

Technology Technical Note MO-2

Utilizing
a ProXYZ Unit
for Field Data Collection
in Missouri



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Introduction

The intent of this document is to provide instructions for utilizing a ProXYZ GPS unit for field data collection. The instructions include:

- An overview of the ProXYZ GPS Unit.
- Setting up the ProXYZ.
- Pre-loading data (imagery, shapefiles) into the ProXYZ
- Collecting data with the ProXYZ.
- Required accuracy levels.
- Using the Microsoft ActiveSync software to download data from the ProXYZ into ArcGIS and to upload ArcGIS data into the ProXYZ for use in the field.
- Navigating with the ProXYZ.

Required Software

In order to use the procedures contained in this document, the following software is needed:

On the device:

- ArcPad 8.0 SP2 or greater
- Microsoft Windows Mobile 5.0 or greater

On the computer:

- ArcMap 9.2 or greater
- Microsoft ActiveSync 4.2 or greater.

NOTE: The mention and/or use of any software contained in this document should not in any way be considered as an endorsement by USDA-NRCS.

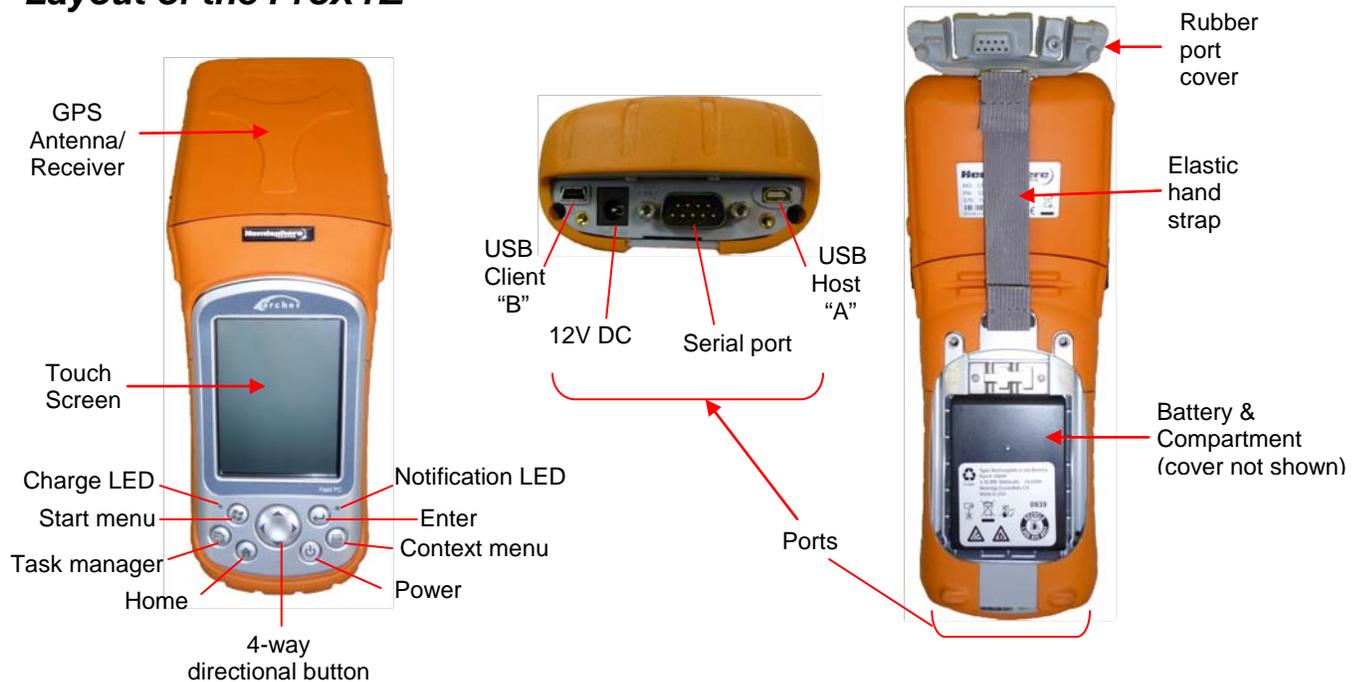
Equipment

This document assumes the equipment being used is the 3-D ProXYZ Mobile Mapping System. This is comprised of an Archer Juniper PDA with an attached Hemisphere XF101 GPS receiver and accessories, which include battery, AC power supply, cigarette lighter power cable, USB download cable, carrying case, Windows Mobile CD, Juniper Field Device CD, and a quickstart guide sheet. The unit has 512M of internal memory and 4G of memory via an internal SD card. This equipment provides real-time differential GPS capability utilizing WAAS (Wide Area Augmentation System). This simply means that a correction from a WAAS satellite can be received and applied to the GPS satellite information your unit is receiving to obtain a more accurate location.

Overview of the ProXYZ

This section gives a brief overview of the unit and how to use the basic features. For more details, users should refer to **Field PC User Documentation CD** included with the system.

Layout of the ProXYZ



Button descriptions

Power : Used to turn the unit on and off. Press and release the Power button to turn on or off (suspend) the unit. If unit is on, press and hold the power button to suspend, reset, or completely power off the unit. The power off choice is only available when on battery power.
Suspending the device puts it to sleep, and when it is turned back on, the device remembers where it was. Some battery power is used.
Powering off the device closes all programs and turns off all of the power. No battery power is used.

4-Way Directional Button: Allows you to navigate through menus, etc. on the screen.
In ArcPad: up/down – zoom in/out; left/right – pan left/right

Start Menu: Provides a menu of applications.

Task Manager: Lets you switch between or close running applications.

Home: Returns you to the Today screen. If used while in ArcPad, ArcPad will be minimized and can be restored by tapping small icon in lower right of screen.

Enter: Enters selected softkey or option.

Context menu: Displays the context menu for the item selected (similar to a right-click on a desktop computer).

Tips on using the ProXYZ unit

The following tips should be helpful in preparing and using the ProXYZ unit.

Unit Warning

As mentioned earlier, the unit is comprised of a GPS receiver/antenna attached to a PDA (via the 2 screws on the top sides of the PDA). This should never be removed or it will void the warranty.

Also, the AC adapter should NOT be used without a battery installed.

Battery

To access the battery, press on the battery door on back of unit, slide the door latch to the right to unlock it and remove the door.

When replacing the battery, insert the battery pack so battery contacts match up. Insert the tabs on the bottom of the battery door into the case slots.

Close the battery door. Press on the battery door and slide the latch to the left to lock it.

To charge the battery, connect the AC adapter to a wall outlet and the other end to the 12V DC jack on the unit. The red charge LED should begin flashing to indicate the unit is charging. The unit should initially be charged for at least 6 hours to get a full charge. A solid red charge LED (non-flashing) will indicate the unit is fully charged.

Touchscreen

The first thing you should do is to apply the provided screen protector. Instructions on doing this are provided with the screen protector. Make sure the screen is clean before applying it.

For tips on using the touchscreen, see the Touchscreen section under Windows Mobile below.

Windows Mobile

The operating system used by the ProXYZ units is Windows Mobile 6. This section provides basic instructions on using this operating system and would therefore be applicable to devices other than the ProXYZ (e.g., Trimble GeoXT, GeoXM, and Juno) that utilize the Windows Mobile operating system.

Touchscreen

TAP : This term will be used in this document to refer to the action of using the stylus to select an item on the screen by gently tapping the stylus on the touchscreen. This would be like left-clicking with a mouse on the desktop screen.

TAP AND HOLD : This describes the action of gently applying pressure and holding the stylus on the touchscreen until something happens (e.g., context menu appears). You can think of this as the method of right-clicking that you do with a desktop computer mouse.

TAP AND DRAG : This describes the action of gently applying pressure and dragging the stylus across the touchscreen without lifting the stylus. This technique is used for highlighting multiple files in File Explorer and for moving a point in your ArcPad map.

Calibrating : If the touchscreen is not responding correctly to taps, you may need to calibrate the screen. **TAP** *Start > Settings*. Select the *System* tab at bottom. **TAP** on *Screen* icon. **TAP** *Align Screen* button and follow prompts. When done, **TAP** *OK* in upper right to close screen window. **TAP** *X* in upper right to close Settings window.



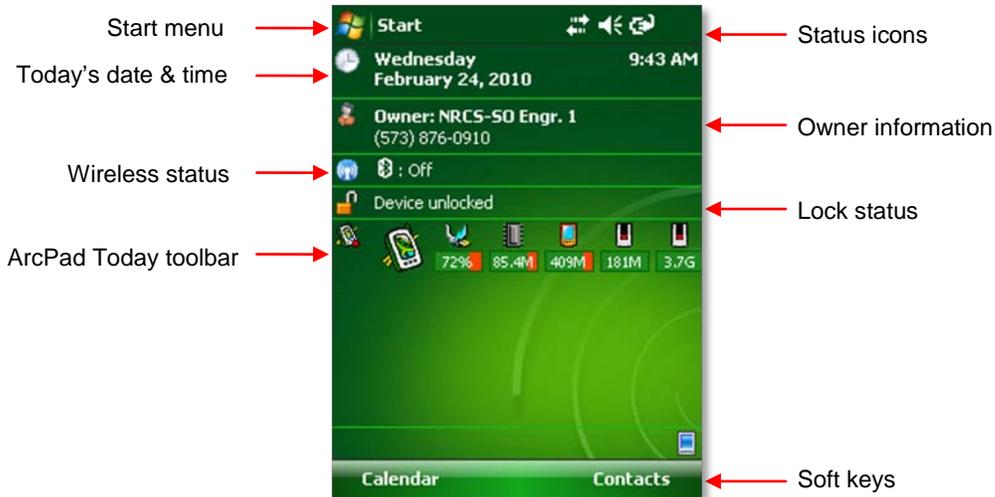
Keyboard : When you need to enter any data (i.e., numbers or characters), you should see a small keyboard icon near the bottom of the screen. Simply **TAP** this icon and an on-screen keyboard should appear. **TAP** the icon again to hide the keyboard.

Settings

Various settings can be accessed by using the Start Menu and selecting “Settings”. Some settings you might have a need to change are Backlight (brightness and non-use time), Power (non-use time), and Screen (orientation and align). These are all found on the “System” page of the Settings window.

Today Screen

When turning on your unit, you will be presented with either the “my info” screen or the “**Today**” screen depending on how your unit is set up. The “**Today**” screen functions similarly to the Windows desktop on your computer and will look similar to that shown below. The items shown on this screen may differ based on the settings of your unit. The items shown in the screen shot are explained below.



Start menu : Tapping this provides access to programs, files, and settings on the device similar to clicking the Start button on your desktop computer.

Status icons: Icons that indicate the operating conditions of various items on the device. A few useful ones are explained below.

-  : Connection. **TAP** to view or modify connection settings.
-  : Speaker. **TAP** to set volume level or to turn on/off speaker.
-  : Battery charging. **TAP** to view or modify power settings.
-  : Battery level. **TAP** to view or modify power settings.

Today's date & time : This shows the current date and time set on the device. **TAP** anywhere on the line to change the date and time.

Owner information : This shows the some of the current owner information. **TAP** anywhere on the line to change the information.

Wireless status : Indicates if Bluetooth is on or off. **TAP** to change settings.

Lock status : Indicates if the device is locked (taps and buttons are disabled) or unlocked. If device is unlocked, **TAP** this line to lock it. You will then need to **TAP** Unlock near bottom of screen to initiate unlocking.

ArcPad Today toolbar: This toolbar provides an icon to start the ArcPad application as well as battery and memory indicators.



: **TAP** to start ArcPad application.



: Battery and charging indicator. **TAP** to change power settings.



: Memory indicator. Number indicates memory free. **TAP** to view status.



: Device storage indicator. Number indicates free storage.
TAP to open File Explorer showing files stored on device.

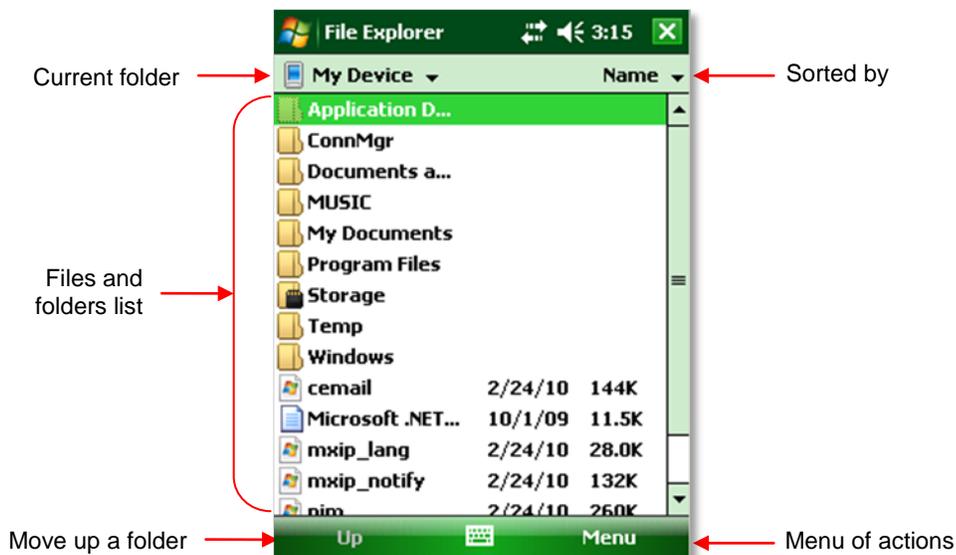


: SD card storage indicator. Number indicates free storage.
TAP to open File Explorer showing files stored on SD card.

Soft keys : These are context-sensitive keys that will allow you to perform various actions or open menus. Simply **TAP** on the desired one to activate.

File Explorer

The File Explorer application allows you to perform file management functions (e.g., copy, move, delete, rename, etc.) on the device just as Windows Explorer does on your desktop computer. (**Note:** Since filenames are often truncated because of the small display, you may find it easier to do file management using the Explore feature of Microsoft ActiveSync on your desktop computer. This is explained later). To start the File Explorer application, **TAP** *Start > File Explorer* (or *Start > Programs > File Explorer* if not on the start menu). A window similar to that shown below should appear.



Navigating: **TAP** folder to open that folder. **TAP Up** at bottom of screen to move up to parent folder. Use the current folder drop-down to move back up to a higher folder or to switch between the SD Card and My Device.

Opening: If you **TAP** on a file that has an associated application, the application will load and open the selected file. If there is no associated application, an error message will display.

Selecting multiple files/folders: **TAP AND DRAG** the stylus over the desired files and/or folders to highlight them.

Copying, cutting (i.e, moving), deleting, renaming: **TAP AND HOLD** on a single file/folder or on the highlighted files/folders (see above). A context menu should pop-up. Select the desired action (e.g., copy, cut, delete, rename).

For Copy or Cut, move to desired folder; **TAP AND HOLD** in an empty area of the screen (or use Context menu button, or select *Menu > Edit* at lower right) and select Paste from the pop-up menu.

For Delete, answer yes or no to the confirm prompt.

For Rename (single files only), bring up on-screen keyboard  and enter new name.

Creating a new folder: Select *Menu > New Folder* at lower right of screen. Bring up on-screen keyboard  and enter new folder name.

Communicating with Desktop Computer

In order to communicate (i.e., download and upload) with a desktop computer, Microsoft ActiveSync software (ver. 4.5 or newer) needs to be installed and running on the desktop computer. If ActiveSync is running, you should see this icon  in the lower right of your screen (near the time). If the icon is not there, you will need to start ActiveSync by selecting *Start > All Programs > Microsoft ActiveSync*.

Establishing a connection

Turn on the device. Using the provided USB cable, plug the “mini B” end into the USB client “B” port on the device (far left port).

With the computer on and logged into your desktop, plug the “full size A” end into a USB port on the computer.



If this is the first time you have connected the device to this computer, you may see some messages displayed in “yellow bubbles” near the lower right of your monitor about finding new hardware. You will need to allow this process to complete and for a message to display that the hardware is installed and ready to use before proceeding.

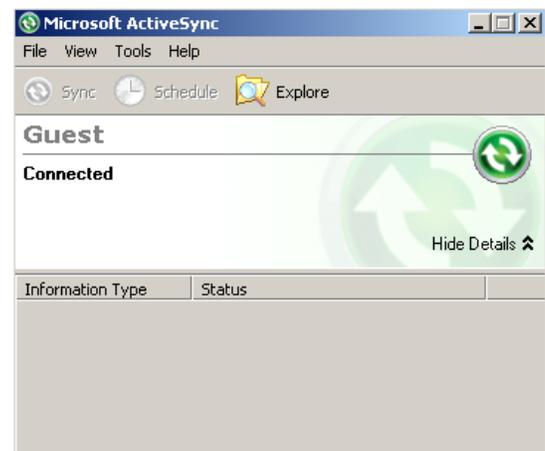
ActiveSync should recognize you have connected a device. If no partnership has been set up with this device, a “Synchronization Setup Wizard” window will appear as shown at right.



At this point, you have two options.

- 1) You can click [Cancel]. The device will connect as a “guest”. You will be able to copy and move files between the device and your computer. This is the recommended choice if the device will be used by multiple people and/or connected to multiple computers.
- 2) If you click [Next >], you will be walked through setting up a “partnership” between the device and this computer. A partnership allows items such as contacts, appointments, etc. to be synchronized between the device and your computer. The items to “sync” are selected by the user during this setup wizard. Also, the next time this device is connected to this computer, it will recognize the device and skip the synchronization setup screen.

You should then see a screen similar to that at right showing that you are connected. If a partnership was created, you will see the name of the device rather than “Guest”.

