



Esri ArcPad: Working with Offsets

(From the Esri ArcPad User's Guide online)

http://resources.arcgis.com/en/help/arcpad/10.2/app/index.html#/Working_with_offsets/00s1000000pm000000/

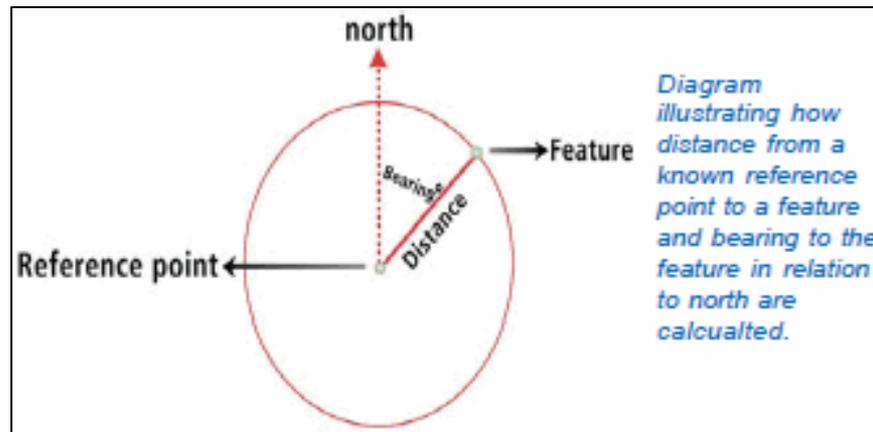
Introduction

Offsets are used for GIS data collection in the following situations:

When mapping the location of an inaccessible feature because it is either difficult to reach or it is not safe to reach. For example, a tree on an island, or a manhole in the middle of a busy road.

When mapping the location of a feature where it is not possible to get a GPS signal, or a GPS position of sufficient accuracy. For example, under a large tree or in a narrow street or 'urban canyon'.

Offsets combine the use of distance, bearing (or angle), and/or inclination (or slope) to determine the location of features. In ArcPad, there are two types of offsets: simple and complex.





Simple Offsets

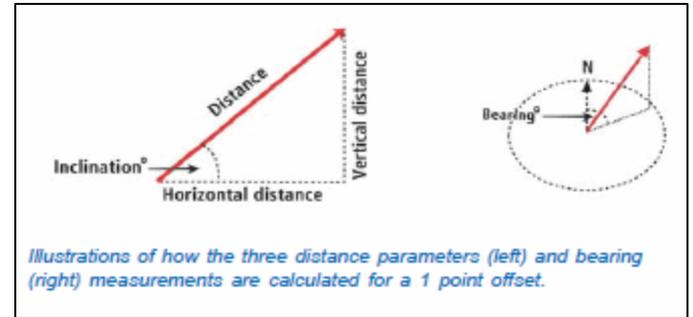
A simple offset is performed on a polyline or polygon and only uses a distance measurement. Using a simple offset, you would map a feature that is a constant distance away from a polyline captured via pen or GPS. You would also specify whether the new feature is left or right of the captured polyline. For example, you could map the distance of a new sidewalk to the left of and at a distance of 5 meters from the center of an existing road.

Complex offsets

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. ArcPad supports 1 point offsets and 2 point offsets. A 1 point offset uses distance and bearing measurements (distance-bearing) to determine the offset. A 2 point offset uses either 2 distance measurements (distance-distance) or 2 bearing measurements (bearing-bearing) to calculate the offset. Inclination can be used in combination with any of these offsets, if a height value is known and you are storing your results in a shapefile that supports a z value.

1 point offset

A 1 point offset enables you to create a point or vertex offset from a single reference point. The reference point can be set using a pen, GPS, or manually entered coordinates. A 1 point offset uses bearing and two other parameters such as slope distance, horizontal distance, vertical distance, or inclination to calculate the offset. Refer to the diagrams below for an illustration of the distance and bearing parameters.



Typically you would select a 1 point offset if you were using a rangefinder that included a built-in compass. For example, you could capture a tree (target) that was a distance of 15m and had a bearing of 45 degrees from True North from your location, a known reference point.

The screenshot shows the ArcPad interface with the 'Point/Vertex' dialog box open. The 'Reference Point' is set to 483032.53587375. The 'Bearing' is 328.8 °T, 'Slope Distance' is 194.284 m, and 'Inclination' is 0 °. There is an empty 'M' field. At the bottom, there are buttons for 'XYZ', 'Offset', and '2 Point Offset', along with 'ok' and 'cancel' buttons.

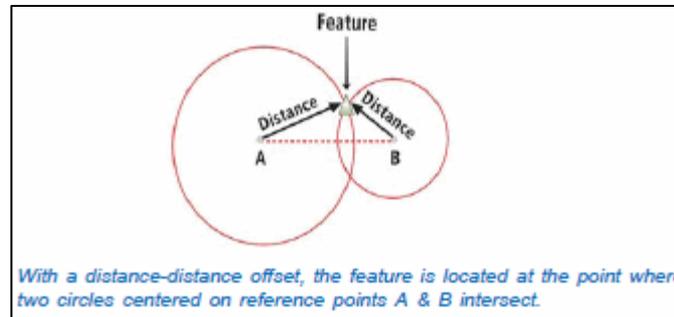
The Point/Vertex dialog box displaying the 1 point offset parameters.

2 point offsets

A 2 point offset enables you to create a point based on two reference points (A & B). The reference points can be set using a pen, GPS, or manually entered coordinates. There are two variations available in ArcPad for the 2 point offset: distance– distance and bearing–bearing. Typically, you would use a 2 point offset to calculate point features rather than vertices for a polyline or polygon.

Distance-distance

A distance-distance offset is used when the bearings are not known from the reference points but the distances are. For example, when you are using a rangefinder without a compass. The distance between the feature and the two reference points A & B are used to calculate the location of the feature. The feature's location is at the point where the two circles centered around reference points A and B intersect. Without a bearing, there are two possible solutions to this type of offset. You must, therefore, determine (and set) if the offset point is to the left or right of an imaginary line between Reference points A & B. Vertical distance or inclination are required if a correct 3-dimensional solution is to be calculated.

