshooting a Network Rover

1. Are corrections being received by the rover? Check the green LED on the rover. It should blink once each second.
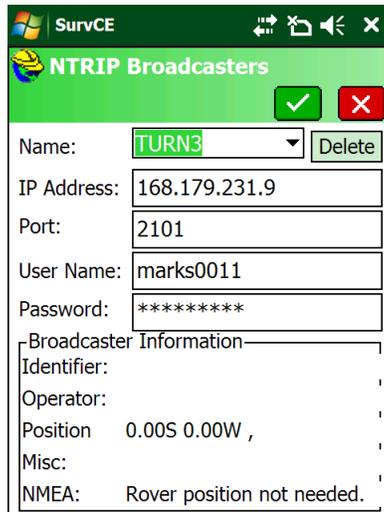2. There is no warning if the Username or Password is wrong. Double check these values and the IP/PORT if the connection is not successful!
3. Is the internet connection still working? You can check it by using the Internet Explorer to browse to a web page.
4. If the Rover reports 'Float' corrections are being received. It can take up to 1-minute after connecting for the rover to receive a base location. The position will remain autonomous until the base location is received.
5. Are the HRMS and VRMS on the 'Equip: Monitor Skyplot' screen dropping?
6. If the Rover is FLOAT, but never fixes, and the latency is 5 seconds or less, check the effective baseline from your rover to the virtual base. On the 'Equip: Monitor Skyplot' screen, choose the 'REF' tab. Check the distance to base. Is it what you expect (less than 25 miles?)
7. Make sure the protocol matches on the base and rover "CMR+" or "RTCM3" are best, but must match exactly (Warning, there is an RTCM2 and RTCM3.)

Building, Loading and Using a GSF (GEOID Separation File)

GPS receivers measure Ellipsoid Height. Users typically need Orthometric Heights.

The GEOID Separation File (GSF) is a file organized as a grid of height differences. Field data collection tools like SurvCE use the GSF file to derive an orthometric height at a Latitude - Longitude - Ellipsoid height from the ellipsoid.

It is very important that you survey with a GSF loaded for moderate sized jobs. If you don't, water will not necessarily flow downhill and fields will not be leveled for irrigation purposes.

Every three to five years, the National Geodetic Survey (NGS) produces a new GEOID realization for the United States. The most recent GEOID is Geoid12A.

The GEOID file (actually it is not a single file, but a group of files) for the United States is too large to load into data collector memory (when using SurvCE and FAST Survey) at once, so it is necessary to extract a portion of the GEOID for field use. A typical maximum file size is 400 Kbytes, while the full GEOID model is typically 40 megabytes for the United States.

GEOID Tools

Carlson SurvCE includes a Carlson XPort license number. You can download the latest XPort tool here:
http://www.carlsonsw.com/support/software-downloads/?product=SurvCE

Typically the XPortSetup tool is button number 1:

No	Name	File Size / File Date	Description
1	XPortSetup.exe [Download]	15,945,477 Oct-12-2012	Carlson X-Port is a utility for data transfer and traverse adjustment among other things. Serial number is requred for installation. One complimentary serial number is provided with SurvCE purchase on the back of SurvCE manual. Additional serial numbers are available for purchase.

The Carlson XPort tool automatically downloads needed grid files from the internet as needed. Thus it is important to have internet access when building GEOID files in an area for the first time.

If you are using Spectra Precision FAST Survey, or your computer is not online, you can use the Ashtech Geoid Extraction tool. In addition, the Ashtech tool can be used to visualize the GEOID subsets that you create:

The Ashtech Geoid Extraction tool can be downloaded with this link:
http://ashgps.com/mirror/master/GEOIDS/Install_Geoids.exe

The full Geoid12A for use with the Ashtech tool can be downloaded with this link:
http://ashgps.com/mirror/master/GEOIDS/Install_GEOID12A_RevC.exe

Building a GSF file for a Project:

1. Start the Carlson XPort tool using the desktop icon:

2. From the main menu of the X-Port tool, select "Tools: Geoid Manager":

3. Choose the correct Geoid. If you are in the United States, the current correct GEOID is 'USA (Geoid 12A)', however other geoids are available for use if you need to match an older job.