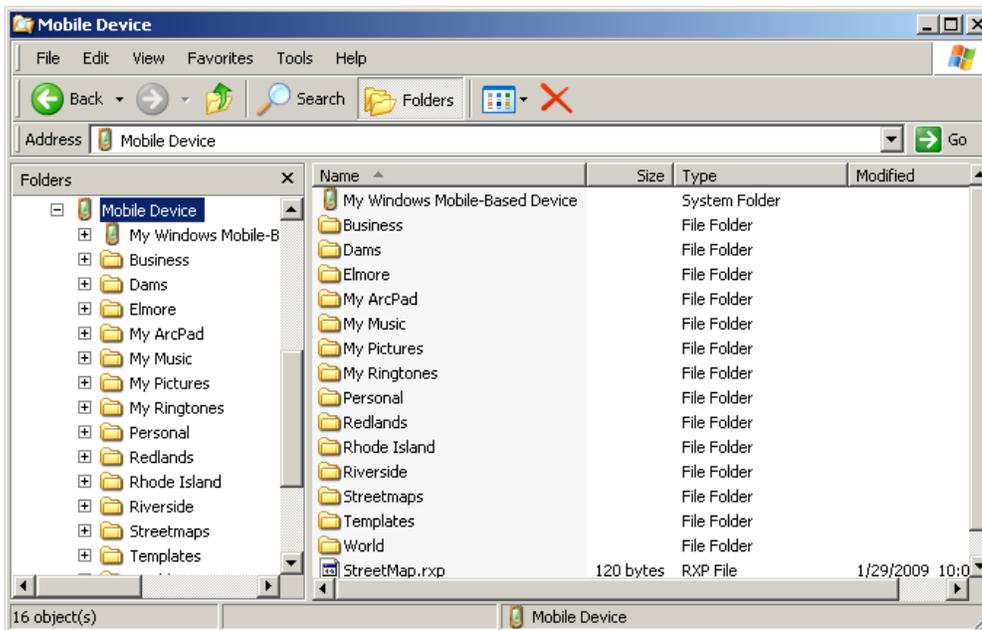
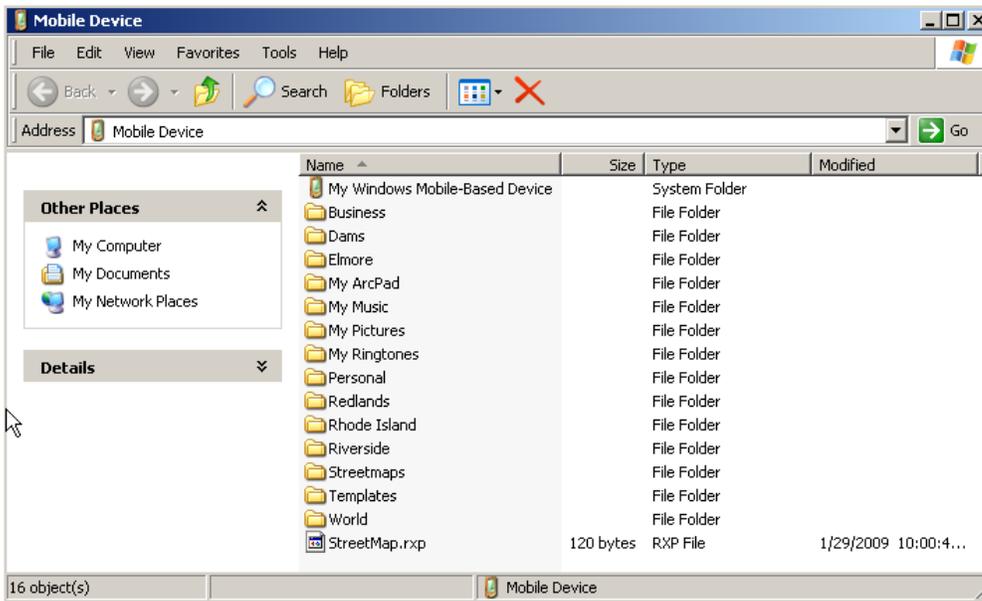


Transferring files between computer and device

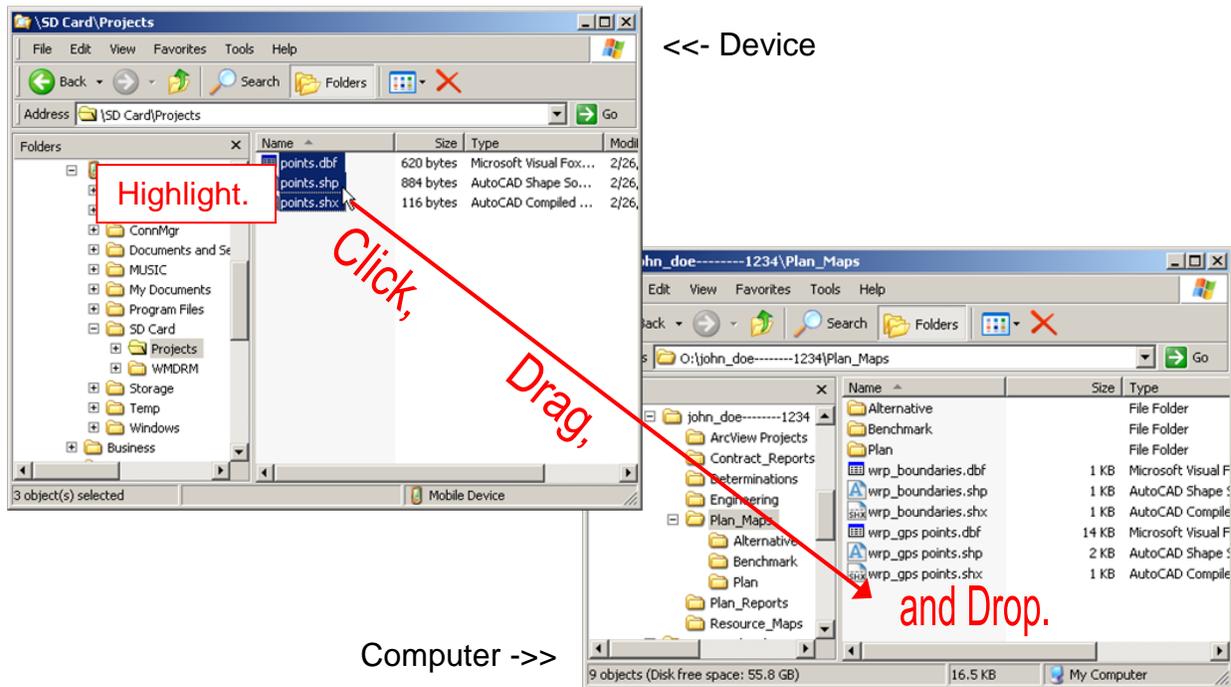
Once the device is connected, you can select *Tools > Explore Device* or simply

click  **Explore** on the ActiveSync toolbar. A window similar to the one shown below should appear. It will normally open to the “My Documents” folder on the device. You can now navigate the folders and perform the usual Windows Explorer actions (i.e., copy, rename, delete, etc.). To help in navigating folders,

you might want to click  **Folders** on the toolbar to open a folder tree in the left window (see second screen shot below).



This single explorer window can be used to copy files between the device and your computer using the Copy (Ctrl-C) and Paste (Ctrl-V) method. You might find it easier, however, to open a second Windows Explorer window and navigate to the desired folder on the computer. Tip: An easy way to open an explorer windows is to use the  + E shortcut (on your keyboard, hold down the windows key  and then press E). You now have 2 windows that you can drag and drop files and folders from one window to the other to copy them (see below).



Recommended folder structure

To provide some consistency in file management, the following folder structure should be used. Doing this should allow any user to pick up a unit and easily find files. To create a folder from ActiveSync's Explore window, click on the desired parent folder and then select *File > New Folder*.

- [-] SD Card
 - [-] geodata
 - [+] cadastral
 - [+] elevation
 - [+] map_indexes
 - [+] ortho_imagery
 - [+] topographic_images
 - [+] transportation
 - Projects

Preparing to Go to the Field

Before heading out to the field, you may want to take some steps to prepare for your trip. Though these may not be absolutely necessary, you will likely find them quite helpful in the field. These steps include checking battery status, setting up device and copying aerial photography (i.e., orthoimagery) and other useful data you may wish to have (e.g., soils, CLU, contours, features you need to locate, etc.)

Check Battery Status

It would be wise to check the battery the day before you plan to use it. See the “Today Screen” above on how to do this. If it is low, you can charge it overnight using the AC adapter provided.

Device Setup

The setup steps detailed here should only need to be done one time. If the device has to be reset to factory defaults, the software has to be reinstalled, or the unit does not seem to be working as it should, you should check the setup again. The following steps are done from within ArcPad (the application you will be using to collect the field data). More detailed instructions on using ArcPad are given later in the “In the Field” section. To start ArcPad, either select *Start > ArcPad 8.0*

or **TAP** the ArcPad icon  on the Today screen. When the “Open Map” window appears, **TAP** the red/white X icon  on the bottom toolbar.

ArcPad Options

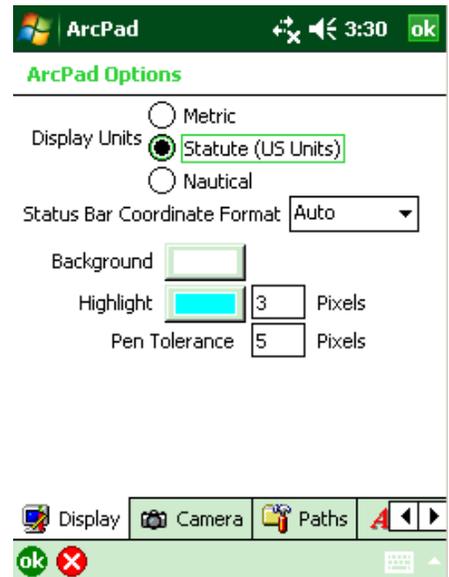
To set up or check ArcPad options, **TAP** the Options icon on the Main toolbar.



The only two option screens that really need to be checked are “Display” and “Paths”. The “Display” screen comes up first.

Recommended settings are shown at right.

To switch to “Paths” screen, **TAP** on “Paths” tab near the bottom of screen.



The “Default Maps & Data Path” should be set to **\SD Card\Projects** as shown at right. This can be done either by using on-screen keyboard or by **TAPPING** yellow folder icon to right of input field and then navigating to \SD Card\Projects.

The other values should be left as shown.

TAP the ok icon  in lower left of screen.



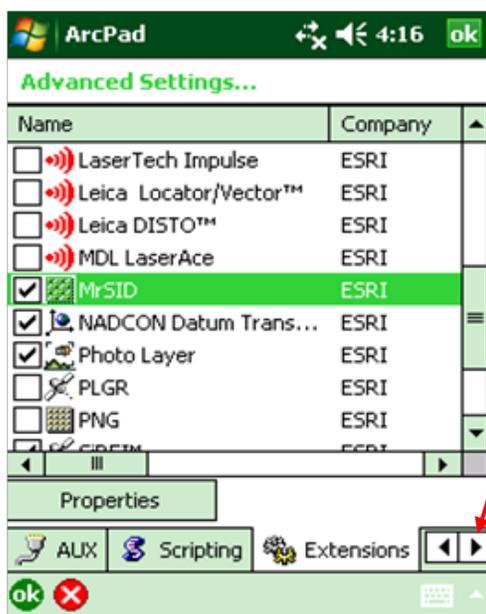
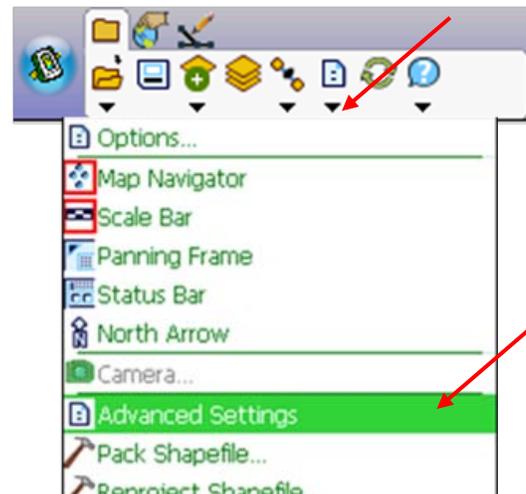
ArcPad Extensions

To insure MrSID images (e.g., orthoimagery) display, the MrSID extension needs to be turned on.

To do this, **TAP** the drop-down arrow under the Options icon on the Main toolbar

and then

select Advanced Settings on the menu.



TAP the right arrow at lower right of screen to scroll over to “Extensions” tab.

Using vertical scroll bar, scroll down to “MrSID” and make sure the box is checked.

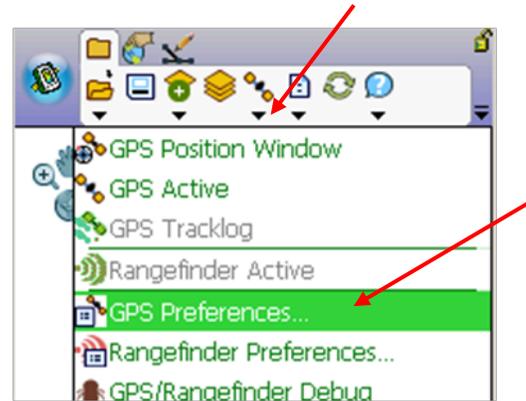
If there are any other extensions you know that you need, you can check them as well.

TAP the ok icon  in lower left of screen.

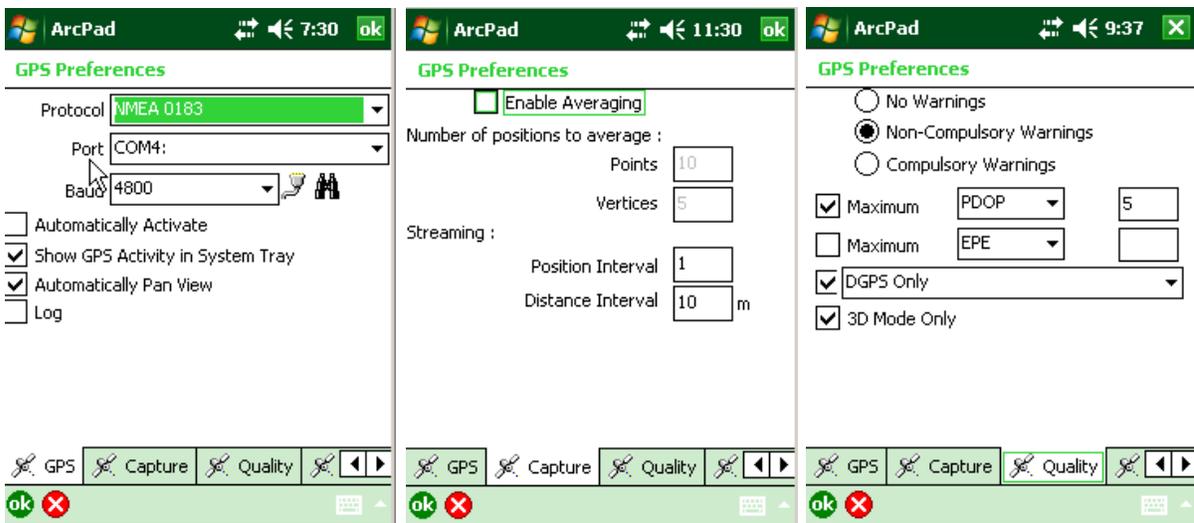
GPS Preferences

In order for the GPS receiver to work with ArcPad, the GPS preferences need to be set correctly.

To set these, **TAP** the drop-down arrow under the GPS icon on the Main toolbar and select “GPS Preferences” on the menu.



The first 3 screens of GPS Preferences are shown below – GPS, Capture, and Quality.



The items that **MUST** be set as shown above are as follows:

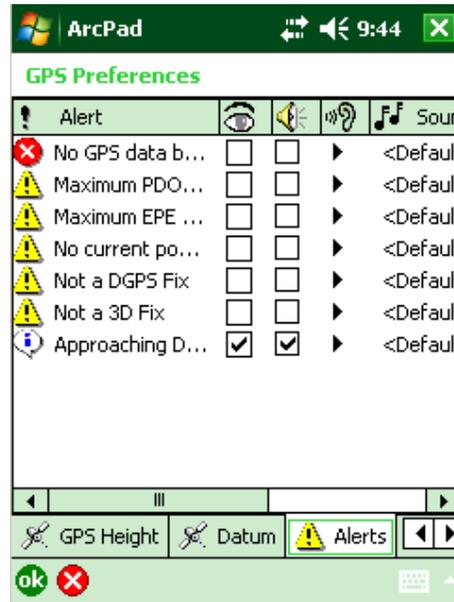
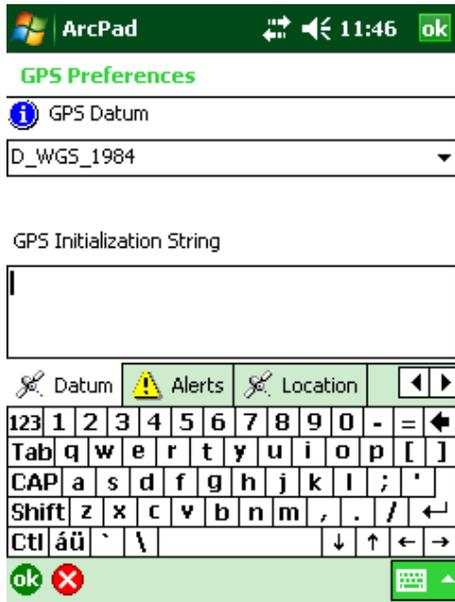
ProXYZ : GPS – Protocol: NMEA 0183 ; Port: COM4: ; Baud: 4800
 (Note: For Trimble GeoX?, **GPS** – Protocol: NMEA 0183 ; Port: COM2: ; Baud: 9600)

The **recommended** settings of items shown above are as follows:

- GPS** – Automatically Activate: unchecked
 Show GPS Activity in System Tray: checked
 Automatically Pan View: checked
 Log: unchecked
- Capture** – Enable Averaging: unchecked.
- Quality** – Non-compulsory Warnings selected. This setting will provide a warning when trying to record a GPS measurement that does not meet the criteria set on this screen. You will still be able to store the point by responding Yes to the prompt given.
 Check and set the other values as shown: Max PDOP=5, DGPS Only, 3D Mode Only.

The remaining items are “user preference” (i.e., set as you desire).

The other 2 screens of preferences you should check are “Datum” and “Alerts” (see below). To move to these screens, **TAP** the right arrow button  to the right of the tabs on the bottom of the screen.

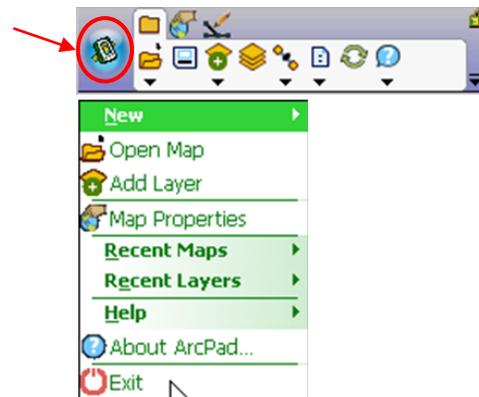


Datum – GPS Datum should be set to D_WGS_1984.

Alerts – The items on this screen can be set as you desire. These alerts can be quite annoying, so you might want to turn most of them off as shown above. A check in the first column will cause a message to display on the screen when that alert condition occurs (e.g., Maximum PDOP exceeded). A check in the second box will cause a sound to play when the condition occurs.

TAP the ok icon  in lower left of screen.

To exit ArcPad,
TAP ArcPad’s “quick action” icon and select “Exit”.



Pre-Loading Data

One benefit of ArcPad is that it provides the capability of showing imagery (e.g., aerial photography) and other data layers that may be useful while collecting data in the field. For example, aerial photography can provide a reference background image to insure you are in the right location as well as verifying the accuracy of the GPS location you are recording. Another example may be a shapefile that you have created with points or lines that you would like to find (i.e., navigate to) and mark.

Once you have decided what you would like to use, refer back to the sections on “Transferring files between computer and device” and “Recommended folder structure” to copy those files to your device. If the file or files are very large (e.g., a full county MrSID of orthoimagery), take note of the following section.

Full County MrSID (and other large files)

For very large files like a full county orthoimagery MrSID, you should be aware of some pros and some cons.

Pros

Once copied to your device (\SD Card\geodata\ortho_imagery), the whole county is available in case you visit a site that you had not planned on.

Cons

It takes considerable time to copy the file (approx. 15Mb/min.).

(Note, however, this would only need to be done once, unless it was erased from the device.)

Displaying in ArcPad can be slow.

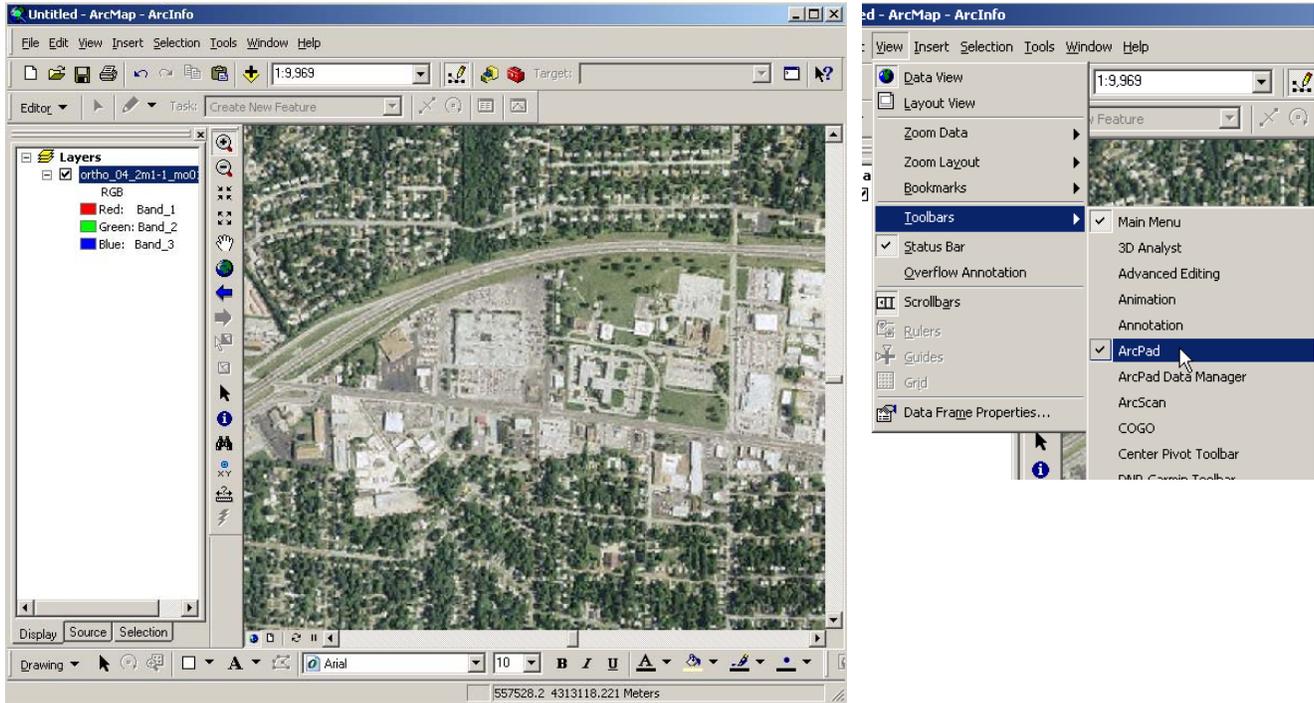
If the cons are something you can’t live with, an alternative method to using the large file (and thus avoiding the cons listed above) is to subset an area of the full coverage. This can be done in ArcMap using the procedure described below. One limitation of this method is that there is a maximum area you can clip. This area is dependent, among other things, on the resolution of the image you are using. A rough guide of the maximum areas is as follows:

Image Resolution	Max. Area, acres	Square Dimensions, miles
1 meter	4,000	2.5 x 2.5
2 meter	16,000	5 x 5
2 ft.	1,500	1.5 x 1.5

Load ArcMap and add the desired layer (e.g., orthoimagery) to the View. Zoom to the extent you wish to transfer to ArcPad. Keep in mind that the image is clipped to what is shown in the display window. So, if you want an image that is tall and narrow, size your window accordingly.