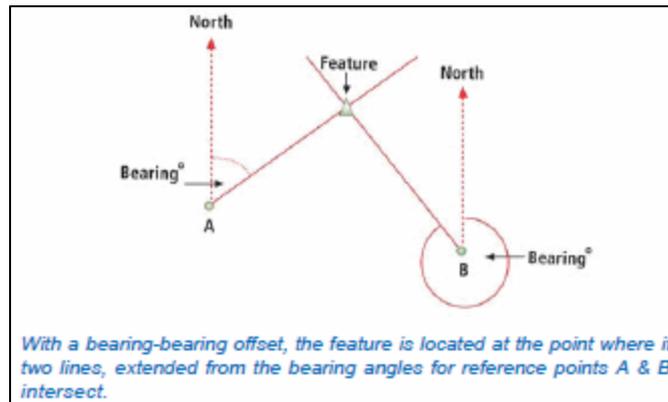


M or Measure field

The Offset and 2 Point Offset pages in the Point/Vertex dialog box include a box to enter a measure, or M, value for the target point. The x, y, and optionally z coordinates are calculated automatically but the M value needs to be entered manually. The M field is not a default field in a shapefile, and therefore must be created when the shapefile is created. Data can only be entered in this input box if the editable shapefile contains an M field.

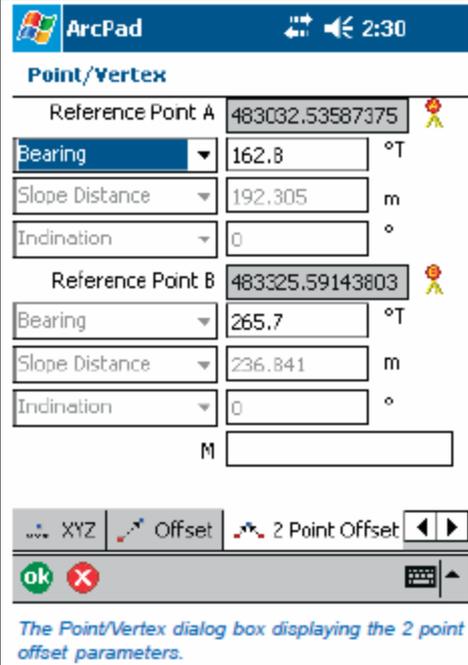
Bearing–bearing

A bearing–bearing offset is used when two bearings are known for the reference points but the distances are not. For example, when you are using a compass without a rangefinder. The bearing from north from each of the two reference points A & B is used to calculate the location of the feature. The feature's location is at the point where the two bearing lines intersect. Vertical distance or inclination are required if a correct 3-dimensional solution is to be calculated.



M or Measure field Cont.

By default, a 2 Point Offset in ArcPad is bearing–bearing. To activate the distance–distance solution, tap the bearing dropdown and set the location of the offset point. The distance– distance solution requires that you nominate which side of the A–B line the offset point lies. Once activated, the distance fields can be completed. With a rangefinder active, the fields are automatically populated.



The screenshot shows the ArcPad interface for a Point/Vertex dialog box. The title bar includes the ArcPad logo, signal strength, and a time of 2:30. The dialog is titled "Point/Vertex" and contains the following fields and controls:

- Reference Point A:** 483032.53587375
- Bearing:** 162.8 °T
- Slope Distance:** 192.305 m
- Incination:** 0 °
- Reference Point B:** 483325.59143803
- Bearing:** 265.7 °T
- Slope Distance:** 236.841 m
- Incination:** 0 °
- M:** (empty field)

At the bottom, there are three radio button options: "XYZ", "Offset", and "2 Point Offset". The "2 Point Offset" option is selected. Below the options are "ok" and "X" buttons, and a keyboard icon.

The Point/Vertex dialog box displaying the 2 point offset parameters.

Laser Technology Inc.

