TerraSync V5 and Pathfinder Office V5 Software

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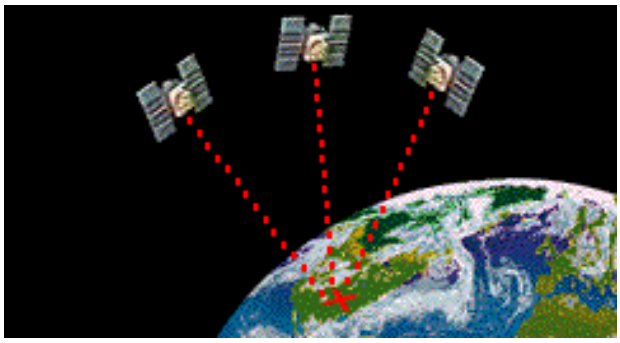
I. Intro to GPS

GPS is a constellation of satellites that were developed and are maintained by the Department of Defense. There are over 30 DOD satellites in service today. These satellites orbit about 10,900 nautical miles above the Earth's surface. This keeps the satellites free of space debris and other satellites. The GPS Satellites are neither polar nor equatorial, they orbit at 55º off the Earth's latitudes. The satellites orbit at a single revolution every 12 hours. The satellites are monitored by ground stations twice a day. GPS satellites travel at a speed of 8,653 miles per hour.

With the use of GPS we can be supplied with our Geographic position on Earth. Our position is gathered in the same way conventional surveying works, through Triangulation.

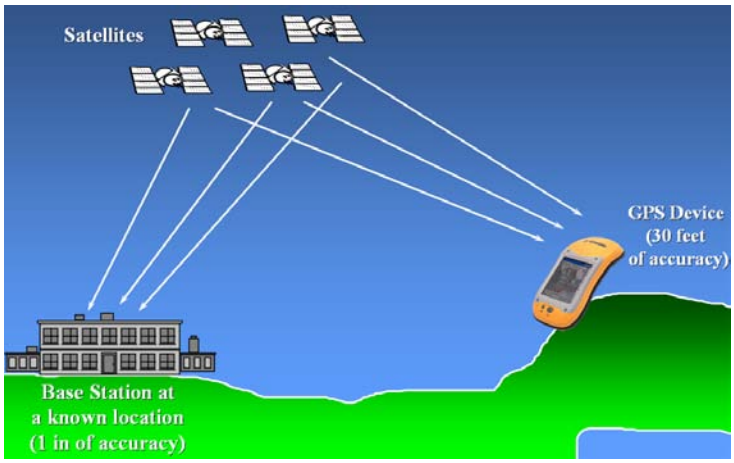


With three satellites we can obtain our round about position but with four satellites we can obtain an accurate position.

DGPS is Differential GPS. It's data that is corrected to give us accuracies from 5 meters down to sub-centimeter.

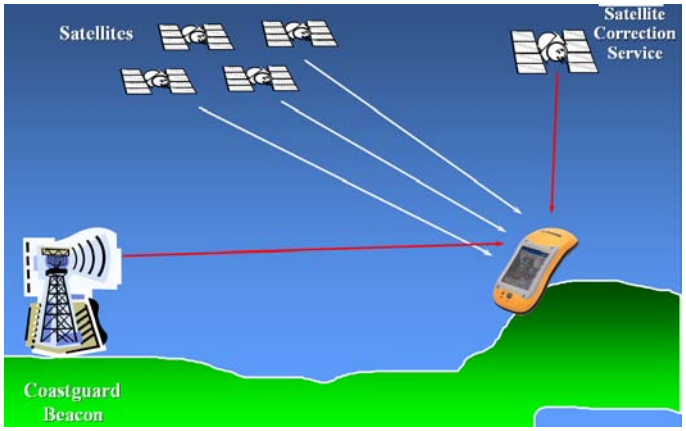
GPS can be differentially corrected two ways:

1. Post Processing-using a community base station that is continuously recording data on a known point. We can obtain the data through the internet from these community base stations and correct our data that was collected autonomous GPS in the field.



Post-Processing example

2. Real-Time Differential-using a station that is either located on the ground or using a private satellite provider that is sending out radio signals that correct your autonomous GPS signal on the fly. For example the Coast Guard has ground stations located all over the world and they offer free corrections and Omnistar is a private corrections provider that also offers corrections around the world. (Note: the Pro XRS, discontinued 8-8-2007, is the only Omnistar enabled Trimble receiver) Both of these are 24 hour 7 days a week.



Real-Time Differential example

HSTAR is high accuracy GPS (sub-foot) collected only with a XH series receiver. The differences are separated for ease of use.

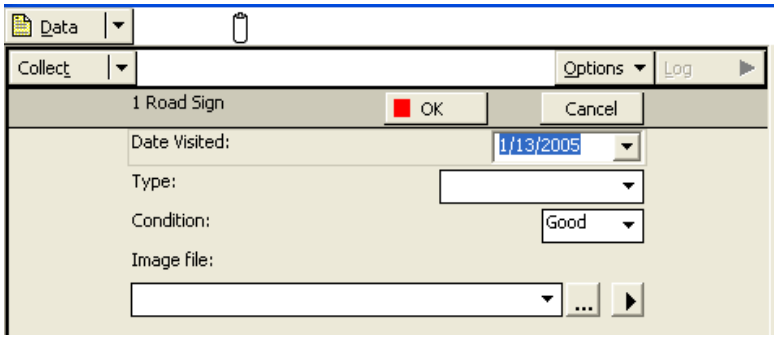
II. Intro to GIS

GIS stands for Geographic Information System. A GIS is a compiled database where we take spatial data and its' attribute and put this information into a database for someone else to view. That database can be displayed as a map or as text.

For example we can go out and record a tree (spatial data) and record what type of tree (attribute) and place this on a map or put into an Excel spreadsheet for someone to view later.

How do we use GPS for GIS?
We use our GPS to record the location of a feature (tree) and also record its attribute (type of tree) and then that data is uploaded into a program that compiles a database and then onto a map.

With the Trimble GPS we have receivers and we also have a data loggers. Trimble Software gives us the ability to have a data dictionary (spreadsheet) that we can fill in the blanks in the appropriate field. The example below shows us what we would see how in the field when logging GPS data. All we have to do in the field is fill in the blanks. While we are filling in the information our GPS Receiver is recording positions.

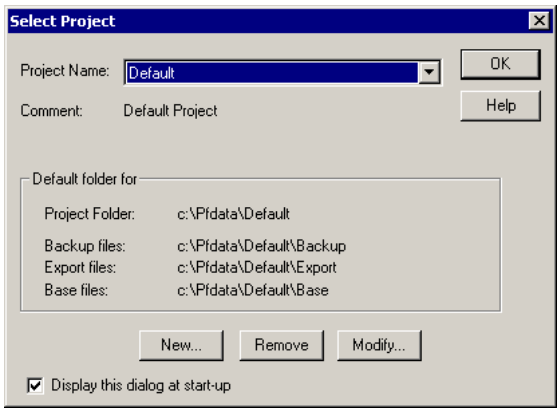


III. Pathfinder Office

A. Setting up a project

This is for Pathfinder Office V5 or higher. When first starting PFO you will be prompted to select a ***Project***. You can either choose from an existing project in the drop down list under the ***Project Name*** list or you can create a new project.

1. To create a new project hit the **NEW** button down at the bottom left hand side.
2. A new window will open named ***Project Folders***. The first line is where you will type in your project name. Type "Training" in this filed and hit **OK**. Notice that the cursor has moved down to the ***Project Folder*** field. This can be changed if that's not where you want this stored. If this looks good than hit **OK**.
3. Now you should be back at the ***Select Project*** box. Double check that everything looks good. If everything is okay then hit the **OK** key at the top right hand corner.



B. Data Dictionary

A Data Dictionary is created and used in the data logger to enter in your feature and attribute information.

You can create your data dictionary in PFO and then transfer it to your datalogger. This dictionary will be a list of features and attributes that you wish to collect out in the field.

1. Go to **UTILITIES** and select **DATA DICTIONARY EDITOR**.
2. Name the dictionary "Training" and hit the TAB key
3. Type in your name in the ***Comment*** Field
4. Hit F3 or select a ***new feature***. For example type in "fire hydrant" and make sure that it is set up as a point feature. Then hit the OK tab.
5. Click on the default settings tab, and set you parameter to how you would like to log your data. For example set the logging intervals to 1 second and your minimum positions to 15 positions.
6. Next you will want to have an attribute or description for fire hydrant, so select **F7** for ***new attribute***. You have a choice of how you would like you attribute to be stored. We will do ours a few different ways. First select ***MENU*** as this will be used to create a drop down list so there is less to type out in the field. After you have selected ***Menu*** for you choice we must give an ***attribute name***. Type in "color" and then click on the **NEW** tab at the bottom to add colors. Type in "green", and then hit the **ADD** button. Enter in as many colors as you like and then after you have added the last one hit the **CLOSE** button and then hit **OK**. Now lets select another ***New Attribute Type***. Chose ***DATE***, this

will give us an auto generate date that will be exported out as an attribute for review at a later time. Follow the steps and hit **OK** once you have entered your date information. After you have entered all the different types of attribute information you want for a fire hydrant then hit **CLOSE** at the ***New Attribute Type*** box. Continue with the dictionary until you have the desired amount of features and attributes.

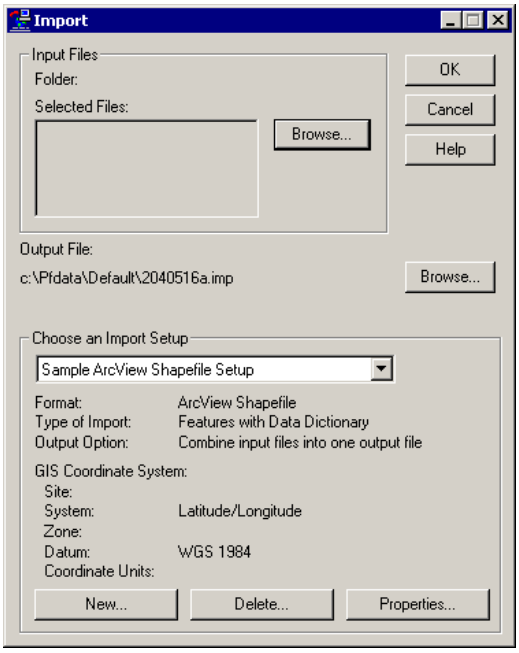
7. Make sure to save your dictionary in the selected ***Project folder*** before you close it.

C. Importing

With Pathfinder Office we have the ability to import data files from an external source. For example we can import a Shapefile from ESRI's ArcView Software.

Imported file can be then sent over to the data logger through Trimble's Data Transfer Utility and viewed as a background file or used as a Data file. When the imported file is brought over as a data file you have the ability to edit the data and if need be the file can still be viewed as a background file if you choose to open a new file.

1. To start the Import process, go to UTILITIES and select IMPORT. The following box will be displayed.

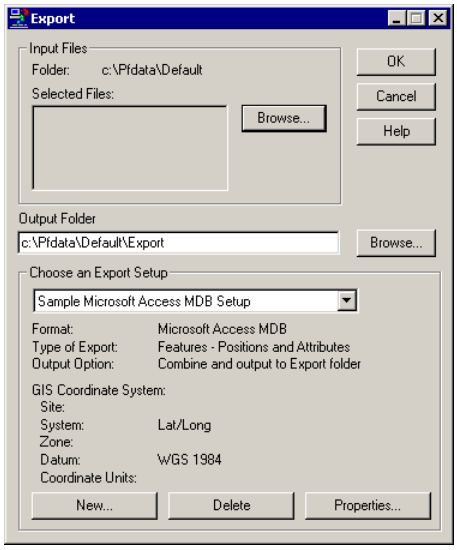


2. Under the INPUT FILES section, click on the BROWSE button and browse to the folder where the Shapefile is located.
3. Next look under the OUTPUT FILE section and make sure you keep up with the name the imported file is being given and stored. If you want to change the name from the default name click the BROWSE button and you can change the name as well as the storage location.
4. Next make sure that you have the correct setup that you are trying to import. This can cause a little bit of a problem. Technically you should make sure you on the correct set up before you do the previous two steps. For example if you accidentally had the Import Setup as a AutoCAD .dxf then when you hit the browse button to select your file to import it will be looking for .dxf files instead of shapefiles.

D. Exporting

You can export your data that you collected out to your existing GIS or CAD or even just as an ASCII file to view in Microsoft Excel.

