

Washington State Department of Transportation

Operating the Trimble® GeoExplorer® 6000 Series GeoXT™ handheld, using ArcPad® 10.0 with service pack 1 and GPSCorrect™ 3.20 software

Version 1.0

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Operating the Trimble® GeoExplorer® 6000 Series GeoXT™ handheld, using ArcPad® 10.0 with service pack 1 and GPSCorrect™ 3.20 software¹

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1. The Trimble® GeoExplorer® 6000 Series GeoXT™ Handheld (GeoXT)



¹ Except where noted, information about the GeoXT™ 6000 series model GNSS receiver is from the *GeoExplorer® 6000 Series User Guide* (February 2011, Version 1.00, Revision A).

2. Deciphering the Leds

Key	LED	Description
 Battery status		Battery charging is complete.
		Battery is charging.
		Battery level is critically low (<5% remaining).
		Battery fault.
 GNSS receiver status		Receiver is on, and GNSS positions are available.
		Receiver is on, but GNSS positions are not available.
 Wireless radio status		A wireless radio is turned on.

3. Use and Care of the GeoXT™

- To protect the unit when not in use, Trimble® recommends storing it in its pouch.
- Protect the touch screen by using your finger or the stylus provided; avoid using excessive pressure and sharp or abrasive objects.
- Keep the outer surface free of dirt and dust.
- Ensure protective covers and doors are appropriately fitted to the external antenna port, SIM, and storage card areas, so they are kept free of dirt, dust, fluids, and electrostatic discharge.
- Protect the unit from extreme temperatures. (For example, do not leave the unit on the dashboard of a vehicle.)
- When the battery is removed, the handheld is not waterproof. Avoid exposing the internals of the handheld to dust and moisture when removing the battery. **Note:** Trimble® recommends that you only swap the battery indoors or inside a vehicle.
- Use the hand strap.
- To clean the unit, wipe it with a clean, dry cloth.

4. Powering the GeoXT™ and Related Information

- The GeoXT has a removable, rechargeable Lithium-ion battery. When fully charged, the battery provides enough power for a full working day (10 hours) using the internal GPS/GNSS antenna and with the backlight on the default settings.
- Cold temperatures or using a Bluetooth™, Wi-Fi®, or wireless cellular modem consumes additional battery power thus shortening battery life between charges.
- To insert the battery into the handheld:
 - Slide the battery into the cavity with the label facing upward.
 - Push the battery in until it clicks in place.



d. To charge the battery:

- Charge the battery inside the handheld. If you have a spare battery, you can charge it outside the handheld.
- Connect one end of the AC adaptor cable to the battery and the other to an AC power outlet. Turn off the handheld.
- Leave the battery to charge. It may take up to 5 hours for the unit to charge completely.
- When the battery is charging inside the handheld, the Power LED is solid orange. If the Power LED changes to red, a battery charging fault has occurred. This is most likely to happen if the battery overheats. The unit will suspend charging until it cools and then will automatically restart charging. When fully charged, the Power LED is green.

Power source	LED state	Handheld/battery state
Battery power	Off	Handheld is turned off or is in Suspend mode.
	Off	Handheld is turned on and battery level is good.
		Flashing red: Handheld is turned on and battery level is critically low (<5%).
External power		Solid orange: Battery is charging.
		Solid red: Charging fault - for example, there is a problem with the battery, or the temperature of the battery has exceeded the acceptable temperature range.
		Solid green: Charging is complete.

- e. The life of the battery can be significantly shortened if power is constantly supplied to the handheld. To avoid this, connect the handheld to an external power source only when the battery requires charging. Once fully charged, disconnect the external power source and allow the battery to discharge through normal use.
- f. To check the level of battery power remaining at any time, check the ArcPad® Today display on the Home screen. The icon will differ depending on whether the unit is charging or not; the percent battery power is displayed.



g. Low battery indicators – When the battery level reaches:

- 15% – The battery icon in the title bar of the Home screen changes to 
- 10% – The Power LED on the GeoXT flashes red and the “Main battery low” message appears.
- 5% – The “Main battery very low” message appears.

Note: Trimble® recommends that you recharge the battery when any of these indicators appears.

h. Swapping the battery – If the battery runs low while you’re working, you can swap the battery without the need to close files and shut down the handheld, and can resume work right away.

- Save any open files.
- Ensure you have a spare battery close by with sufficient charge to keep working. To check the level of battery power remaining on a spare battery, press the battery

icon on the battery pack label. The level of charge indicator will light up with the approximate level of battery power remaining on the battery. Each LED represents a 20% increment in battery capacity.

- Turn off the handheld or put the handheld in Swap Battery mode. To switch to Swap Battery mode, press and hold the Power button, and then tap Swap Battery on the Power menu. The battery LED shows as a red warning. When the device is ready, the red LED turns off, and the battery can be safely swapped.
 - Remove the old battery by pinching the battery latches together until the battery is ejected. Slide the battery out. The handheld has enough power to keep the device running for approximately 30 seconds with the battery removed. If the power drains before the battery is restored, the device will shut down. **Note:** Trimble® recommends saving open files before swapping the battery.
 - Insert the new battery.
 - Press the Power key to resume your session.
- i. Conserving power:
- Turn off the integrated Bluetooth™ and Wi-Fi® whenever they're not being used. To do this, tap on , then go to | Settings | Connections | Wireless Manager. Tap the "All" icon to turn both Bluetooth™ and Wi-Fi® off, or tap the Bluetooth™ or Wi-Fi® icon to turn them off individually.
 - Disconnect from the GPS/GNSS receiver when GPS/GNSS data is not required (see [Section 10.I](#)). Don't bother to disconnect from GPS/GNSS if you'll be reconnecting within about 5 minutes.

5. Status Indicators

Status indicators that appear at the top of the Home screen are as follows:

Battery status indicators

Icon	Description
	Battery has full charge
	Battery has high charge
	Battery has medium charge
	Battery has low charge
	Battery has very low charge (20% or less)
	Battery charging/using external power

Speaker status indicators

Icon	Description
	Speaker is on
	Speaker is off

Network and modem status indicators

Icon	Description
	Connected to ActiveSync or the Windows Mobile Device Center (WMDC) on a computer
	Connected to a Bluetooth-enabled phone
	Disconnected from ActiveSync or WMDC
	Disconnected from a Bluetooth-enabled phone
	Wi-Fi radio is on
	Wi-Fi is detected
	Connected to a wireless network

6. Getting Started With ArcPad® 10.0

- Connect the antenna to the GeoXT. Turn on the GeoXT. The Power button is the green button below the screen. If it won't start up, see [Troubleshooting](#).
- To start ArcPad® 10.0 (ArcPad), tap the ArcPad icon on the Home screen.



- Be patient; ArcPad takes a while. To open an ArcPad map, go to [Section 10b](#).

7. Troubleshooting

Most of the information in this section is from the *GeoExplorer 6000 Series User Guide*, February 2011, Version 1.00, Revision A. Additional information is from colleagues and vendors.