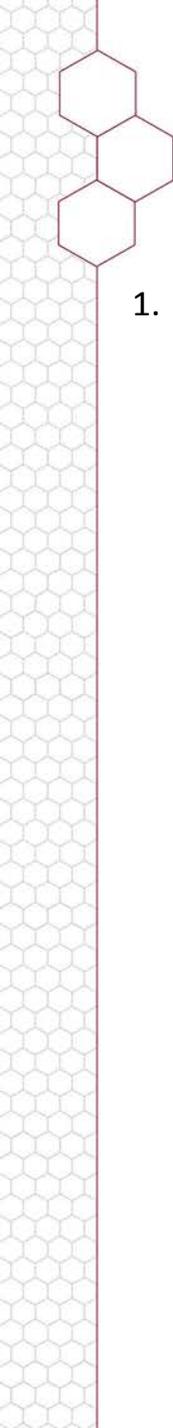
1.800.280.6113 or 1.303.649.1000

info@lasertech.com

sales@lasertech.com

support@lasertech.com

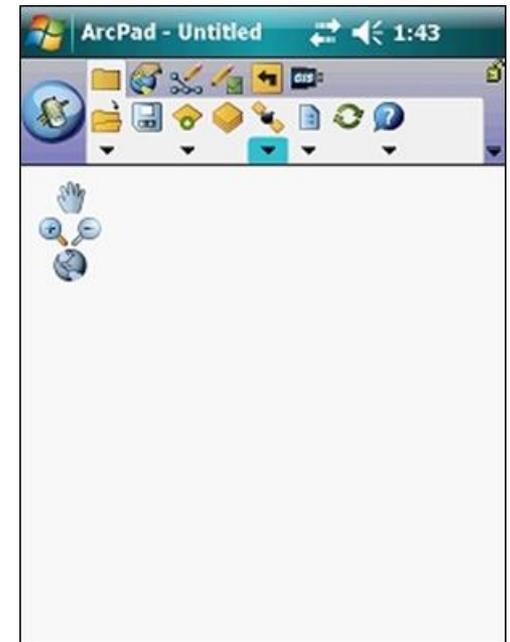
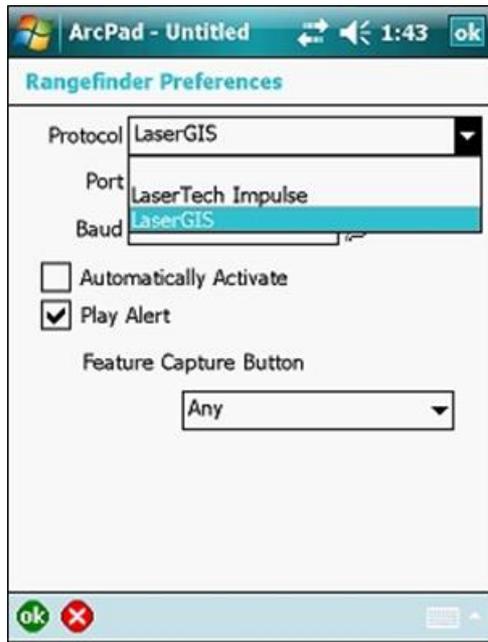
 LASER TECHNOLOGY INC.



Connecting & Activating TruPulse

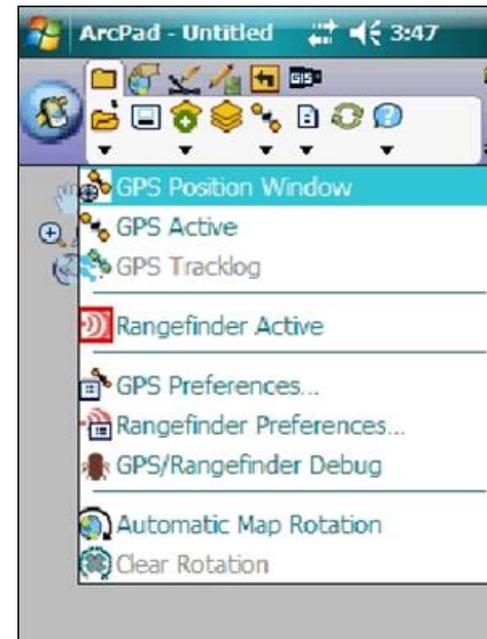
1. Set the TruPulse protocol and communication parameters in the Rangefinder Preferences dialog box to match the settings on the TruPulse.
 - a. Protocol: Choose the protocol of your rangefinder's output: "LaserTech Impulse"
 - b. Port: Choose the COM port that your TruPulse is connected to on your device.
 - c. Baud: Choose the baud rate of your TruPulse's output. The default is 4800.
 - d. Advanced Serial Port Parameters: Tap NO ALT TEXT to open the Advanced Serial Port Parameters dialog box to specify additional communication settings for the serial port used to connect your TruPulse. For most rangefinders, it should not be necessary to specify these additional serial communication settings.
 - e. Automatically Activate: When checked, the TruPulse is automatically activated whenever an existing ArcPad map file (.apm) with a defined projection is opened.
 - f. Feature Capture Button: Choose the Feature Capture button on the rangefinder, which notifies ArcPad to capture a vertex or point: None, Any, or Button 0 to Button 15. Choose "any".
 - g. Press "ok"

Connecting & Activating TruPulse



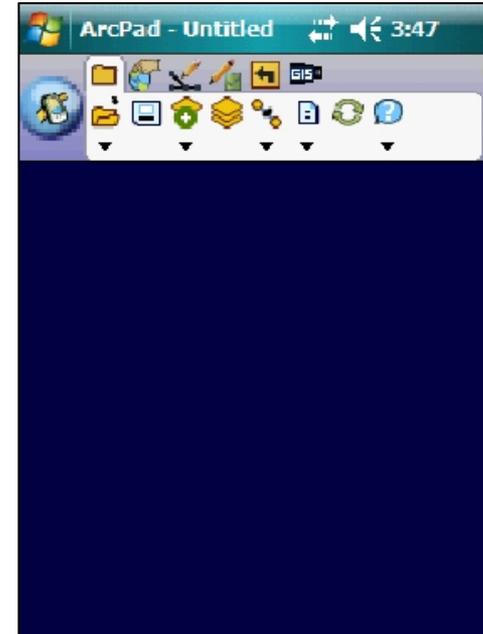
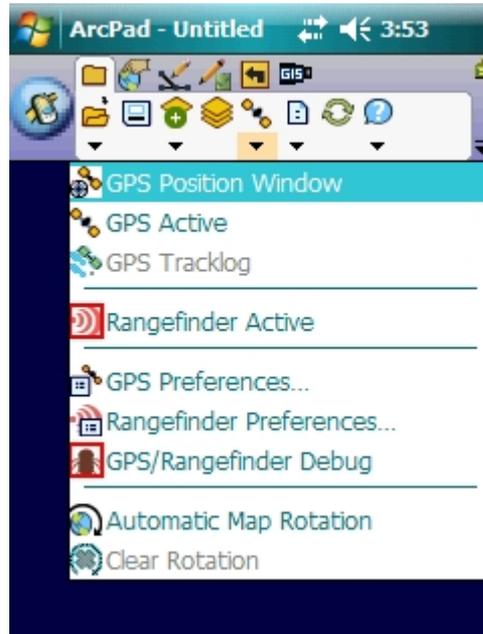
Connecting & Activating TruPulse

7. Tap the arrow to the right of the GPS Active Menu button to display the drop-down list, Tap “Rangefinder Active”
 - a. The Rangefinder Active icon is highlighted with a red box when the TruPulse is active.