1. Go to Utilities and then click on Export. You will have a screen that looks like the one below.

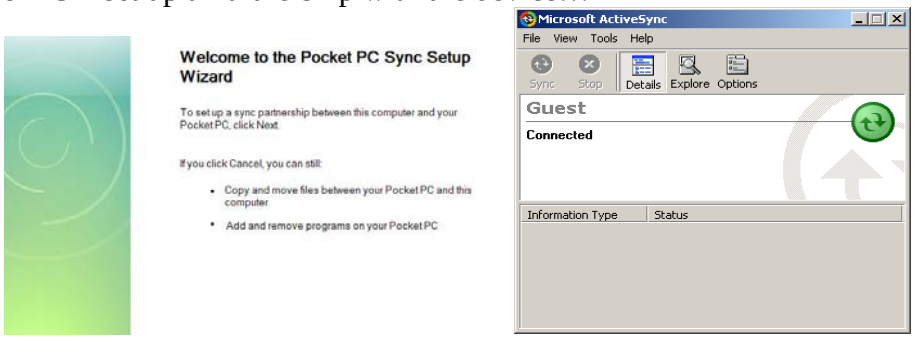


2. Under the INPUT FILES section make sure that you have selected your file to be exported.
3. Under the OUTPUT FOLDER make sure the file is going to a place where you will find it easily. The Export folder of your project is a good place.
4. Next you will need to Choose the Export Setup that you need.
5. Once you have selected the correct Export Setup click on the PROPERITES button and go through each properties tab and make sure all of your settings are correct.

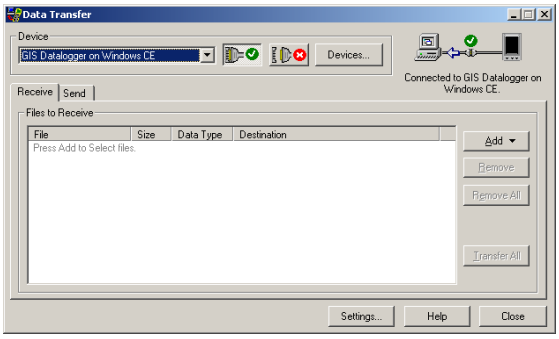
E. Data Transfer

After you have created your dictionary you are ready to go out and start recording you features. Before you can do this you need to transfer (send) the data dictionary to the data collector. The transfer utility is also used for receiving data from the data collector.

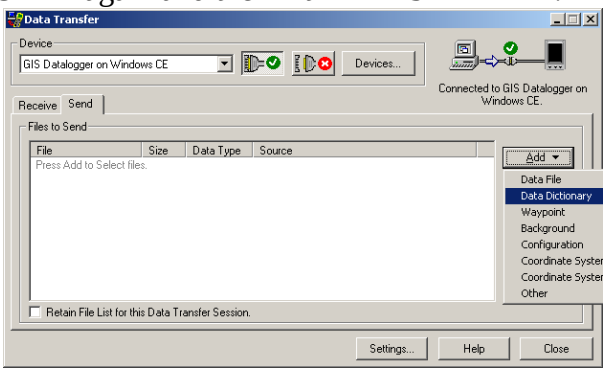
1. You will first need to make sure that your GeoXT, XH, Ranger, or Recon is connected to your PC using Microsoft ActiveSync. If you do not have Microsoft ActiveSync you will need to go to www.microsoft.com and download version 4.5. (Make sure that you do **NOT** set up a Partnership with the device!!!

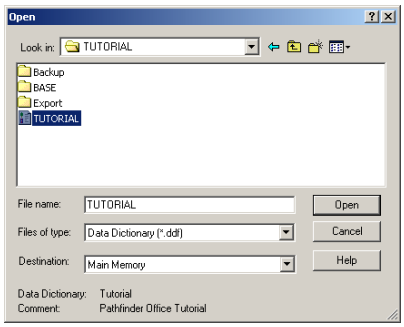


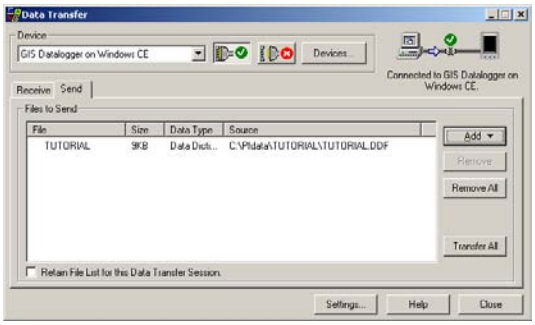
2. Once your data collector is connected to ActiveSync you will be able to go to UTILITIES/DATA TRANSFER and make sure that your device is set up to GIS Datalogger on Windows Mobile.



3. You should automatically connect as show below. Once you are connectd you will be able to either Receive or Send data. If you wish to put your Data Dictionary onto a device then choose the Send mode and then hit the ADD button on the right hand side and browse to your dictionary and then hit OPEN. Next you will be able to hit TRANSFER ALL and you Dictionary will be sent over. If you wish to transfer a Data File do the same steps except hit the Receive button and select the Data file you wish to transfer and then hit OPEN again and then hit TRANSFER ALL.







F. Background Files

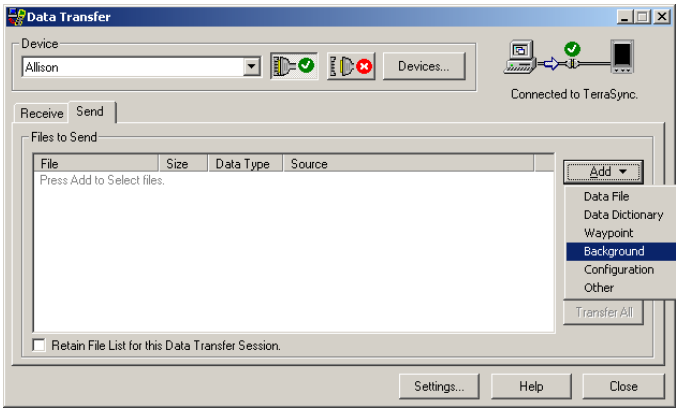
You can bring in a background file to be used in the data logger in the field. This is good for reference.

Make sure you are connected to MicroSoft ActiveSync with your data collector.

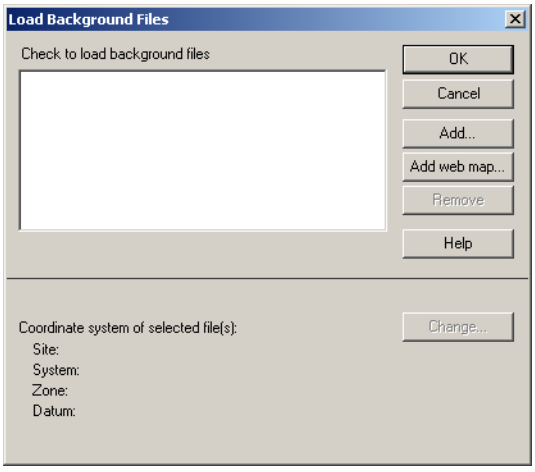
Follow the steps below to setup and data transfer your background map.

This example is of a *Mr. SID* - DOQQ. The background files supported are .sid, .tif, .bmp, .gif, and .jpg.

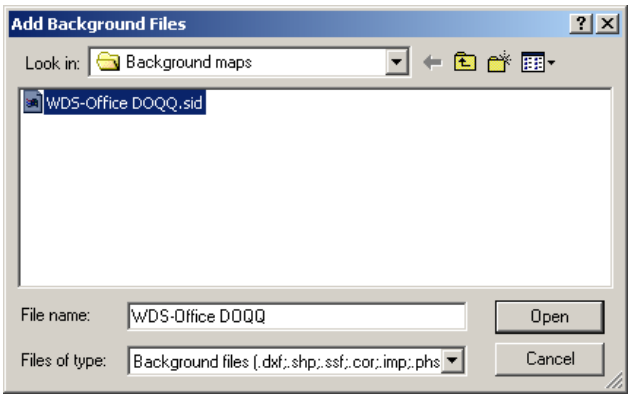
Open Pathfinder Office and go to Utilities/Data Transfer. Select the Send button and then select the Add button and select Background from the drop down list.



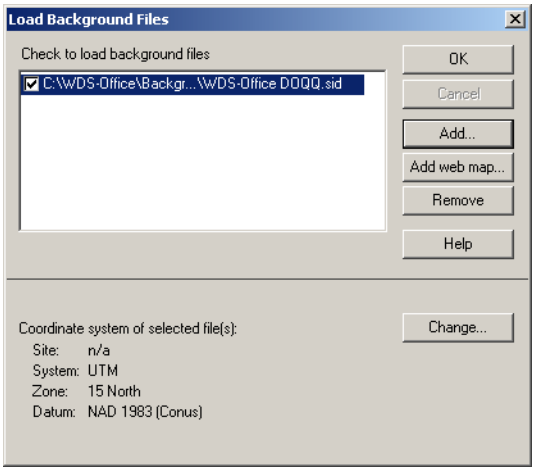
Next you will be given the window below. If you have not set up your background file already then you need to do so now. All you need to do is click the ADD button on the right hand side.



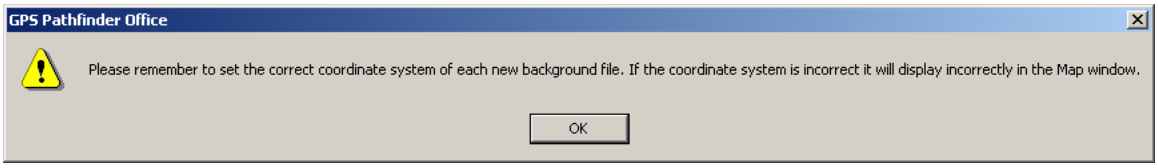
After you have clicked the ADD button you will be given the window below. Browse to your .sid file and then hit the Open button.



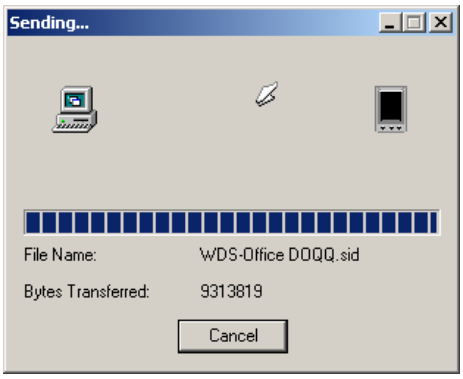
Next you will be back in the "Load Background Files" box and your background map should be listed with a check mark next to it. (please see picture below) You will need to highlight your file and click the Change button for the coordinate system is this is not the correct one.



Once you have changed your coordinate system you need to click the OK button. You will be given the message below reminding you to make sure your coordinate system is correct. If not correct then the background map will not be loaded correctly.



Then hit your Transfer All button and your file will be sent over.

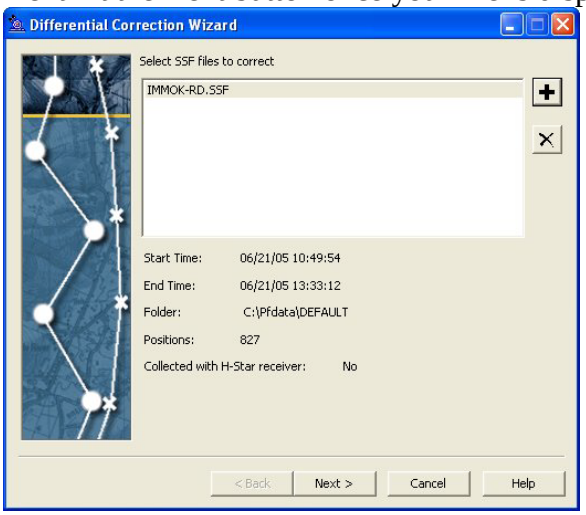


G. Differential Corrections – Except XH

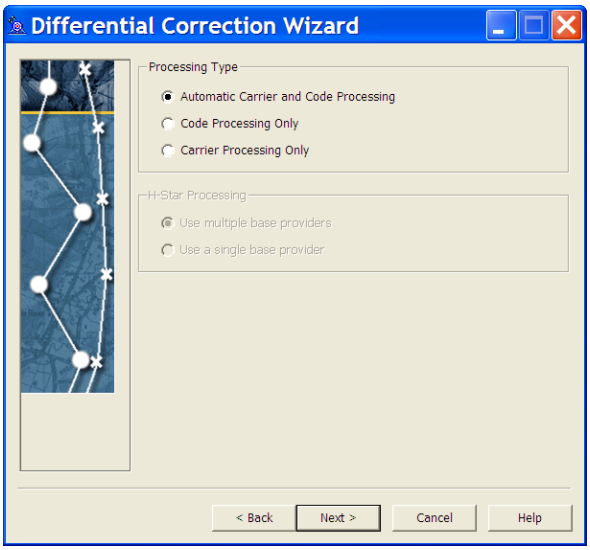
To start the Differential Corrections utility click on Utilities and then click on Differential Corrections.

Select your file to be process by clicking on the plus sign in the upper right hand corner. If you have a file open in Pathfinder Office it will automatically be displayed.