- Suspend Mode:** The GeoXT may go into Suspend mode when it has been idle for a specified period of time (3 minutes by default). This is a low-power mode that makes the GeoXT appear to be turned off. If the screen suddenly goes blank, before jumping straight to a reset ([Section 7c](#)), try pressing the Power button first in case it is just sleeping.
- Nonresponsive Screen:** If the GeoXT stops responding to the stylus, here are some things to try:
 - The touch screen may be incorrectly aligned. If this happens, tap the Windows² icon in the lower left corner of the screen. Go to Settings, System, Screen. Tap the Align Screen button and follow the instructions.
 - Touch screens can be sensitive to cold weather (cold weather isn't defined, unfortunately). Apparently, the plastic screen covers can cause a problem in these situations. Try taking the screen protector off.
 - Locked screen – The main screen has an option to lock the screen. To unlock the screen, slide the Unlock icon.
 - Reset (see below).

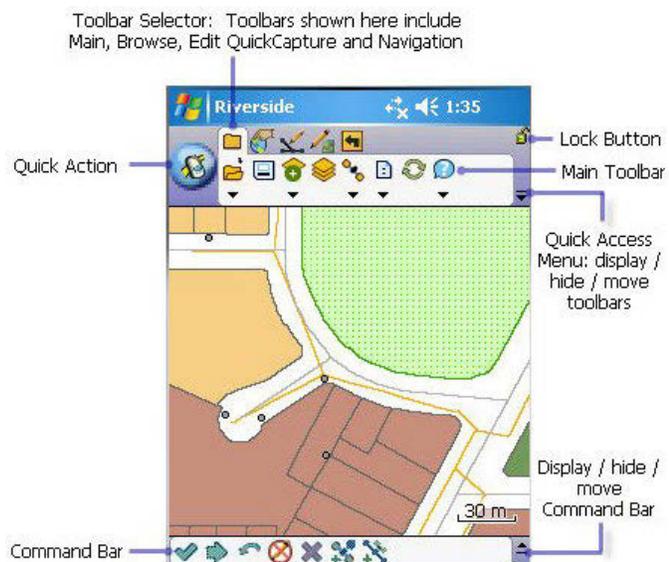
² Windows is a registered trademark of Microsoft Corporation in the United States and other countries. *Operating the Trimble® GeoExplorer® 6000 Series GeoXT™ handheld, using ArcPad® 10.0 with service pack 1 and GPSCorrect™ 3.20 software* is an independent publication and is not affiliated with, nor has it been authorized, sponsored, or otherwise approved by, Microsoft Corporation.

- c. **Resetting the GeoXT:** This may be the solution if the GeoXT won't turn on, the screen goes blank, or the GeoXT becomes unresponsive to the stylus. Try a soft reset first. If that doesn't work, then try a hard reset. Occasionally, it may take a few tries to reset the GeoXT.
 - **Soft Reset:** Press the Power button for about 1 second. The Power menu appears. Use the stylus to tap Reset. It will probably take the GeoXT a few minutes to fully wake up. A soft reset will retain all the settings and device data that you have previously saved on the GeoXT. The GeoXT saves any unsaved data, closes all applications, and then restarts.
 - **Hard Reset:** Perform a hard reset only if a soft reset doesn't resolve the problem. Press and hold the Power button for 4 seconds – the Reset option in the Power menu starts counting down. Release the Power button when the power is turned off. A hard reset retains settings and data that you have previously saved. However, any unsaved data may be lost.
- d. **Dead Battery:** If the screen goes blank and the GeoXT isn't in Suspend mode, and a reset doesn't work, maybe the battery is depleted. Try letting the GeoXT recharge for a while. A full charge may take up to 5 hours.

8. The ArcPad® 10.0 Map Window

Except where noted, information about ArcPad is from the [ESRI ArcPad Help Library](#).

The ArcPad map window includes five default toolbars that are located at the top of the window: the Main toolbar, the Browse toolbar, the Edit toolbar, the QuickCapture toolbar, and the Navigation toolbar. One toolbar is active at a time. You can select the toolbars from the toolbar selector. The selected toolbar becomes active and appears below the toolbar selector. The Command bar is at the bottom of the window and is only visible while editing. A sixth option is available on our devices; on the right end of the toolbar selector is a button to take you to the GPSCorrect™ 3.20 (GPSCorrect) screens.



- a. **Main Toolbar:** Contains the tools necessary to manage your data. You will also find the options to connect to a GPS/GNSS receiver, rangefinder, or camera. This toolbar is displayed at startup.



From left to right, the buttons are for: the Open map menu, Save map, Add layer menu, Table of contents, GPS/GNSS active menu, Options menu, Refresh, and the Help menu.

- b. **Browse Toolbar:** Includes tools for exploring the data by panning, zooming, and retrieving information.



From left to right, the buttons are for: Zoom in menu, Zoom to full extent menu, Go back to previous extent menu, Identify menu, Find, Clear selected feature, and Quick draw toggle.

- c. **Edit Toolbar:** The Edit toolbar and the Command bar activate the editing tools so new data can be added and existing data can be updated.



From left to right, the buttons are for: Start/Stop editing, Select menu, Feature type menu, Capture point using GPS/GNSS, Add GPS/GNSS vertex, Add GPS/GNSS vertices continuously, Feature properties menu, and the Offset menu. A GPS/GNSS receiver needs to be activated in order for the GPS/GNSS buttons to be enabled (see Main toolbar).

- d. **Command Bar:** The Command bar contains more editing tools so new data can be added and existing data can be updated.



From left to right, the buttons are for: Save geometry changes, Proceed to attribute capture, Undo, Pen toggle, Cancel, Add GPS/GNSS vertex, and Add GPS/GNSS vertices continuously. The GPS/GNSS buttons are only available when a GPS/GNSS receiver is active and the polyline or polygon feature type is active for data capture; these are duplicates of the buttons on the Edit toolbar and are designed to use with the QuickCapture toolbar.

- e. **QuickCapture Toolbar:** The QuickCapture toolbar is a dynamic toolbar generated by ArcPad, and its content is defined by the open layers in your map. Its purpose is to provide you a one click ability to create new features in your map. This view of the toolbar shows it when a new QuickProject is opened in ArcPad.