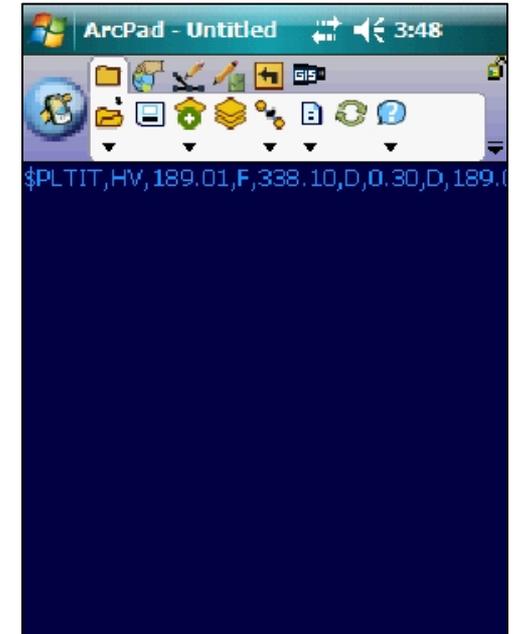
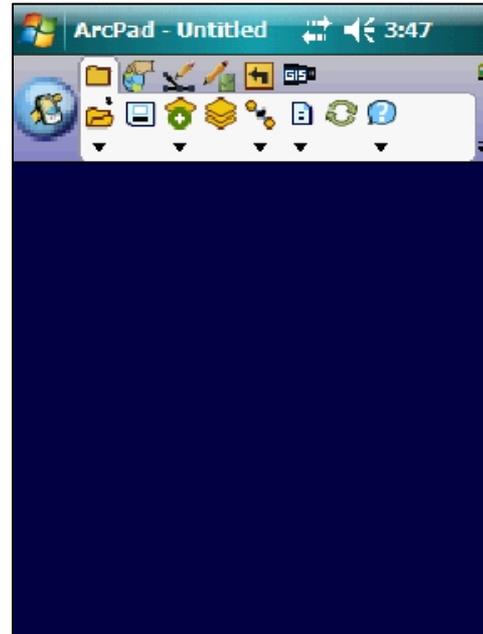
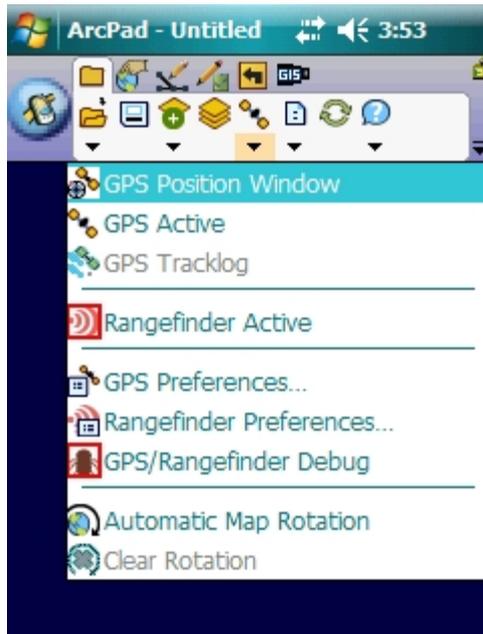
Connecting & Activating TruPulse

8. To verify the TruPulse is connected and the serial string is downloading correctly.
 - a. Tap the arrow to the right of the GPS Active Menu button to display the drop-down list, Tap “GPS/Rangefinder Debug”
 - b. Once in this screen, fire the TruPulse laser to view the serial string.



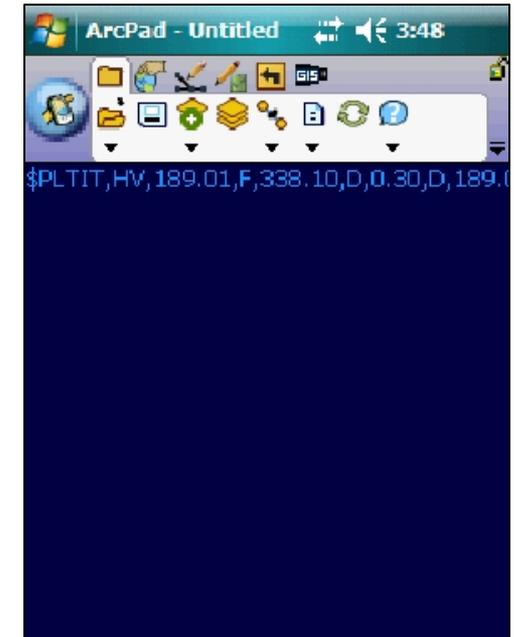
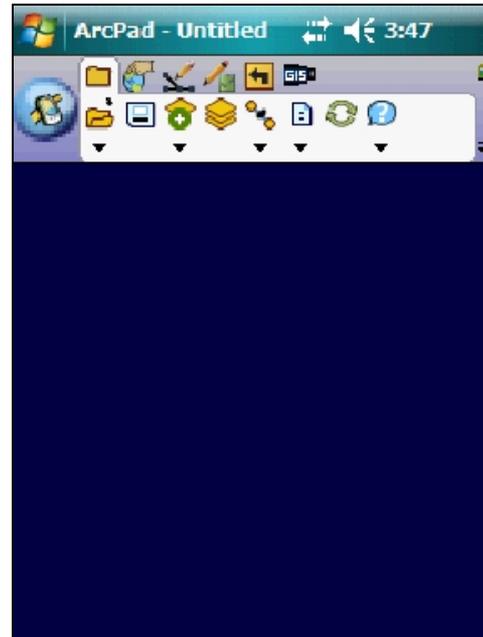
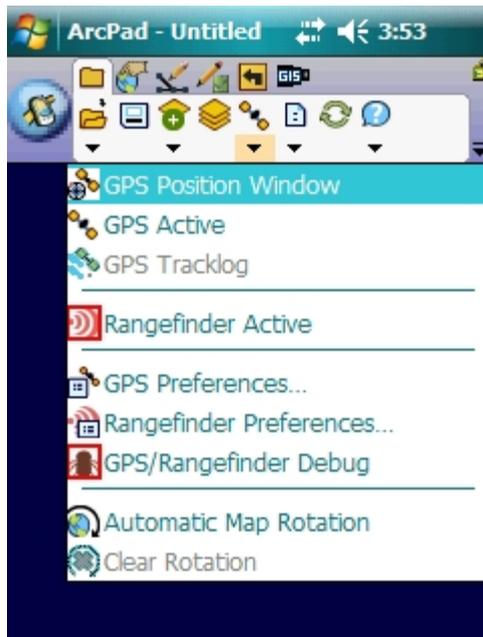
Connecting & Activating TruPulse

8. To verify the TruPulse is connected and the serial string is downloading correctly.
 - a. Tap the arrow to the right of the GPS Active Menu button to display the drop-down list, Tap “GPS/Rangefinder Debug”
 - b. Once in this screen, fire the TruPulse laser to view the serial string.