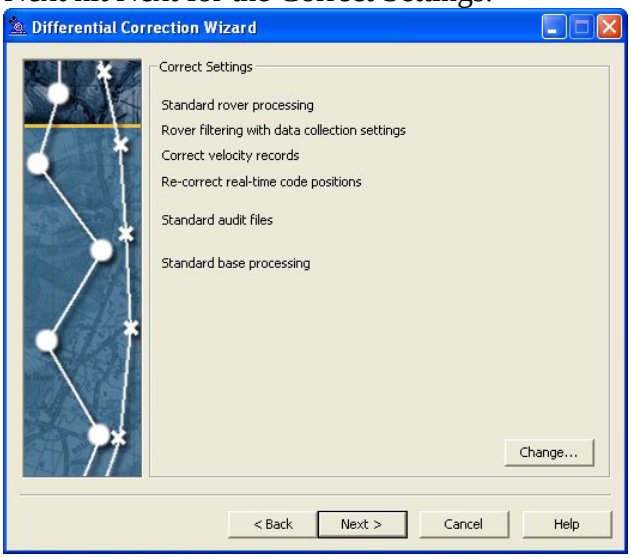
Next hit the Next button once your file is displayed in the box.



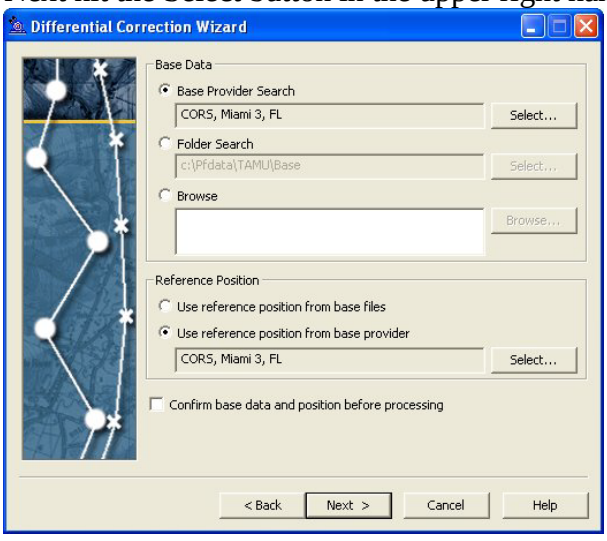
Click Next after you selected Automatic Standard Carrier and Code Processing under Standard.



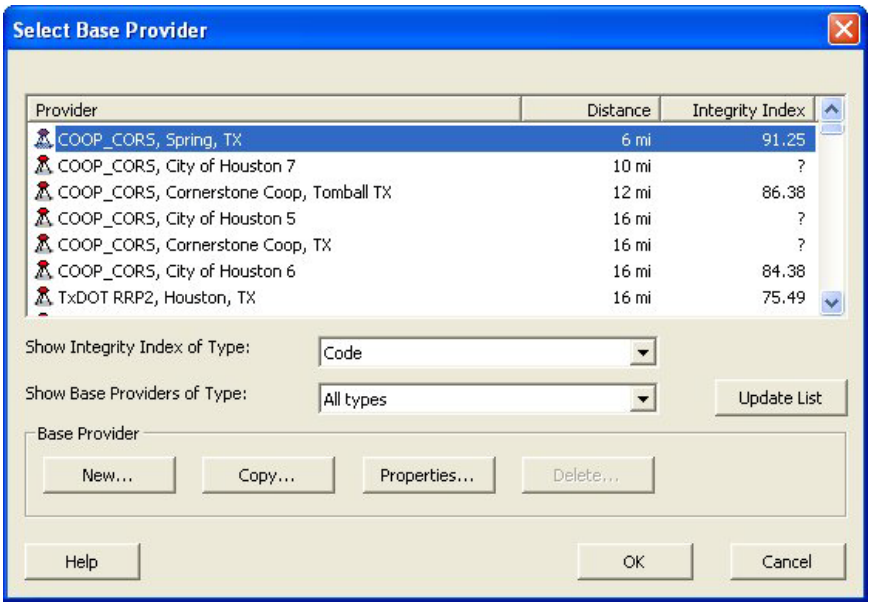
Next hit Next for the Correct Settings.



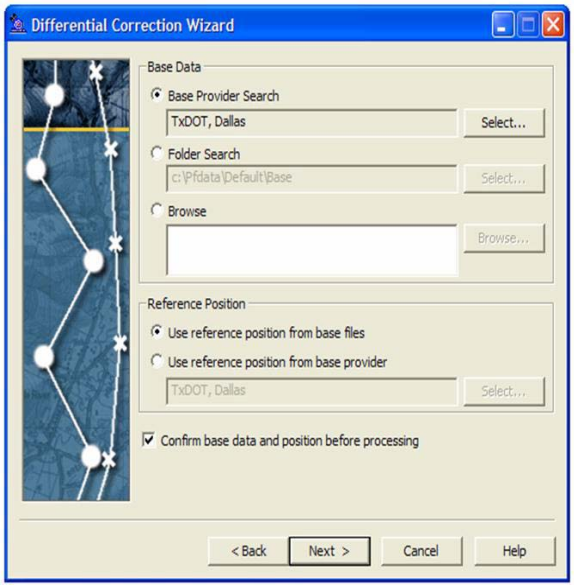
Next hit the Select button in the upper right hand corner.



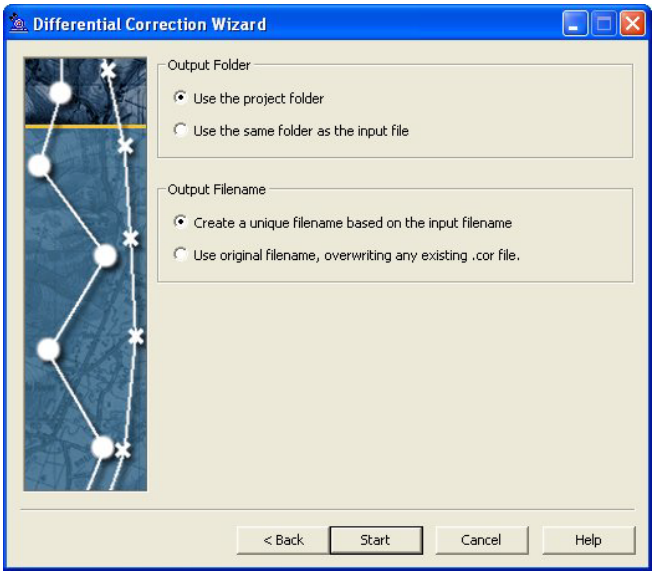
This will bring up the list of base stations in your area. Choose the one with an integrity index above 70 and a distance less than 150 miles. The hit the OK Button.



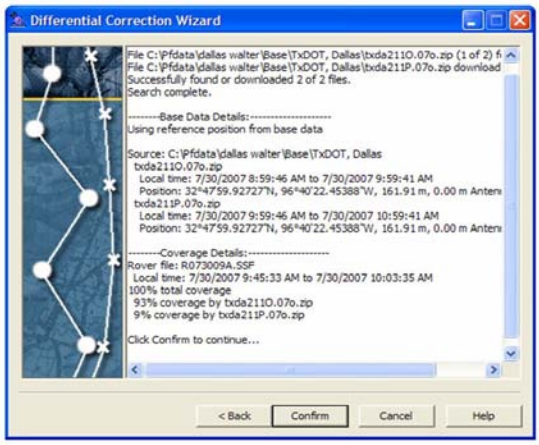
In the Reference Position box make sure to select "Use reference position from base files" (top selection). Check the Confirm box at the bottom. Hit the Next button.



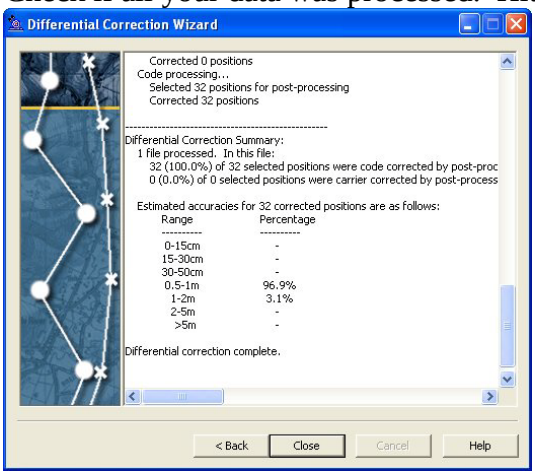
Next hit the Start button.



Next you will see your results of the corrections.
Check Coverage Details for 100% total coverage.
Hit the Confirm button.

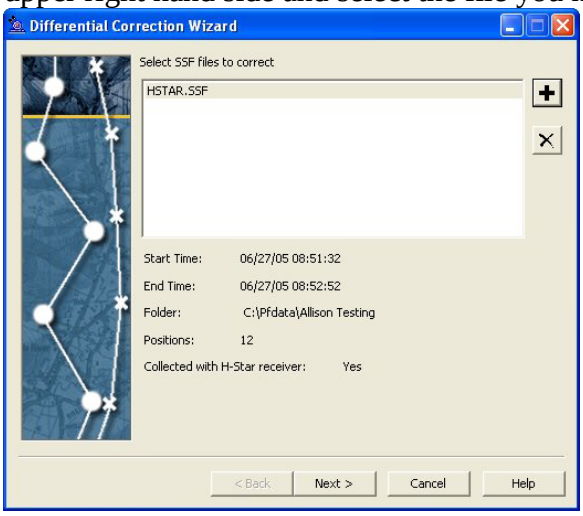


Check if all your data was processed. Hit the Close button.



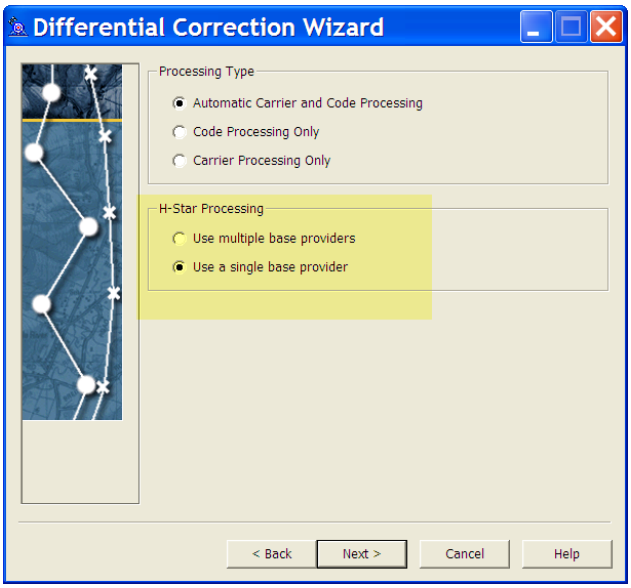
H. Differential Corrections with HSTAR

Click on UTILITES/DIFFERENTIAL CORRECTIONS. Click the plus sign on the upper right hand side and select the file you need to process.

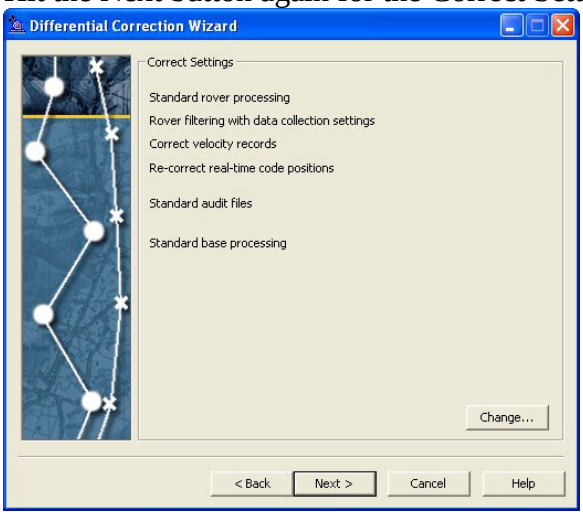


For the Processing Type you will need to select H-Star and then hit the Next button.

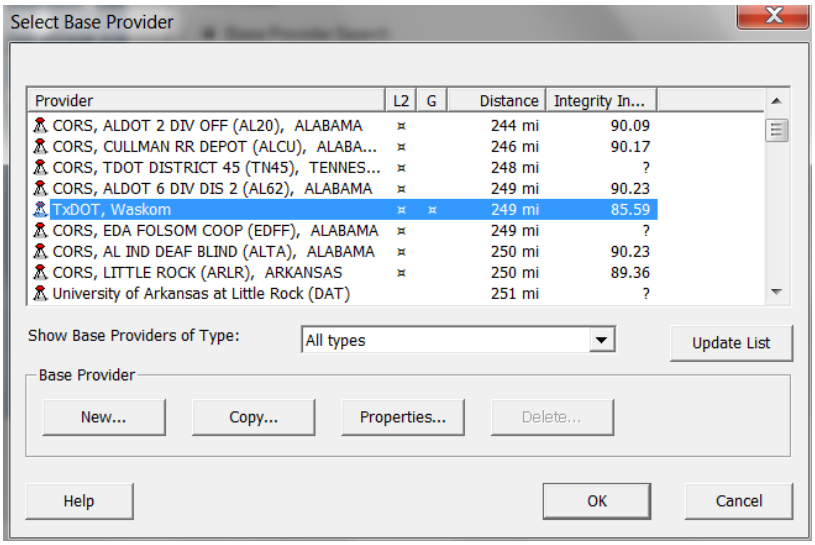
Choose to either use one base station or multiple. If you have one good base station within 50 miles then use one, if you have a longer base line then choose three.

