Grid & Stakeout

Help Document

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Overview

The **Grid & Stakeout** universal application software will let you digitize

Points and Area Features and create **Grid Points** or **Grid Lines** over an Area Feature.

This app also provides the Point Stakeout and Line Stakeout functions to help you approach a grid point or move along a grid line or the boundary of the area.

You might be a forester interested in collecting timber cruising data at the sampling points on a grid of given dimensions. Or, you might be a scientist wanting to collect soil samples at the evenly spaced grid points. The app will let you easily create a square or rectangular grid in the orientation that you specify. If you wish to see the grid lines, you could have those created instead of the grid points.

If your iOS device has **GPS** capability, you could pick the GPS position to use as a node for the Area Feature that you are digitizing. You could use the GPS device in conjunction with the stakeout functions to help you get to the desired grid point or walk or drive along a grid line.

A drawing will be automatically created on the screen for the digitized Features. You will see the grid points or grid lines that you have created. You can also view the area and perimeter of an Area Feature. You may also elect to have an Area Feature labeled with segment lengths and corner angles when feasible.

The Features could be displayed over a **Map** when the latter is available.

The **Grid & Stakeout** app will let you measure distances on the displayed map. You will also be able to tap around the boundary of a region and measure its area.

When you start the **Grid & Stakeout** app, you will see a number of tool icons displayed across the top of the screen. Other tool icons may be displayed on various screens, depending on the function being used.

 Main Menu (pull-down list)

Tap the Main Menu icon to display the list of functions on the Main Menu:

> **Job**
> **Export to PDF**
> **Export to DXF**
> **Map**
> **Email Files**
> **Setup**
> **Help**
> **About Grid & Stakeout**

 Tools Menu (pull-down list)

Tap on the inverted arrowhead to show the following tools:

> ● **Add Point manually**

Add Area manually

Add Point by Coordinates

Delete Feature

Move Node

Create Grid

Measure Distance/Area Tools

Zoom-Fit

GPS Menu

> **GPS On/Off**
> **Position Info**
> **Point Stakeout**
> **Line Stakeout**

Feature Properties

On-screen Keyboard

An on-screen keyboard will automatically pop up when the focus is on a data entry field, such as the **Grid Scale**. After entering data, tap the **Return** button on the pop-up keyboard. To hide the keyboard, tap the **Hide Keyboard** icon on the keyboard, or tap in an area outside the keyboard.

When entering numeric data, you will notice that there is a Special Key showing several symbols on it. To enter a distance value with a fractional part, tap this key to put in the decimal point.

To enter angles in **DMS** (Degrees-Minutes-Seconds), if your data value will not fill in all the places, then tap the special key after entering the desired value. For example, to enter the longitude of 91°09'26.082"W, you could type in 0910926.082W. Or, you could type 91, tap the special key, type 9, tap the special key, then enter 26.082W.

Open a Job File

Tap the **Main Menu** icon, select **Job**, select **Open Job**, then select an existing job file to open, such as **test.pmp**.

To create a new job file, first tap on the **New** button. You may accept the default file name or enter a unique file name then tap the **OK** button. (Yes, it's okay to type over the displayed file name.)

Whenever you open a Job file, the app will automatically close the previously opened file.

To cancel out of the screen for opening a file, simply tap the **Exit** button.

Setup

Before the first-time use, please select the distance and angle units to be used. You may also specify how the Feature labels should be displayed as well as the default parameters for creating a grid.

<u>Unit and Angle System</u>

Select the **Unit and Angle System** under **Main Menu - Setup** to specify the desired length unit for displaying line segments. The areas will be computed in the metric or British system accordingly.

Available choices for displaying angles are **Azimuth** and **Bearing**. If Azimuth is chosen, also specify the **Angle System**: North or South. Angles will be displayed in Degrees, Minutes and Seconds (DMS).

<u>Feature Labels</u>

This app gives you the option of labeling the line segments, areas and corner angles for the selected Feature when feasible.

You can define the font color and size for the labels after selecting **Feature Labels** under **Main Menu - Setup**.

Mark the **Show white background** checkbox if you wish to have the labels displayed on a white background to make them stand out better over a satellite map.

<u>Default Grid</u>

You may use the Default Grid Setup page to define the orientation, the grid spacings and the grid color to be used as default values for creating a new grid. You can still change the grid parameters on the fly when creating a new grid.

Display Map

Whenever you are connected to the Internet and your location can be determined, Map can be displayed as the background map for your job data.