Connecting & Activating TruPulse

8. To verify the TruPulse is connected and the serial string is downloading correctly.
 - a. Tap the arrow to the right of the GPS Active Menu button to display the drop-down list, Tap “GPS/Rangefinder Debug”
 - b. Once in this screen, fire the TruPulse laser to view the serial string.



9. Once the serial string is confirmed, close window by tapping the arrow to the right of the GPS Active Menu button to display the drop-down list, tap “GPS/Rangefinder Debug” to inactivate.

Taking a laser offset

Use the editing tools to create new point, line, or polygon features. To create point features, tap once on the map or tap the GPS Point button. The new feature is saved in the selected layer of the same feature type. You can use offsets and a rangefinder to determine the location of your point feature. Capture features when you are using both a GPS and rangefinder in 3 different ways:

1. 1 and 2 point offsets using TruPulse models only
2. 1 point offset with GPS and TruPulse 360 models
3. 2 point offset with GPS and TruPulse 360 models

1 and 2 point offsets using TruPulse models only

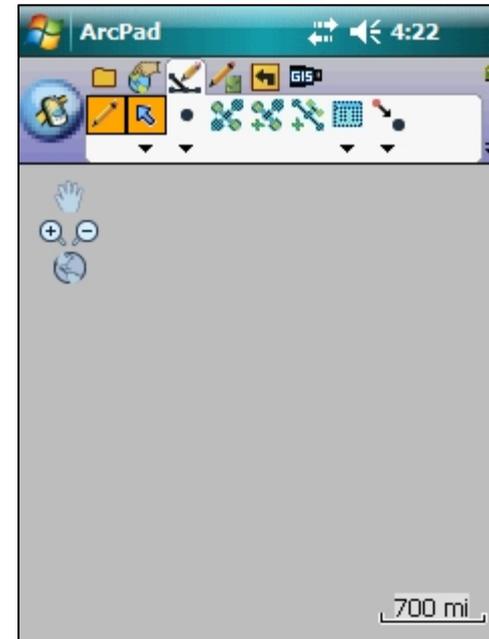
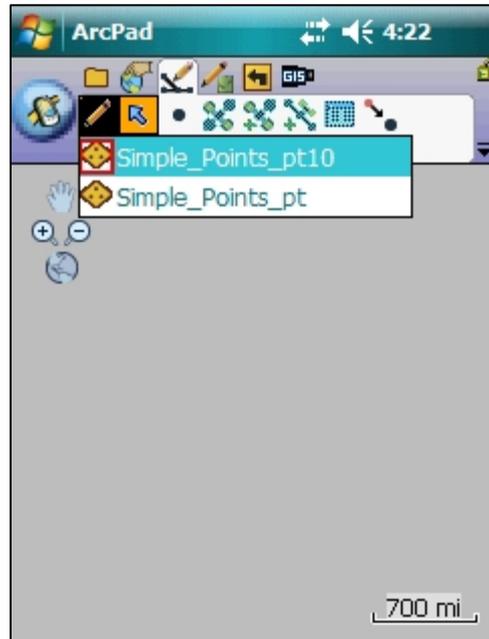
You can create features that have a different offset value for each point or vertex of the feature, as measured by a TruPulse 200/360 standalone.

- 1 point offset enables you to create a point or vertex offset from a single reference point and uses bearing and two other parameters such as slope distance, horizontal distance, vertical distance, or inclination to calculate the offset. This is performed using a TruPulse 360 model.
- 2 point offset enables you to create a point based on two reference points (A & B). When you use a rangefinder, you will typically use a distance-distance offset. This is performed using a TruPulse 200 model.

Taking a laser offset

Steps:

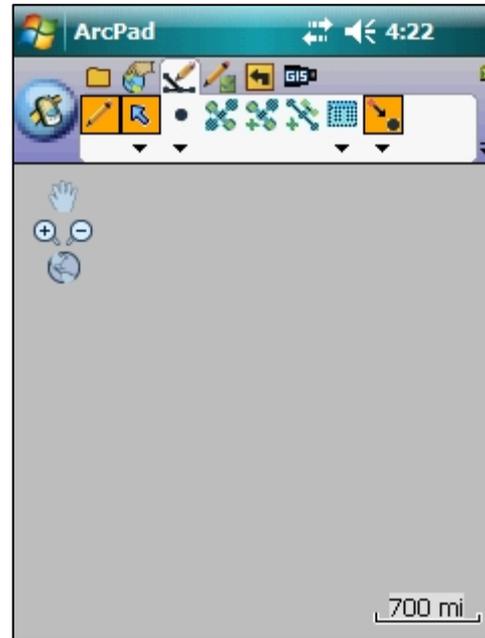
1. Select a layer for editing via the Start/Stop Editing tool, Quick Capture tool or the Table of Contents



Taking a laser offset

Steps:

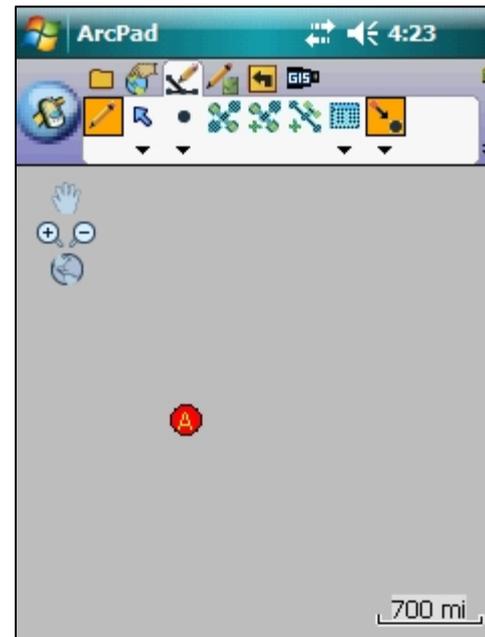
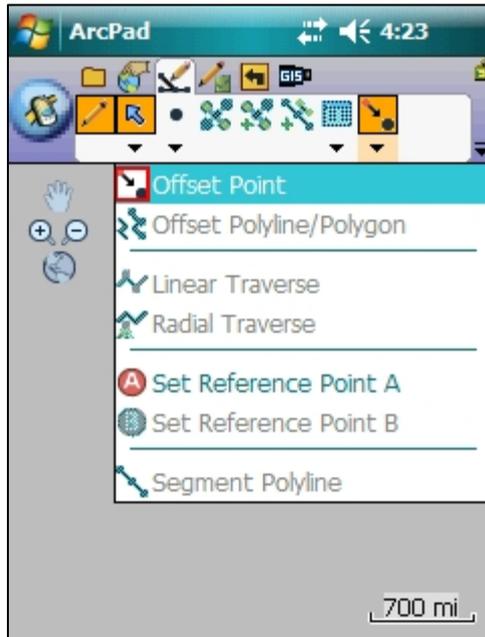
2. Tap the Offset Point button



Taking a laser offset

Steps:

3. Set Reference Point A (and B if required)



Taking a laser offset

Steps:

4. Shoot the target from Reference Point A using a rangefinder. If you defined a Reference Point B, Shoot the target from Reference Point B also.

ArcPad 4:25

Point/Vertex

Reference Point -52.93340931970

Bearing 338.8 °T

Slope Distance 191.01 ft

Inclusion 0.7 °

M 0

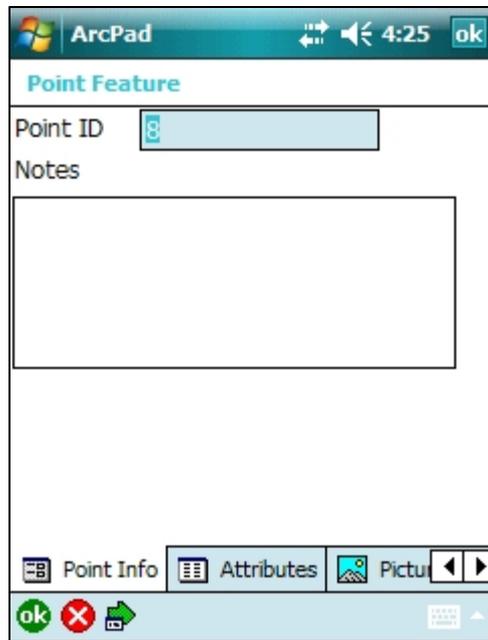
xyz XYZ Offset 2 Point Offset

ok cancel

Taking a laser offset

Steps:

5. Type the attributes for the new feature and press "Ok" to see the offset point. Repeat steps as necessary or from other features.

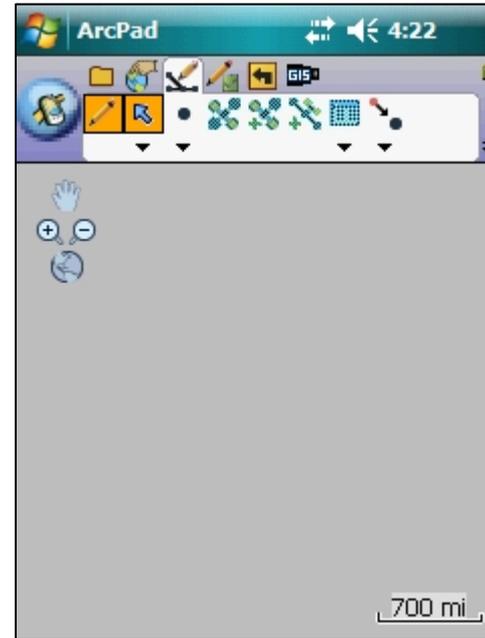
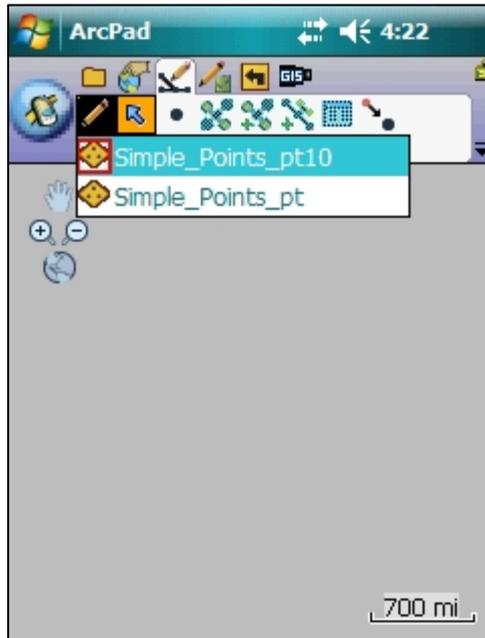


1 point offset with GPS and TruPulse 360 models

These steps describe how to capture features when you are using both a GPS and rangefinder.