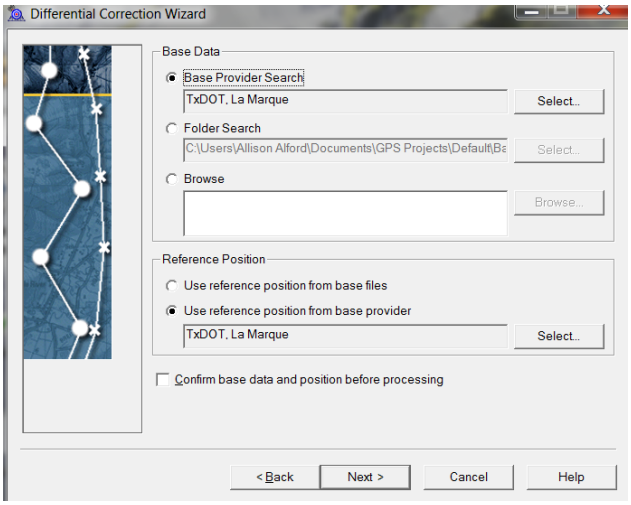


Hit the Next button again for the Correct Settings.

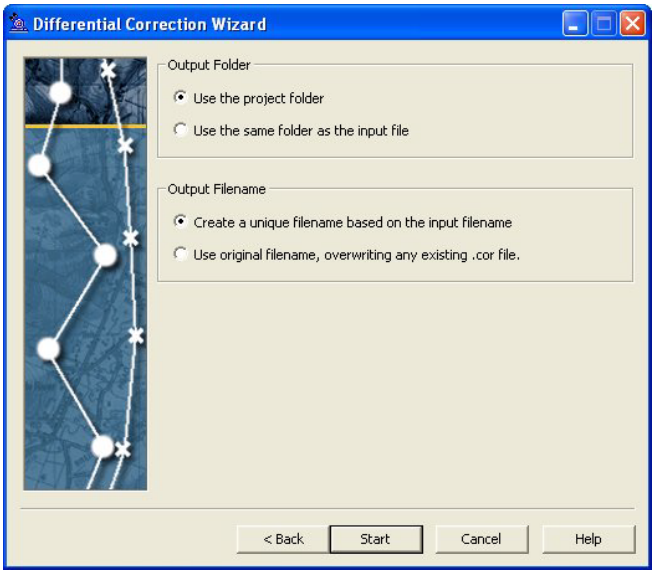


Select ONE Base Station and hit the OK key. You will be brought back to the Base Provider Group window. Hit the Add button again and repeat the process until you have three base stations selected. IF YOU ARE USING A GEOXH WITH GLONASS YOU WILL NEED TO SELTECT A BASE STATION THAT HAS ALSO GLONASS.

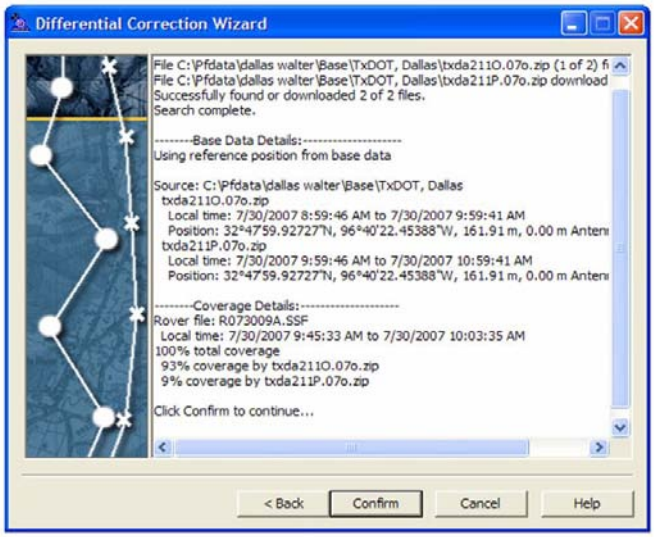




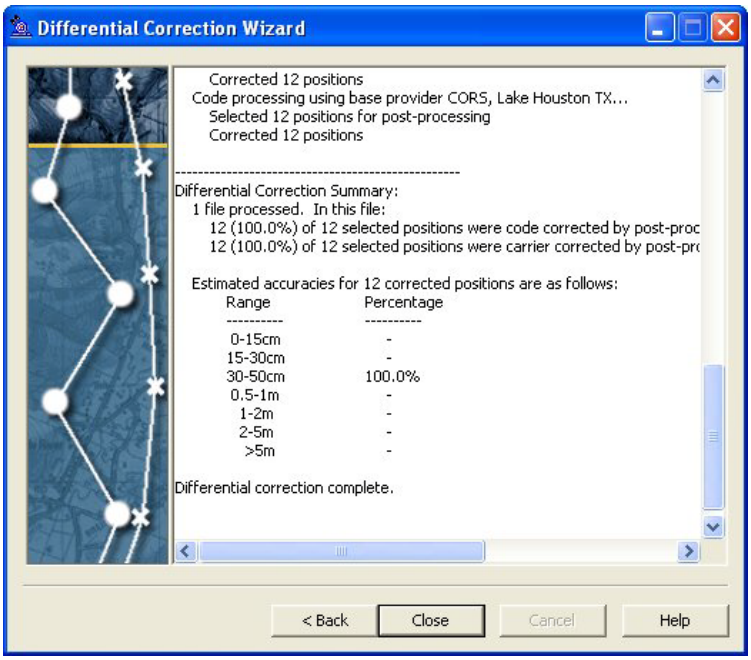
Hit Start.



Next you will see your results of the corrections.
Check Coverage Details for 100% total coverage.
Hit the Confirm button.



The processing will start.
Check for all (100%) of your data was processed.
Once the Differential Correction is complete hit the Close button.


Differential Correction Wizard
Corrected 12 positions
Code processing using base provider CORS, Lake Houston TX...
Selected 12 positions for post-processing
Corrected 12 positions
Differential Correction Summary:
1 file processed. In this file:
12 (100.0%) of 12 selected positions were code corrected by post-proc
12 (100.0%) of 12 selected positions were carrier corrected by post-pr
Estimated accuracies for 12 corrected positions are as follows:
Range Percentage
0-15cm -
15-30cm -
30-50cm 100.0%
0.5-1m -
1-2m -
2-5m -
>5m -
Differential correction complete.
< Back
Close
Cancel
Help

IV - FieldOperation of TerraSync Professional

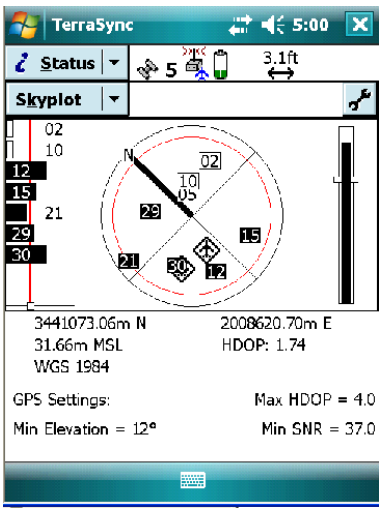
A. Setup

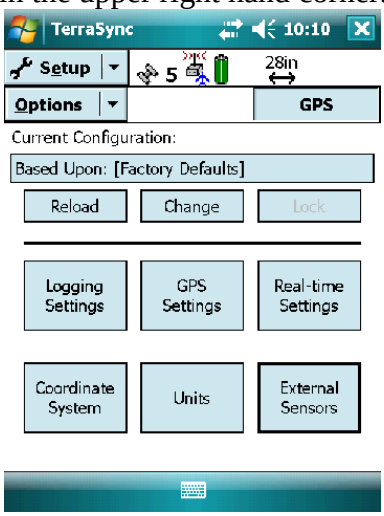
This is for TerraSync V5 or higher.
Make sure that you are running ActiveSync V4.5 or higher

DO NOT PERFORM A HARD RESET WITHOUT TALKING TO YOUR WDS SALES REP!!!

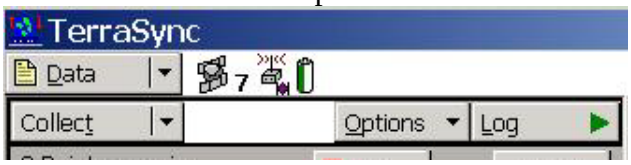
With the GPS turned on, start the TerraSync program.
There are five (5) main screens, MAP, DATA, NAVIGATION, STATUS, and SETUP, each with sub-screens.

The first screen at start up will be the STATUS – Skyplot.
**IF this screen shows GPS IS DISCONNECTED then hit the down arrow next to STAUS and choose SETUP and hit the GPS button in the upper right hand corner.



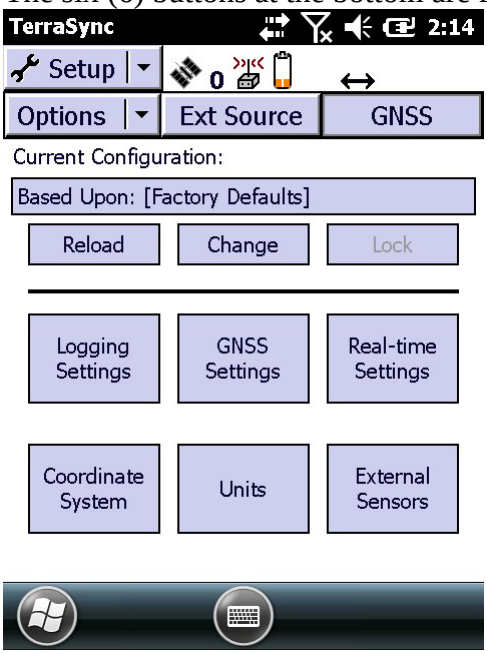


When the GPS connects you will see the satellite icon with a number of satellites in the information bar at the top of the screen.



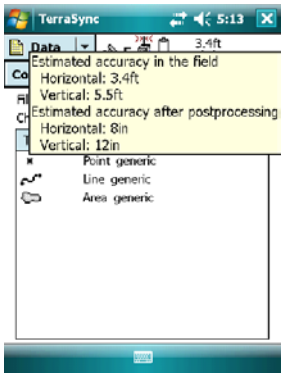
The icon and/or number will blink until enough satellites are locked on to calculate a position. In the bottom screen enough satellites have been acquired to calculate a position.

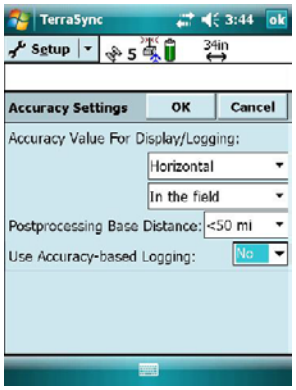
The six (6) buttons at the bottom are for set up and GPS control.



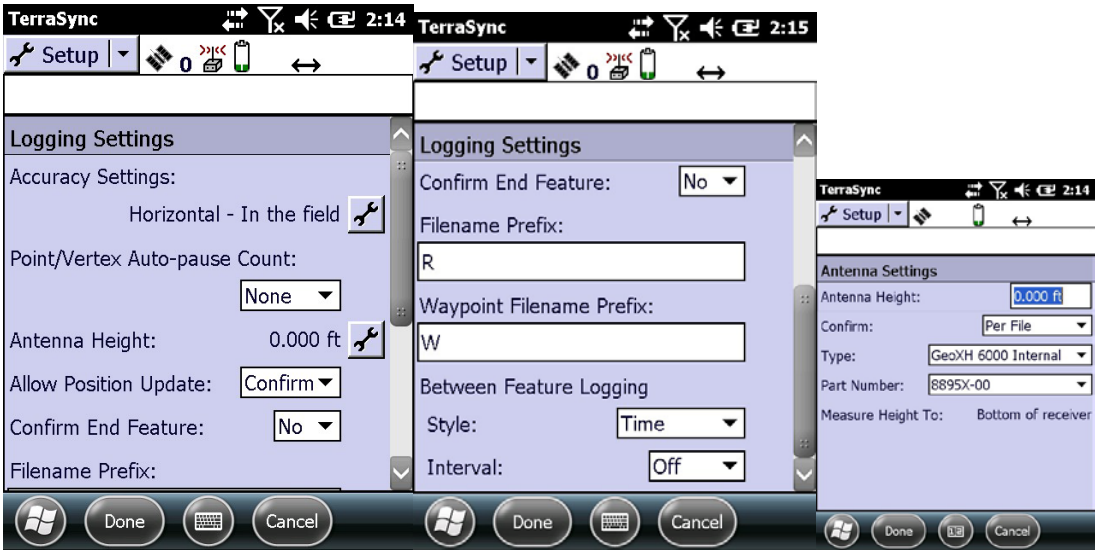
Hit the Logging Settings button. For Accuracy Settings hit the wrench to the right of Accuracy Settings and choose to display either Horizontal accuracies in the field or Post Processed accuracies.