You may select one of the following view modes after tapping the **Main Menu** icon then choosing **Map**:

Show Standard - Show a map of streets and landmarks.

Show Satellite - Show satellite photos.

**Show Hybrid**   - Show street names on satellite photos.

To turn off the Map display, tap **Close Map** on the Map menu.

<u>**Where am I?**</u>

When you start a new job, the app does not know where you are. If you have the Map turned on, you can find your continent then zoom in to your country, your city, hence your neighborhood. You may zoom into or zoom out of portions of the graphical view by using your fingers to pull or pinch on the display, respectively.

If your device is equipped with GPS or has Location Service, then you can tap the **GPS Menu** icon and select **GPS ON** to turn on GPS. This will permit the app to immediately zoom to your location. (Make sure the **Location Service** is turned on for the Grid & Stakeout application software.)

To nail down your location, you will need to digitize at least one node. If you open the job, named "**test.pmp**", you will see that a few Point Features have been added to the map. Go ahead and turn on Map in the **Show Standard** mode so you will see a map similar to that on the following screen.
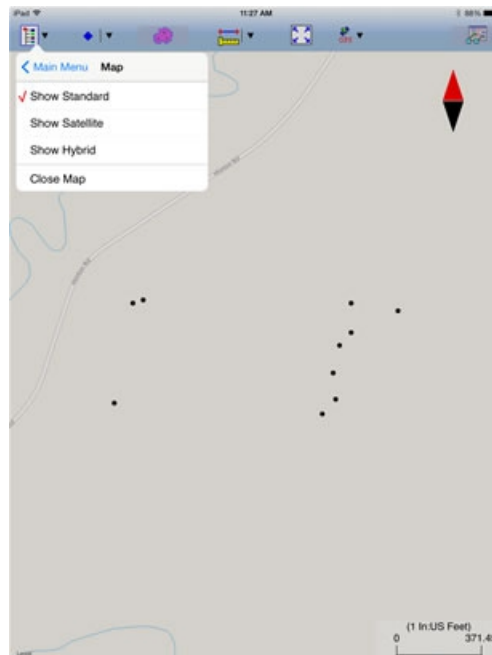
Create an Area Feature

Tap on from the Tools Menu to get to the screen for digitizing an **Area**

Feature.

The **Grid & Stakeout** app will let you create one or more Area Features. (However, you may only create a grid on one Area Feature at a time.)

Digitizing involves tapping on the screen to drop a node for the Area Feature. For example, if you wish to make a triangular shape, you would tap the screen at its three corners.

When the **Add** icon ✋ is lit, you will be able to digitize the Area Feature. To work with the standard touch-screen mode to zoom or pan the map, first tap the **Add** icon ✋ to turn it off.

When the **Snap to Node** icon ⤬ is lit, you may only tap on an existing node to include it in the Area Feature.

If you don't want to snap to a node then turn off the **Snap to Node** icon ⤬ by tapping on it and making sure it is not lit. Then you will be able to tap anywhere on the screen to drop a node.

When you need to place a node precisely, tap on the donut-shaped **Node tool** ◉. A larger donut with crosshairs at its center will be displayed on the map. Touch on the purple area of this tool and drag the crosshairs to the desired location. Then tap once in the donut hole to drop the point. You could also keep holding down on the purple donut and use another finger to touch outside of the donut area to drop the point.

If your device has GPS capability, you could use the GPS position as a node for the Area Feature that you are digitizing. With GPS turned on, tap the **Pick GPS** icon 🛰 **Pick** to add such a node.

If you made a mistake in digitizing, you may tap the **Undo** button to back-step.

To fit the drawing to the screen, simply tap the **Zoom-Fit** icon. You may wish to zoom into a map to make it easier to place your node more accurately. When **Map** is turned on, you may not be able to zoom to a really small scale. In that case, turn off the Map then pull to zoom into the map.
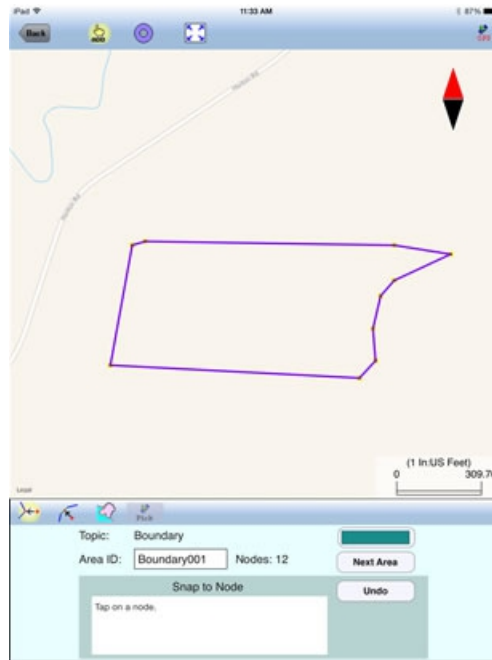
All of the sample screens in this document display the distances in **US Survey Feet**, and the angles as **Azimuth**.