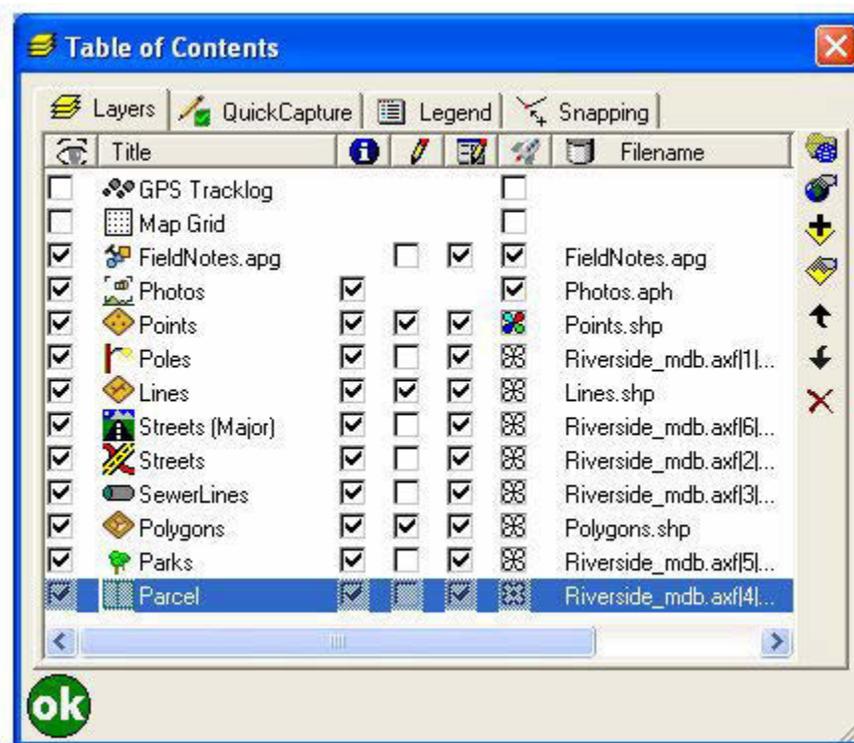
By default, three of each layers categories are shown as capture tools

- f. **Navigation Toolbar:** This toolbar displays different tools depending on the install status of the StreetMap extension. When only ArcPad is installed, only the Add Basemap tool will display, but it will be grayed out (StreetMap is required to display a basemap). StreetMap is not loaded on the Environmental Services Office’s (ESO) GeoXTs.

9. Managing Data Layers in ArcPad® 10.0

You organize and manage layers through the Table of Contents, which is accessed via the Table of Contents button on the Main toolbar. The Table of Contents dialog consists of three or four tabs; the QuickCapture tab is dynamic, like the QuickCapture toolbar. The Snapping tab is used to specify which layers will be used to snap to when creating or editing features. It will not be used during GPS/GNSS data collection. The Layers and Legend tabs will be the most useful.

The Layers tab shows you all the layers in the current ArcPad map. From the Layers tab, layers can be added or removed from the map by making them visible or not, and the drawing order of the layers can be changed (layers are drawn from the bottom of the layers list to the top). Layers can be activated for editing or for use with the Identify tool.



Layer Visibility

When checked, the layer is drawn on the ArcPad map, provided the map scale is within the range specified on the Scale tab of the layer's Layer Properties dialog box.

Identify

When checked, the layer is active for querying with the Identify and Advanced Select tools.

Edit

When checked, the layer is active for editing.

Select Projection

Tap to select a projection file (.prj) for ArcPad to use for the current map's coordinate system and projection parameters.

Map Properties

Tap to open the Map Properties dialog box. The Map Properties dialog box is described in section Map Properties of this reference guide.

Add layers

Tap to open the Add Layers dialog box to select layers to be added to the current map.

Layer properties

Tap to open the Layer Properties dialog box to view and change various properties for the selected layer. The Layer Properties dialog box is described in section Layer Properties of this reference guide.

Move up

Tap to move the layer up one position in the layer drawing order.

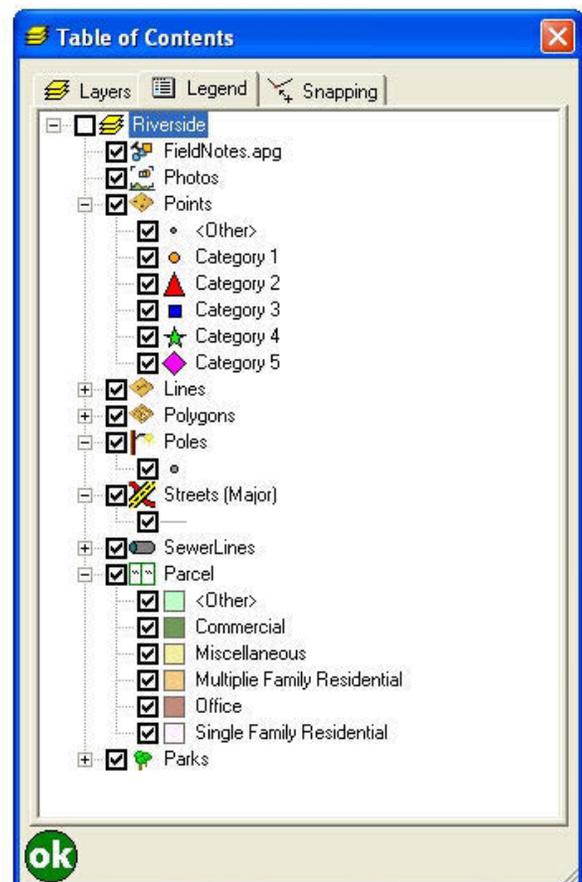
Move down

Tap to move the layer down one position in the layer drawing order.

Delete

Tap this to remove the selected layer.

The Legend tab lists all the layers in the current ArcPad map as well as the symbology for each layer. The visibility of the layers can be turned on or off, and the symbology for the layer can be changed by double-tapping a layer to open the Symbology Properties dialog box for the layer.



10. Collecting GPS/GNSS Data

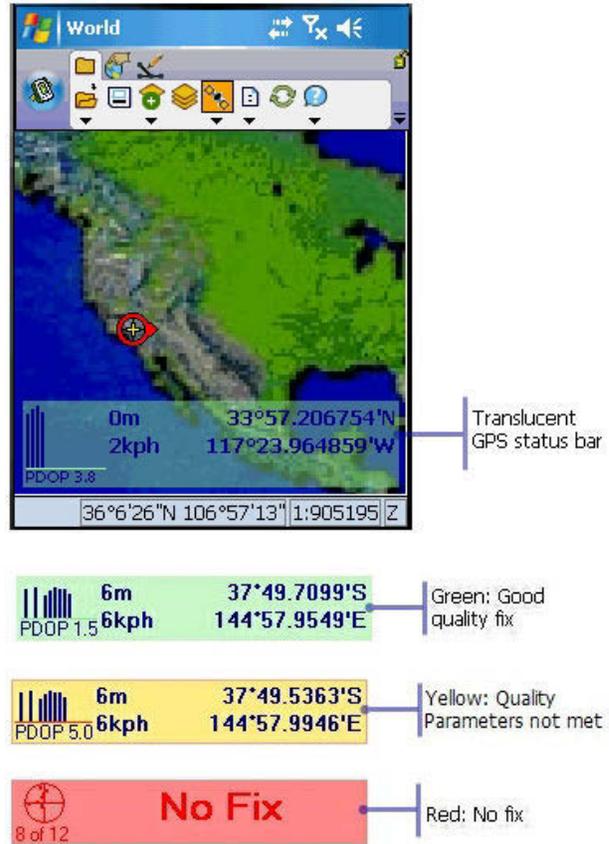
ArcPad can capture points, lines, or polygons using either the stylus or the GPS/GNSS receiver. To collect GPS/GNSS data, you need a clear view of the sky. Satellite signals can be received from any direction, but they can be blocked by people, buildings, heavy tree cover, large vehicles, or powerful transmitters. Anything that blocks light also blocks signals. GPS/GNSS signals can go through leaves, plastics, and glass, but these all weaken the signal.