4. Enter the center of job in Dd.MmSsss; select an appropriate size (I prefer 125 miles):
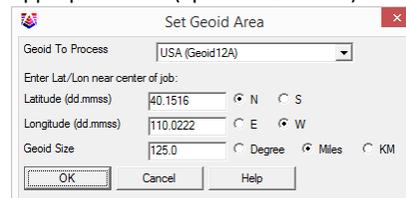
5. Click OK, the tool may need to go online to download the base geoid files, then choose an appropriate location for the output file. I prefer to use the Geoid name, followed by the State,

followed by the general area:
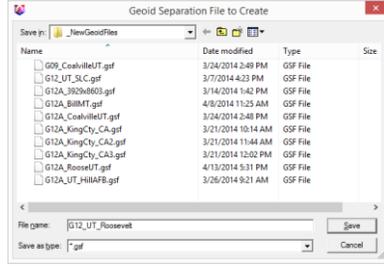
6. Click on "Save".
7. OPTIONAL: You can test the new geoid file with the Ashtech Geoids tool. Click on the

desktop icon and then browse for the file you just made. Be sure to change the files of type to '.GSF' as shown by the red arrow below:

If the extraction was successful, then you will get a pretty picture:

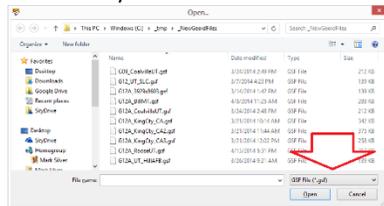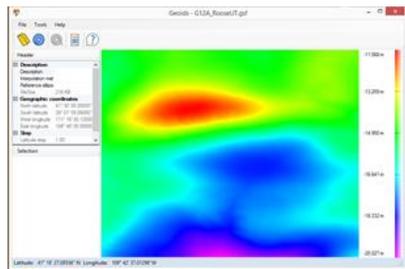8. Next transfer the GSF file to your data collector using ActiveSync or by mounting the device as a Flash Drive.
9. In SurvCE or FAST Survey, you load the GEOID from: "Equip: 6 Localization: GPS (tab):
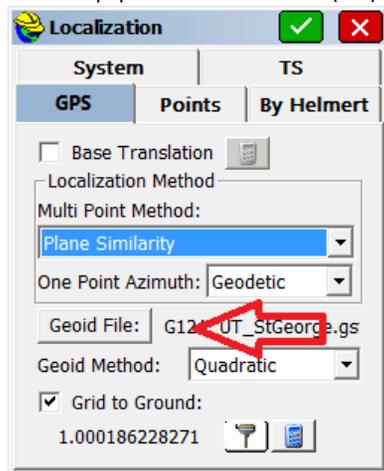
Click the 'Geoid File:' button, then browse to find the new GSF file.

10. You can verify that a GEOID file is loaded and in-use by going to "Equip: Monitor Skyplot: Position (tab)" where you will see the ellipsoid height, and the GEOID separation listed:
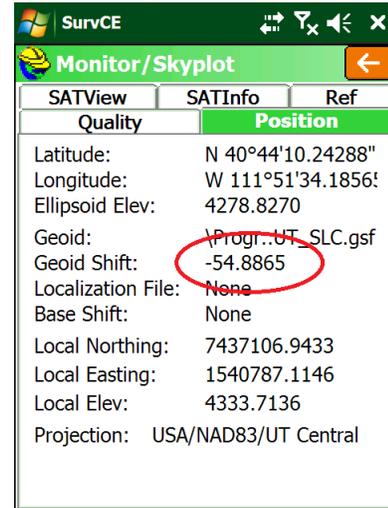
Notice that the GEOID Shift is negative. It is subtracted from the Ellipsoid elevation and causes the Local (orthometric) height to be higher than the ellipsoid. (This is true for most of the planet.)