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The example shown in the window below is basically square.
Select *View > Toolbars* and select "ArcPad" if it is not checked.



You should see a toolbar that looks like this

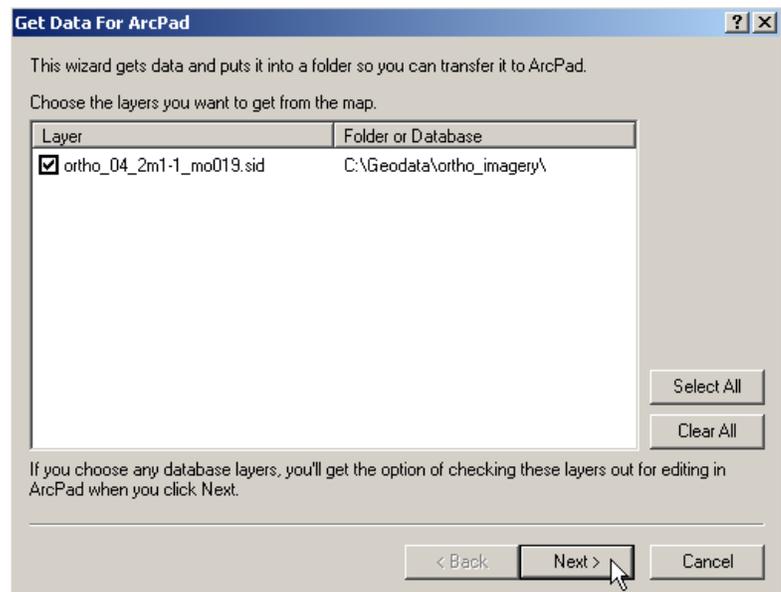


Click on the "Get Data for ArcPad" icon



The screen at right should appear.

Check on the desired layer(s).

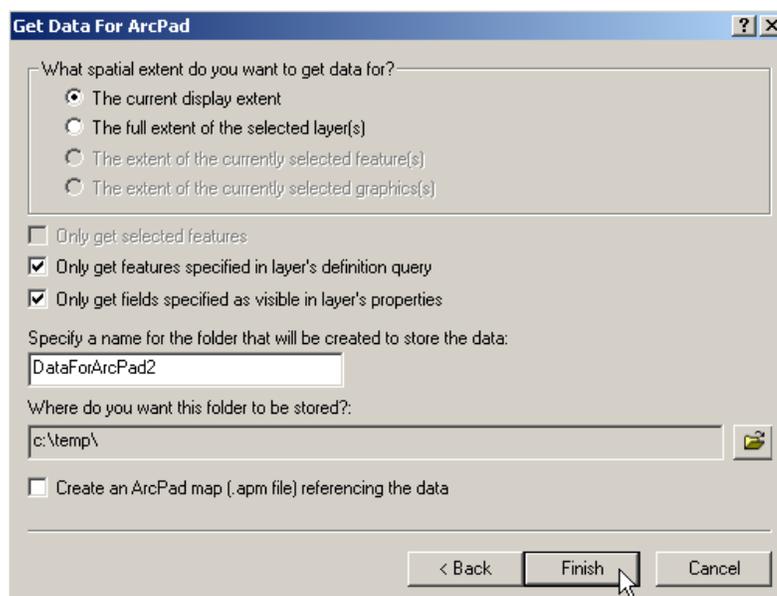


Click [Next >].

For spatial extent, select
“The current display extent”

Note folder name
(e.g., DataForArcPad2) and
where it will be saved
(e.g., c:\temp) or
change these as desired.
Uncheck “Create an ArcPad
map (.apm)...”.

Click [Finish].



Once finished, transfer the partial files created in the specified folder to your device using technique described earlier. They will be named the same as the full file names with an additional file extension added (e.g., ortho_04_2m1-1_mo019.sid.sid). When clipping 2 or more areas from the same image, be aware that the filenames will be identical, so the folder specified should be unique for each one. You then will need to either rename all the files before transferring them to the device's geodata folder or transfer folder along with the clipped files.

With this method, the files are smaller, transfer quicker, you can store more, and they process faster in ArcPad. On the downside, you only have that specific area (i.e., not a different area you decide to stop at while out).

In the Field

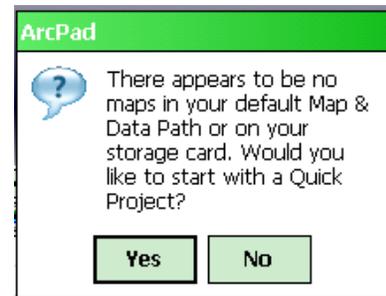
As stated earlier, ArcPad will be used in collecting data while in the field. With this application comes the ability to collect more information (i.e., attributes) on features in the field. Let's take a quick look at ArcPad and how it looks and works before jumping into actual data collection.

ArcPad Overview

To start ArcPad, you can either select *Start > ArcPad 8.0* or **TAP** the ArcPad icon on the ArcPad Today toolbar on the "Today" screen.

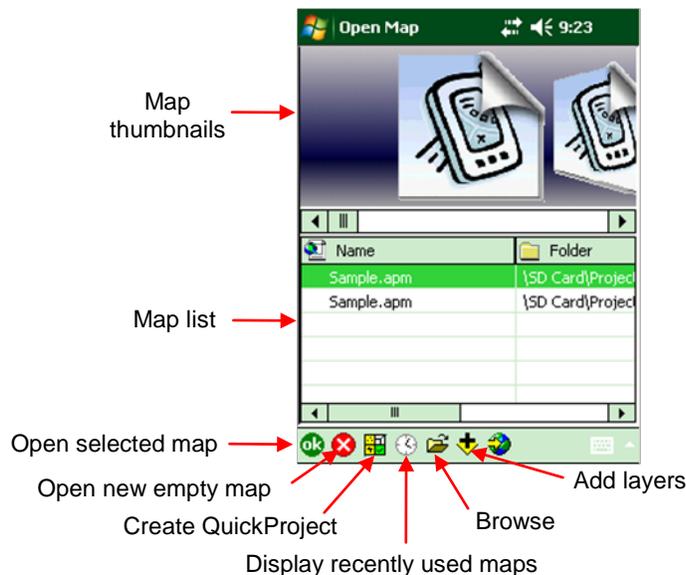


If ArcPad cannot find any maps you will get the window shown at right. For now, select "No" (QuickProjects will be discussed later).

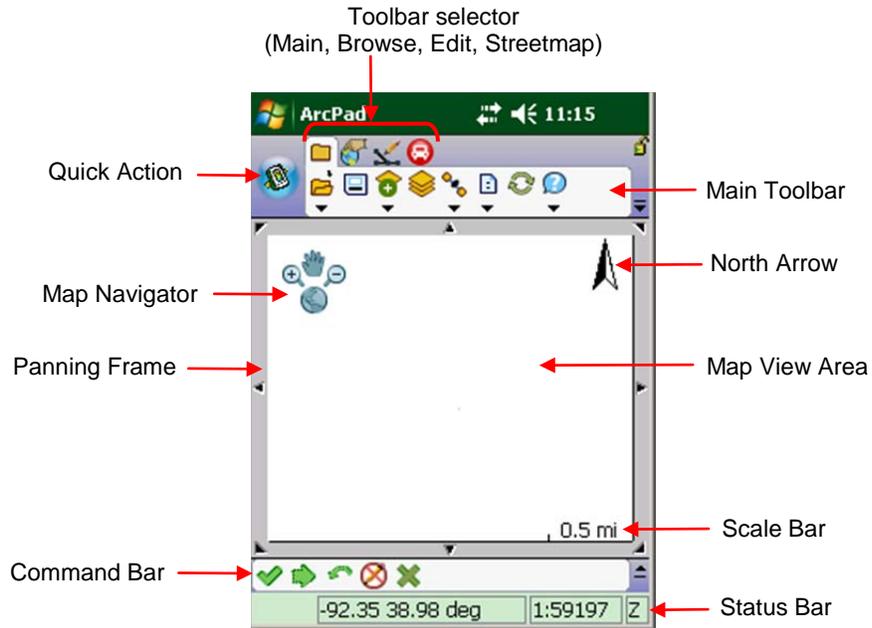


The "Open Map" window will then display (see below). In this window, you can

- Open an existing map by selecting it in the thumbnail or the list view and then **TAPPING** OK in lower left
- **TAP** the cancel icon  to open a new empty map.
- **TAP** the QuickProject icon  to create a QuickProject.
- **TAP** the clock icon  to display recently used maps.
- **TAP** the folder icon  to browse for maps and data in a different folder.
- **TAP** the plus icon  to add layers to a new empty map.



Let's assume that we open a new empty map. The ArcPad map window should then display ready for us to start adding data to the map. This window is shown below with all the components shown and labeled. (Note: Some of these may be turned off on your unit under the Options menu. Also, the "Command Bar" only shows up when editing or adding certain features).



Most of these components will be discussed in the instructions below as the need arises for them to be used. Some basic help can be found by **TAPPING** the drop-down arrow on the help icon (blue/white question mark) on the Main toolbar and selecting *Help > Quick Reference Help*.



Now that you have a basic idea of what the ArcPad interface looks like and the parts it is made of, let's look at what we need to do to begin collecting data.

Preparing a Shapefile

The first step we need to do is to create or add a shapefile that we can add our data to. The several different options we have to accomplish this are:

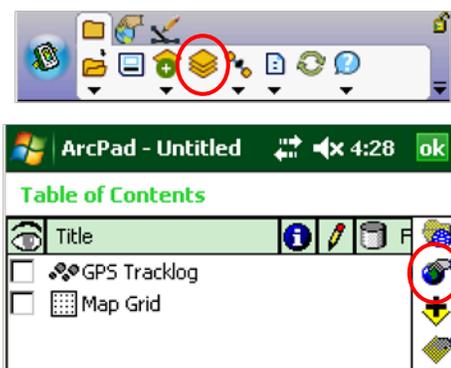
- create shapefile in ArcMap or AutoCAD and copy to device
- use ArcPad's "Quick Project" feature (this creates a folder with 3 different pre-defined shapefiles- points, lines, and polygons)
- create shapefile on the device ("on-the-spot").
- have one general shapefile to collect all your data in. Separate data out spatially or via an attribute (e.g., point ID, tree size, etc.).
- use a "template" shapefile. Make a copy and collect data in the copy.
- use a developed application that assists in collecting data.

Some of these, but not all, are discussed in this document.

Projections

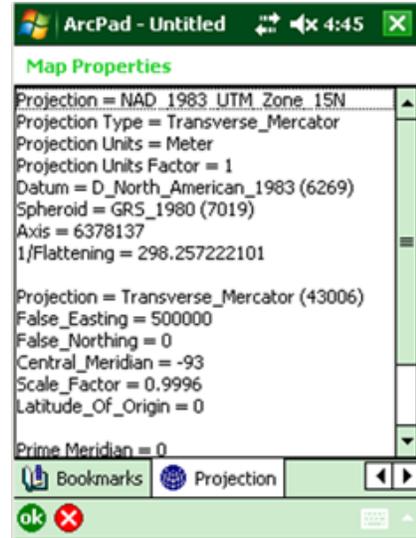
The first thing you need to be aware of when starting a new map is the projection you wish to work in (e.g., UTM NAD 83-Zone 15-meters). ArcPad, unlike ArcMap, can only use one projection for a map. This means that any layers you create or add need to be in the same projection to be used in the same map. If a projection file named *arcpad.prj* exists in the *My Documents\My ArcPad* folder, ArcPad will use it as the projection for the new map. The ProXYZ units in Missouri have been pre-loaded with an *arcpad.prj* file set to "UTM NAD 83-Zone 15-meters" so that any new map by default will be created in that projection. If a different projection is needed for a NEW map, you can add a layer (e.g., orthoimagery, shapefile, etc.) that has an associated projection. This will set the current projection to that of the added layer. An alternative method is to perform the following steps. These steps **should not be done** if a map has been created and layers have already been added.

1. The first thing to do is check what the current projection is. Do this by **TAPPING** the "Table of Contents" icon on the Main toolbar.
2. On the "Table of Contents" screen, **TAP** the "Map Properties" icon on the toolbar on right side of screen.



- Use the right arrow button near the lower right corner of screen to scroll to the right and select the "Projection" tab. This will show the information for the current projection selected.

TAP ok to return to the "Table of Contents" screen.

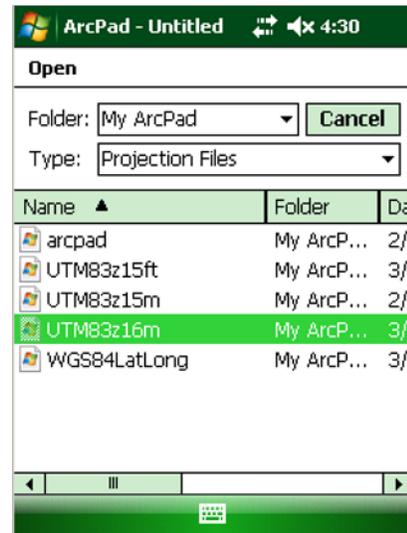


- If you need to change the projection, **TAP** the top icon ("Select Projection") on the toolbar at right side of screen.



- Select the folder where you have a projection file (i.e., .prj) that defines the desired projection you wish to use. The example to the right shows a few that were made and stored in the "My ArcPad" folder. Select the desired file.

You can repeat steps 2 and 3 above to check that it did in fact change the current projection.



- TAP** ok to close the "Table of Contents" window.

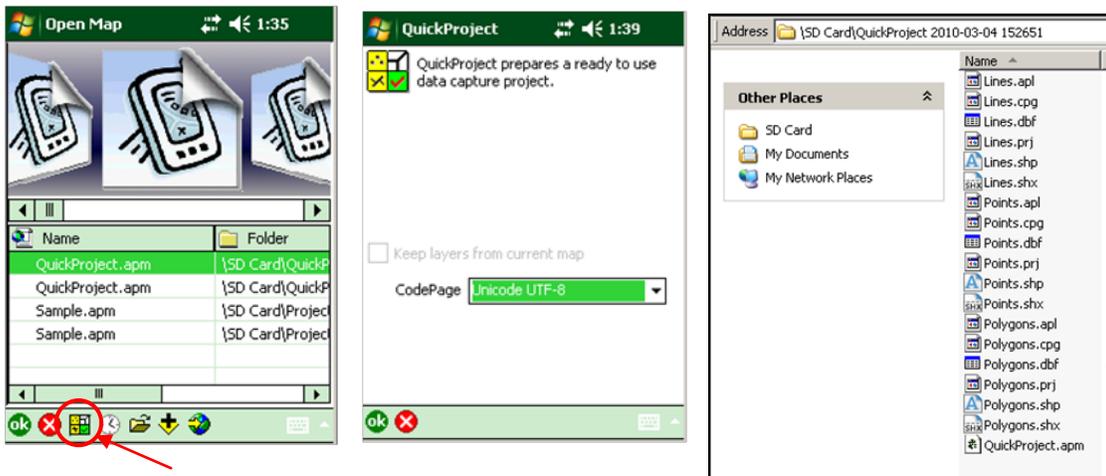
Use “Quick Project” feature

To create a “quick project” from the “Open Map” window, **TAP** the “quick project” icon (see left window below).

Leave CodePage set at Unicode UTF-8. (middle window below)

TAP OK.

A folder will be created in your default data path. It will be named “QuickProject” followed by a unique date/time stamp. The three pre-defined shapefiles (i.e., Points, Lines, and Polygons) will be created in that folder (see right window below) and opened for editing.



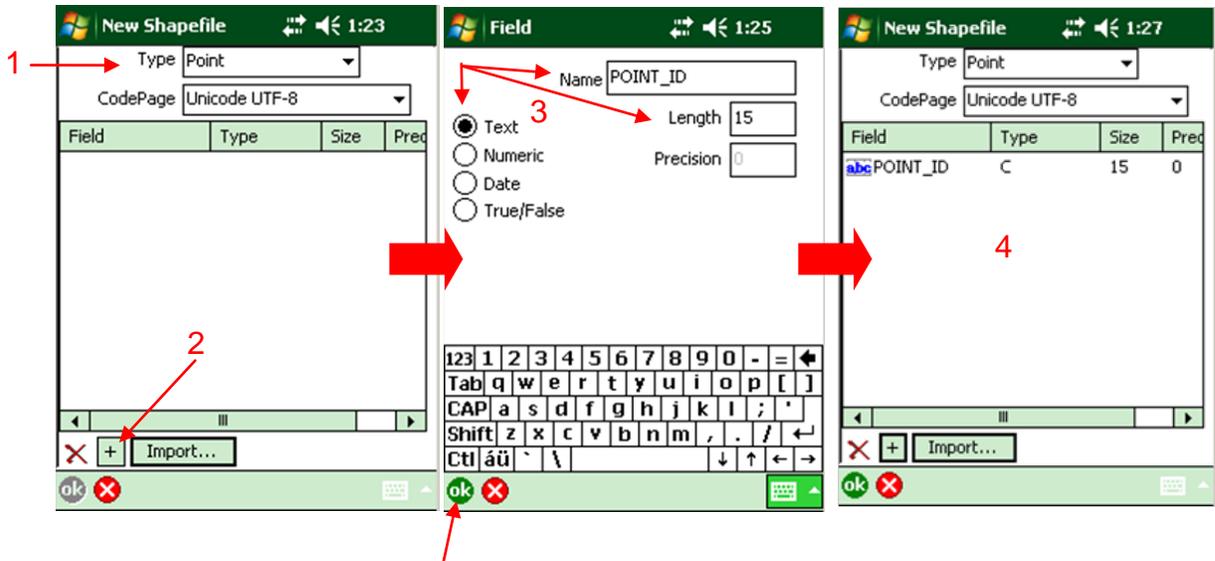
Create a new shapefile on the device

To create a new shapefile, **TAP** the drop-down arrow below the open folder icon on the Main toolbar.

Select *New > Shapefile*

The new shapefile window will appear (see below).

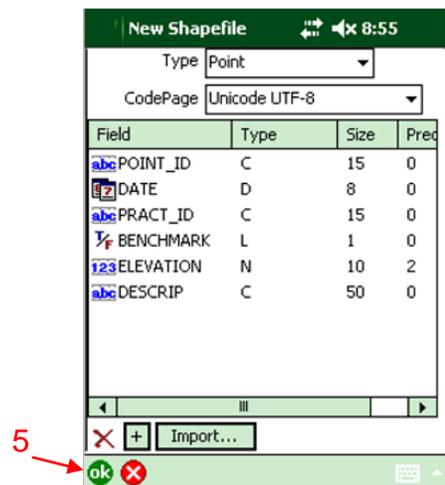




1. Select the type of shapefile you are defining from the “Type” drop-down list. Note: All types store x,y coordinates. Types with an M on the end (e.g., PointM) will also store an “m-measure-value” (sort of a time stamp) and types with a Z on the end (e.g., PointZ) will store a z-value (elevation) and an m-measure-value.
2. **TAP** the “ + ” icon at the bottom.
3. For the “Field” window that appears, enter a name for the field (i.e., attribute), select the type of field, and enter length and precision if applicable. **TAP** OK.
4. You are returned to the “New Shapefile” window with the new field added to the list. Repeat steps 2 and 3 for each field you wish to add.