- a. **Start ArcPad:** To start ArcPad, tap the ArcPad icon on the Home screen.



- b. **Open an ArcPad Document:** When you begin an ArcPad session, you will be prompted to select the way to start the new session: New map, Create a QuickProject, Choose map to open, or Open last map used. In most cases, you'll be working with an existing map, so select "Choose map to open." The Open Map screen will appear and will list all available ArcPad .apm files. Tap on the one you want to open, then tap OK to start ArcPad with the selected map.
- c. **Select a Layer for Editing:** This can be done in one of two places: the Layers page in the Table of Contents or the Start/Stop Editing tool on the Edit toolbar. In ArcPad, you can have up to three layers active for editing—one layer for each feature type: one point layer, one line layer, and one polygon layer. To keep organized, it's suggested that you have just one layer editable at any time. Tap the Start/Stop Editing button. A drop-down list displays all of the editable layers, with a corresponding icon to indicate the type of layer (point, line, polygon). Tap the layer you want to edit. A red box around the layer icon indicates that the layer has been selected for editing. Tap the layer again to unselect it. You cannot edit a layer that was originally edited more than a week earlier; edited data must be routinely downloaded so a new version of the data can be uploaded for editing (i.e., you cannot add to an ssf file older than one week).
- d. **Activate the GPS/GNSS Receiver:** Before any of the GPS/GNSS buttons on the Edit toolbar are enabled, the GPS/GNSS receiver needs to be activated. This can be done in one of two ways: tap directly on the GPS/GNSS Active button in the Main toolbar or tap the arrow below the GPS/GNSS Active button then tap GPS/GNSS Active. The GPS/GNSS Active icon is highlighted with a red box when the GeoXT receiver is active. The GeoXT receiver can only be activated if there is a projection defined for the current ArcPad map. This shouldn't be a problem as long as you open a pre-existing map. Wait until the GeoXT has a signal (this could take several minutes). Initially, the GPS/GNSS Status Bar will state "No Fix" at the bottom of the screen.
- e. **The GPS/GNSS Status Bar and GPS/GNSS Position Window:** The GPS/GNSS Status Bar and GPS/GNSS Position Window are used to display information about the GPS/GNSS satellites and the GPS/GNSS position, as well as navigational information.

- GPS/GNSS Status Bar:** The status bar is a translucent window that displays over the map at the bottom of the screen. The background color of the status bar indicates the current conditions of the GPS/GNSS measurements according to defined settings. A GREEN background indicates that the quality is acceptable according to settings, YELLOW indicates that the quality parameters are not met, and RED indicates no fix. The status bar also shows current position, current speed, and altitude (if applicable). On the left side, the graphical area cycles every few seconds to display skyplot and satellites alternately with signal strength and PDOP. If a destination feature is selected, a compass, distance to the feature, and bearing are displayed intermittently.

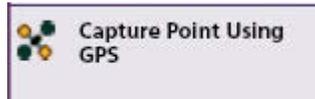


- GPS/GNSS Position Window** – To open this window, tap the drop-down arrow below the GPS/GNSS button and select GPS/GNSS Position Window. The window displays a variety of information about the GPS/GNSS satellites, position coordinates, and navigational information, which is spread across four tabs: Data, Skyplot, Compass, and Quality. The window can only be opened if the GPS/GNSS receiver has been activated; it automatically closes when the GPS/GNSS receiver is deactivated. If the GPS/GNSS receiver is not active, a message box will be displayed. To close the window, tap OK at the lower left corner of the screen.

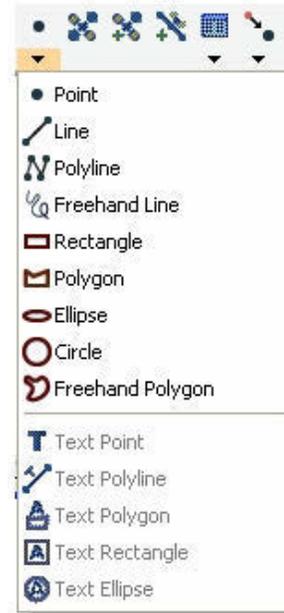
Once the unit has a fix, the GPS/GNSS cursor at the center of the map turns from a red circle with a slash through it to a red circle with a yellow “+” in it.

f. **Creating Point Features Using GPS/GNSS:**

- Select a point layer for editing (see [Section 10c](#)).
- Select the Point option from the feature type menu in the Edit toolbar.
- Tap the GPS/GNSS Point button on the Edit toolbar. The GPS/GNSS Point button is only enabled when a point layer is active for editing.



- The Command bar will be displayed at the bottom of the screen.
- ArcPad will display progress by showing the percentage of GPS/GNSS positions collected relative to the number of positions required for averaging.
- Enter in attributes for the new point feature. You can type in attributes without waiting for the position averaging to be completed. Tap to type in an attribute or to activate a drop-down list. The keyboard may get in the way when trying to fill in some attributes; you may need to turn it off and on to see some fields. To finish data entry in one field, tap on another field.
- To cancel a feature, tap the Cancel button  in the Command bar. The screen will return to the map. **Note:** ArcPad will not confirm that you want to cancel.
- Tap OK to save the attributes and complete the new point feature. The screen will return to the map. **Note:** ArcPad will not confirm that you want to save the data.



g. **Creating Line Features Using GPS/GNSS:**

- Select a line layer for editing (see [Section 10c](#)).
- Select the Polyline option from the feature type menu. The Line option is only for use with the stylus and will not work with GPS/GNSS input. The Command bar will be displayed.
- There are two options available for collecting line features: averaged vertices or streaming. Averaged vertices (the Add GPS/GNSS Vertex button) is good for collecting features with straight lines and sharp corners, such as a fence. A feature is captured one vertex at a time, like collecting a series of points. Streaming (the Add GPS/GNSS Vertices Continuously button) is good for features that are curved, such as a streambank. A feature is captured by walking along its path. The Add GPS/GNSS Vertex and Add GPS/GNSS Vertices Continuously buttons are only enabled when either a polyline or polygon layer is active for editing.
- If the Add GPS/GNSS Vertex button is selected, the Vertex dialog box will appear with a progress bar, which counts down from the specified number of GPS/GNSS positions to average to zero. When the specified number of positions to average is reached, the vertex dialog will close automatically. Move on to the next vertex in



your line, then repeat. Averaged vertices can be handy under heavy canopy; wait at each point until you get enough information to average, then continue.