If the GEOID file does not cover your survey area, or is not loaded you will see a screen like this:
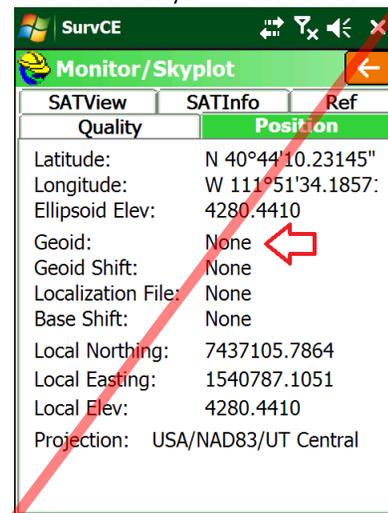
Note the 'Ellipsoid Elev' is exactly the same as the 'Local Elev'.

Connecting Data Collector by Bluetooth to PC 'Windows Mobile Device Center'

It is easy to plug your data collector into your PC with the USB connector and use Windows Mobile Device Center (under Windows XP the sync center is called 'ActiveSync'). But it is also easy to connect to your data collector with Bluetooth.

Here are the instructions for configuring a Bluetooth connection:

1. On the mobile device, first click on the 'connectivity' icon (1) on the top bar, then click on 'Wireless Manager' (2):
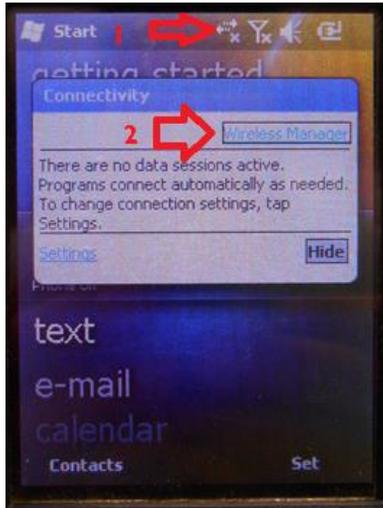
2. The Wireless Manger is shown, if Bluetooth is off click on the big blue Bluetooth bar:

3. Click on menu (bottom right corner):

then 'Bluetooth Settings'

4. The Bluetooth Settings screen will be shown:
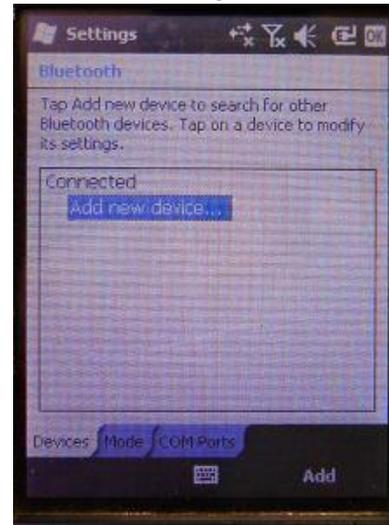
5. Click on the 'Mode' tab:
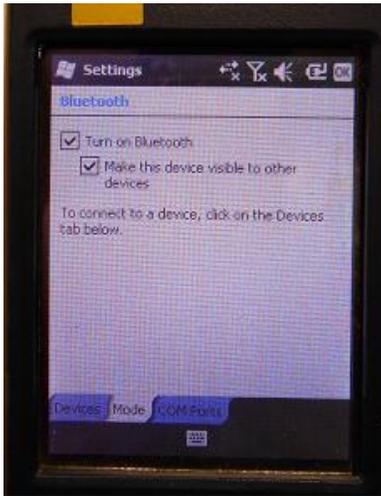
Then check the 'Make the device visible to other devices'.

6. Back on your PC:
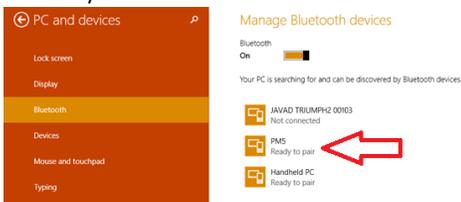
You should be able to see the PM5 device, shown as 'Ready to pair'. (Wait 20 seconds if needed.) Click on the PM5 device, and then click on the 'Pair' button.