NOTE: Utilizing these fields to collect data about the recorded features is an added capability over what you were able to do with the Garmin equipment. It is highly recommended that you take full advantage of this capability by setting up fields appropriate to the task that you are trying to complete.

Here is a screen showing a sample list of fields created for a shapefile.



5. When done adding fields, **TAP** OK.

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Enter a name for the shapefile. Try to be as descriptive as possible. Having some sort of a file naming convention would be beneficial here to keep the files in order.

Select a Location and then select a Folder.

Type should be Shapefiles.

TAP Save.

You will be asked if you wish to create a Quickform. This is a form that will be used to enter attribute data for the feature. You will normally want to answer “Yes” here.

After answering “Yes”, you will define the Quickform using the screens shown below.

New Shapefile 9:05

Create New ShapeFile Layer

Name: Fn1234-pts

Folder: Projects

Type: Shapefiles

Location: SD Card

Save Cancel

Create QuickForm

Would you like to now create a QuickForm for this shapefile?

Yes No

QuickForm

Caption: Fn1234-pts

Width: 130

Height: 80

Picture Page, Symbology Page, Attributes Page, Geography Page, Page Tabs, Text, Background

QuickForm

Choose the table fields to appear on the form

Name	Size
<input checked="" type="checkbox"/> abc POINT_ID	15
<input checked="" type="checkbox"/> DATE	
<input checked="" type="checkbox"/> abc PRACT_ID	15
<input checked="" type="checkbox"/> BENCHMARK	
<input checked="" type="checkbox"/> 123 ELEVATION	10.2
<input checked="" type="checkbox"/> abc DESCRIP	50

QuickForm

Additional properties for form controls

Required	Label	Minimu
<input checked="" type="checkbox"/> abc	POINT_ID	Point_id
<input checked="" type="checkbox"/> DATE	DATE	
<input checked="" type="checkbox"/> abc	PRACT_ID	Pract_id
<input type="checkbox"/> BENCHMARK	BENCHMARK	
<input type="checkbox"/> 123	ELEVATION	Elevation
<input type="checkbox"/> abc	DESCRIP	Descrip

Use “Layout” tab to define form properties: caption, size, pages (if any), text and background. You might find the symbology, attribute, and geography pages useful when viewing feature properties.

Use “Fields” tab to specify which fields to display on form.

Use “Controls” tab to specify required fields, min-max values, list values, and tooltips.

TAP OK when done.

A message displays informing you the form was created.

ArcPad ok

A 'QuickForm' has been created and is now ready to use. Use ArcPad Studio to further customize the form.

You are now ready to begin adding data to this shapefile.

Using one shapefile to collect all your data

You can create (either on your desktop computer using ArcMap or on the device using ArcPad) a shapefile for each feature type (point, line, polygon) that you might use to collect all your data. The fields could be made generic enough that they would cover the majority of your data collection needs. You could simply add the shapefile (see “Adding existing layers to map” section below) each time you open a new map and you would be ready to collect your data. When back in the office, you would copy the shapefile(s) to your desktop computer and add to ArcMap. If you want to separate out the features for a particular job or farm, select those features using the normal selection tools in ArcMap and then right-click the layer and select “Data -> Export Data”. You can then complete the dialog box to export only the selected features to a shapefile. This could be stored in the customer’s toolkit folder.

It would be up to the user on how they would like to manage this one “generic” file. They could just continue to keep all their data in it, they could choose to delete features from it after each use or on an as needed basis, or they could simply keep an empty “template” file that they could simply copy to the device to start fresh each time.

Adding existing layers to map

You may want to add an existing shapefile, imagery, street map or other reference layer to your map.

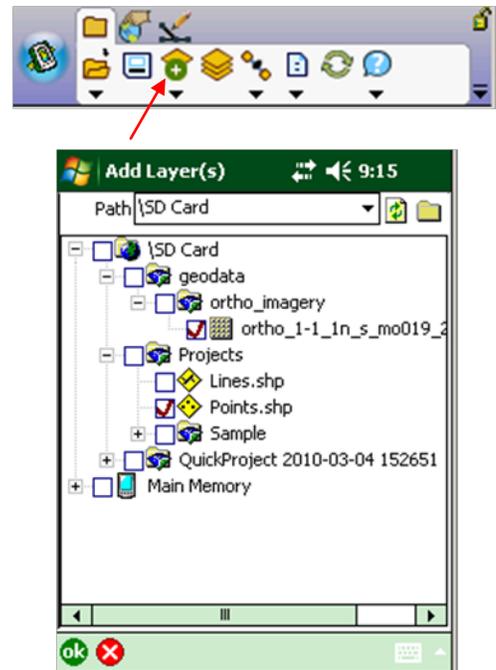
Note: If this is the first layer added and it has an associated projection (i.e., prj file), the map’s projection will be set to that of the added layer. Any additional layers will then need to match this projection or you will be unable to add them.

To add the layer, **TAP** the “Add Layer” icon 

In the “Add Layer(s)” window, find the item or items you wish to add (you will need to **TAP** the “+” next to a folder to expand it). Check the box to the left of the desired item(s). The example at right shows a MrSID file and a points shapefile as selected.

TAP OK.

The selected layer(s) will then be displayed.



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Note: A “streetmaps” layer has been created for Missouri and can be found at *Main Memory\My Documents\streetmaps\Missouri_navi_mo.navmap*. This provides a layer that shows roads, cities, and water features. Adding this layer will activate a “Streetmap” toolbar (see below). For details, on using the Streetmap functions (finding an address, creating and navigating a route, etc.), refer to Streetmap help available online.



Collecting Data

Once you have prepared a shapefile using a method above, you are ready to collect some data. To begin collecting data, you need to make sure the shapefile is open for editing.

To do this, select the “Edit” toolbar.

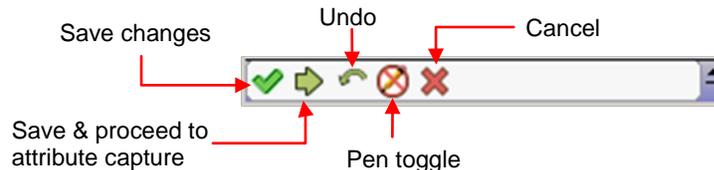
TAP the “Start/stop edit” pencil icon.

TAP the desired layer to start or stop editing. A red box around the icon indicates it is in edit mode.



Command toolbar

For a feature with multiple vertices (e.g., polyline, polygon, etc.), a “Command toolbar” will be displayed on the bottom of the screen. The toolbar along with each icon’s function is shown below.

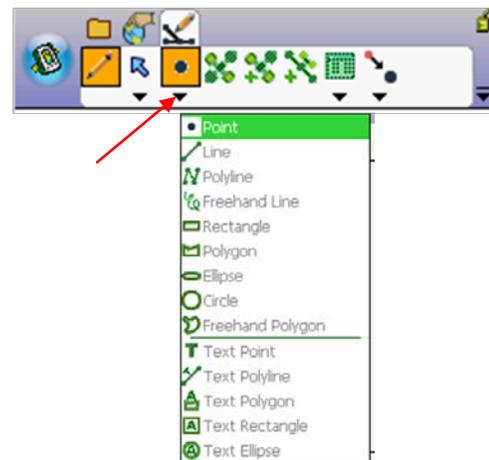


Adding features without GPS

To add features manually to your map, you should first select the feature type (e.g., point, polyline, polygon, etc). To do this, **TAP** the drop-down arrow on the third icon on the Edit toolbar. Only the features that pertain to the shapefile(s) you are working on are selectable.

The icon should then change to the selected feature in an orange square.

NOTE! Be very careful in using this. It can be quite easy to inadvertently record an unwanted



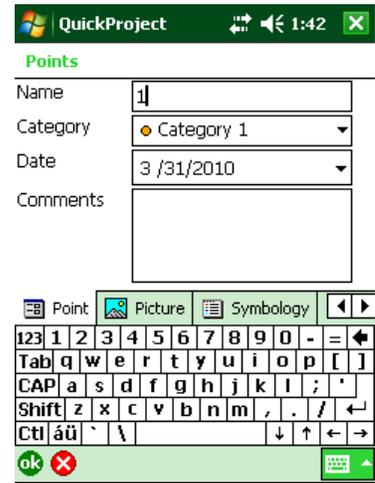
feature (e.g., point) by simply tapping on the screen. This technique might be useful in setting a general navigation point, but should be avoided for collecting actual features. Use the GPS method described below for collecting accurate feature data.

You can now **TAP** on the desired location on your map to add the feature (e.g., point, vertex of a polyline, etc.).

For a point, it will then bring up the form for you to enter the related data (see example at right).

Note: You can switch to the “Geography” page and enter coordinates of a known location rather than the location you tapped on the screen.

TAP OK when finished entering data.



For a multi-vertex feature (e.g., polyline, polygon, etc.), continue adding vertices until you are done with that feature. To end the capture of that feature, **TAP** the big right arrow icon  on the “Command toolbar” (explained above). This will bring up the form to collect the attribute data for that feature (similar to the point one shown above).

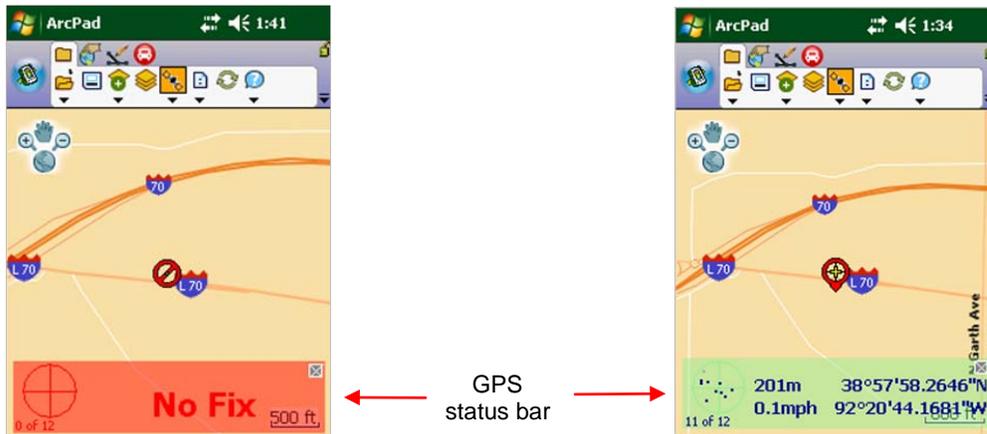
Initiating GPS data collection

In order to record a feature at your current GPS location, you first need to activate GPS. Do this by **TAPPING** the “GPS Active” icon on the Main toolbar.



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The “GPS Active” icon should be displayed in an orange square to show it has been activated. A red circular marker will be displayed in the map view area showing your current GPS location with a pointer showing the direction you are moving. A translucent GPS status bar will show at the bottom of the screen. See the two examples in the screenshots below.



The GPS status bar contains information as detailed in the images below. The background color of the GPS status bar is used to indicate the current condition of the GPS measurements as stated below.



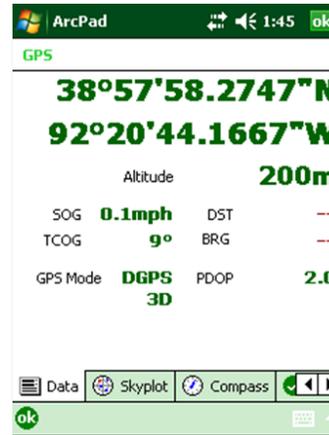
A “GPS Position Window” can be displayed by either **TAPPING** the drop-down arrow under the GPS Active icon on the Main toolbar and selecting “GPS Position Window” or by **TAPPING** on the GPS status bar.



The “GPS Position Window” is actually a collection of screens (i.e., tabbed pages): Data, Skyplot, Compass, Quality, and Debug. These are explained below.

Data tab:

The coordinates of your current position are shown on this screen along with altitude (i.e., elevation), navigation information, GPS mode, and quality of measurement.



Position Coordinates
Elevation
Navigation Information
Quality of Measurement

The type of coordinates displayed can be changed by **TAPPING** on the coordinates and selecting the desired type from the list as shown at right.

The units shown for elevation can also be changed by **TAPPING** the elevation and selecting from list shown at right.



The navigation values shown are
SOG: speed over ground

TCOG: true north course over ground (can be set to MCOG-magnetic north COG)

DST: distance from current location to destination

BRG: bearing from current location to destination.

See “Required Accuracy Levels for GPS” section below for what the quality of measurement values should be.

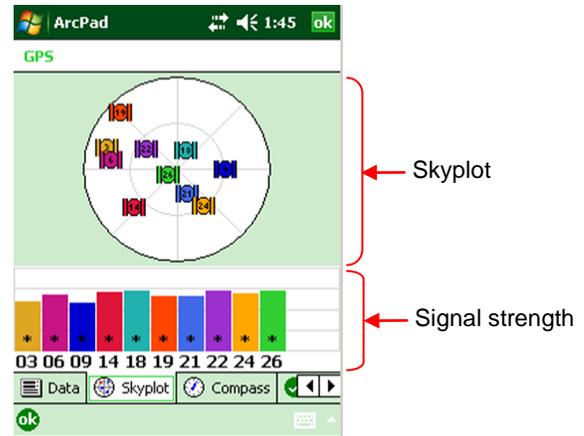
Skyplot tab:

The skyplot view shows a bird's-eye view of the position of each satellite according to the satellite almanac. The outer circle represents the horizon (north is up); the inner circle represents 45° above the horizon; and the center point represents what is directly overhead

Each satellite is displayed with its PRN number and a unique color. If the color is outlined in black, it is available and being used for calculating the GPS position.

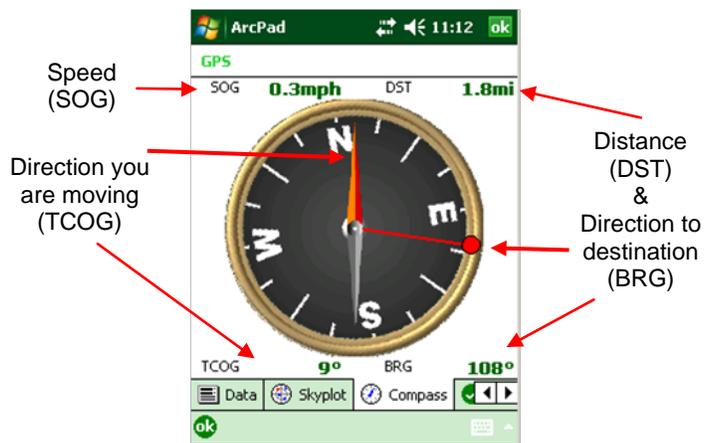
Satellites available but not used are simply colored. Grey satellites are unavailable.

The signal strength bar chart shows the relative signal strength for each satellite. An asterisk in the bar indicates it is being used for calculating the GPS position.



Compass tab:

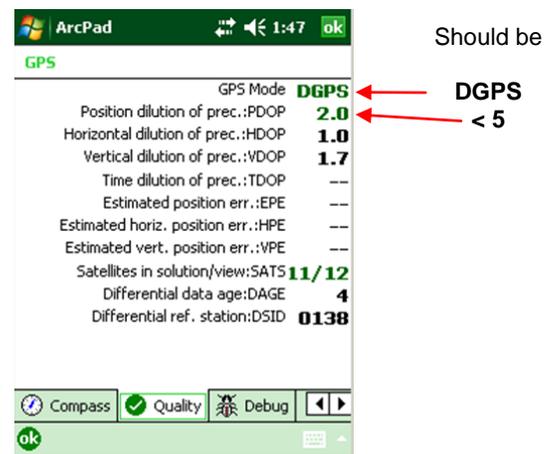
The compass screen shows the same navigation information that was on the Data screen plus a visual compass. The orange compass needle indicates the direction you are moving. The red line indicates the direction to your destination if you have set one.



Quality tab:

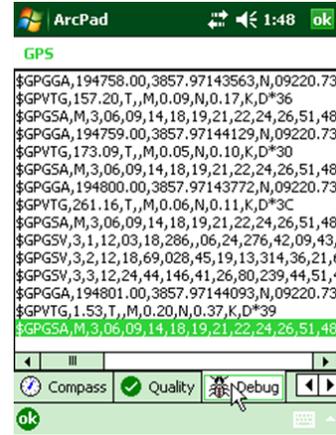
This screen displays the values of various parameters that are useful in determining the quality of the GPS location you are receiving.

See "Required Accuracy Levels for GPS" section below for what some of these values should be.



Debug tab:

This screen simply shows data being received from the GPS receiver. It probably is not a screen you would view too often. It would most likely be used in troubleshooting problems you may be having.



TAP OK to close the GPS Position Window.

Required Accuracy Levels for GPS

When collecting data with GPS in the field, certain accuracy levels need to be maintained in order to collect data as precisely as possible. Any collected features should also be verified using some reference layer (e.g., aerial photo, map, etc.) in ArcPad (if available on the device) or by downloading them and overlaying them on a reference layer in ArcMap.

The user should only collect data when the following parameters have been met in the field:

**GPS Mode = DGPS 3D
PDOP < 5.0**

These values can be viewed on either the Data tab or Quality tab of the GPS Position window described above. PDOP is also shown periodically on the GPS status bar as well.

Adding features using GPS

Once the GPS has been activated and you are receiving quality GPS measurements, you can begin adding features. As instructed in the section, “Adding features without GPS”, you should first select on the Edit toolbar the feature type (e.g., point, polyline, polygon, etc.) you will be adding. The left image below shows the Edit toolbar when in “point” collection mode, while the right image shows it in “polyline” collection mode.



Notice the 3 GPS icons in the toolbars above. When in “point” collection mode, the first icon (“Capture point”) is the only one active. When in polyline or polygon mode, all 3 will be active. Each of these icons uses the current GPS position in the following way:

-  : Captures a point.
-  : Captures a single vertex in the current line or polygon feature
-  : Continuously captures vertices in the current line or polygon feature (determined by Capture settings in GPS Preferences).

Point

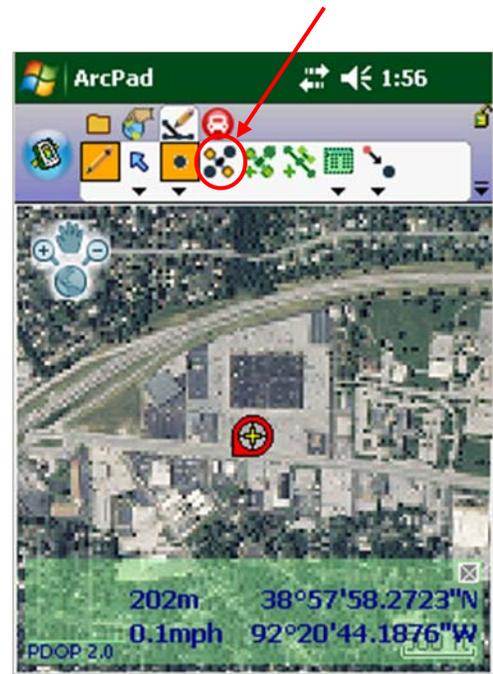
To capture a point, your screen might look similar to that shown at right. You are in point edit mode (pencil and point icons highlighted), you are at desired location, and GPS status bar is green with good quality info shown.

TAP the “GPS Capture Point” icon.

You will then be presented with the form to enter attribute data for that point.

Enter the appropriate data and **TAP** OK.

Repeat this process to collect additional points.



Polyline

To capture a polyline, your screen might look similar to that shown at right. You are in polyline edit mode (pencil and polyline icons highlighted), you are at desired location, and GPS status bar is green with good quality info shown.



TAP the “GPS Capture Vertex” icon. Move to next location and **TAP** the icon again. Keep doing this until you are finished with the line.

TAP the right green arrow  on the command bar at the bottom of screen to end and save the feature.

You will then be presented with the form to enter attribute data for that line.

Enter the appropriate data and **TAP** OK.

Polygon

The procedure for capturing a polygon is the same as that above for a polyline with the exception that the feature type selected is “polygon” so the toolbar looks like that shown here.