Steps

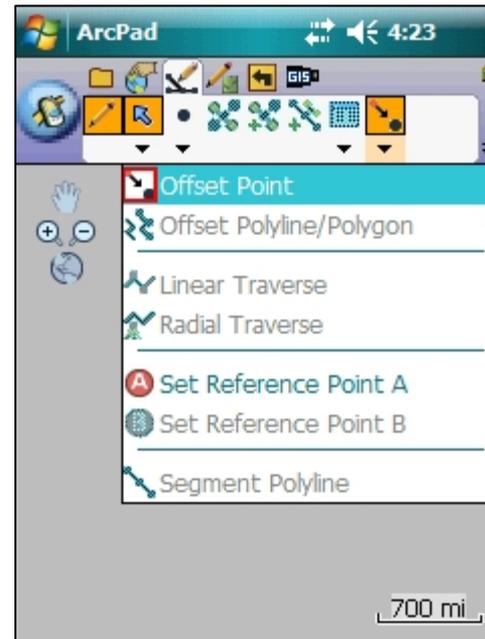
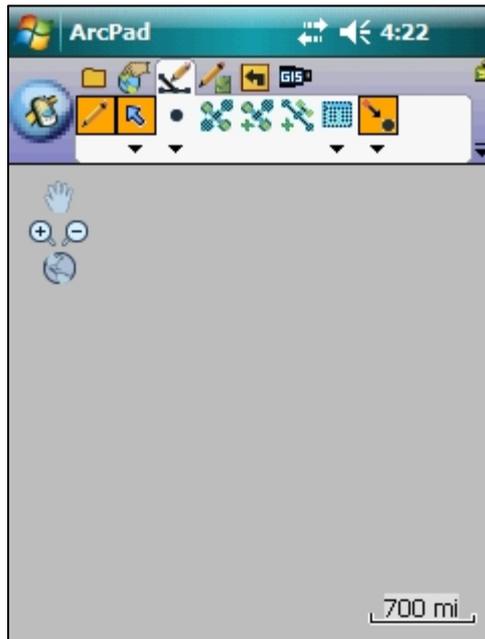
1. Ensure GPS has a fix & TruPulse are activated and connected.
2. Select or make a layer to create the new offsets features
 - a. Activate the Edit Toolbar; Ensure a layer is activated (editable); refer to ArcPad User's Guide



1 point offset with GPS and TruPulse 360 models

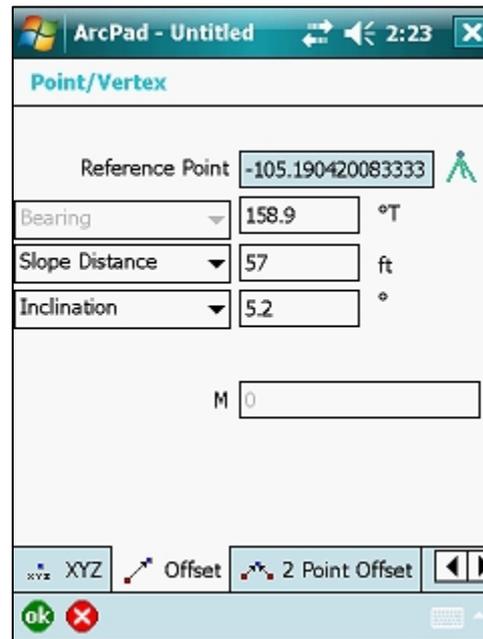
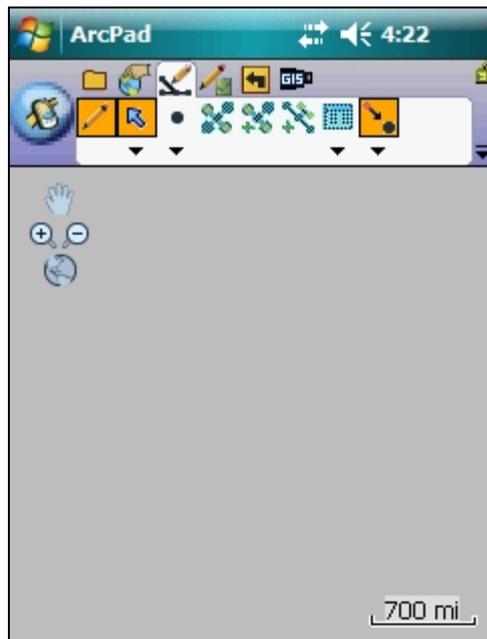
These steps describe how to capture features when you are using both a GPS and rangefinder.

3. Tap the Offset Point icon for the drop down list
 - a. The Offset Point button is only available when editing is turned on for a point layer in the Start/Stop Editing dropdown list or on the Table of Contents dialog box.
 - b. For this example tap the Offset Point.



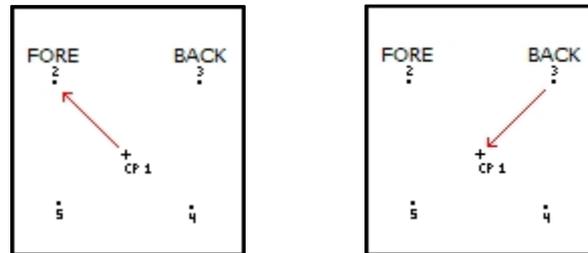
1 point offset with GPS and TruPulse 360 models

4. Using the TruPulse eyepiece, aim at the offset target; press the fire button to take measurement, values will download into ArcPad.
 - a. As well as the distance and bearing information, the GPS coordinates at the time of capture will be sent to ArcPad, and displayed in the Offset page of the Point/Vertex dialog.
 - b. On the Offset page you can optionally change any of the values. Shoot the feature with your TruPulse again to update the bearing and distance, or tap the Survey button to display the vertex dialog for the reference point. Tap the GPS button on the Vertex dialog to capture the incoming GPS coordinates as your reference point.



1 point offset with GPS and TruPulse 360 models

5. At this time you can review the “Options” tab. On the Options tab, you can change the offset direction from the reference point; Choose the compass North reference (True or Magnetic); Observer height and Target height values.
 - a. Offset Direction:
 - i. Foresight: Shooting at your target from a known reference point (CP).
 - ii. Backsight: Shooting from your target to a known reference point (CP).



- a. North Reference: Set your bearing to be calculated from True north or Magnetic declination read from a GPS (if available).
 - i. A declination value can be set on the TruPulse 360 model to reference True North(refer to manual). You will need to know the declination value for your current location when using the TruPulse.
 - ii. NOTE: Ensure you do not set the declination on the TruPulse 360 and choose True North in the Point/Vertex dialog box, this will apply a double declination to your compass (bearing) values.
- b. Observer Height: Height of TruPulse in relation to a reference point at ground level.