, make sure if you change to Use Accuracy based logging that you set a value that is workable and that you change it if you decide to abandon this mode of data collection.

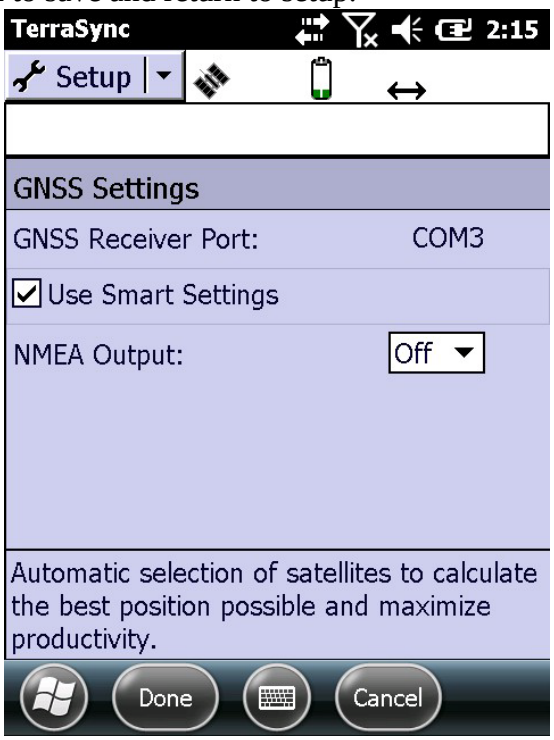




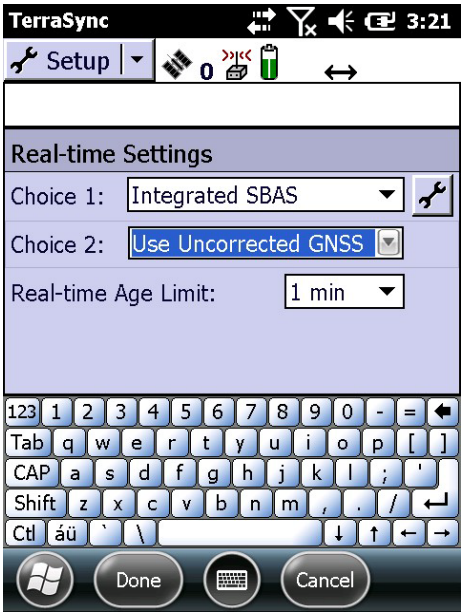
To configure the antenna hit the “wrench” button. Hit OK when done. Hit OK again to save your settings and return to the setup page.



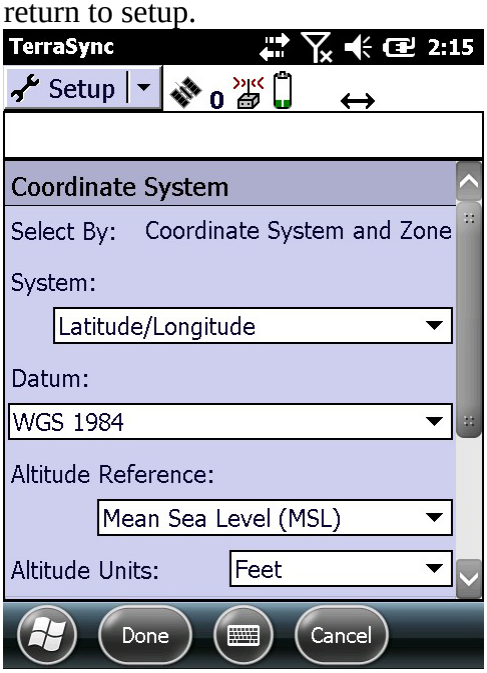
Hit the GPS Settings button. Make sure your TerraSync is set to use the Smart Settings. Hit OK to save and return to setup.



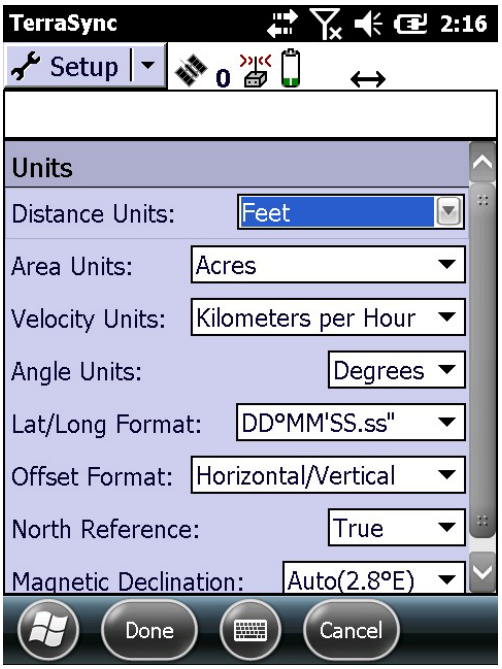
Hit the Real-time Settings button. Use Uncorrected GPS for data collection. Use SBAS (WAAS) for navigation. Hit OK to save and return to setup. **IF USING THE VRS NETWORK PLEASE REFERENCE APPENDIX A FOR SETUP INSTRUCTIONS.**



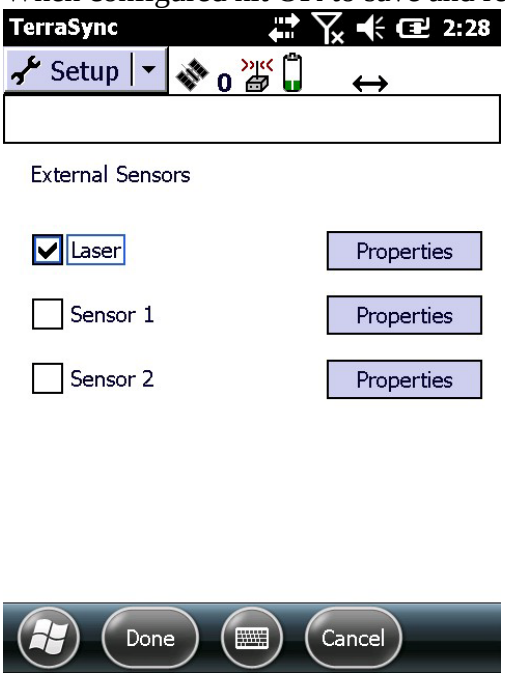
Hit the Coordinate System button. Select the coordinate system required. NOTE: if working in a state plane system use **US Survey Feet** ONLY!!!! Hit OK to save and return to setup.

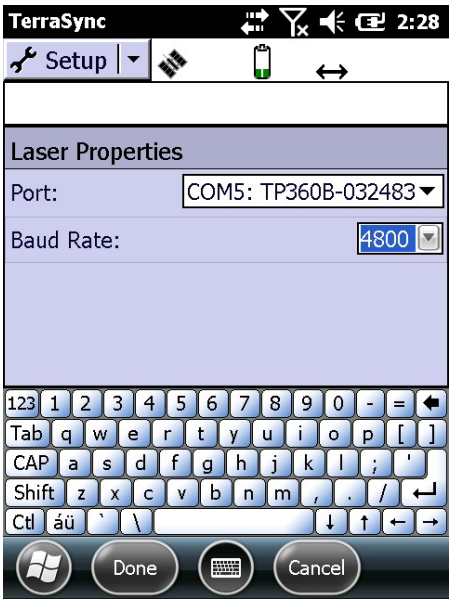


Hit the Units button. Set the units you are working in. For feet remember to use **US Survey Feet**! Hit OK to save and return to setup.



Hit the External Sensors button. You will only set up the External Sensors if you will be using a device with your GPS unit. For example a laser range finder or pipe locator. When configured hit OK to save and return to setup. Change SETUP to DATA.





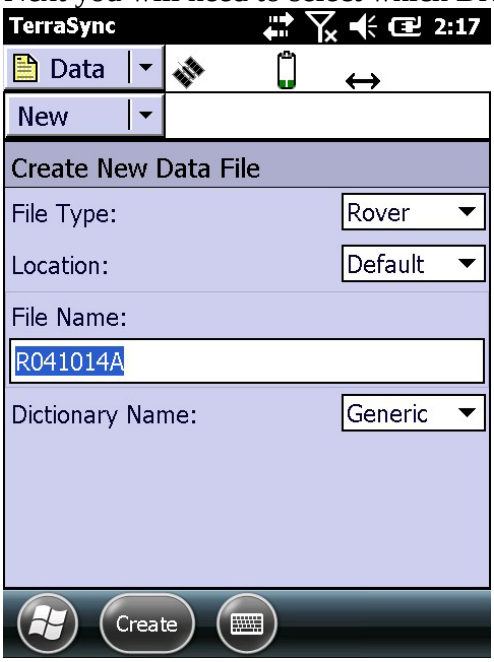
B. Data Collection

Under the DATA tab in the upper right hand corner of TerraSync you will be able to record new data files, open existing files or go into you file manager.

Select the NEW button under the DATA tab.

Next you will need to name your file. By default it comes up with R and then the date. You can put your cursor in the box and change this if you need to.

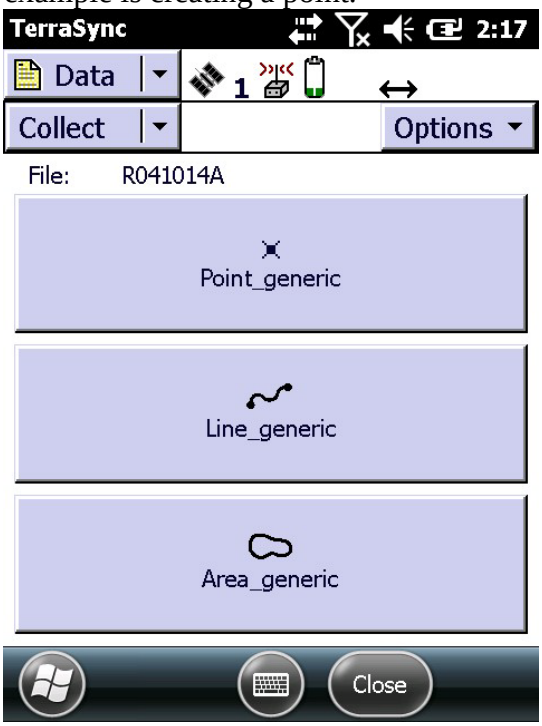
Next you will need to select which DATA DICTIONARY you will be using.



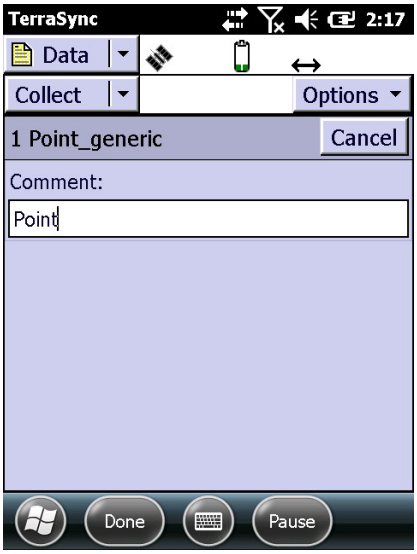
Once you have named your file and selected your dictionary you can choose the CREATE button to start your rover file. You will be asked to confirm your antenna height.

Now you can start creating features!!!

You can select a point, line, or area from the list of features and hit CREATE. The first example is creating a point.



Your device will start logging (HOLD STILL) and once you have the desired amount of positions and you have entered in your attribute data you can hit the DONE button to save and return back to the START FEATURE screen. See picture below.

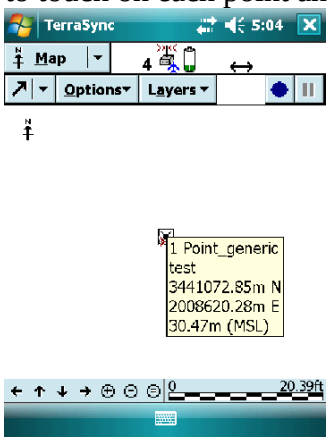


If you would like to repeat the same attributes as the last feature simply click on the OPTIONS button while at the choose feature screen and select REPEAT.

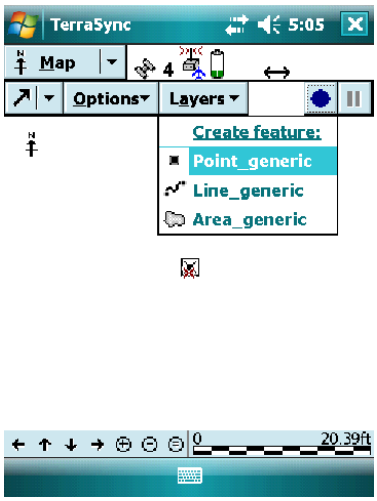
WHEN YOU ARE DONE COLLECTING DATA AND ARE READY TO TURN OFF THE GEOXT PLEASE MAKE SURE YOU CLOSE OUT THE DATA FILE BEFORE SHUTTING DOWN THE TERRASYNC SOFTWARE!!!!