Digitizing an Area Feature

Let's create an Area Feature by joining the Point Features in **test.pmp**. First open this job then tap on 🧩 under the Tools Menu.

With the **Snap to Node** icon ⤬ turned on, tap on each of the Point Features

displayed on the map. You do not need to tap on the first node again.

Tap the **Add** icon 🖑ADD to turn it off if you need to zoom or pan. The above screen shows that we have turned off the Add icon and zoomed in somewhat.

Tap the **Undo** button to back-step, if necessary. The app will report the length of the line segments as well as the area of the Area Feature.

When you tap the **Back** button and confirm to end the Feature, you will see the completed Area Feature in the map.

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Add Points

Besides creating an Area Feature, you could also add one or more Point Features to the map.

To add a new Point, first tap on the **Add Point** icon ● . This is one of the tools provided on the **Tools** menu.

Tap on the screen twice to add two points as shown below:

Whenever you need to place a Point precisely, tap on the **Node tool** ⊕ then use the crosshairs to zero-in on the desired location.

If you wish to have the Point Feature snap to a node on the boundary of an Area Feature, then tap on the **Snap to Node** icon ⤖ before tapping in the vicinity of the target node. Tap on ⤖ again to see the placement of the new Point Feature.

Tap the **Add** icon 👆 ADD to turn it off when you need to zoom or pan.

If your device has GPS capability, you could tap the **Pick GPS** icon Pick to add a Point.

To remove a Point that you have just added, tap on on the **Undo** icon ↶ .

Tap the **Back** button to exit this screen.

Add Point by Coordinates

If you know the geographic coordinates of a point, you can add the point to the map by entering its coordinates after tapping on the Digitizing Tools Menu then selecting **Add Point by Coordinates**. If the Add Point by Coordinates icon ◆ is already displayed then simply tap on that icon to display the data input screen.

You may tap on the **Pattern** button to select a different symbol and color for the Point Feature to be created.

Enter the known coordinates then confirm the screen. Make sure you specify the

correct North or South Latitude, and the correct East or West Longitude. Otherwise a point may be created very far away from your job site.

You may tap on the **Pattern** button to select a different symbol and color for the Point Feature to be created.

The Orthometric height is the elevation based on mean-sea-level. The ellipsoidal height is based on the ellipsoid.

Tap on **Cancel** if you decide not to create the new point.

Move Node

The **Move Node** tool on the Digitizing Tool Menu will let you adjust the position of an existing Point Feature or a node on an Area Feature.

To move a node on a Feature, first tap on the Feature to select it. Then tap on the Digitizing Tool Menu and select **Move Node**. If the Move Node icon is already displayed, then simply tap on that icon to get to the Move Node screen.

Drag the **Crosshairs** to the node you wish to move. Tap once in the center of the donut to mark the node to be moved.

If you've tapped on the wrong location, you may tap the **Reset tool** icon to reset the selection then select the correct location.

Then drag the **Crosshairs** to the new position and tap once in the center of the donut to affix the node there.

Turn on the **Snap to Node** icon if you wish to place the node exactly on an existing point or exactly on a node of an existing Area Feature.

Create Grid

This app will let you create **Grid Points** or **Grid Lines** for the selected Area Feature.

Suppose we wish to make an array of sampling Grid Points in the Area Feature that we have created in **test.pmp**. The grid points are to be separated by 100 ft both ways, and the grid direction will be prallel to an imaginary line joining the two Points that we have previously added.