- If the Add GPS/GNSS Vertices Continuously button is selected, vertices are captured in continuous mode. A vertex will be captured each time ArcPad receives a GPS/GNSS position. To pause GPS/GNSS data capture, see [Section 10i](#).
- You can use averaged vertices and streaming in the same line. For example, click on streaming to start, then click to stop. Then click on averaged vertices for the rest of the line.
- When you're finished capturing a line using either method, tap the Proceed button  on the Command bar to complete the process.
- Enter the attributes for the new line feature. For new features, the Feature Properties dialog box is automatically displayed once the geometry of the new feature has been captured. Tap to type in an attribute or to activate a drop-down list. The keyboard may get in the way when trying to fill in some attributes; you may need to turn it off and on to see some fields. To finish data entry in one field, tap on another field.
- Undoing or canceling your edits – When collecting data using averaged vertices, use the Undo tool  (in the Command bar) to go back a step to the previously captured vertex. With both methods of data collection, use the Cancel tool to erase all edits. The Undo tool is only enabled prior to tapping the Proceed button.
- Tap OK to store the line feature.

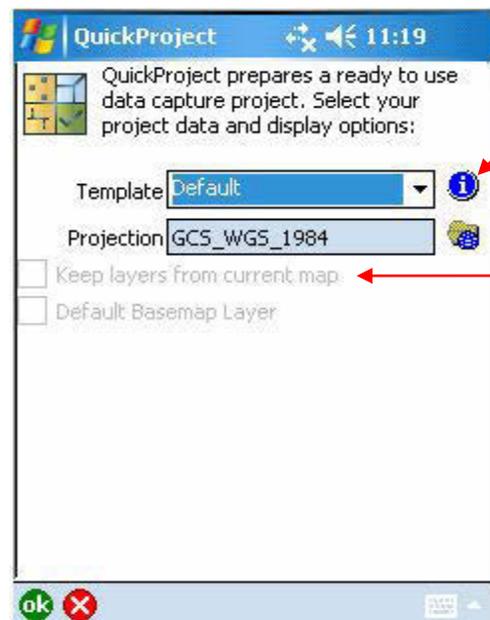
h. **Creating Polygon Features Using GPS/GNSS:**

- Select a polygon layer for editing (see [Section 10c](#)).
- Select the Polygon option from the feature type menu. All other tools are only for use with the stylus and will not work with GPS/GNSS input. The Command bar will be displayed.
- There are 2 options available for collecting polygon features: averaged vertices or streaming. Averaged vertices (the Add GPS/GNSS Vertex button) is good for collecting features with straight lines and sharp corners, such as a fenced area. A feature is captured one vertex at a time, like collecting a series of points. Streaming (the Add GPS/GNSS Vertices Continuously button) is good for features that are curved, such as a wetland. A feature is captured by walking along its outer edge. The Add GPS/GNSS Vertex and Add GPS/GNSS Vertices Continuously buttons are only enabled when either a polyline or polygon layer is active for editing.
- If the Add GPS/GNSS Vertex button is selected, the Vertex dialog box will appear with a progress bar, which counts down from the specified number of GPS/GNSS positions to average to zero. When the specified number of positions to average is reached, the vertex dialog will close automatically. Move on to the next vertex in your polygon, then repeat. Averaged vertices can be handy under heavy canopy; wait at each point until you get enough information to average, then continue.
- If the Add GPS/GNSS Vertices Continuously button is selected, vertices are captured in continuous mode. A vertex will be captured each time ArcPad receives a GPS/GNSS position. To pause GPS/GNSS data capture, see [Section 10i](#).



- You can use averaged vertices and streaming in the same polygon. For example, click on streaming to start, then click to stop. Then click on averaged vertices for the rest of the polygon.
 - When you're finished capturing a polygon using either method, tap the Proceed button  on the Command bar to complete the process; the polygon will automatically close with the first vertex.
 - Enter the attributes for the new polygon feature. For new features, the Feature Properties dialog box is automatically displayed once the geometry of the new feature has been captured. Tap to type in an attribute or to activate a drop-down list. The keyboard may get in the way when trying to fill in some attributes; you may need to turn it off and on to see some fields. To finish data entry in one field, tap on another field.
 - Undoing or canceling your edits – When collecting data using averaged vertices, use the Undo tool  (in the Command bar) to go back a step to the previously captured vertex. With both methods of data collection, use the Cancel tool  to erase all edits. The Undo tool is only enabled prior to tapping the Proceed button.
 - Tap OK to store the polygon feature.
- i. **Pause/Resume:** This can be useful for getting around obstacles when collecting lines or polygons in streaming mode. ArcPad continuously captures vertices in a streaming mode when the Add GPS/GNSS Vertices Continuously tool is active. Tap the Add GPS/GNSS Vertices Continuously button to pause capturing vertices. Tap the button again to resume capturing vertices.

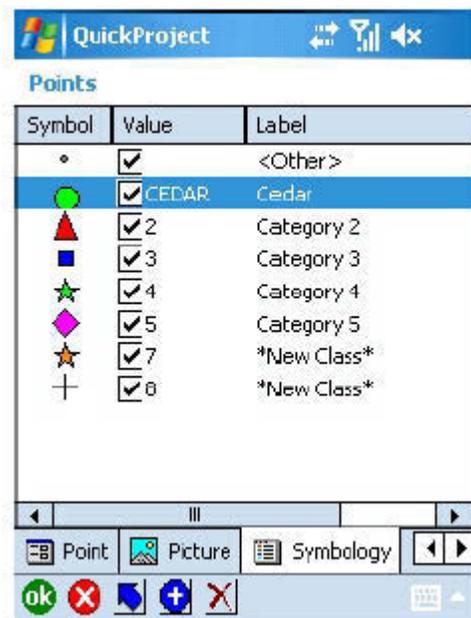
- j. **Collecting Data at an Unexpected Stop/Creating a New Shapefile:** ArcPad works with a map and data specific to a project area. What if you have to make an unexpected stop and collect data on the way to the original project area? Or you require a new shapefile to collect unexpected data? QuickProject  works for both situations. QuickProject creates a “ready to use” data capture project. It can be accessed in a couple of different ways: (1) When you first open ArcPad, one of the options is “Create a QuickProject,” (2) Via a button in the Open Map window, or (3) via the Open Map menu in ArcPad’s Main toolbar (New | QuickProject...). The QuickProject tool:



- Closes the current map, if one is open. Select the default template; this will be the only option available unless you created your own QuickProject templates. An option is provided to keep the layers from the current map, that is, to automatically add the layers from the current map to the new QuickProject map. This is recommended (see below).