1 point offset with GPS and TruPulse

360 models

- c. Observer Height: Height of TruPulse in relation to a reference point at ground level.
- d. Target Height: Height of target above ground.
 - i. By default, the target height is 0 or unknown. If the target height is known and specified, the resulting coordinate will be the XYZ value of the feature at ground level; the target height is subtracted. If the target height is not known (value of 0), the resulting coordinate will be the XYZ value of the actual target.

ArcPad - Untitled 2:23

Point/Vertex

Offset direction from reference point :

Foresight Backsight

North Reference :

True Magnetic 0 °

Observer Height 0 m

Target Height 0 m

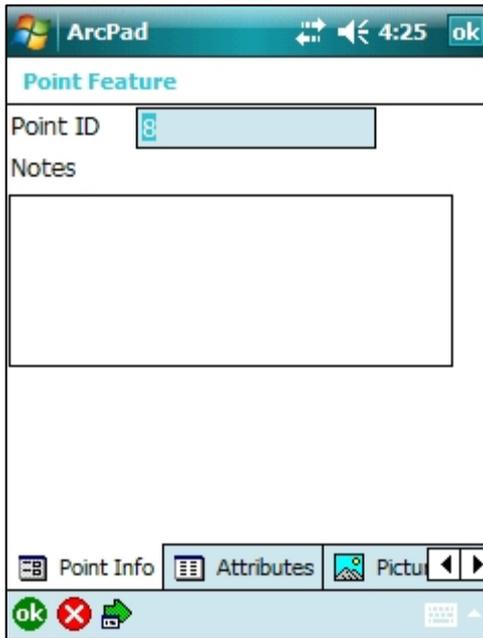
2 Point Offset Options

ok X

1 point offset with GPS and TruPulse

360 models

6. Tap OK.
 - a. The Feature Properties dialog box is displayed with an edit form, if it exists. Enter the information for the new feature.



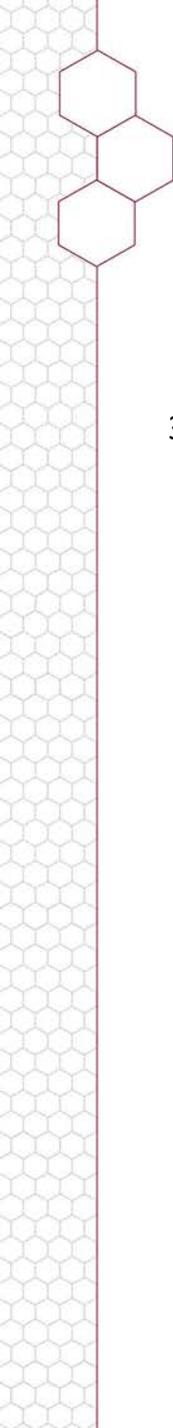
7. Tap OK.
 - b. Your new feature is created.

2 point offset with GPS and TruPulse 360 models

1. Follow steps 1 thru 4 from previous instructions.
2. Tap on the 2 Point Offset page of the Point/Vertex dialog. See that values that were initially shown on the Offset page now populate the top half of the 2 Point Offset page. The GPS location at the time of capture is used for Reference Point A and the bearing distance and inclination (if available) values are shown.

The screenshot shows the ArcPad interface for the 'Point/Vertex' dialog. The '2 Point Offset' option is selected. The 'Reference Point A' section is populated with values: Bearing 339.4 °T, Slope Distance 190.01 ft, and Inclination -0.3 °. The 'Reference Point B' section is currently empty, with Bearing 0 °T, Slope Distance 0 ft, and Inclination 0 °. A measurement 'M' is shown as 0. The bottom of the dialog has buttons for 'Offset', '2 Point Offset', 'Opti', and 'ok'.

Field	Value	Unit
Reference Point A	<Not Set>	
Bearing	339.4	°T
Slope Distance	190.01	ft
Inclination	-0.3	°
Reference Point B	<Not Set>	
Bearing	0	°T
Slope Distance	0	ft
Inclination	0	°
M	0	



2 point offset with GPS and TruPulse

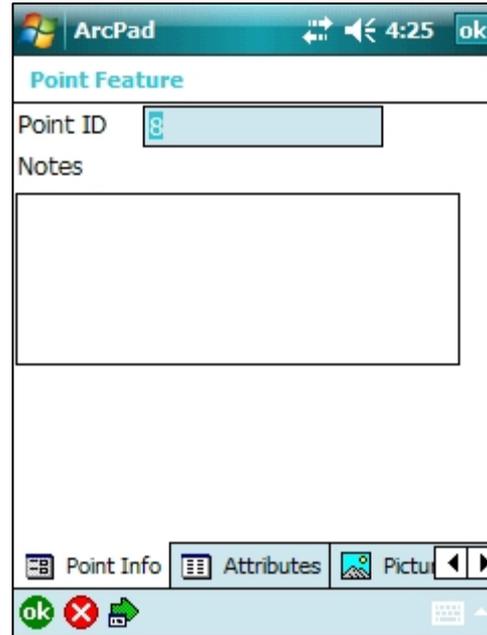
360 models

3. The second half of the page should be automatically selected ready for your second TruPulse shot. Use the TruPulse to measure a second distance (and optionally, bearing) to the feature you are capturing, from a different location. This GPS location will be used for Reference Point B and the bearing distance and inclination values will be inserted in the second half of the page.
 - a. On the Point/Vertex page you can optionally change any of the values. Shoot the feature with your rangefinder again to update the bearing and distance. To ensure you are capturing the correct reference point information, tap on the bearing field to move to the focus to that point. To change either of the Reference Point locations, tap the Survey button adjacent to the Reference Point to display the vertex dialog. Tap the GPS button on the Vertex dialog to capture the incoming GPS coordinates as your reference point.

2 point offset with GPS and TruPulse

360 models

1. Tap OK.
 - a. The Feature Properties dialog box is displayed with an edit form, if it exists. Enter the information for the new feature.



2. Tap OK.
 - a. Your new feature is created.