7. On the mobile device, you will be prompted to pair:

Click on 'Yes'.

8. Your PC will display a secret passcode:
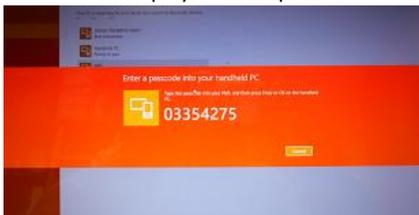
9. Quickly enter this number on your mobile device:
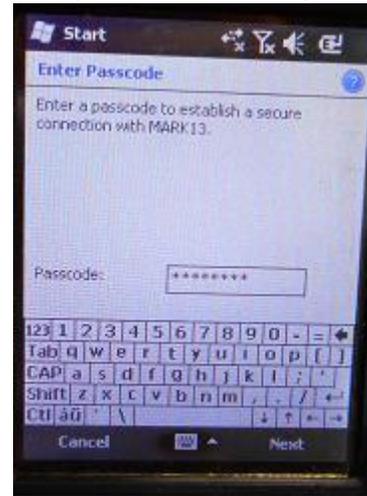
and then click 'Next'.

10. Start Windows Mobile Device Center

You will be 'Not Connected'.

11. On the mobile device, navigate to the Bluetooth Settings dialog:
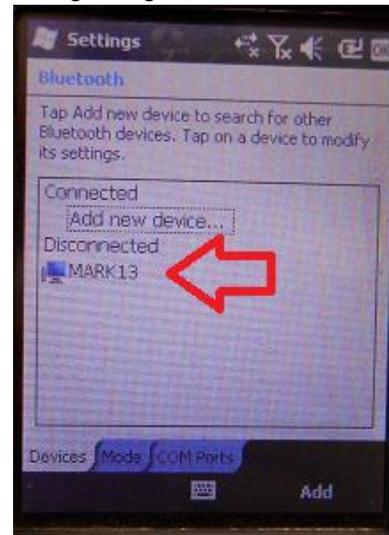
Click-and-hold on your computer name (mine's name is MARK13)

12. A pop-up dialog will be shown:

13.
Click on Connect.

14. Now, on your PC you will see:

After 30 seconds your device will be active-synced to your PC. The connection is fast and it will be remembered. So it will be easy to setup in the future.

X900+: Fixed – Verified Fix

The X900+ GNSS engine has two levels of fix: FIXED and VERIFIED FIX.

A standard 'Fix' is shown as "Fixed*" while a verified 'Fix' is shown as 'Fixed' with no asterisk.

From the 'Survey: Store Point' menu, you can click on 'C' (Configuration):
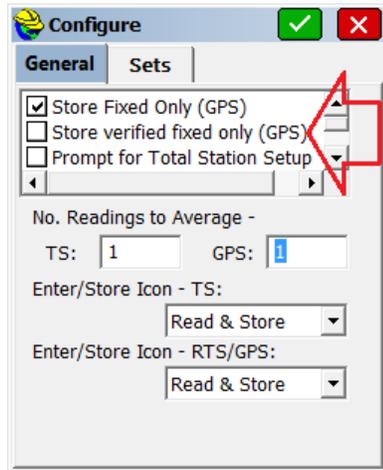
And specify that ONLY 'Verified Fixes' be stored.

The difference between a 'Fix' and a 'Verified Fix' is best described as:

Fix   99.0% confidence that the Fix is valid

Verified Fix   99.9% confidence that the Fix is valid

Typically it takes an extra 10-20 seconds to get 'Verified'. However in locations of high-multipath or very low satellite counts you may never get a 'Verified Fix'.

Collecting Static Data

You can collect static data with either the Base or the Rover. A typical use for static data collection would be subsequent processing in OPUS, RTX, AUSPOS or manual post processing using a tool like CGO.

Prior to using the receiver, charge the batteries or use an external power source to insure that the static occupation is not interrupted by power failure.