C. Background Maps

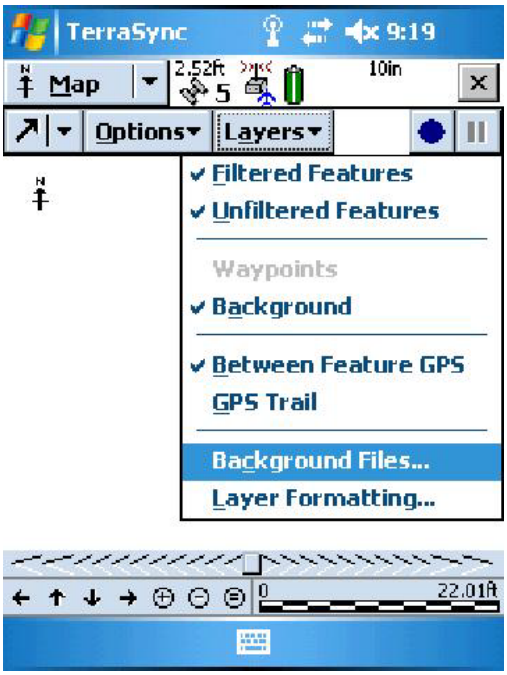
If you want to view you features while in the field select the MAP tab. You will be able to touch on each point and it will show you the information about that feature.

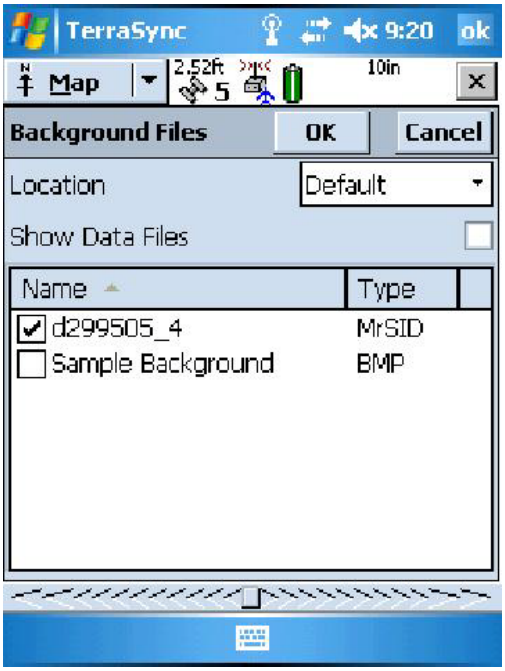


Data can also be logged from the Map screen, simply hit the blue circle in the upper right hand corner and choose a feature from the drop down list.



To load a background image or background data while in the MAP screen go to the Layers tab.
Check next to Background then select Background Files.
The window will show all image or data files that are loaded on the GPS data collector.
Select the needed file or files by checking the box beside the file name.
Hit the OK button to save and return to the MAP screen.



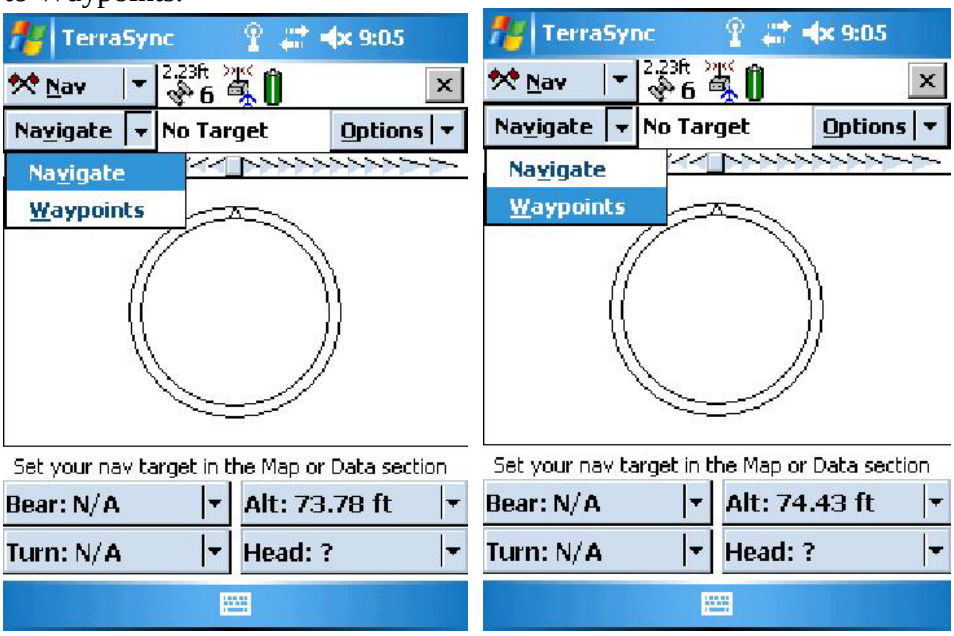


NOTE: The background image or data file MUST be in the same coordinate system you are currently working in. Check the SETUP-Coordinate System page for settings. If there is a problem it is usually due to wrong settings.

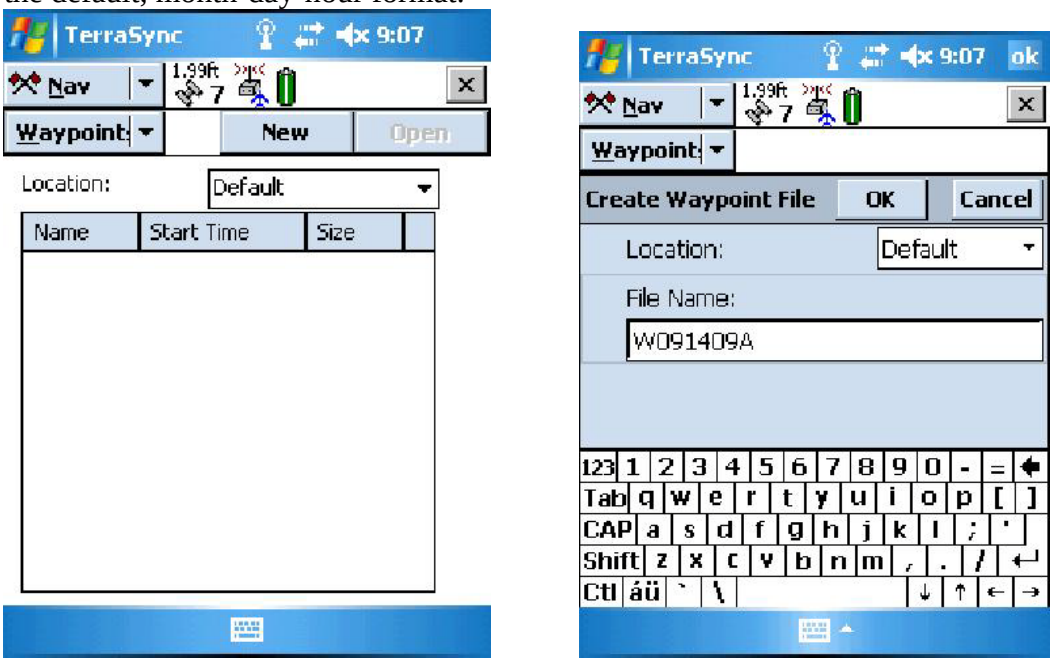
There are tools in the upper left hand corner under the MAP tab for Zoom in and out, Pan, and Select.

E. Creating Waypoints and Navigation

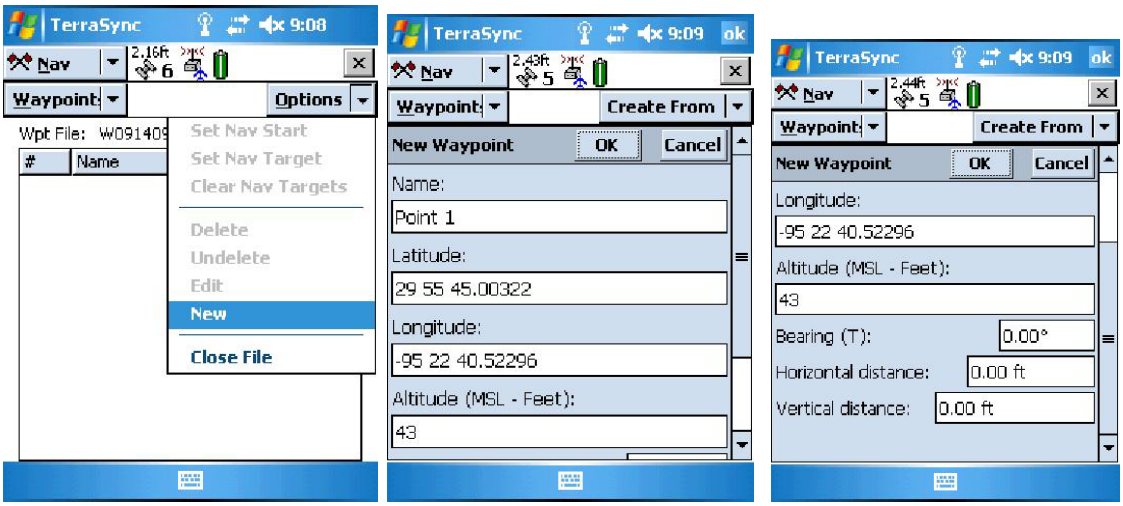
Change to the NAVIGATION screen. Under NAV select the Navigation tab and change to Waypoints.



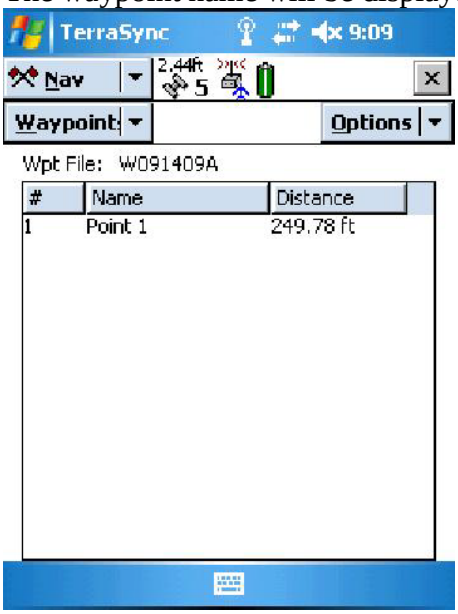
Select the NEW tab to create a Waypoint File. Name the file for your reference or leave the default, month-day-hour format.



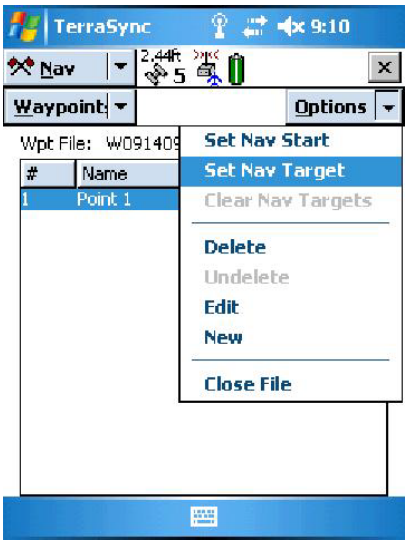
Hit the OK button. The Waypoint File screen will appear. Select the OPTIONS button in the upper right. Under OPTIONS select NEW. Start entering the waypoint name and coordinate information. When done hit OK to save and return to the Waypoint File screen.



The waypoint name will be displayed in the list.

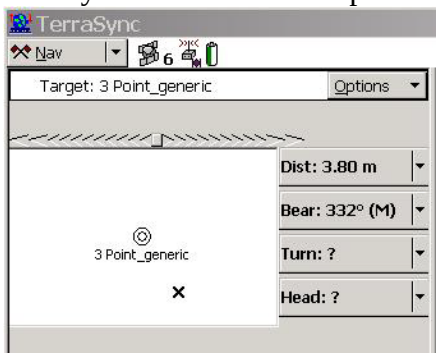


To navigate to the waypoint, select the point by highlighting then go to the OPTIONS tab. Under OPTIONS select Set Nav Target.

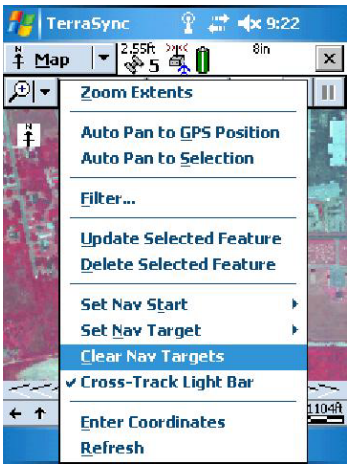


Under the NAV tab at the upper right change Waypoints to Navigate.