Continuous

You can capture polyline or polygon vertices continuously by using the third GPS capture icon as shown at right. The procedure is similar to that above for polylines and polygons except that vertices are automatically recorded rather than you having to manually **TAP** the capture icon at each location. The recorded locations are based on the “Streaming - Position and Distance Interval” settings on the Capture page of GPS Preferences (mentioned earlier).

The “Position Interval” setting is the number of readings received from the GPS receiver. Since the ProXYZ is set to take GPS readings every second, this number correlates to number of seconds.



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The “Distance Interval” setting is the distance you must move before the next vertex is recorded. This is entered in the units of the current projection (which will most likely be meters if using the default UTM83 projection).

Both of these conditions must be met before the vertex is recorded. For example, if the position setting is 10 and the distance setting is 30 meters, ten seconds must have elapsed AND you have moved at least 30 meters.

You can stop the continuous mode by **TAPPING** the icon. You can then continue to manually add vertices to the polyline or polygon by using the “GPS Capture Vertex”.

Once you are finished with the polyline or polygon, **TAP** the right green arrow  on the command bar at the bottom of screen to end and save the feature.

You will then be presented with the form to enter attribute data for that line.

Enter the appropriate data and **TAP** OK.

If you are finished collecting GPS data and no longer need the GPS, you can deactivate the GPS by **TAPPING** the GPS icon  on the Main toolbar.

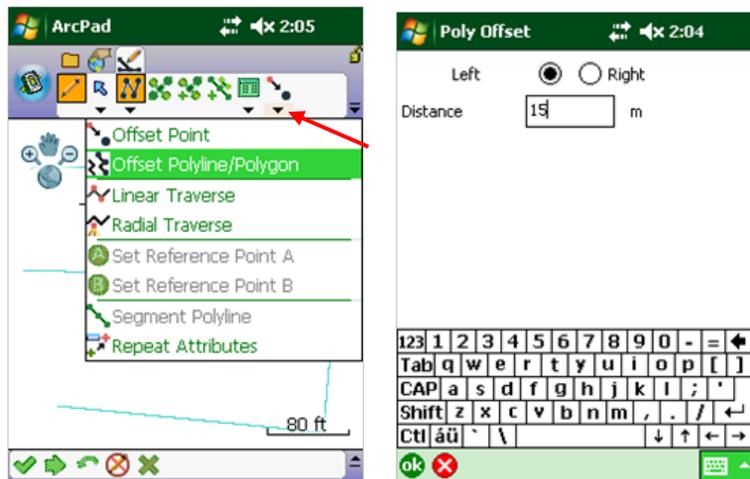
Offset Tools

The offset tools can be used to record a feature that is either in an inaccessible location or a location where you are unable to get a GPS signal. In ArcPad, there are two types of offsets: simple and complex. A simple offset is performed on a polyline or polygon and only uses a constant distance measurement and either left or right of the feature. Complex offsets can be used for point features and vertices of polylines and polygons. Complex offsets use a combination of distance, bearing, and inclination measurements.

Simple Offset

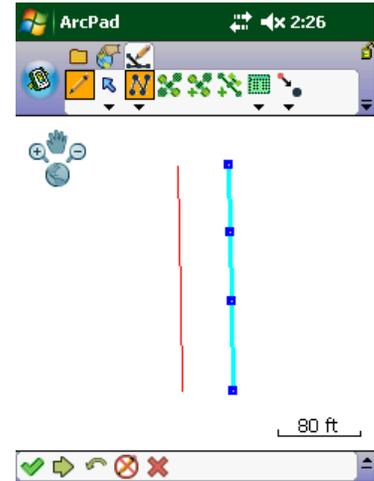
To do a simple offset of a polyline or polygon, first make sure desired layer is in edit mode as described earlier.

TAP drop-down arrow under the “Offset” icon on the Edit toolbar and select “Offset Polyline/Polygon”. Select left or right and enter an offset distance (units will be those of current projection).



A red box around the “Offset Polyline/Polygon” button indicates that it is active.

You should follow instructions given above for capturing the polyline or polygon. As you are defining it, you will notice a red line which is at the given offset from the feature you are capturing.



Once you are done and **TAP** the right green arrow  on the command bar at the bottom of screen, the red line will become the saved feature.

You will then be asked for the attribute data for that feature.

Complex Offsets

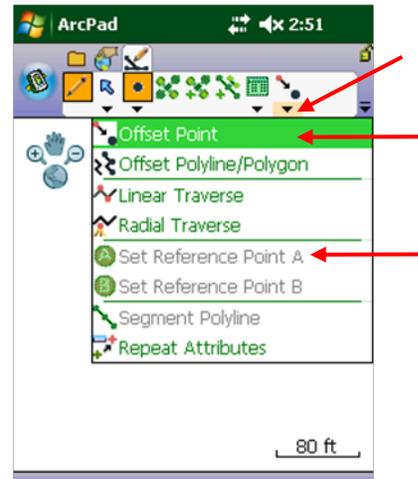
For complex offsets, ArcPad supports 1 point offsets and 2 point offsets. Instructions for performing a 1 point offset, which uses distance and bearing measurements (distance-bearing) to determine the offset, will be given here. For 2 point offset instructions, you should refer to ArcPad’s help resources.

To do a 1 point offset of a point, first make sure point layer is in edit mode as described earlier.

TAP drop-down arrow under the “Offset” icon on the Edit toolbar and select “Offset Point”.

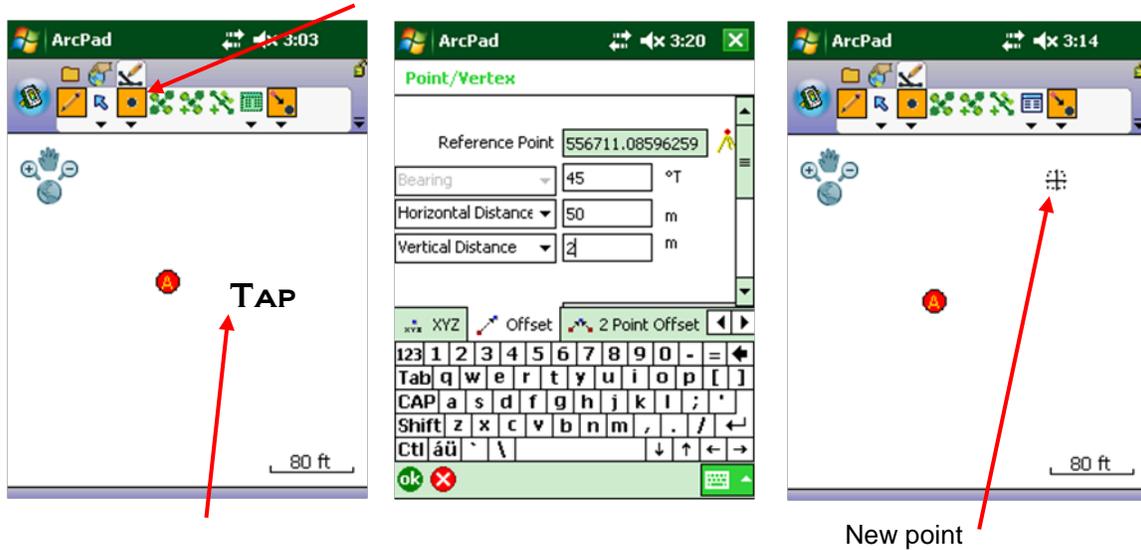
TAP drop-down arrow under the “Offset” icon on the Edit toolbar and select “Set Reference Point A”.

A red box around the Offset Point and Set Reference Point A buttons indicates that they are active.



To set point A, move to desired location and **TAP** “GPS Capture Point” icon or **TAP** on the map at desired location. A red circle with an “A” will be placed on the map.

TAP the Point feature icon (see below). **TAP** the screen anywhere in the map area. The Point/Vertex dialog box opens on the Offset page. Enter the appropriate information (e.g., bearing, horizontal distance, vertical distance). **TAP** OK . Enter any attribute data and **TAP** OK. A new point will appear as shown below



Viewing Data

The various layers in your map can be controlled (as described below) by **TAPPING** on the “Table of Contents” icon on the Main toolbar.



Layers

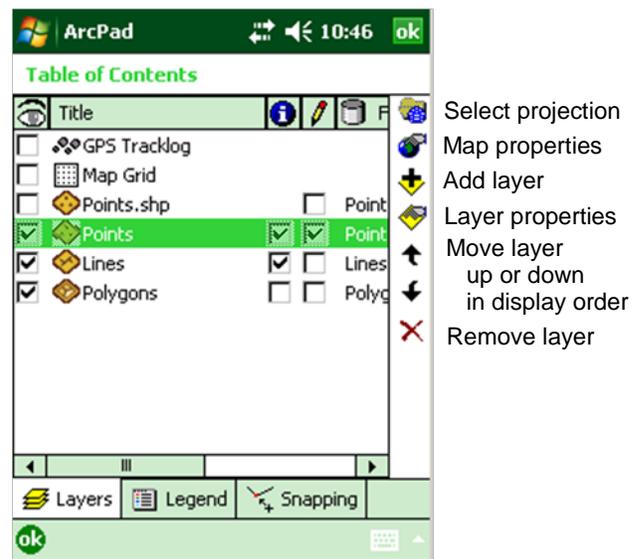
On the Layers tab, you can then check or uncheck the boxes under the appropriate columns for each layer.

The columns are as follows:

-  - visibility of layer (checked=visible)
-  - enable identify tool (checked=on)
-  - edit mode (checked=on)

Note: You can only select one of each type for editing.

The functions of the side toolbar are shown at right. The bottom four icons are layer specific and require you to select a layer before the icon is active.



Layer Properties

Upon picking a layer and **TAPPING** the “Layer Properties” icon  , you will be presented with a screen with several tabbed pages.

You can change the name of the layer and enter comments on the “Information” page. This does not change the shapefile name.

The “Labels” page allows you to change how the feature is labeled.

The “Symbology” page is used to change the symbol(s), control visibility, and edit the label.

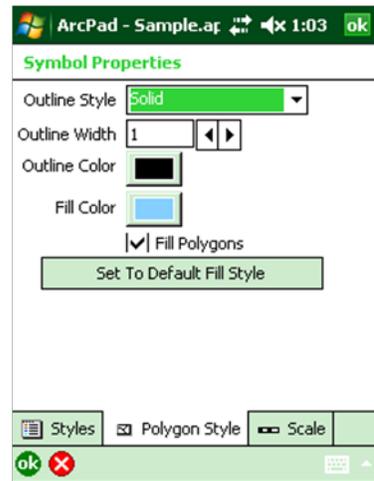
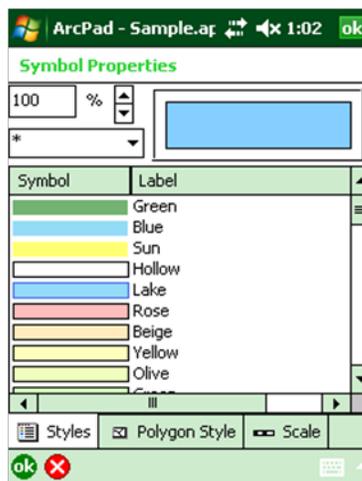
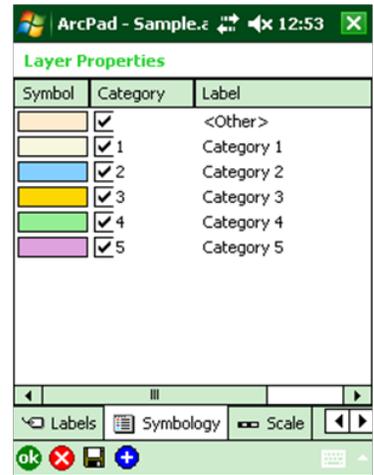
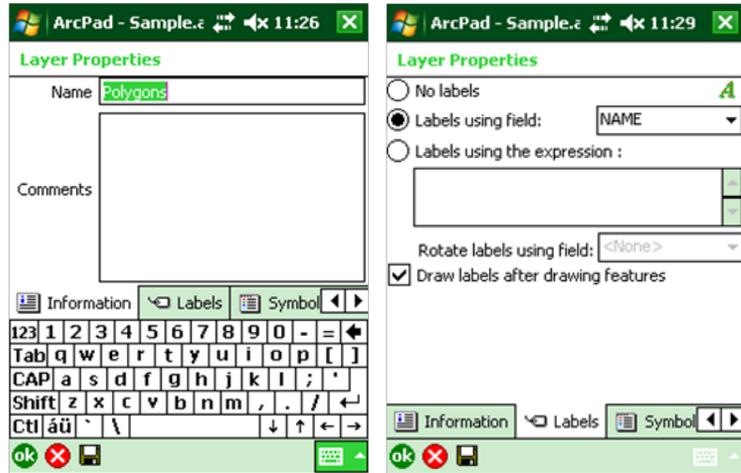
To change the symbol, simply **TAP** on the symbol you wish to change.

A screen with three different pages will then display. A pre-defined style can be selected from the “Styles” page. If you want to specify your own custom style, use the “Point Style”, “Line Style”, or “Polygon Style” page depending on the type of symbol you are changing.

If the options are greyed-out, you will need to **TAP** on the “Set to Default Style” button and then you should be able to change the settings.

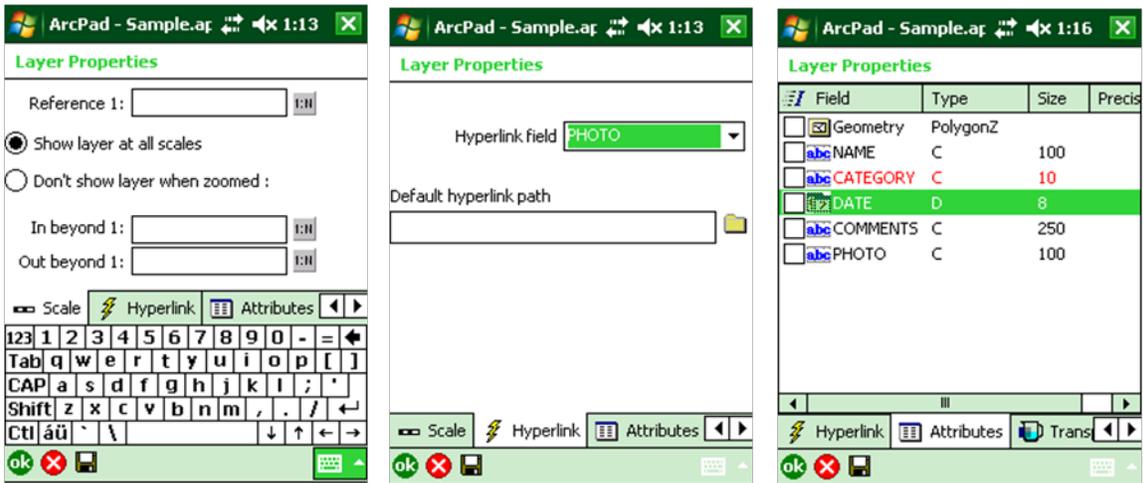
The “Scale” page allows you to change at what scales the symbol displays.

TAP OK when done with your changes.



Technology Technical Note MO-2

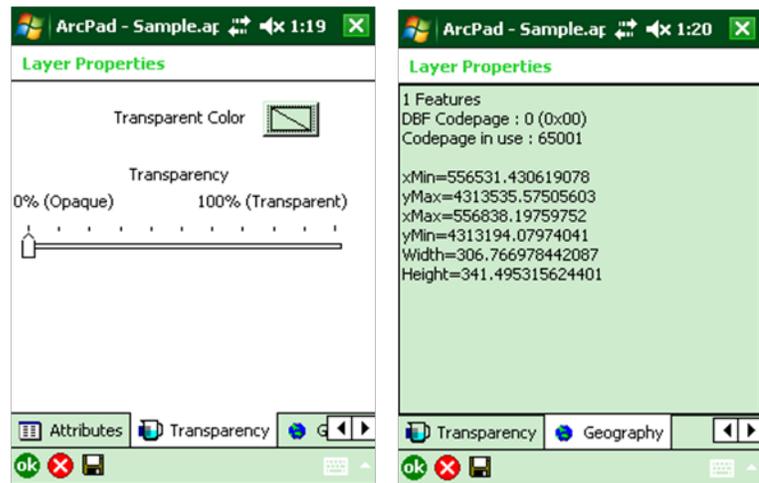
Use the “Scale” page to set visibilities at different scales. The “Hyperlink” page is used to specify a field to be a hyperlink field. The “Attribute” page is basically for viewing the attributes of the layer and to manage indexes.



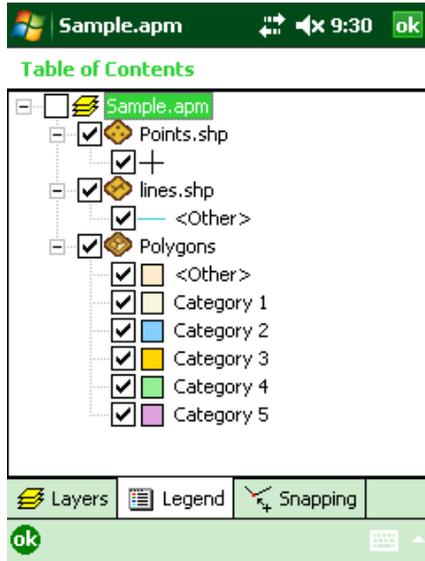
The “Transparency” page can be used to specify a particular color as being transparent.

The “Geography” page simply provides information for the chosen layer. It provides the total number of features in the layer as well as the layer extents. Nothing is editable on this page.

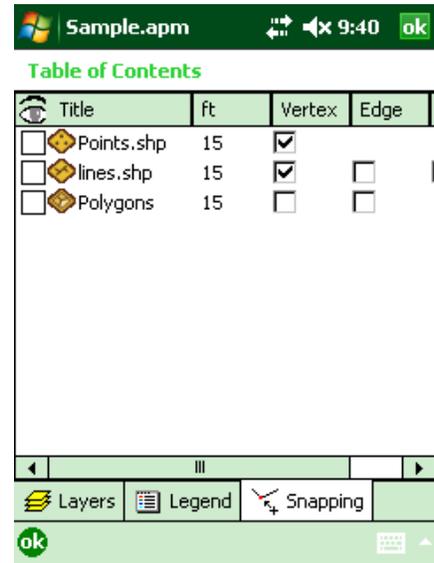
TAP OK when finished.



Legend and Snapping



The Legend tab allows you to change visibility (using check boxes) and also the symbology (e.g., style and color) of a feature. **TAP** on the symbol to change style or color of that symbol.



The Snapping tab allows you to turn on/off snapping to a particular location (vertex, edge, end) on a feature and set the snapping tolerance.

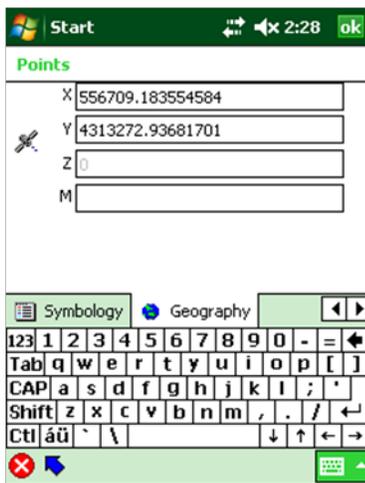
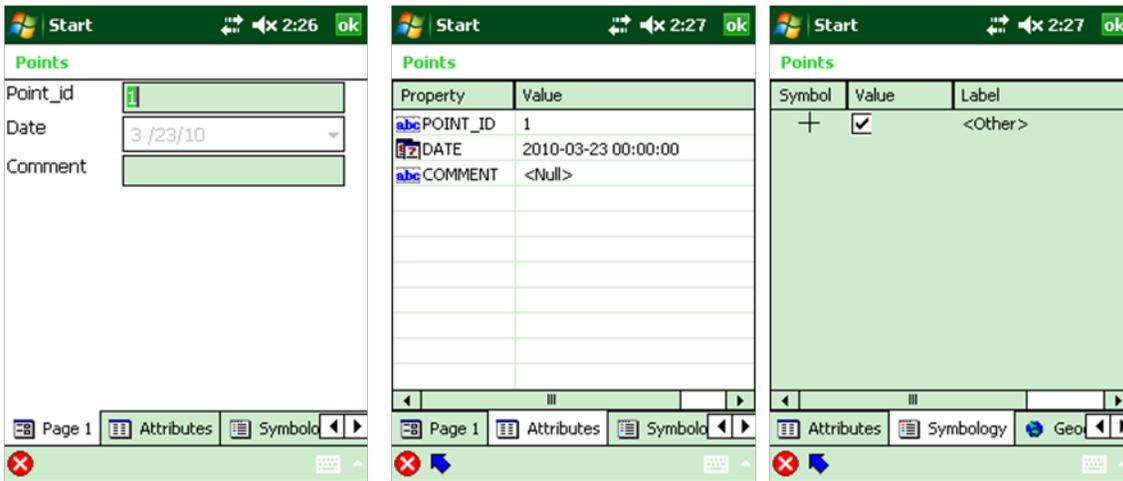
TAP OK to close window.