The internal battery when new and fully charged will run the receiver for around 5-hours, for occupations longer than 4-hours you should provide external power to the receiver with the included battery clips.

> Place a freshly charged battery into the receiver.

> Place the receiver above the point you want to survey.

> Rotate the receiver so the pushbutton panel faces the North.

> Level the receiver.

> Record the 'Vertical Height' from the top of the survey mark to the bottom of the receiver; alternatively you may measure a 'Slant Height' to the blue rubber gasket.

At a minimum, make a careful note of the following items in your field book:
Start Time and Date
Instrument Height (HI)
PID (Point ID, Mark Name)
Description

Point	Desc	HI	Start Time	End Time
1001	NW C Sec 14	2.0M V	9:45 am Tue 1 March 2013	

Turn on the receiver.

Check that 5 or more satellites are tracked (the blue LED will blink 5 or more times.)

If the receiver is not configured to automatically begin data collection, push and hold the 'Files' button for 1-second to begin data collection. You will see the Yellow "Files" LED flash once every epoch (default 1-second) as the receiver records observables.

Wait an appropriate time period for data collection:

> **OPUS-RS (Rapid Static)**
>
> > Minimum of 15-minutes
> > Maximum of 2-hours

> **OPUS-STATIC**
>
> > Minimum of 2-hours
> > Maximum 48-hours
> > 4-hours suggested minimum

Remember that the data is going to be decimated to 15-second intervals. It is best to wait at least 1-minute longer than required.

At the end of the occupation Press and hold the 'Files' button for one-second.

Make a note of the end time in your field book:

Point	Desc	HI	Start Time	End Time
1001	NW C Sec 14	2.0M V	9:45 am Tue 1 March 2013	12:18 pm

Downloading Observation Data from a Receiver

When you plug the GPS head into a PC with the USB cable, the receiver will turn into a USB Flash Memory device and will mount as a drive letter. Your observation files will be found in folders by year, month and day.

You can manually transfer files from the receiver to your PC using the Windows Explorer, or you can use the iGage X9 Download tool which can be downloaded from the www.X90GPS.com website. Click on 'Updates', then click on the X90 Download Tool link.

If you manually download files, they will have an .HCN file extension. A HCN to RINEX convertor can be found on the www.x9GPS.com website under "Tools: Utilities: HCNtoRINEX"

Troubleshooting the X91+ or X900+ Receiver

1. Receiver won't turn on:

Battery is installed backwards or upside down! Remove and install properly.

Battery is fully discharged: Charge battery or use external power.

Contacts on battery are dirty: Clean battery and receiver contacts with a soft cloth.

Battery is bad: Try another battery.

2. Is the receiver tracking satellites?

The BLUE LED flashes once for each SV (satellite vehicle) that is currently tracked.

If you are indoors, the LED will flash once every 5-seconds. However no SV's will be tracked.

The receiver should begin tracking within 30-seconds after a warm start. After a cold start (off for more than 1 week) it may take 90-seconds for the receiver to begin tracking.

3. Is the receiver storing observation data?

The right-hand YELLOW LED will flash once every time data is stored to the current occupation file. The default recording rate is 5-seconds, thus the YELLOW LED will flash once every 5-seconds when data is being stored.

It is possible to stop the recording of data and close the observation file by pressing and holding the Record button. You can verify the mode by quickly pressing the record button:

If the GREEN radio LED flashes, then the receiver is RECORDING.

If the YELLOW files LED flashes, then the receiver is NOT RECORDING.

4. The RED Power LED is flashing!

If the RED Power LED is flashing, then the internal battery is low. Connect external power or turn receiver off and replace battery.