- Creates a new project folder, located in the default folder. The new project folder is called QuickProject YYYY-MM-DD HHMMSS, where YYYYMMDD is the current date and HHMMSS is the current time.
- Creates three new shapefiles in the project folder: Points.shp, Lines.shp, and Polygons.shp. Each new shapefile has the following fields: Name, Category, Date, Comments, and Photo. Each layer is symbolized based on the Category field. If the option is selected to keep the layers from the current map, then the projection of the new QuickProject shapefiles, and the new QuickProject map, will be the same as the projection of the current map (otherwise, it will be lat./long. WGS84). This is a good argument to keep the layers.
- Creates a new ArcPad map, called QuickProject.apm, in the project folder. The map contains all three new shapefiles; each shapefile is activated for editing and the Identify tool. The QuickProject.apm is automatically loaded into ArcPad.
- Creates a QuickForm for each new shapefile. The QuickForm contains a pick list for the Category field and is automatically displayed once a feature is captured.

By default, there are 5 categories: Category 1 – Category 5. You may wish to rename the categories using terms that are more appropriate for the type of data you’re capturing. You can rename the existing categories, change the value of a category, add new categories (“+” button at the bottom of the page), delete categories (“X” button at the bottom of the page), and change the symbol for each category. To do this, go to the Table of Contents and select the feature you want to change. Click on the Layer  properties button on the right margin of the Table of Contents, then go to the Symbology page.



Note: A shapefile created in the field will not check in with the other data. Be sure to let the office staff know when you use QuickProject.

- k. **Saving an ArcPad Map:** After you finish working on a map, you can save it or not. It is not necessary to save an ArcPad map to preserve the GPS/GNSS edits; each time you store a feature, the geometry and attributes are automatically updated. To save a map, tap the Save Map button in the Main toolbar.
- l. **Exiting ArcPad: Before turning off the unit, you should deactivate the GPS/GNSS receiver and exit ArcPad.** Failing to do so may corrupt the field data. To deactivate the GPS/GNSS receiver, either tap the GPS/GNSS Active button or tap the arrow below the GPS/GNSS Active button and then tap GPS/GNSS Active. To exit ArcPad, tap the arrow below the Open Map button and then tap Exit. Tapping the “X” in the upper right corner of the screen will not exit the ArcPad application, but will minimize it.
- m. **Turning off the GeoXT:** Turn off the unit by pressing the green Power button below the screen.

11. Other ArcPad® 10.0 Functions

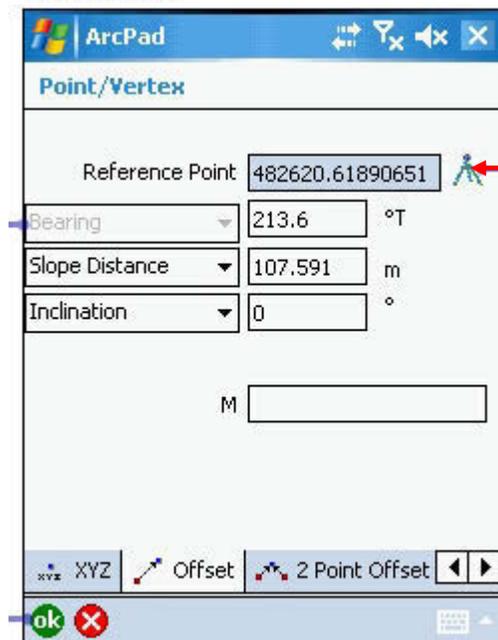
- a. **Repeating Attributes:** Using the Repeat Attributes tool, ArcPad will populate the attribute information of any new feature you create using the attribute information of the current feature. Create a new feature whose attributes you would like repeated when creating subsequent features. Before tapping OK to save the attributes and complete the current feature, tap the Repeat Attributes  tool at the bottom of the Feature Properties dialog. Repeat Attributes is active when there's a white box around the green arrow. When a new feature is created, the Feature Properties dialog is displayed and the attribute information is populated. Double-check the attributes, make any necessary changes, and then tap OK. Tap the Repeat Attributes tool again to deactivate it.
- b. **Offsets:** Offsets are used in the following situations: when mapping the location of an inaccessible feature because it's either difficult to reach or it's not safe to reach (a manhole in the middle of a busy road), or when mapping the location of a feature where it's not possible to get a GPS/GNSS signal (under a large tree).

- **1 Point Offset**

A 1 point offset enables you to create a point offset from a single reference point. The reference point can be set using the GPS/GNSS. A 1 point offset uses bearing and either slope distance and inclination, or horizontal distance and vertical distance to calculate the offset.

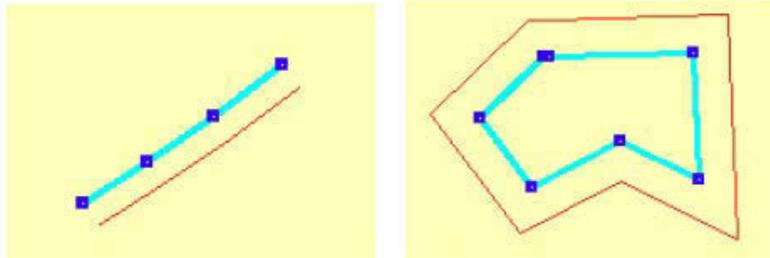
To make a point layer editable, tap the drop-down arrow below the Offset Point button to display the drop-down list. Tap "Offset Point." Tap "Set Reference Point A." A red box around the "Offset Point" and "Set Reference Point A" options indicates they're active. Select the Point option from the feature type menu. Tap the Capture Point using the GPS/GNSS button. The Point/Vertex dialog opens on the Offset page. Tap what looks like a tripod to the right of the Reference Point box to indicate you want to use your current GPS/GNSS location as the reference point. A new window opens. You don't need to do anything except tap OK.

Back in the Point/Vertex dialog, fill in the fields. The Bearing, Slope Distance, and Inclination fields are the defaults to fill in. You can use the drop-down arrows next to Slope Distance and Inclination to change those fields to Horizontal Distance and Vertical Distance. Fill in the distance in the



units indicated. Tap OK. Fill in the attributes. Tap OK to save the feature. The new feature should be displayed with offsets on the mobile device.

▪ **Simple Offset of a Line or Polygon**



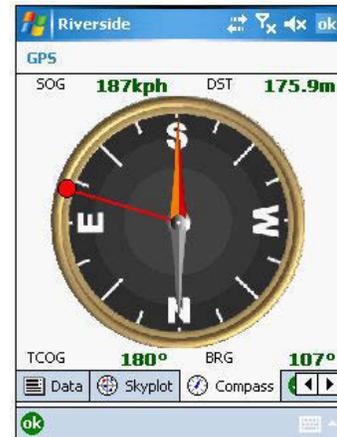
Polyline (left) and polygon (right) using simple offsets in ArcPad. The blue line is the line captured. The red line is the offset line that becomes the resultant feature when the feature is completed.