Identify Tool

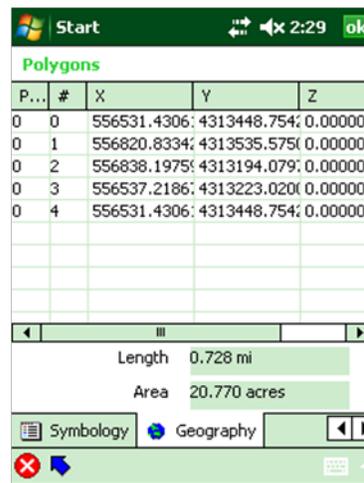
The “Identify” tool can be used to view (not edit) information about a selected feature. To activate this tool, **TAP** on the identify icon on the “Browse” toolbar.



You can now select a feature by **TAPPING** on the desired feature. A screen should then be displayed with one or more pages of information depending on how the shapefile and quickform were created. The possible pages are Page #, Attributes, Picture, Symbology, and Geography (coordinates, length, and area). Samples of these (except Picture) are shown below.



Points



Polygons
(similar for polylines)

Editing Data

ArcPad provides some basic editing functions that can be performed on your data. As mentioned earlier, this requires that editing be enabled for the desired shapefile. This can be done using either the method given in the Collecting Data section (using Start/Stop Edit on the Edit toolbar) or the method given in the Viewing Data section (using the Table of Contents icon on Main toolbar).

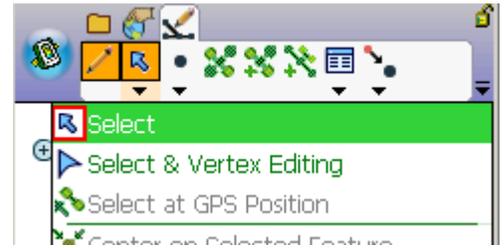
If the feature you need to edit is not in the map view area, you can use the tools on the “Browse” toolbar shown here to move the feature into view or to select it.



You should refer to ArcPad’s help for more info on each of these tools.

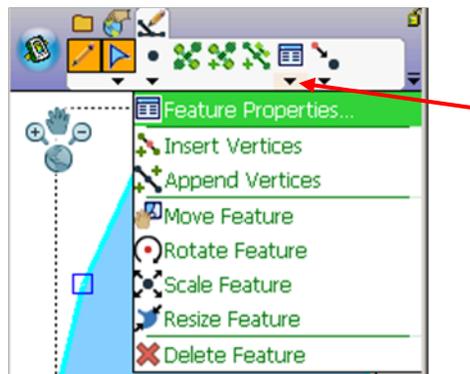
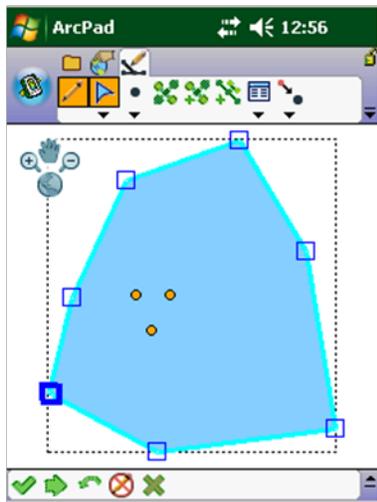
Switch to the Edit toolbar. From the drop-down list of the “Select” icon (second from left), choose the desired select tool.

The “Select” and “Select at GPS Position” tools are used to change a feature’s attributes; insert and append vertices; and move, rotate, scale, resize, and delete features.



The “Select and Vertex Editing” tool is used to move (by pen, GPS, or offsets) and delete a feature’s vertices.

TAP on the desired feature to select it. It will be highlighted with a color and with a dashed box around it. If the “Select and Vertex Editing” tool was chosen, a blue box will be placed around each vertex as shown below. To modify the entire feature or the feature’s attributes, **TAP** the drop-down arrow below the Feature Properties icon  and select the desired action. Selecting “Feature Properties” will allow you to edit the attributes as shown below. This can be done on the form page or the “Attributes” page.

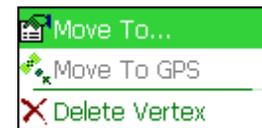


To edit a single vertex, you can **TAP AND DRAG** one of the blue boxes to move it or **TAP AND HOLD** one of the blue boxes, which will open the menu shown at right.

Use “Move To...” to move the vertex to a keyed-in x,y location or to a specified offset.

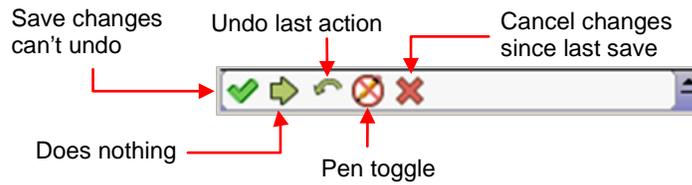
Use “Move To GPS” to move the vertex to the current GPS position (only available if GPS is active).

“Delete Vertex” will remove that single vertex.



Technology Technical Note MO-2

While in edit mode, the Command toolbar is available at the bottom of the screen. The function of each icon is shown below.



Tips: Undo will only undo 1 change. If more are needed, you will need to use the cancel icon to undo everything. If the X cancel icon is green, it indicates there are no changes to undo.

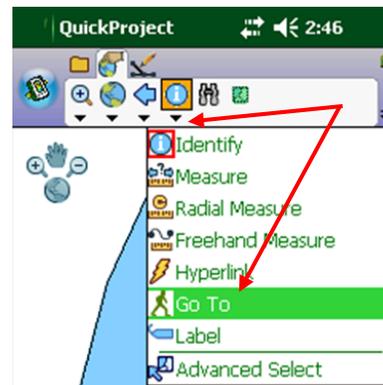
When done editing the feature, simply **TAP** the save changes icon (green checkmark).

Setting a Destination

ArcPad along with the GPS can be used to navigate to a desired location. There are multiple ways to set your destination.

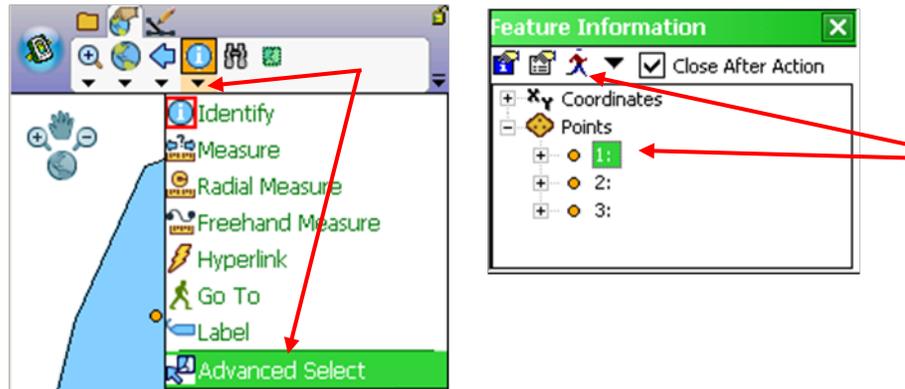
Tapping on Map

On the Browse toolbar, **TAP** the drop-down arrow under the Identify icon and select "Go To". You can then **TAP** anywhere on your map to set the destination.



Using Advanced Select

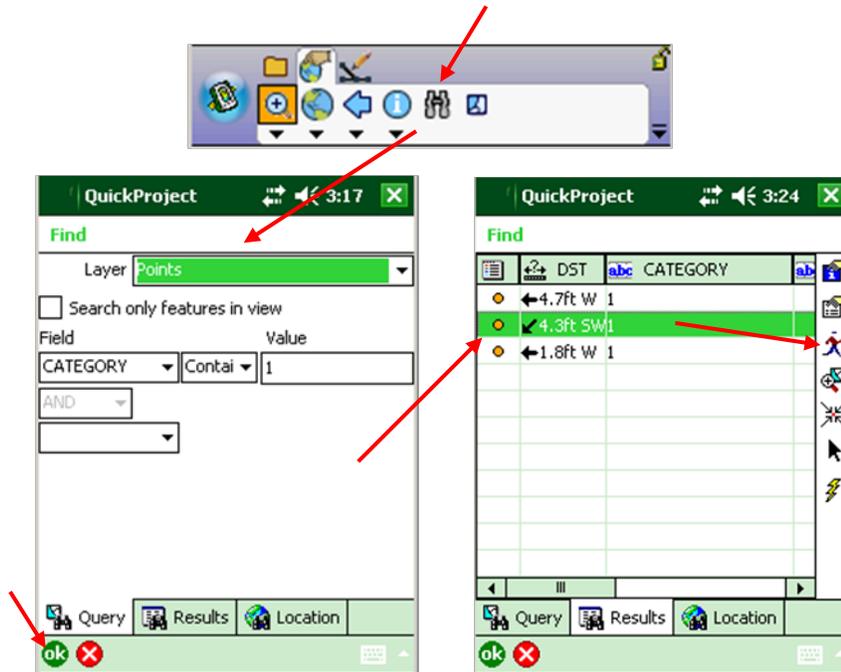
On the Browse toolbar, **TAP** the drop-down arrow under the Identify icon and select “Advanced Select”. You can then select a single feature by **TAPPING** it or multiple features by dragging a window around them. Highlight the desired feature in the “Feature Information” window and **TAP** the Go To icon .



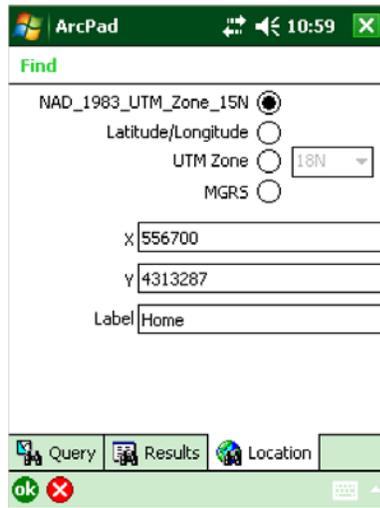
Using Find (binoculars)

On the Browse toolbar, **TAP** the Find (binoculars) icon. You can then find a feature based on a query of attributes (see step 1 below) or find a location by entering known coordinates (step 2 below).

1. On the “Query” tab, specify desired search criteria. **TAP** OK . Highlight feature in “Results” screen. **TAP** Go To icon .

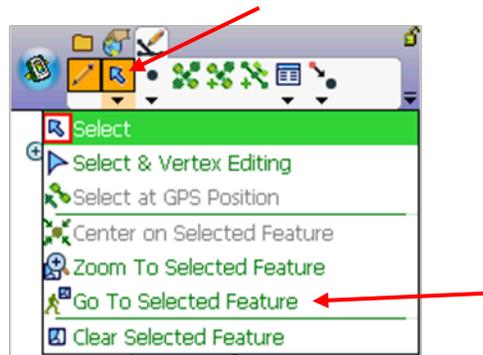


2. On the “Location” tab, select coordinate system and then specify the desired coordinates. **TAP OK** .



Using Select then Go To from Edit toolbar

Use the Select tool on the Edit toolbar to select the desired feature on the map. Once selected, **TAP** the drop-down arrow under the Select icon and choose “Go To Selected Feature”



Labeled Destination

Once the destination has been determined, a point labeled either “Mark” or with the field the feature was searched on with the Find tool is placed on the map similar to that shown at right.

For lines and polygons, this point will be the centroid of the selected feature.



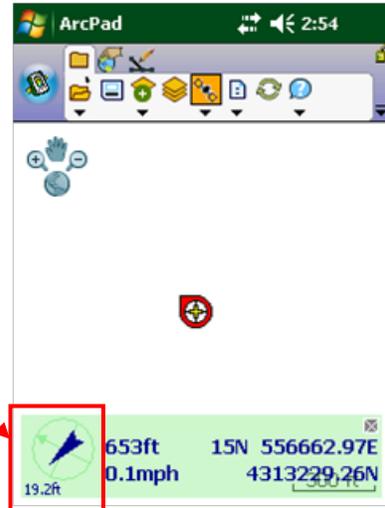
Getting to the Destination

If GPS is not activated, you need to do that using the GPS icon  on the Main toolbar. You then need to wait until you get a good GPS fix.

To assist in navigating to your destination, you can then use the left side of the GPS Status bar (shown at right)

or

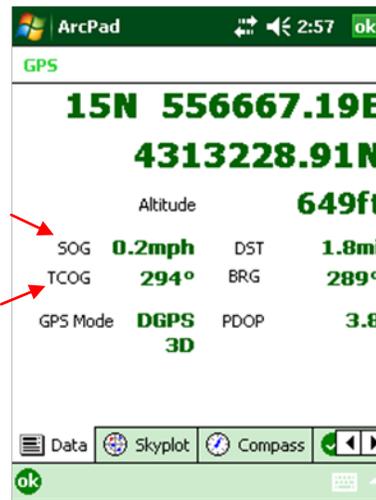
Navigational Information



the Data or Compass tabs on the GPS Position window. The useful information is highlighted on the screen images at right.

Speed (SOG) & Direction you are moving (TCOG)

Distance (DST) & Direction to destination (BRG)

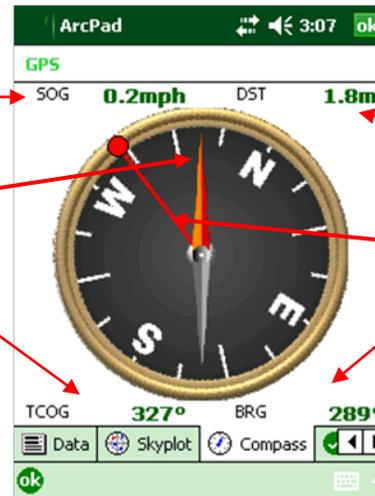


If you are traveling in the correct direction, the TCOG and BRG values should be the same and the red direction line on the compass will be pointing to the top of the screen in line with the orange compass needle.

Speed (SOG)

Direction you are moving (TCOG)

Distance (DST) & Direction to destination (BRG)



When done navigating, you can clear the destination point by tapping the "clear selected features" icon on the Browse toolbar.

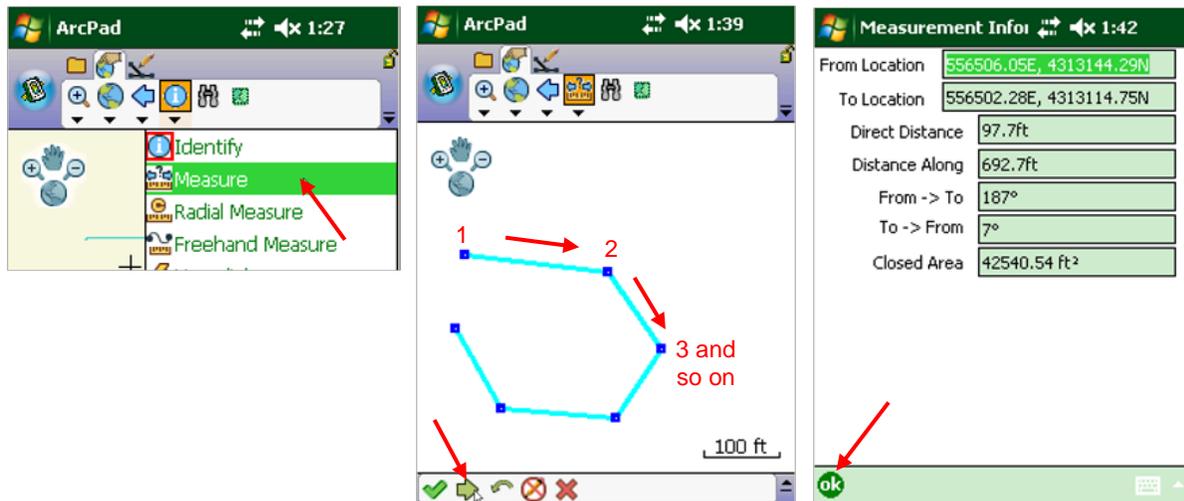


Measuring

If you have a need to measure distances or areas, you have four different methods to choose from: Measure, Radial Measure, Freehand Measure, and the Identify tool.

Measure tool

To use the measure tool, switch to the Browse toolbar and **TAP** the drop-down arrow for the “Identify” menu (fourth icon) and select Measure (see below). The icon on the toolbar will switch to the “measure” icon . **TAP** the first point where you wish to begin measuring from. Continue **TAPPING** points along the line or around the area you are measuring. When done, **TAP** the “proceed” icon in the command toolbar at the bottom. A measurement screen should appear with the appropriate information. The From and To Locations are the coordinates of the first and last points (i.e., taps). Direct Distance, From -> To angle, and To -> From angle are from the first to the last point. Distance Along is the total length of the drawn line. Closed Area assumes a line drawn from the first to last point to close the figure. **TAP** OK to close window.



Radial Measure tool

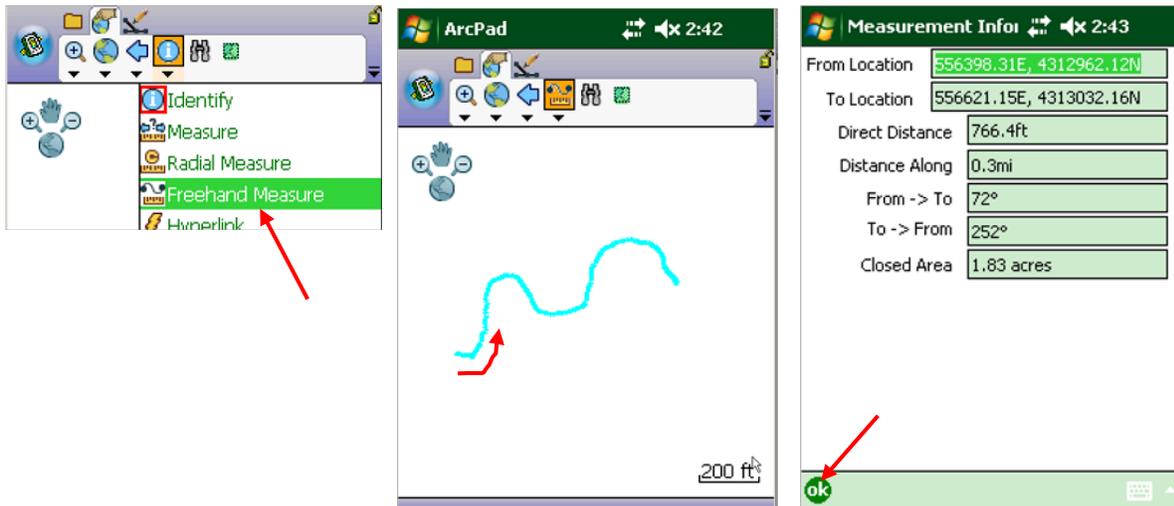
To use the radial measure tool, switch to the Browse toolbar and **TAP** the drop-down arrow for the “Identify” menu (fourth icon) and select Radial Measure (see below). The icon on the toolbar will switch to the “radial measure” icon . **TAP AND DRAG** from the first point to the second point. When you lift the stylus, a measurement screen should appear with the appropriate information. The From and To Locations are the coordinates of the first and second points. Radius, From -> To angle, and To -> From angle are from the first to the second point. Perimeter is the perimeter distance for the circle of given radius. Closed Area is the area for a circle of given radius. **TAP** OK to close window.