Tap on the Area Feature then tap the **Create Grid** icon to display the **Grid Property** screen.
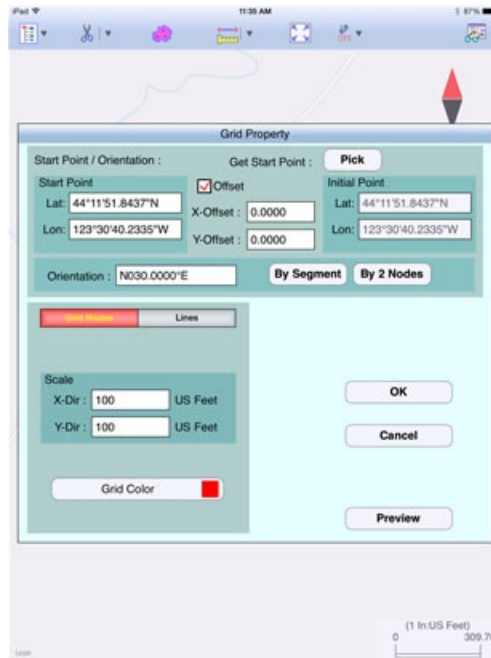
The first thing to do is to select a starting point for the grid. Tap the **Pick** button then tap on the displayed map to select a starting point for the grid.
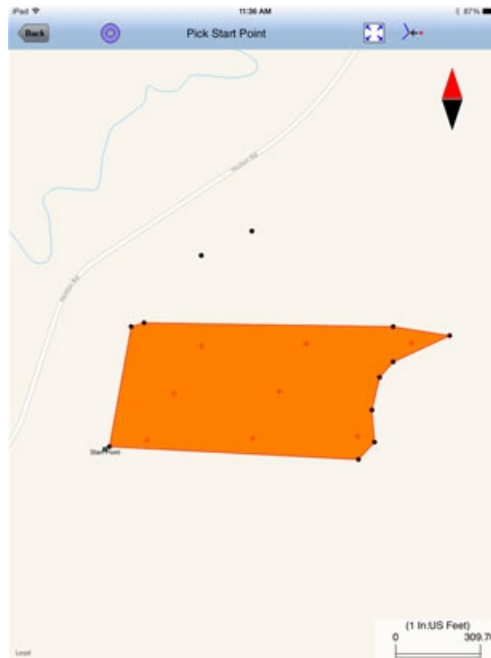
If you tapped the wrong location, you may tap on the correct location, and the wrong one will be automatically removed.

The above example shows that we have selected the lower-left corner of the Area Feature to be the starting point for the grid.

Please turn on the **Snap to Node** icon ⤢ so you will be able to easily snap to the exact location of the corner node by tapping in its vicinity.

Tap the **Back** button to close this screen.

If you want the grid to be somewhat offset from the Start Point, then mark the **Offset** checkbox and enter the offset values. The Intial Point location will be recomputed.

You could specify the grid orientation by entering the desired angle value. Or you could tap the **By Segment** button and select one of the line segments of the Area Feature and have the grid created parallel to that line segment.

For our example, we will select the **By 2 Nodes** option and select the 2 Points located to the north of the Area Feature.

If you selected the wrong node, you may tap on that node again to unselect it.

Tap the **Back** button to return to the **Grid Property** screen.

Enter a grid spacing of 100 ft in the X and Y directions. You may enter different grid spacing for the X and Y directions, if you wish. You may select a different grid point color after tapping on the **Grid Color** button.

Tap the **Preview** button to see if the grid looks like what you want. If so, tap the **Back** button then tap the **OK** button in the **Grid Property** screen to actually create the grid as shown below. Note that the initial point is indicated by a tiny triangular symbol.
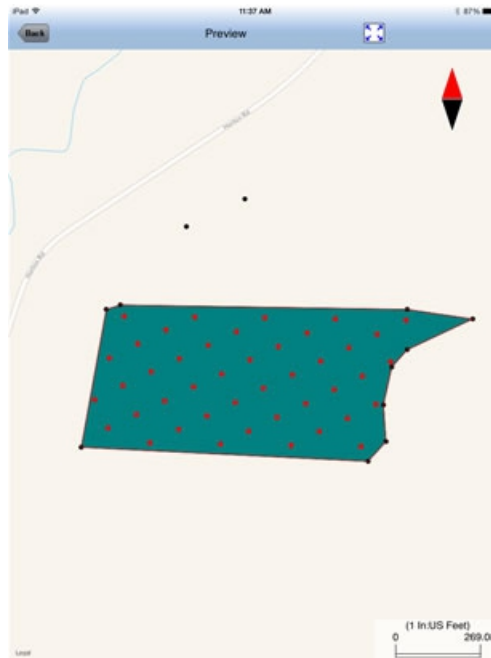
If you open **Example2.pmp**, you will see a grid oriented at 30º north azimuth. You may choose to have the grid lines run in both directions, as in this example, or just in the X direction or the Y direction.

In the above screen we have set Map to **Show Satellites**.