A simple offset of a line or polygon only uses a distance measurement. Using a simple offset, you can map a feature that's a constant distance away from a line or polygon captured via GPS/GNSS. You would specify whether the new feature is left or right of the captured feature. For example, you could map the centerline of a road that is 15 feet to the left of a sidewalk.

- Select a line or polygon layer for editing.
 - Tap the drop-down arrow below the Offset Point button.
 - Tap Offset Polyline/Polygon. A red box around Offset Polyline/Polygon indicates it's active.
 - The Poly Offset dialog box is displayed.
 - Tap the Left or Right checkbox to determine the relative position of the offset. Specify the distance value in the units indicated. Tap OK.
 - Tap the Polyline or Polygon option from the feature type menu.
 - Tap the Add GPS/GNSS Vertex or Add GPS/GNSS Vertices Continuously button and collect the line or polygon.
 - Tap the Proceed button to complete the process.
 - Enter the attributes for the new feature.
 - Tap OK to store the new feature.
 - The new feature will be displayed with offsets on the mobile device.
- c. **Nesting Features:** It's possible to create GPS/GNSS point features while capturing a polyline or polygon feature. The GPS/GNSS Point button will be enabled (if a point layer is active for editing), even when the Polyline or Polygon button is active and a line or polygon feature is in the process of being captured. While capturing a polyline or polygon, you can tap the GPS/GNSS Point button to capture a point feature without having to first end the capture of the line or polygon feature. Pause streaming GPS/GNSS data if it is active.
- d. **Extending a Line:** You can extend a line feature by adding vertices to the tail, or end, of the line using the Append Vertices tool. The Append Vertices tool is selected from the Feature Properties menu  (in the Edit toolbar). In order to extend a line at the head (or start) of a line, you can use the Insert Vertices tool found in the same menu.

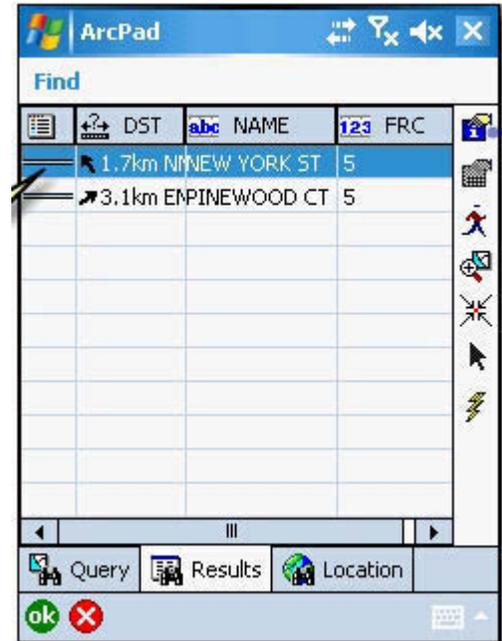
- Select a line layer for editing.
 - Select the line feature you want to extend.
 - Select the Polyline option from the feature type menu.
 - Tap Append Vertices.
 - Tap either the Add GPS/GNSS Vertex or the Add GPS/GNSS Vertices Continuously button to add vertices.
 - Tap the Commit Geometry Changes button in the Command bar when you're finished extending the line. 
 - To exit the append vertices mode, tap any other tool, such as the Select tool, to activate it and deactivate the Append Vertices tool.
- e. **Inserting a Vertex:** You can insert vertices into a selected line or polygon feature using the Insert Vertices tool, which is selected from the Feature Properties menu  (in the Edit toolbar).
- Select a line or polygon layer for editing.
 - Select the line or polygon feature you want to edit.
 - Select the Polyline or Polygon option from the feature type menu.
 - Tap Insert Vertices.
 - Tap on the map to insert a vertex manually, which will then be moved to a GPS/GNSS location.
 - From the Select menu, tap the Select and Vertex Editing  tool.
 - Tap and hold on the vertex you added manually.
 - When the Move To menu comes up, tap "Move To GPS/GNSS...".
 - Tap the Commit Geometry Changes button in the Command bar when you're finished editing. 
 - To exit the Insert Vertices mode, tap any other tool, such as the Select tool, to activate it and deactivate the Insert Vertices tool.
- f. **Creating Segmented Polyline Features:** With the Segment Polyline tool, any new polyline feature you create begins at the end of your previously selected line feature. This capability is useful for capturing line features in succession that may have different attributes. For example, you can capture a continuous road that has been segmented based on its pavement conditions. This tool is only available with the Polyline feature type.
- Select a line layer for editing.
 - Select the line feature whose end you want to be the start of your new feature.
 - Select the Polyline option from the feature type menu.
 - In the Offset menu on the Edit toolbar, select Segment Polyline.
 - The last vertex of the previously selected feature is highlighted using a blue box. This is the start vertex of your new feature.
 - Tap either Add GPS/GNSS Vertex or Add GPS/GNSS Vertices Continuously button to add vertices.
 - Tap Proceed to finish the line segment.
 - Enter attribute information.
 - Tap OK.
 - Repeat as needed.

- g. **Navigation:** Use the Find tool to select a point to which you want to navigate (see Sections 11i and 11j). Open the GPS/GNSS Position Window from the GPS/GNSS Active menu in the Main toolbar and go to the Compass page. This window displays your direction or course over ground (COG) with a red arrow and the direction or bearing (BRG) from the current GPS/GNSS position to the destination with a red line with a dot on the end. Line up the red arrow with the red line/dot and proceed to the target. An alert message and sound will signal when you're within 20 feet of the destination.



- h. **Identifying Features:** The Identify tool (in the Browse toolbar) lets you view attribute information for a particular feature. Once a data layer has been selected for use with the Identify tool (in the Table of Contents), make the Identify tool active by tapping on it and then tap on one of the layer's features. The Feature Properties dialog box is then displayed. (Increase the pen tolerance if you're having difficulty selecting a feature. The pen tolerance can be set in the Display page of the ArcPad Options dialog box. The ArcPad Options button is on the Main toolbar.)
- i. **Finding Features by Attribute Query:** The Find tool can be used to select features from a layer using a search query.
- Tap the Find button on the Browse toolbar (the binoculars). The Find dialog box opens.
 - Use the arrows at the bottom of the page to navigate to the far right, where you'll find the Query, Results, and Location pages.
 - On the "Query" page, tap the "Layer" drop-down list to select the layer you wish to search.
 - Check the "Search only features in view" box to limit the search to the features in the current map view.
 - Tap the "Field" dropdown list to select the field to search on, or use the default "*" to search all fields in the layer. You can also select an operator, or use the default "Contains" operator.
 - In the "Value" box, use the keyboard to type the value you want to find. If no value is entered, ArcPad will ask if you want all the records in the layer to be returned.
 - Optionally, select a second field to search on by tapping the second field drop-down list. The AND/OR drop-down list is automatically enabled when a second search field is selected. You can search up to three fields using the AND/OR operators.
 - Tap the Results page to execute the search and view the results of the query.
 - ArcPad displays a list of features based on your query on the Results page of the Find dialog box. The results list can be sorted by tapping any of the column headings. Tapping a column heading once will sort the column in the ascending order. Tapping a second time will sort in the descending order. You can scroll to view all the attributes of a feature. Tap the feature you're searching for. Tap OK to view the selected feature highlighted in the map.