Freehand Measure tool

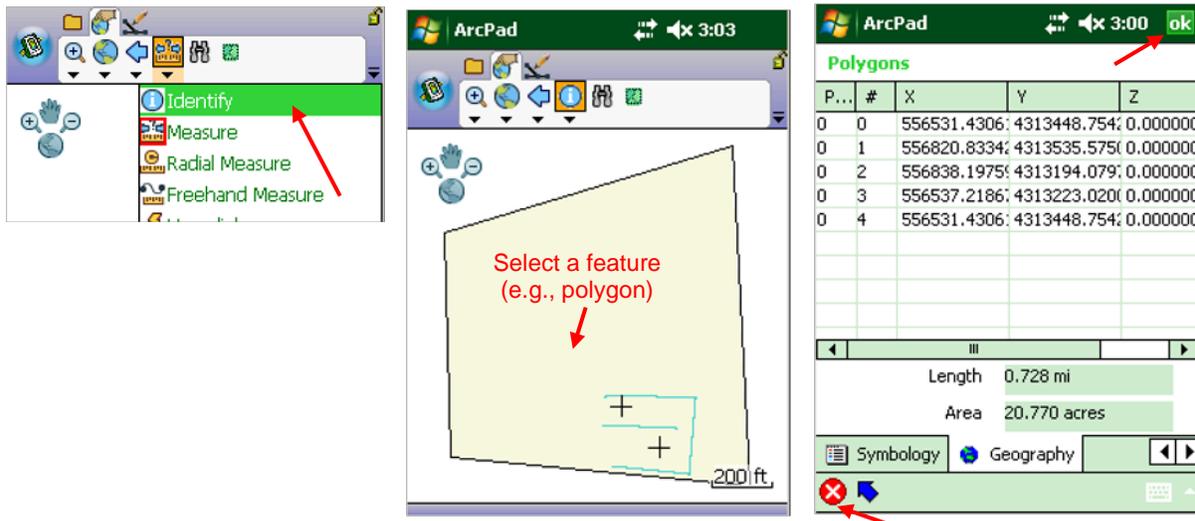
To use the freehand measure tool, switch to the Browse toolbar and **TAP** the drop-down arrow for the “Identify” menu (fourth icon) and select Freehand Measure (see below).

The icon on the toolbar will switch to the “freehand measure” icon . **TAP AND DRAG** the stylus on the map as you draw a “freehand” line. Upon lifting the stylus, a measurement screen should appear with the appropriate information. The From and To Locations are the coordinates of the first and last points. Direct Distance, From -> To angle, and To -> From angle are from the first to the last point. Distance Along is the total length of the drawn line. Closed Area assumes a line drawn from the first to last point to close the figure. **TAP OK** to close window.



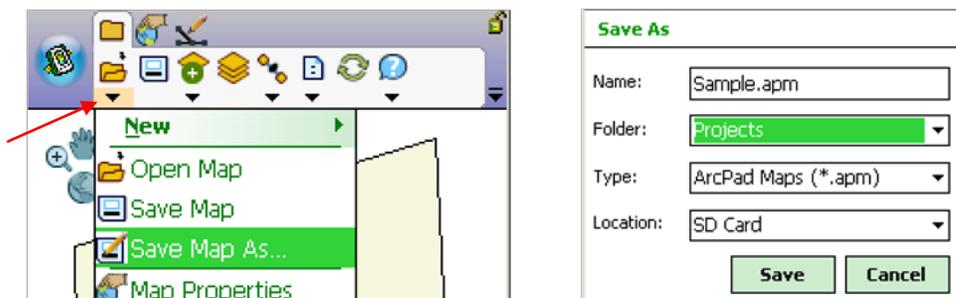
Identify tool

The “Identify” tool can be used to display the length of existing line features and the perimeter and area of existing polygon features. To do this, switch to the Browse toolbar and **TAP** the drop-down arrow for the “Identify” menu (fourth icon) and select Identify (see below). The icon on the toolbar will switch to the “identify” icon . **TAP** on the desired feature (line or polygon). The properties window opens for that feature. Use the right arrow near the bottom to move to the Geography tab and select it. The lower half of that window will display the appropriate length (perimeter) and area values. NOTE: If only one vertex is shown for a line or polygon and the area is not shown for a polygon, try restarting ArcPad (i.e., exit and then start ArcPad again). When you check again, the vertices and area should appear. Tap ok or  to close the window.



Saving a map

To save a map that you are currently working on, simply **TAP** the drop-down arrow of the “Open Map” menu on the Main toolbar and select “Save Map” or “Save Map As...”. Select “Location” (e.g. SD Card); “Folder” (e.g., Projects) and then enter “Name”. **TAP** Save . It will be saved with an .apm extension.



Back in the Office

Downloading

Once you have collected your data, you are ready to return to the office and download the data. Downloading is actually just a matter of copying files from the device using Microsoft ActiveSync software. The details of connecting your device and copying files were given earlier in the section “Communicating with Desktop Computer”. You should refer to that section for detailed steps. A brief summary of those steps is as follows:

1. Turn on computer and log-in.
2. Turn on handheld device.
3. Connect device to computer using USB cable.
4. Microsoft ActiveSync will activate. Press Cancel if Synchronization Setup window appears. A “Guest” partnership will be invoked.
5. On the ActiveSync window that displays, click “Explore” on the toolbar or select *Tools >Explore Device*.
6. An Explorer window will open. Navigate to where you stored your files on the device and use standard copy and paste methods (e.g., Ctr-C/Ctrl-V, right-click Copy/right-click Paste, or drag-and-drop) to copy your files to a desired folder on your computer (e.g., the customer’s toolkit folder, a projects folder,etc.).

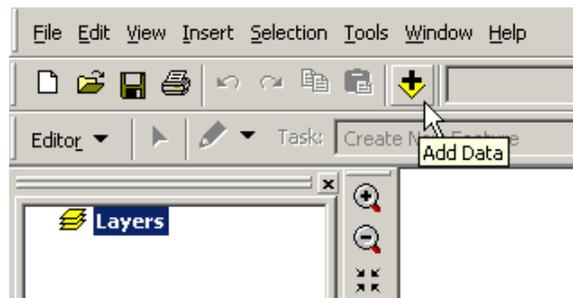
NOTE: Remember that a “shapefile” actually consists of a group of files - the filename plus some or all extensions of .shp, .shx, .dbf, .prj, .apl, .cfg, .sbn, .sbx, .ain. Be sure to copy all of them.

Using the Data

Once your data has been copied to your computer, it can now be used in any software that can utilize an ESRI shapefile, including Toolkit ArcMap. Below are some brief instructions on loading the shapefile in ArcMap and in AutoCAD. For more complete help in using shapefiles in each of these programs, you should refer to the help resources of each program.

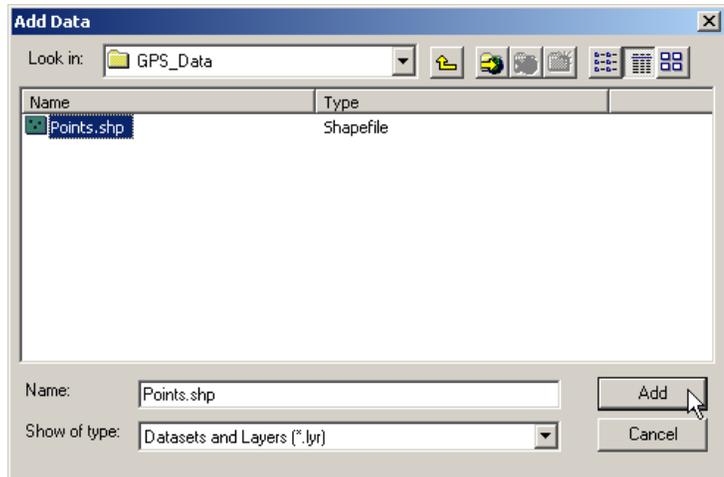
ArcMap

With ArcMap open, you can select *File > Add Data...* or click the “Add Data” icon on the toolbar.

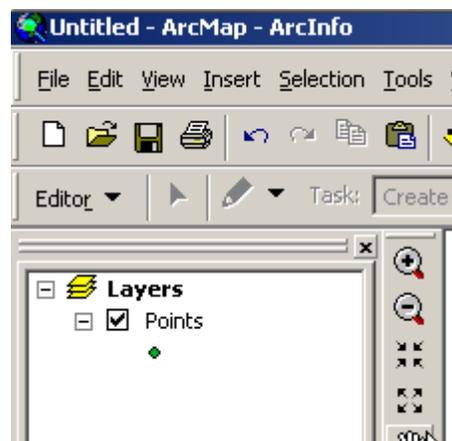


Navigate to where you saved the shapefile.

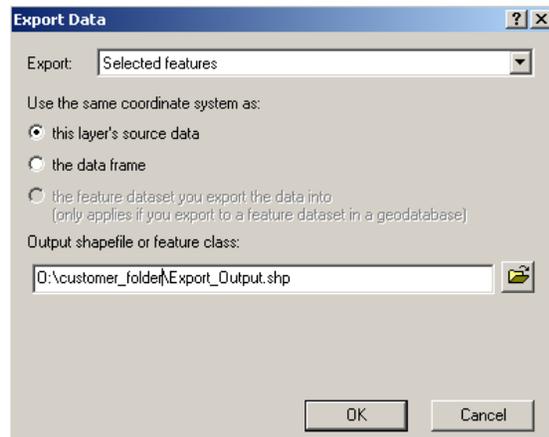
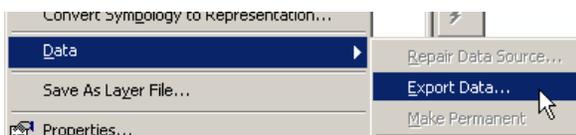
Select the file and click [Add].



The shapefile will be added to your table of contents and be available to use in whatever way you desire.



As stated earlier, if you wish to separate features out from a larger set, you can first select the desired features using the standard selection tools (e.g., clicking on the features, windowing around the features, querying the data, etc.) Once selected, right-click on the layer in the table of contents on the left, select "Data -> Export Data". Choose "Selected features" for Export. Select coordinate system and specify where to store the shapefile. Click OK.

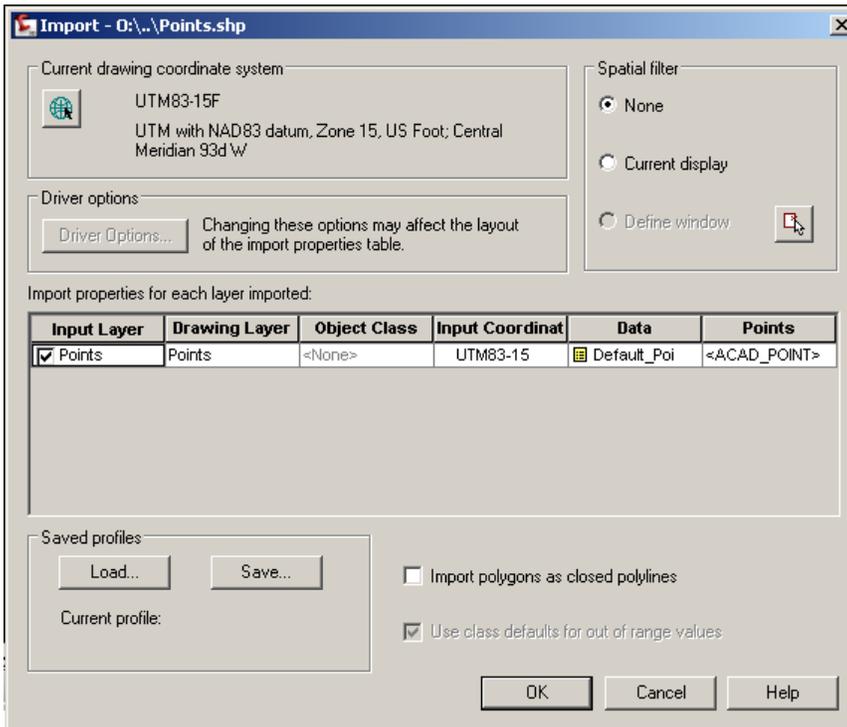
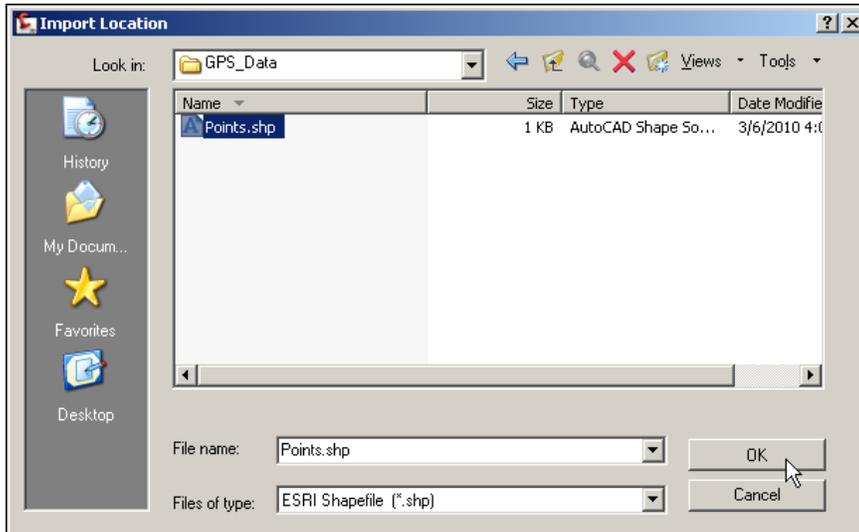


Civil 3D (AutoCAD)

A shapefile can be used in a couple of ways in AutoCAD.

1. It can be imported and each of the points, lines, or polygons becomes a drawing object. If any changes are made, the objects would have to be exported back out to a shapefile (i.e., the original shapefile is left untouched).

Enter the command MAPIMPORT on the command line or select “NRCS MO > GIS Tasks > Import Shapefile”. Navigate to where you saved the shapefile. Select the file and click [OK].



Technology Technical Note MO-2

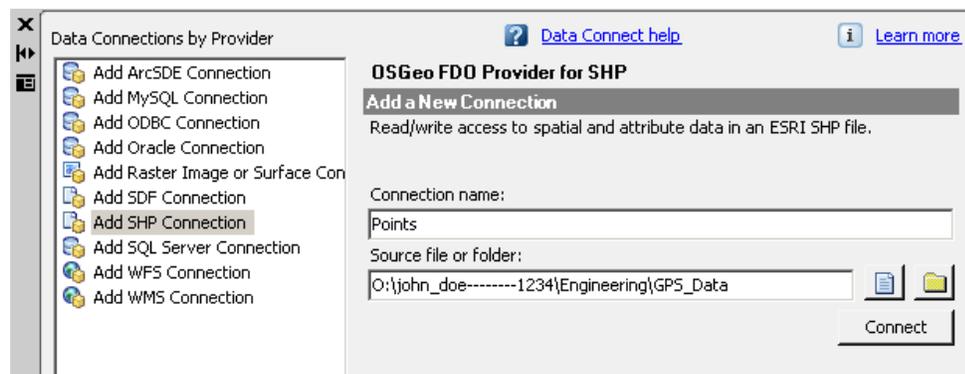
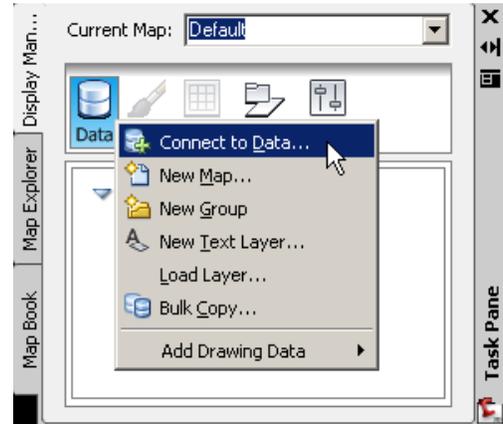
Complete the import screen shown above paying particular attention to the “Input Coordinate” and “Data” (i.e., attribute data) columns. Click [OK].

The features will be imported to the respective drawing objects.

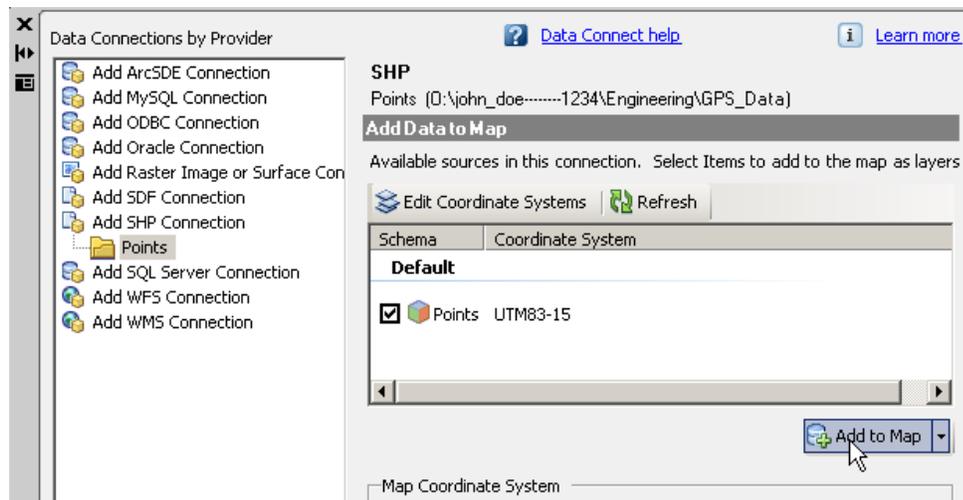
2. The other method is to create a “data connect” to the shapefile. The features are not imported to drawing objects, but rather a connection is made where you can edit the shapefile directly.

Open the “Task Pane” palette and select the “Display Manager” tab. Click on the “Data” icon in top toolbar. Select *Connect to Data...*

In the Data Connection window (below), select “Add SHP Connection” in left window. Enter a connection name. Click yellow folder and navigate to the folder where shapefile was saved and click [OK] Click [Connect].



A list of shapefiles in the selected folder will be listed (see screen below).



If the coordinate system is not set for the desired shapefile, click the “Edit Coordinate Systems” tab.
Check the box to the left of the desired shapefile.
Click [Add to Map].

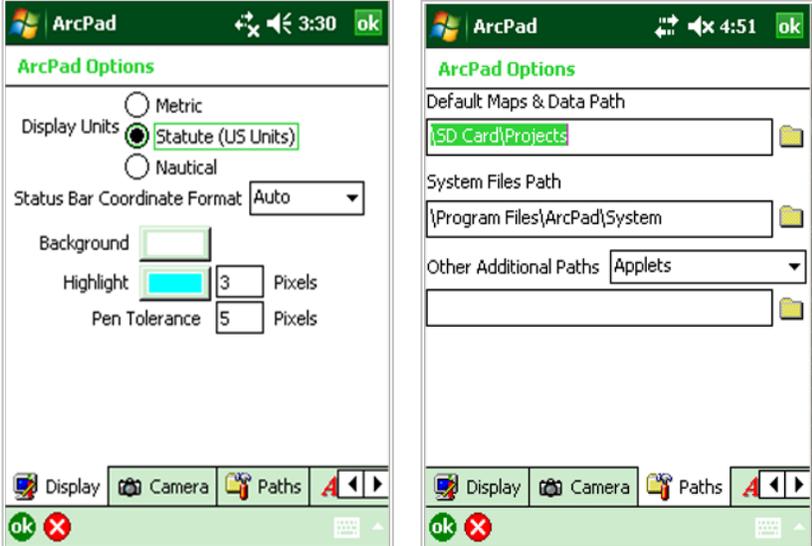
You can then close the Data Connect window.
The shapefile is now listed in the Task Pane’s Display Manager window.
To learn more about how to use the data, refer to AutoCAD’s help.

Appendix A – Field Guides

The “Field Guides” below are simply instruction “cards” that can be printed (single-sided), cut out, folded (where indicated), and laminated to carry along with the ProXYZ GPS unit in the field.