5. The GPS receiver won't mount as a Disk Drive.

1. Before plugging GPS cable into your PC, did you wait for the power LED to blink 3 times?
2. Unplug, wait 15-seconds, try again
3. Try another USB port.
4. Use an external USB Hub (this fixes intermittent disk mounts)
5. Try other computers.
6. Try turning off your PC, wait a minute and then turn on again. Reinsert the USB cable.
7. Get the DevView tool from   http://www.nirsoft.net/utils/usb_devices_view.html
   and use it to uninstall the errant device driver for the GPS receiver.
   a. Download the USBDeview tool, there is a 32-bit and a 64-bit version, choose the correct version for your computer.
   b. Unzip the distribution ZIP file, run the "USBDeview" tool as an administrator.
   c. Unplug the GPS receiver.
   d. Look for the entry "OLIMEX LPC1766 Storage USB Device", right-click it and "Uninstall Selected Devices", answer yes to 'Do you want to uninstall?" wait 10-seconds and then plug the GPS receiver back in.

Configuring the Radio Channel List in the Receiver

In the United States a FCC license is required to operate the UHF radio at any power, on any frequency. Your FCC license will specify a 'Call Sign' which must be broadcast at least once every 15-minutes. Violating these requirements may result in large daily fines.

Several programs are available to program the radio channel lists within your receiver. These programs can be downloaded and installed on a Windows computer from the website:

> www.x9gps.com   click on Tools, then click on Utilities

The HCConfig tool can be used to configure the FCC Call Sign transmission. The iGage Channel Tool can be used to program radio frequencies.

HCConfig

After installing HCConfig using the installation program contained in the supplied archive, you can click on this desktop icon:
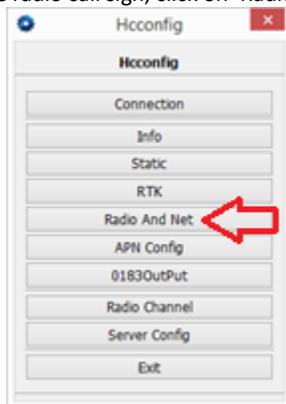

Double-click on the icon to start HcConfig. (Win 8.1) users may need to right-click and 'Run As administrator'.
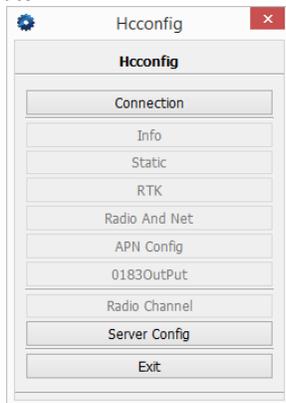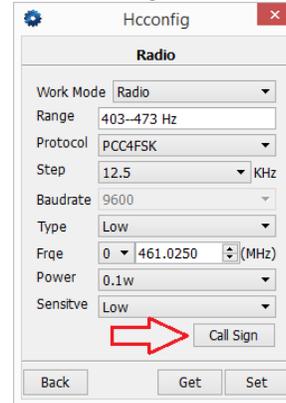

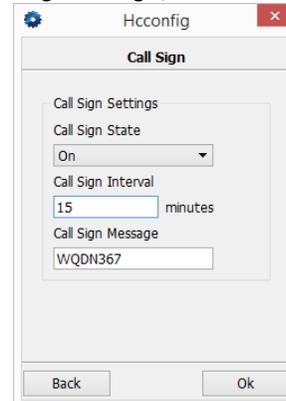Click on Connection, select the correct COM port, the click on 'Connect'.

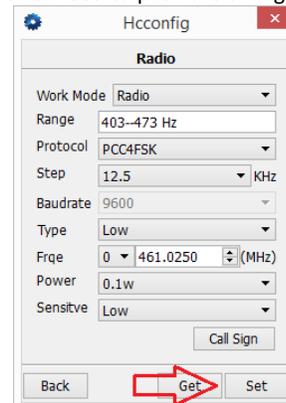To set the radio call sign, click on 'Radio and Net':

Next click on the 'Call Sign' button:

Set the 'Call Sign State' to 'On'; set the 'Call Sign Interval' to '15' and enter your FCC assigned Call Sign in the 'Call Sign Message', then click on 'Ok':

Finally click on 'Set' to push the changes to the radio:

Click on 'Back', then 'Exit' to close the program.

X9xRadioFrequency Tool

Note: it is a violation of US Federal law to operate on an unlicensed frequency or without enabling 'Call Sign' transmission.