Start moving. When you reach the target a tone will sound and the arrow will change to a bullseye and X. Just line up the target.



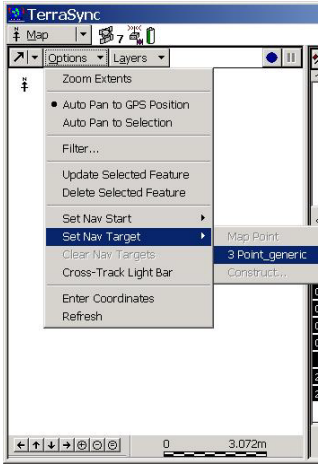
When done go to the Navigate tab and change to Waypoints. Hit the OPTIONS button. Under Options select Clear Nav Target.



Next close the Waypoint file if not using any longer.

Navigation to a particular feature can also be done from the MAP screen.

With the MAP screen open hit the arrow tool and click on the feature you want to navigate to. While the feature is highlighted hit the OPTIONS button and select SET AS NAV TARGET. This will turn you icon into two flags.



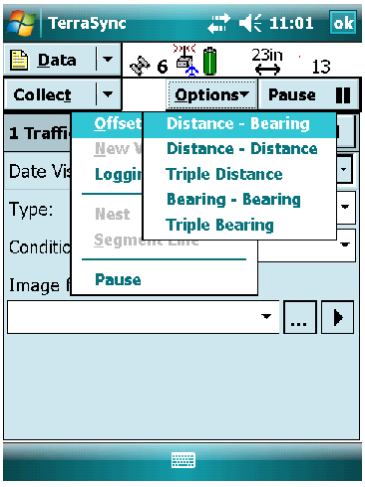
Now go to the NAVIGATION tab and you will have you heading and distance displayed for you.

To clear targets go back to the MAP screen under the OPTIONS tab and select Clear Nav Targets.

F. Offsets

If you need to do an offset for a feature this is a simple thing to do.

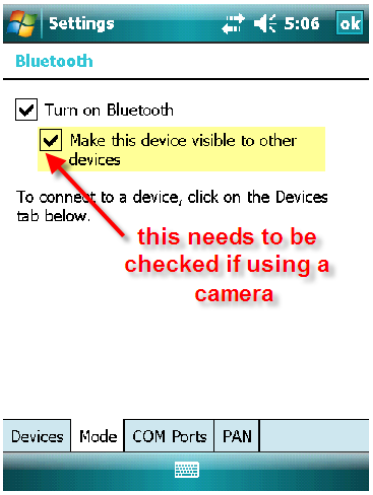
If entering your own offset without a Laser Rangefinder then hit the Options button then hit Offset then hit Distance Bearing or the combination you choose to do.

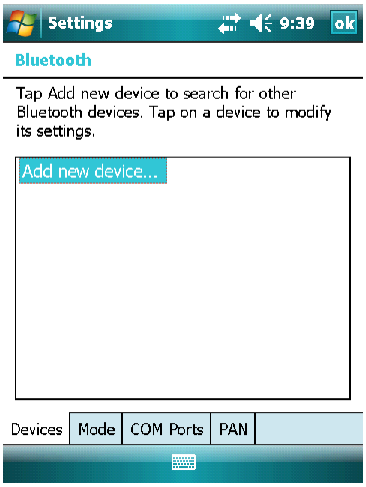


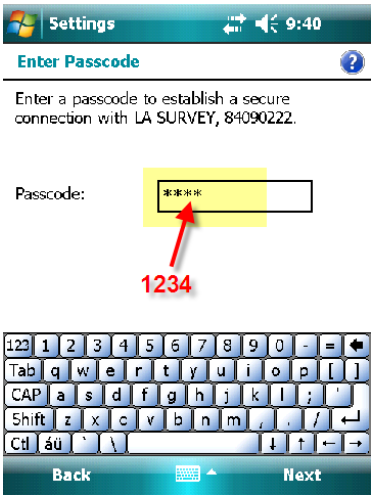
Enter the Offset information then hit OK then hit OK again to save your GPS point with offset.

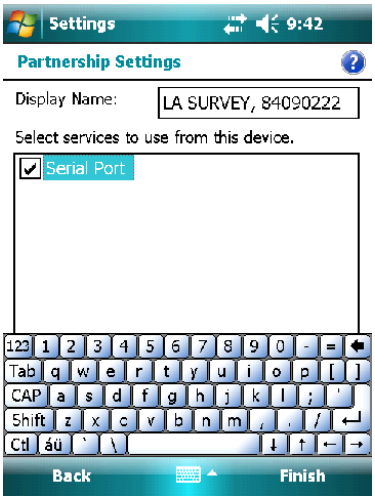
G. Offsets with Laser Rangefinders

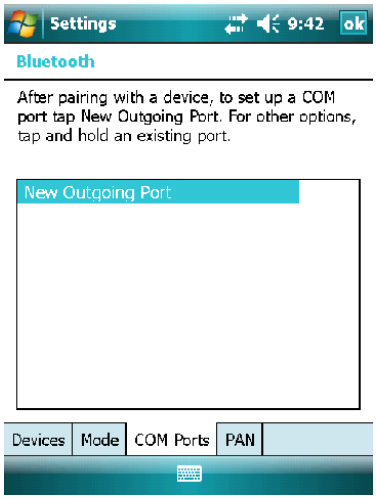
If using a laser first make sure you are set up to use a laser rangefinder.

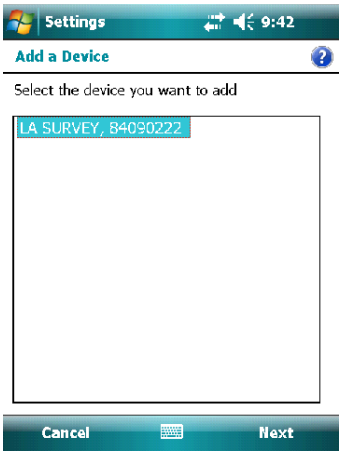


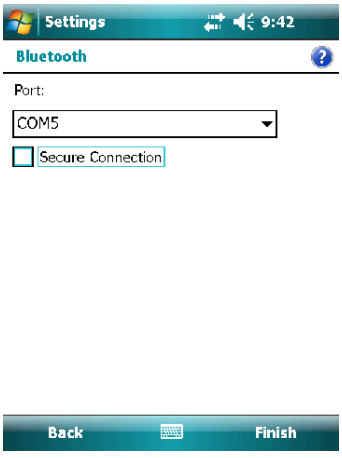






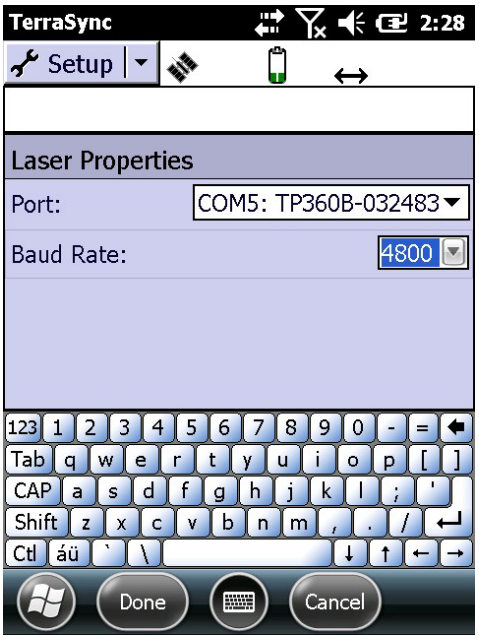






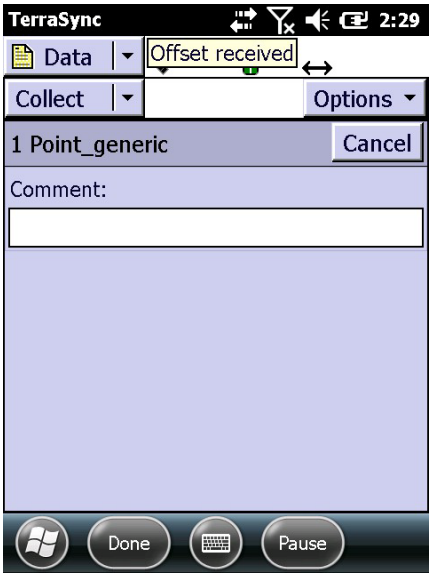
Make sure the laser is set up as an External Sensor in TerraSync.

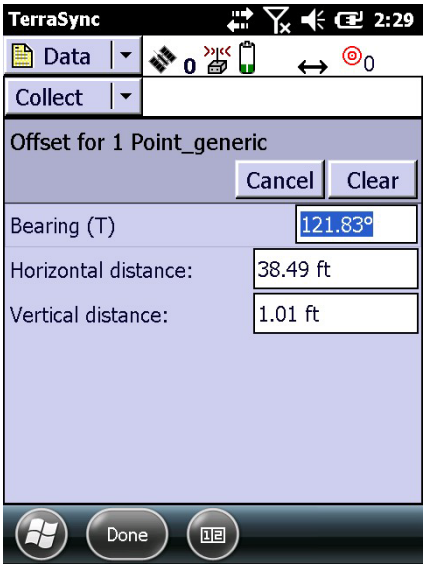
From the Setup screen click on External Sensors, put a check mark next to Laser , click on properties and change the Port to the “Com5 Laser” and make sure the baud rate is 4800.



Open the Data file as normal in TerraSync.

First start logging a feature as normal and then pull the trigger on your laser rangefinder, it will display Offset Received up top. To verify the actual offset hit the Options Key then hit Offset…

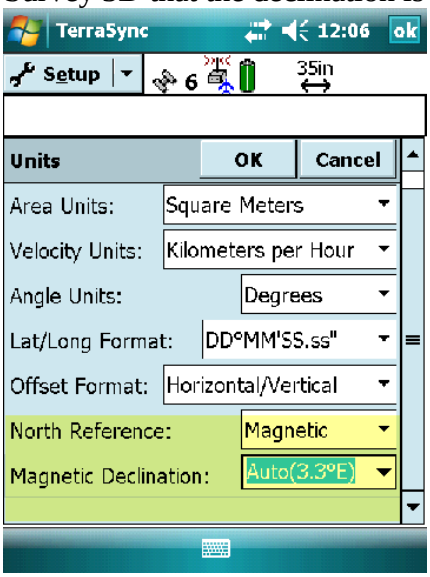




Click DONE to save the Offset then hit DONE again to save the Feature.

******IMPORTANT******

When using the laser gun with your GPS unit. Make sure that you set the North Reference to Magnetic and set the correct declination. This can be set in the SETUP screen under the UNITS button. Also make sure that if you are using the MDL Laser Survey 3D that the declination is set to zero and that your TerraSync is set correctly.



If you are not sure of the Magnetic Declination for you area, please visit the website below.

http://www.ngdc.noaa.gov/geomagmodels/struts/igrfGridZipE;jsessionid=FA00E0C21D2B2DC1E31EB3D2F2D247A8

H. **Setting up Camera**

Firmware:
Bluetooth camera: 1.63
WiFi camera: 2.63
To obtain the new versions please contact your WDS Rep.

Procedure to upgrade firmware for Caplio 500SE

NOTE: If your SD memory card has not been formatted in the camera, complete the following:

In Photo Mode (green camera icon on the dial):

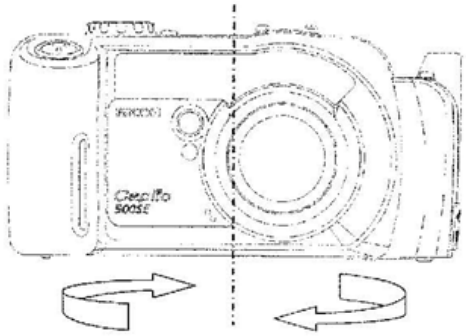
- Press Menu/OK button
- Press right arrow to SETUP
- Scroll to FORMAT (CARD)
- Press right arrow to Execute-YES (*WARNING: pictures on SD card will be deleted)

1. Copy firmware file: “urflect3” to SD card (in root directory). It is recommended to use a SD card reader to perform this function.

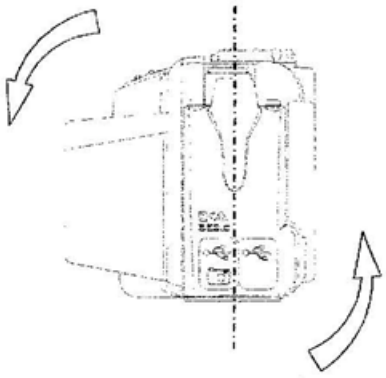
2. With camera powered OFF, rotate camera dial to audio mode (Microphone):
   - Hold the UP arrow (Scene) and Right Zoom Out button (right yellow button), and press (green) Power ON button while holding first two buttons down (press all three buttons at once)
   - Camera will ask you to “Execute. Select “YES” (this will flash the firmware to camera)
   -

3. Check and verify firmware version:
   - Hold the Down arrow (Macro) and Right Zoom Out button (right yellow button), and press (green) Power ON button while holding first two buttons down (press all three buttons at once)
   - CPU2: V _.__ display the firmware version.