- Before you tap the OK button, you can perform a number of actions on the selected feature using the buttons along the right margin of the Results page, including:
 - View information about the feature using the Identify tool (make sure the data layer has been selected for use with the Identify tool in the Table of Contents). This is the first button along the right margin of the page.
 - Use the feature as a navigation target. Tap the Go To button, which is the third button, then open the GPS/GNSS Position Window to navigate to the point (see [Section 11g](#)).
 - Center the selected feature on the screen (the fifth button).
 - Edit the feature. Tap the Feature Properties button (the second button). The Feature Properties dialog box displays. If the layer is set as editable, the properties can be edited.



- j. **Locating Features by Coordinates:** The Find tool can also be used to find a location based on a set of coordinates. You can select from the following coordinate systems: the current map projection, Latitude/Longitude, the current UTM Zone, and MGRS (Military Grid Reference System).
 - Tap the Find button on the Browse toolbar (the binoculars). The Find dialog box opens.
 - Tap the Location page.
 - Select the appropriate coordinate system, then use the keyboard to enter the coordinate information. If you select the Latitude/Longitude option, decimal minutes are preferred (ex. 122 53.94645 W, 47 2.1327 N), but other formats are accepted (ex. 122 53 56.787, 47 2 7.962; 122.8991075 47.035545).
 - Enter a name for the point's label. The default label is "Mark."
 - Tap OK.
 - The location is labeled on your map.
 - The location automatically becomes a navigation target; a small navigation compass appears at the bottom of the screen. Tap the small compass to go to the navigation page in the GPS/GNSS Position Window (see [Section 11g](#)).
- k. **Measuring Distance, Radius, and Area on the Map:** ArcMap has Measure, Radial Measure, and Freehand Measure tools available via the drop-down arrow below the Identify button (the Browse toolbar).
 - **Measure:** Measures distances in the map view in point mode. Tap on the screen to delineate a line or area. Tap the Proceed button on the Command bar to end and view the measurements in the Measurement Information window. The

Measurement Information dialog box displays the following information: the coordinates (from and to location); the direct distance (from start to end); the actual distance drawn; the bearings; and, if you drew more than two vertices, the estimated closed area of the shape.

- **Radial Measure:** Measures the radius of a circle using the stylus. Tap on the screen, then drag the stylus the radial length you wish to measure. The Measurement Information window will open automatically when the stylus is lifted from the screen and list the following information: the coordinates (from and to location), the radius, the perimeter, the bearings, and the area.
- **Freehand Measure:** Measures distances in the map view in freehand mode. Tap the screen, then drag the stylus around to delineate a line or area. The Measurement Information window will open automatically when the stylus is lifted from the screen and list the following information: the coordinates (from and to location), the direct distance (from start to end), the actual distance drawn, the bearings, and the area.

12. Data Collection Best Practices

Trimble® has come up with some new data collection best practices to work with their latest hardware and software improvements ([Trimble Mapping and GIS Webinar Series: Mapping and GIS GPS Data Collection Best Practices](#), 12/16/2010). They include:

- a. Keep the GPS/GNSS antenna correctly oriented to the sky.
 - If you aim the antenna at the ground, it will pick up reflected signals and degrade accuracy. This includes the time spent walking between features.
 - Consider turning off the device rather than walking with the antenna pointing down.
- b. Collect good quality GPS/GNSS measurements between features (30–60 seconds minimum). This doesn't mean actually collecting a point or other feature, but having ArcPad connected to the GPS/GNSS receiver and having the antenna correctly oriented to the sky while standing or walking in the open. For example:
 - Collect good measurements in the open while walking toward the “tough” feature.
 - Collect the feature.
 - Collect more good measurements while walking away toward the open.

Why? Good data before/after the feature helps the postprocessing software to smooth out the data collected at the feature where conditions aren't optimal.

- c. How long should a point feature be logged in difficult conditions? In difficult conditions, or if the accuracy is less than desirable, log for 15 or 30 seconds, or even longer if necessary.
- d. Use an external antenna in tough environments.
 - It's easier to get above your body.
 - The signal reception is stronger.
 - There are fewer reflected signals.

13. Miscellaneous

Most of the information in this section is from [Trimble GeoExplorer 6000 Series Datasheet](#). Additional information is from colleagues and vendors.

- a. **Weather Issues:** The GeoXTs are designed to be water resistant, dustproof, and shock resistant. They can be used between -4 and 122 degrees Fahrenheit and can be stored between -22 and 158 degrees Fahrenheit. Despite their ruggedness, there are a few things to keep in mind:
 - In hot weather (~ > 90 degrees F), the screen protectors seem to mark up more easily. This could make it more difficult to see the screen. Notify GPS/GNSS support staff if the screen protectors need to be changed.
 - Avoid using the GPS/GNSS receiver in weather that would allow snow or ice to build up on the antenna. This could block the GPS/GNSS satellite signals.
 - Avoid using the GPS/GNSS receiver when lightning is imminent; the antenna makes an excellent **lightning rod**.
- b. **Heavy Canopy:** Heavy canopy can block radio signals from the GPS/GNSS satellites. The new Floodlight Technology should help this situation. Collecting lines and polygons using averaged vertices may also help improve data collection in this adverse environment.

14. References

ESRI® ArcPad® 10.0 Help Library:

🔗 <http://help.arcgis.com/en/arcpad/10.0/help/index.html>

GeoExplorer® 6000 Series User Guide, Version 1.00, Revision A, February 2011:

🔗 http://tienda.eptisa.com/archivos_web/file/geoexplorer%206000/manual%20usuario/geoexplorer_6000_series_manual_usuario_ingles.pdf

Trimble® GeoExplorer® 6000 Series Datasheet, 5/7/2012:

🔗 http://trl.trimble.com/docushare/dsweb/get/document-597676/022501-285a_geo%20series%206000_ds_0212_mgis_lr_nc.pdf

Trimble® Mapping and GIS Webinar Series: Mapping and GIS GPS Data Collection Best Practices, 12/16/2010:

🔗 <http://www.trimble.com/mappinggis/webinars.aspx>

15. Acronyms

AC	Alternating Current	GLONASS	GLObal NAVigation Satellite System
ArcPad	ArcPad® 10.0 with service pack 1	GNSS	Global Navigation Satellite Systems
BRG	Bearing	GPS	Global Positioning System
COG	Course over ground	GPSCorrect	GPSCorrect™ 3.20
ESO	WSDOT, Environmental Services Office	LED	Light emitting diode
GeoXT	Trimble® GeoExplorer® 6000 Series GeoXT™ handheld	PDOP	Precision Dilution of Position
GIS	Geographic Information System	SIM	Subscriber identity module