The X9xRadioFrequency tool is a single file executable that you can download from:
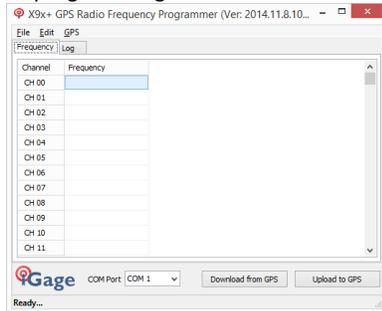
http://x9gps.com/

click on 'Tools: Utilities: RadioFrequency; iGageChannelTool' then right-click on 'X9xRadioFreq.exe' and save to your desktop.

Double-click on the program icon on your desktop:

The channel programming tool will start:

Select the correct 'COM Port', then click 'Download from GPS' and the current channel list will be shown:
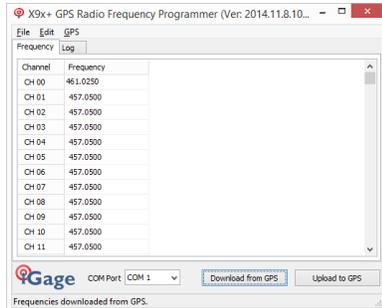
This tool includes an option to automatically stuff the most common GPS frequency list:
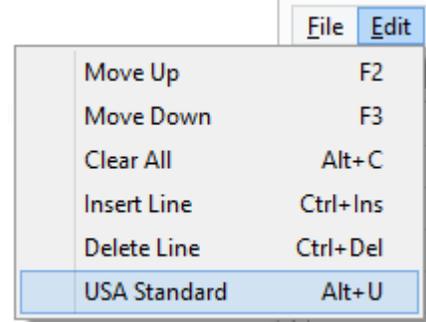
With the editing tools (Insert, Delete, Move) you can quickly configure your channel list. The File menu allows you to replicate settings across multiple receivers quickly.

After configuring the channels how you want them, don't forget to click the 'Upload to GPS' button to transfer the channel settings.

X9x 10-Pin Connector
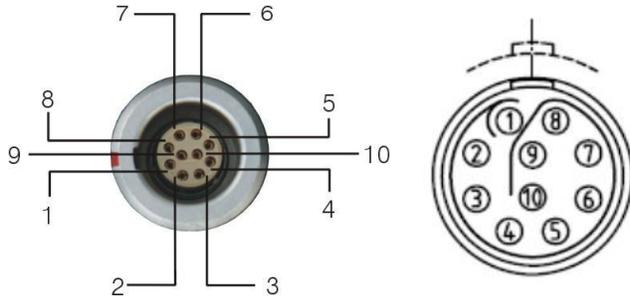
PIN	Signal Name	Description
1	TXD	Transmit Data(PC receive data through this pin)
2	RXD	Receive Data(PC transmit data through this pin)
3	PWR	External Power Input (9-15 V DC)
4	PWR	External Power Input (9-15 V DC)
5	GND	External Power Ground
6	GND	External Power Ground
7	USB PWR	USB Power
8	D-	USB Data-
9	D+	USB Data+
10	(Txd2)	Optional (High Speed Data Output)

X9x GPS to PC Data Cable

The supplied interface cable includes connections for GPS, USB, Serial and External Power:
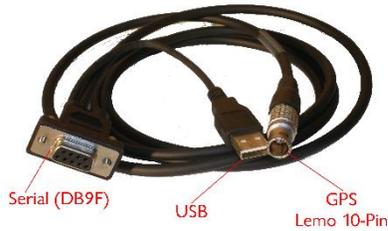
Interface Cable

External Power
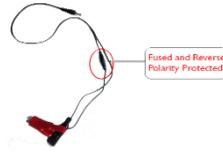
Battery Clips

Your system may include a battery clip cable for supplying External Power.

External power should be in the range: 9 VDC to 18 VDC. The supplied battery clip cable includes a fuse and is reverse polarity protected.