- Install the SE-2C Module to the Ricoh 500SE Digital Camera (see overleaf).
- Hold the Camera with SE-2C Module attached in normal horizontal position; hold still.
- From the Menu select to 'Start Calibration' : (MENU > EXP SET > COMPASS CALIBRATION > OK) The 'Status LED' starts blinking.
- Turn the Camera one full turn (360°) on a level plane for approximately 30 seconds.



- Roll the Camera one full turn (360°) for approximately 30 seconds.
  Rolling direction: the antenna of SE-2C Module should sequentially point up ... opposite direction from the user ... ground ... user ... up again .



- Press 'DISP' button to stop calibration or wait for the Camera to stop calibration automatically. The 'Status LED' starts blinking at a slower frequency.
- When the 'Status LED' stops blinking turn off the Camera. The Compass is now calibrated.

J. Using the Ricoh 500/700 with TerraSync

On Geo

1. Click on START/SETTINGS/CONNECTIONS and click on Bluetooth.
2. Turn Bluetooth and check “Make this device Discoverable”
3. Hit OK to close out of the Bluetooth setup.
4. Go to START/SETTINGS/CONNECTIONS/BEAMS and put a check mark in the box.

On the 500SE-B

1. Turn dial on the camera to the green camera button.
2. Hit the Menu/OK button
3. Hit the right arrow key twice until EXP SET is shown
4. Scroll down BT AUTO CONN is OFF
5. Scroll down to BT Serial and hit the right arrow key and either search for your device (Geo) or hit the OK key to Connect.
6. Master/Slave should be set to Master
7. Scroll down to Quick Send Mode and select one touch.
8. Hit Menu to get out of this setup.

In TerraSync

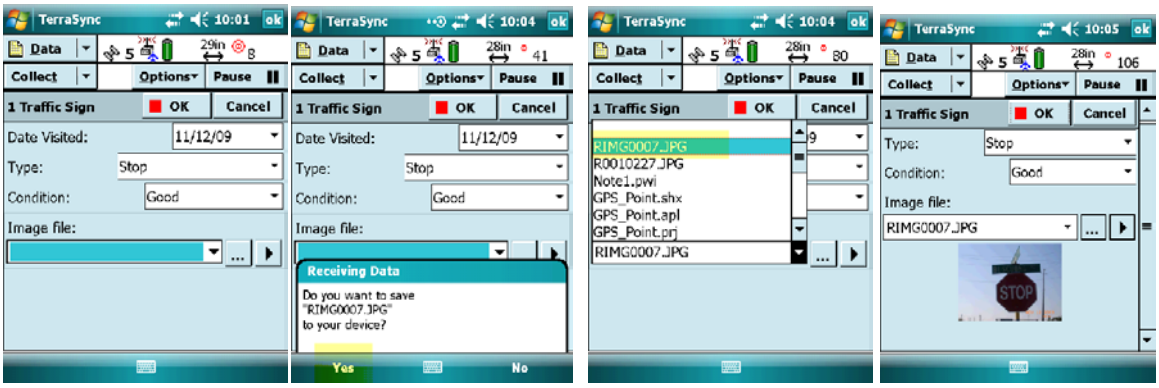
Open a Feature to be collected, and fill in your attribute information…If you need to move from where you are standing to capture then picture then PAUSE the GPS and DO NOT resume it…if you do GPS positions will start calculating again and you may not be standing exactly where you took the picture.

After you take the picture a message will come up on the Camera screen to ask you to do a one button send…HIT the OK button on the camera.

The GPS will then ask you if you want to accept the image, hit Yes.

After you hit next you will need to click the down arrow in the Image File box and choose that image.

Next you will be able to see a Thumbnail of the picture you captured. Once you are finished please hit the OK button to save the feature with the picture.



K. Status Checks and Troubleshooting

You can always check the status of you GPS, satellite Plan, and Carrier Time.

Do this go to the STATUS menu and under STATUS choose the items you wish to view.

Problem:
Have plenty of Satellites but the GPS unit will not record positions.
Solution:
Click on the Setup screen and under set up click on the OPTIONS button and select RESET GPS RECEIVER. This will force the Receiver to collect and new almanac.

Be prepared to wait 20-30 minutes for the almanac to reload if you do this.

If the Reset of the receiver doesn't work then click on the Reload Configurations. This will not loose any of your data just resets the settings back to factory default.

You will have to reset all your settings such as coordinate system and units.

Problem:
Touch screen stops responding.
Solution:
Hold down the Power key (green button) for 10-15 seconds, the screen will shut off. If the system does not automatically restart, depress the power button sharply and release. The reboot display will come up.

VII. Back in the Office

This is a good time to inspect the GPS for any damage or wear. Clean the screen and replace the screen protector if needed. Be sure to give the GPS a good recharge.

A. Data Transfer

Connect the GPS to your PC using the USB or cradle. Make sure ActiveSync connects as a guest.
Start Pathfinder Office, create a project or select an existing one. Go to the Utilities tab. Select Data Transfer.
Follow the directions above.
When done close the Data Transfer Utility.

If the GPS is a Geo series leave the GPS in the cradle on charge. Other data collectors will need to be disconnected and charged properly.

B. Differential Correction (Post-Processing)

Follow the instructions above.

C. Exporting

Follow the instructions above.

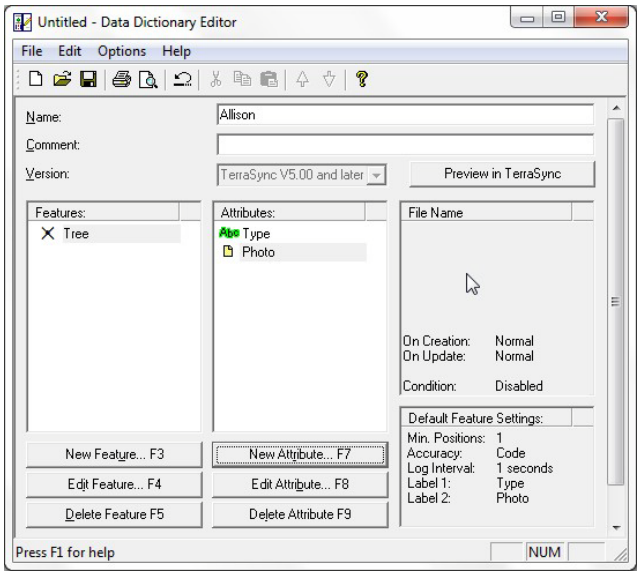
Geo6000 with Internal Camera Operation

With the Geo6000 you are two ways of capturing photos in the field.

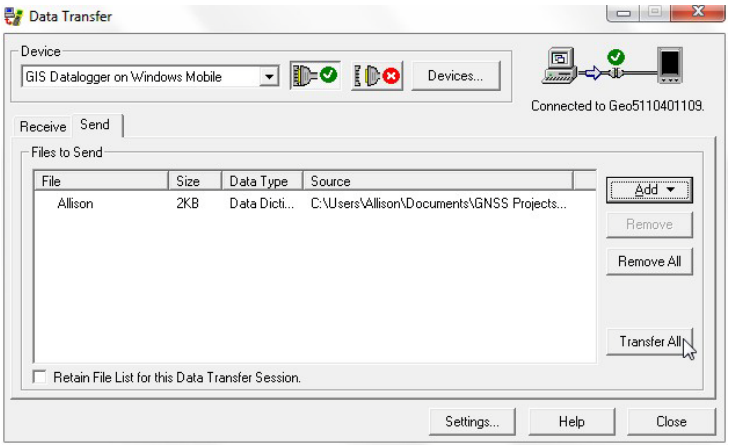
1. First you can activate the NMEA option on the Geo and this will allow you to watermark your photos with a GPS position.
2. You can edit your Data Dictionary in Pathfinder Office and create a File Name attribute called Photo and as you are entering data for a feature the Photo will be one more attribute you can capture.

Setting up the Dictionary

1. Open Pathfinder Office and either edit or create a new data dictionary.
    a. Utilities/Data Dictionary Editor – name the dictionary, example: Tree
        i. New feature – example: Tree
        ii. New Attribute – example: Type as a text or menu
        iii. New Attribute – example: Photo as a File Name

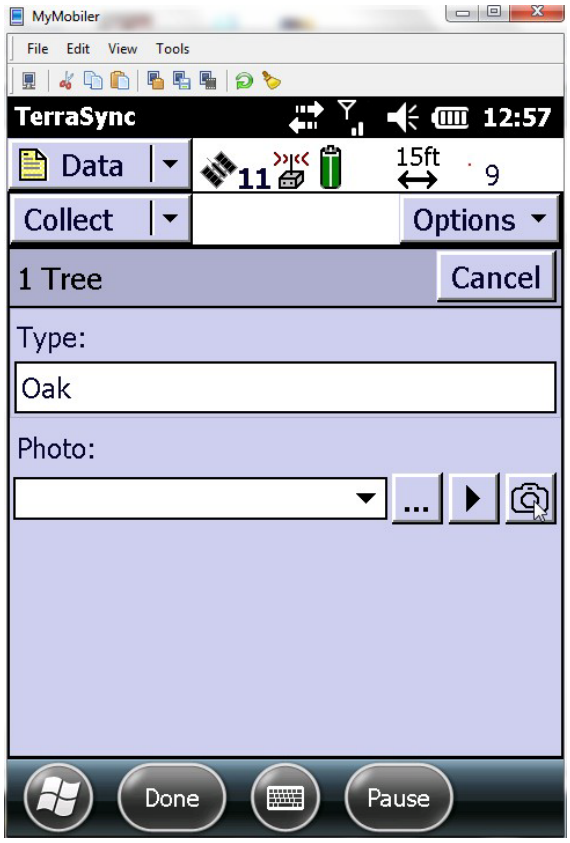


2. Data Transfer the dictionary to your Geo6000.
    a. Utilities/Data Transfer/Send/Add/Data Dictionary/Tree



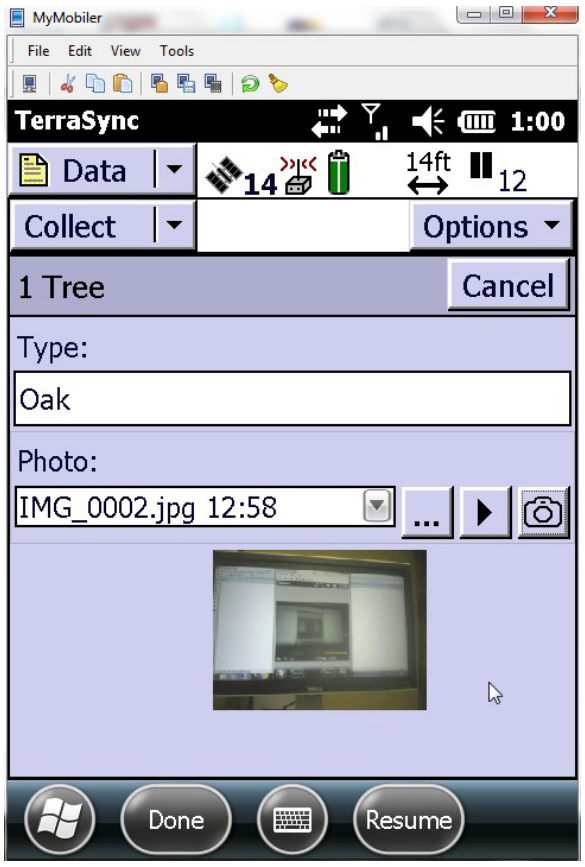
3. On your Geo6000 open TerraSync
    a. Create a new Data File with your new dictionary, example Tree

4. Select your feature that contains your photo field, in our example Tree.
5. Record your “type” first or which ever attributes you have to do first before you capture your photo. When you start to capture your photo your GPS logging will automatically pause so you can step back or move to an ideal location to capture your photo.
6. To capture the Photo it is IMPORTANT that you hit the camera icon button on the screen to activate the camera.



7. Once the camera viewer is open you then will hit the CAMERA BUTTON on the Geo6000 to take the photo.
8. After you capture the photo and it looks good then you will hit the OK button on the bottom right….***Notice in the upper right hand corner TerraSync appears, when you see this you will know the Geo6000 is processing and attaching your photo as an attribute.*****

9. Next your photo will appear as a thumbnail.



10. When you are done capturing your feature hit the Done button on the bottom left. ****Do not hit resume as this will start collecting more GPS positions and if you are not standing in the same exact spot you will have a bust on your accuracy as your Standard Deviation will increase****

Complete data transfer as normal and your photos will appear in your attribute box in Pathfinder Office and you can then export them to your GIS.
All photos are stored in the My Documents/My pictures folder on the Geo6000 and when your data transfer is performed a folder will be created with the same file name as your data file and it will contain all your photos. This will allow for a Hyper link to be created in ArcGIS or which ever program you export to.