Table of Contents & ArcPad Options

**ArcPad Options
Recommended Settings**



1

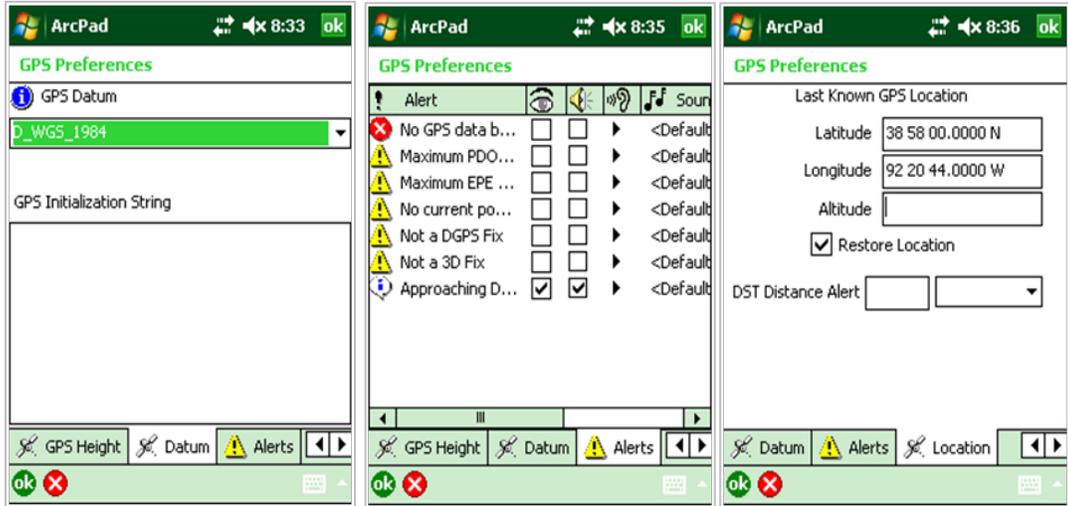
Fold

ArcPad Field Guides - Table of Contents

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New shapefile (Add Fields)	6
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GPS Preferences

GPS Preferences (page 2)

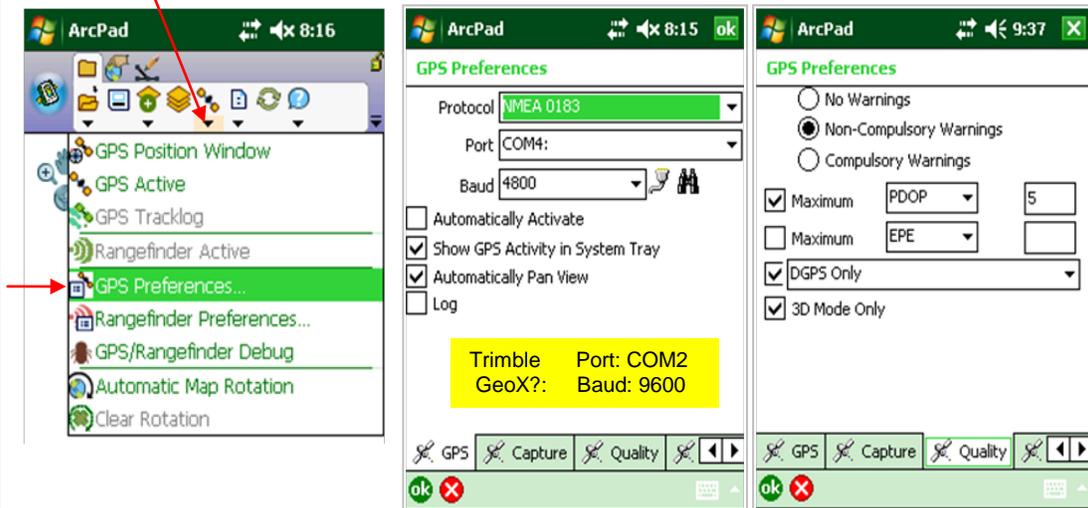


If unit has trouble finding satellites, enter coordinates of current location on location tab (these do not have to be exact).

3

Fold

GPS Preferences (page 1)

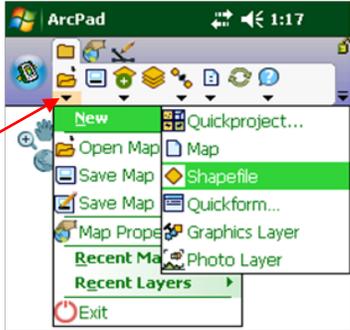


NOTE: Protocol, Port, and Baud must be set as shown above.

2

Create New Quick Project / New Shapefile

Create New Shapefile



On Main toolbar, Select **New** -> **Shapefile** from Open Map menu.

Define fields
(See "Add Fields" card)



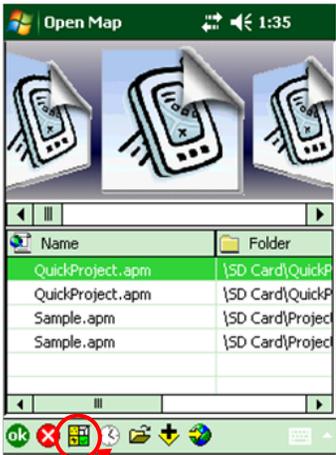
Define QuickForm
(See "QuickForm" card)

Enter name and desired storage location.
TAP Save.

5

Fold

Create New Quick Project



TAP quick project icon in Open Map window



TAP OK

3 shapefiles will be created:
Points
Lines
Polygons
in a Quick Project folder.

4

New Shapefile Setup

New shapefile (QuickForm)

TAP OK to save & exit.

Enter form layout info.

Choose fields.

Set additional properties:
required, min, max,
list values, tooltip

7

Fold

New shapefile (Add Fields)

1) Select type.
2) Tap +.
or use [Import...]

3) Enter field info.
Tap OK.

4) Repeat steps 2 and 3
for each field.
5) Tap OK.

6

Collecting Data

Collecting Data (page 2)

Continuous



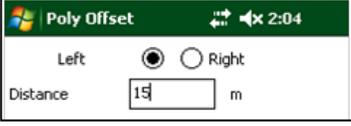
Set "Streaming" settings in GPS Preferences -> Capture



Put in polyline or polygon mode.
TAP GPS Continuous Capture icon.
 Travel desired path. **TAP** icon to turn off.
TAP "Proceed" icon to end capture.



Offset

Select "Offset Polyline/Polygon".
 Select side and enter distance.
 Capture polyline or polygon as described on other card.



When finished with line or polygon, tap "Proceed" icon on command toolbar.

Complete attribute data.
TAP OK and repeat for next feature.

9

Fold

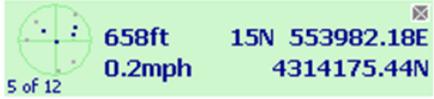
Collecting Data (page 1)




Turn on edit of desired feature(s).



Activate GPS.



Occupy point
 Wait for quality GPS signal:
 green status - DGPS 3D, PDOP<5

Point

Put in point mode.
TAP GPS Capture Point icon.

Polyline Polygon

Put in polyline or polygon mode.
TAP GPS Capture Vertex icon.
 Repeat for each vertex.



When finished with line or polygon, tap "Proceed" icon on command toolbar.

Complete attribute data.
TAP OK and repeat for next feature.

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Viewing Data

Viewing Data (Table of Contents)

The first screenshot shows the 'Table of Contents' window with various layers like GPS Tracklog, Map Grid, Points.shp, Lines, and Polygons. The 'Points' layer is selected, and its properties (Point, Lines, Polygons) are visible on the right.

The second screenshot shows the 'Table of Contents' window with a tree view of layers including Points.shp, lines.shp, Polygons, and several categories (Category 1-5).

The third screenshot shows the 'Table of Contents' window with a table view for snapping criteria:

Title	ft	Vertex	Edge
Points.shp	15	<input checked="" type="checkbox"/>	<input type="checkbox"/>
lines.shp	15	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Polygons	15	<input type="checkbox"/>	<input type="checkbox"/>

Set visibility, edit and identify modes and other properties.

Change symbology. Can also be done via Layer Properties.

Set snapping criteria.

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Fold

Viewing Data (Identify)

Then select a feature

The first screenshot shows the 'Identify' window for a 'Points' feature with fields for Point_id (1), Date (3/23/10), and Comment.

The second screenshot shows the 'Identify' window for a 'Points' feature with coordinate fields: X (556709.183554584), Y (4313272.93681701), Z (0), and M.

The third screenshot shows the 'Identify' window for a 'Polygons' feature with a table of vertex coordinates:

P...	#	X	Y	Z
0	0	556531.4306	4313448.754	0.000000
0	1	556820.8334	4313535.575	0.000000
0	2	556838.1975	4313194.079	0.000000
0	3	556537.2186	4313223.020	0.000000
0	4	556531.4306	4313448.754	0.000000

View: attributes

point coordinates

vertex coordinates and length and areas for polygons & polylines

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Editing Data / Destinations

Setting a destination

Tap on Map:
Browse toolbar > Identify drop-down > Go To tap on map

Advanced Select:
Browse toolbar > Identify drop-down > Advanced Select > select feature(s) > highlight feature > tap Go To icon .

Find:
Browse toolbar > binoculars icon > specify criteria > highlight feature in Results window > tap Go To icon or
Enter known coordinates (location).

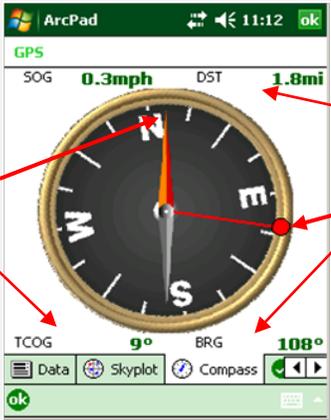
Edit Select:
Edit toolbar > Select icon > select feature > Select drop-down > Go To Selected Feature.

Getting to the destination



Activate GPS.

Use compass on GPS Position window to navigate to destination.



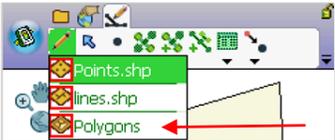
Distance (DST) & Direction to destination

Direction you are moving (TCOG)

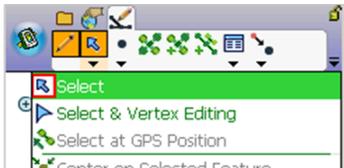
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Fold

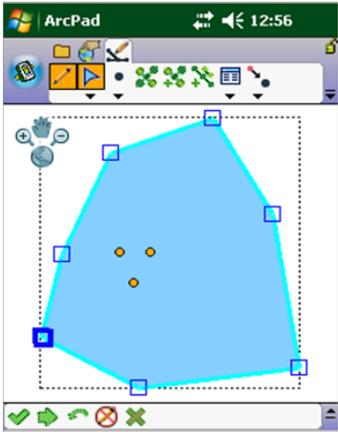
Editing Data



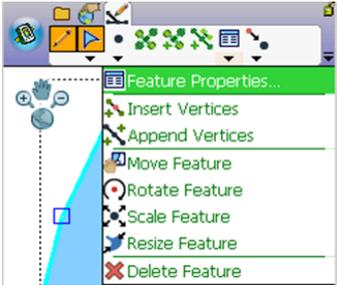
Ensure feature is in "edit" mode.



Choose appropriate Select tool on Edit toolbar.



Select feature or **TAP AND DRAG** a vertex.



Select desired edit feature action or **TAP AND HOLD** on a vertex and select vertex edit action



Command Toolbar



Save changes can't undo

Undo last action

Cancel changes since last save

Does nothing

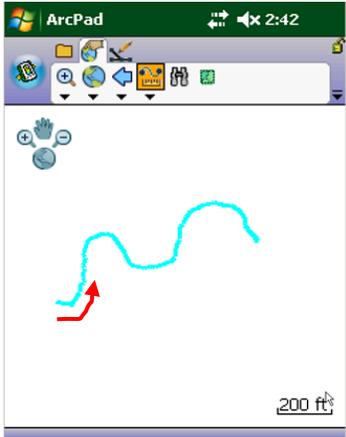
Pen toggle

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Measuring

Measuring (page 2)

Freehand Measure



TAP AND DRAG
to draw freehand line.
Lift stylus.

Measurement Info

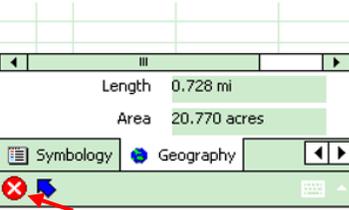
From Location	556398.31E, 4312962.12N
To Location	556621.15E, 4313032.16N
Direct Distance	766.4ft
Distance Along	0.3mi
From -> To	72°
To -> From	252°
Closed Area	1.83 acres

Measurements info
is displayed.
TAP OK to exit.

Identify Tool



TAP feature.



Length and area given on
"Geography" page.
TAP cancel icon to exit.

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Fold

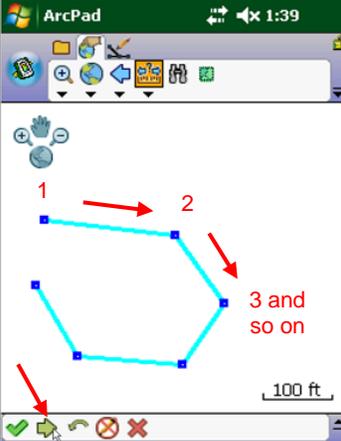
Measuring (page 1)



Select drop-down for Identify
menu on "Browse" toolbar

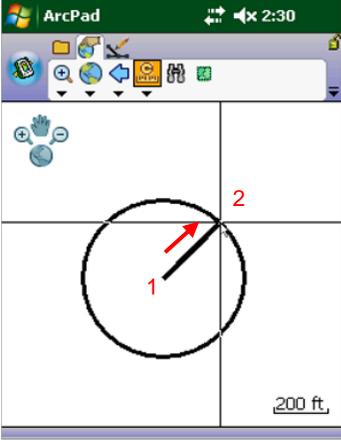
Select: Measure,
Radial Measure, or
Freehand Measure.

Measure



TAP points along
line or around area.
TAP "proceed" icon.

Radial Measure



TAP AND DRAG from
first point to second point.
Lift stylus.

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Troubleshooting



Fold

Troubleshooting

Unit Not Responding

Is device locked? If so, unlock it (“Unlock” at bottom or lock icon in ArcPad), or Reset device - hold down Power button, select “Reset”, or Remove battery. Reinsert battery.



GPS very slow at obtaining fix

Wait longer, or try entering approx. location on “Location” page of GPS Preferences

GPS Off

Check settings in GPS Preferences (see other field guide).

Zoom Extents / nothing displays

Either there is nothing to display, or features are extremely far apart. Try “Zoom to Layer” or use Find tools to look for features.

Error 55 when attempting to open communications on COM#

From Today screen, Start->Settings->System tab->External GPS Programs tab - GPS Program port: COM4
Hardware tab - GPS Hardware port: COM2, Baud rate: 9600
Access tab – Manage GPS automatically should be checked.

GPS location is incorrect or not stable

Check surroundings for possible obstructions.
Reset (i.e., reboot) device. Hold down Power button, select “Reset”.

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Appendix B – GPS Configuration with EZ-PRO

EZ-PRO is an application that lets a user view and modify the configuration of the GPS receiver. A user would not normally have a need to use this application. The only situation that would warrant its use is if the user was in some heavy canopy. You could then use this application to turn on a “ForestMode” setting to improve GPS reception.

To start EZ-PRO,
TAP Start -> EZ-PRO
 from the Today screen.

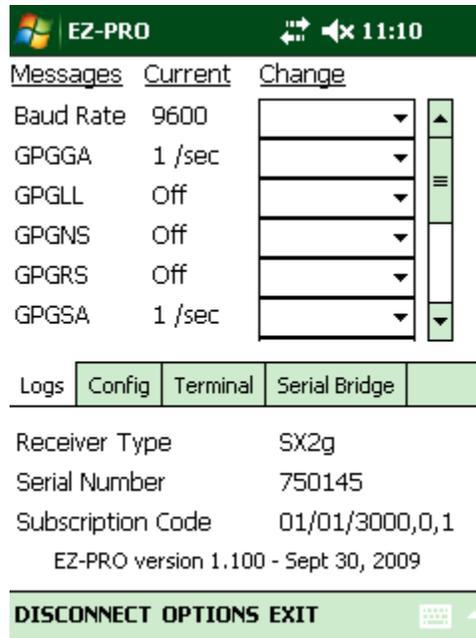


TAP CONNECT > COM2
 at lower right of screen.



It should connect with the GPS receiver and the screen shown at right should appear. The default settings on this Logs screen are as follows and should not be changed

Baud Rate: 9600
 GPGGA: 1/sec
 GPGLL: Off
 GPGNS: Off
 GPGRS: Off
 GPGSA: 1/sec
 GPGST: Off
 GPGSV: 5 sec
 GPRMC: Off
 GPRRE: Off
 GPVTG: 1/sec
 GPZDA: Off



Switch to the Config tab.

The defaults on this screen are as follows.

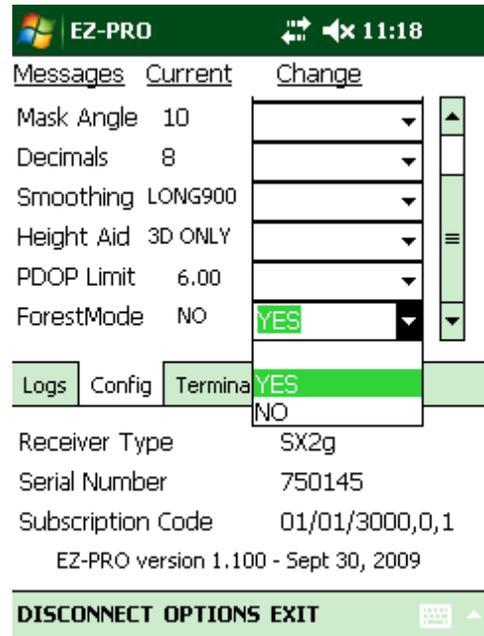
Again, these should not be changed with the exception of ForestMode.

Dif Source:	WAAS
Dif Age:	900
Mask Angle:	10
Decimals:	8
Smothing:	LONG900
Height Aid:	3D ONLY
PDOP Limit:	6.00
ForestMode:	NO

As stated earlier, if you are in heavy canopy, you can change ForestMode to YES to help improve GPS reception in that condition. Once you are no longer in the canopy condition, you should remember to return this setting to NO.

When finished,

TAP *EXIT* > *Exit and Save*
at bottom of window.



Appendix C – Troubleshooting

Unit is not responding (locked up)

The first thing to check is if the device got “locked”.

If in ArcPad, check the small lock symbol  in upper right corner. If it is locked, **TAP** it and select Yes to unlock. If it is unlocked, something else is wrong.

If not in ArcPad, check the bottom of the Today screen. If it says “Unlock”, **TAP** the word and then **TAP** again on “Unlock” near the middle right of the screen.

If the above actions don’t work, hold down the power button until a menu appears. **TAP** on “Reset”. This should cause the device to do a reboot.

If this doesn’t work, it may be necessary to remove the battery temporarily and then reinsert the battery. You should then be able to power it up.

GPS very slow at obtaining a fix

If the unit had last been used at a location far from where you are now or this is the first time you have had it out at your current location, it may take a awhile for the GPS to “find itself”. To speed this up, one thing you can try is to manually enter your location. You can do this by going to “GPS Preferences” in ArcPad and entering the lat-long coordinates of your present position in the “Location” page. This does not have to be real accurate, but just in the general vicinity.

GPS Off

This message indicates that ArcPad is not receiving any information from the GPS receiver. Most likely the reason is that the settings on the “GPS” page under “GPS Preferences” in ArcPad are incorrect. Check the GPS Preferences section in the main body of this document for correct settings.

I do a Zoom Extents and nothing seems to be there

You may have features that are extremely far apart. One thing you might try is to use the “Zoom to Layer” tool under the “Browse” menu. You also can utilize find and select tools to diagnose if this is the case. If you find an errant feature, you could then delete it using the edit instructions given above.

Error 55 when attempting to open communications on COM4

If you get this message when trying to activate GPS in ArcPad, do the following:

From Today screen, **TAP** Start -> Settings

On System tab, **TAP** "External GPS".

Check and set the following settings.

Programs tab - GPS Program port: COM4

Hardware tab – GPS Hardware port: COM2; Baud rate: 9600

Access tab – Manage GPS automatically should be checked.

TAP OK to exit.

Exit settings screen.

GPS location is incorrect or is not stable (i.e., constantly changing by a large amount) even though PDOP shows a good value.

The first thing to check is that you are not near some object (e.g., chain link fence, metal sign, another electronic device, etc.) that may be affecting the GPS signals.

If that is not the case, you should then reset the device. Hold down power button until menu appears. **TAP** Reset. The unit should reboot and the problem should (hopefully) be resolved.