Warranty

IMC is "iGage Mapping Corporation" of Salt Lake City Utah USA.

IMC warrants the CHC X90, X900+ and X91+ receivers to be free of defects in material and workmanship and will conform to our published specifications for these periods:

GPS receivers:	2-years
Cables and accessories:	1-year
Batteries:	90-days

This warranty applies only to the original purchaser of the product.

In addition, the CHC factory offers similar warranties and maintains a repair depot in the United States.

Hardware: Purchaser's exclusive remedy under this warranty shall be limited to the repair or replacement, at IMC's option, of any defective part of the receiver or accessories which are covered by this warranty. Repairs under this warranty shall only be made by IMC at an IMC service center. Any repairs by a service center not authorized by IMC will void this warranty.

In the event of a defect, IMC will at its option, repair or replace the hardware product with no charge to the purchaser for parts or labor. The repaired or replaced product will be warranted for 30-days from the date of return shipment, or for the balance of the original warranty, whichever is longer.

Software: IMC warrants that software products included with hardware products will be free from media defects for a period of 30-days from the date of shipment and will substantially conform to the then-current user documentation provided with the software. IMC's sole obligation shall be the correction or replacement of the media so that it will substantially conform to the then-current user documentation. IMC does not warrant the software will meet purchaser's requirements or that its operation will be uninterrupted, error-free or virus-free. Purchaser assumes the entire risk of using the software.

Exclusions

The following are excluded from the warranty coverage:

Periodic maintenance and repair or replacement of parts due to normal wear and tear.

Product Finishes.

Batteries exposed to heat, cold; or batteries opened or physically damaged.

Installations or defects resulting from installation.

Any damage caused by (i) shipping, misuse, abuse, negligence, tampering, or improper use; (ii) disasters such as fire, flood, wind, and lightning; (iii) unauthorized attachments or modification.

Service performed or attempted by anyone other than an authorized IMC service center.

That the receiver will be free from any claim for infringement of any patent, trademark, copyright or other proprietary right, including trade secrets.

Any damage due to accident, resulting from inaccurate satellite transmissions. Inaccurate transmissions can occur due to changes in the position, health or geometry of a satellite or modifications to the receiver that may be required due to any change in the GPS. IMC GPS receivers use GPS satellites to obtain position, velocity and time information. GPS is operated by the US government, which is solely responsible for the accuracy and maintenance of the GPS system. OPUS and OPUS-RS is a service of the NGS and IMC shall not be responsible for issues with NGS provided services.

Except as set forth in this limited warranty, all other expressed or implied fitness for any particular purpose, merchantability or non-infringement, are hereby disclaimed.

IMC shall not be liable to the purchaser or any other person for any incidental or consequential damages whatsoever, including but not limited to lost profits, damages resulting from delay or loss of use, loss of or damages arising out of breach of this warranty or any implied warranty even though caused by negligence or other fault of IMC or negligent usage of the product.

In no event will IMC be responsible for such damages, even if IMC has been advised of the possibility of such damages.

This written warranty is the complete, final and exclusive agreement between IMC and the Purchaser.

RMA

To obtain warranty service from Igage Mapping Corporation the purchaser must obtain a return materials authorization (RMA) number prior to shipping by calling

+1-801-412-0011

Or by email:

info@igage.com

To obtain warranty service from CHC (the Factory) send email to

support@chcnav.com

Purchaser's return address and the RMA number must be clearly printed on the outside of the package. IMC reserves the right to refuse to provide free-of-charge service if the date of sale cannot be determined or if the serial number is altered or removed. IMC will not be responsible for any losses or damage to the product incurred while the product is in transit or is being shipped for repair. Insurance is recommended. IMC suggests using a traceable shipping method such as UPS, FedEx or USPS with signature tracking when returning a product for service.

The Purchaser shall always pay shipping to IMC, IMC will return warranty repairs by UPS ground, unless the Purchaser agrees to prepay expedited service costs. IMC will not pay for warranty returns to destination outside of the contiguous 48-states. The purchaser shall always pay any associated duty associated with warranty repairs.