Please note that each Job may contain only one grid at t time. After a grid has been created for an Area Feature, if you attempt to create a grid for another Area Feature, you will be asked whether you no longer need the existing grid.

Feature Properties

To view the properties of an Area Feature, a Point Feature, a grid point or a grid line of interest, first tap that item on the map screen then tap on .

The Feature Properties screen will show the coordinates of the selected **Point Feature** or **Grid Point**, the coordinates of the selected **Grid Line**, or the perimeter and area of the selected **Area Feature**.

You may change the symbol for the selected digitized Point or Grid Point, the line style for the selected Grid Line, or the area pattern for your Area Feature by tapping the **Pattern** button in the Feature Properties screen. Select the desired symbol or pattern from the built-in symbols library and select the desired color and size. For the Area Feature, you may also adjust its level of **Transparency**.
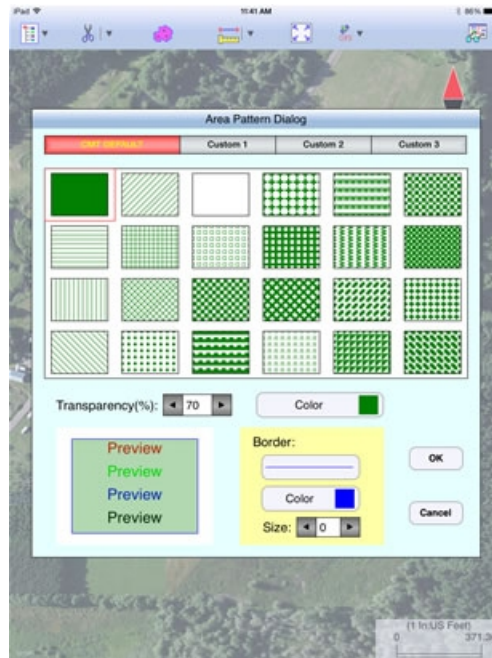
If you wish to delete a Feature, first select that Feature then tap the **Tools Menu** icon ● | ▼ and select the **Delete selected** tool ✂ .

Please note: Deleting the Area Feature will also remove the associated grid points or grid lines. **Once an item has been deleted, it cannot be recovered.**

Show Segment, Area and Corner Angle Labels

For Line and Area Features, you may opt to have the segment, area and corner angle labels displayed on those Features when feasible. On the **Coordinates** page, mark the checkbox for the labels you wish to see:

Show Corner label

Show Segment label

Show Area label (for Area Features only)

Display Area and Length

For Line and Area Features, you may view the size of the area and the length of the perimeter by tapping on the **Area/Length** tab.

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Measure Distance

If you would like to know the distance between two or more map locations, first tap on the **Measure Distance** icon ▭ on the **Measure Tools** pull-down menu. Then tap on the map locations to have the distance calculated. The total distance as

well as the length and direction of the last segment added will be displayed.

Whenever you need to place a node precisely, tap on the **Node tool** then use the crosshairs to zero-in on the desired location.

Turn on the **Snap to Node** icon if you wish to place the next node on an existing node.

You may use the **Undo** tool to backstep or use the **Reset** button to erase all segments that you have entered so far.

Please note that the Measure Distance tool will not retain the **temporary** shape you have digitized for computing the distance.

When you no longer need the displayed information, tap the **Back** button to close this screen and discard the temporary shape.

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Measure Area

The **Measure Area** tool on the **Measure Tools** pull-down menu will compute the area enclosed within a boundary that you form by tapping on the map.

Whenever you need to place a node precisely, tap on the **Node tool** then use the crosshairs to zero-in on the desired location.

Turn on the **Snap to Node** icon if you wish to place the next node on an existing node.

You may use the **Undo** tool to backstep or use the **Reset** button to erase all segments that you have entered so far.

Please note that the Measure Area tool will not retain the **temporary** shape you have digitized for computing the area. If you want to digitize an **Area Feature** that will be saved to the job then use the **Add Area** tool .

When you no longer need the displayed information, tap the **Back** button to close this screen and discard the temporary shape.

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Save the Job File

To save the data in the currently open file, tap the **Main Menu**, select **Job** then select **Save**. The file extension will be ***.pmp**.

To save the data under a different file name, tap the **Main Menu**, select **Job** then

select **Save As**. Enter the new file name. The file extension will be ***.pmp**. For example, if you wish to keep the example files intact, you could open each of them then save it under a new file name.

Whenever you open another job, the program automatically saves the data in the current job and closes the current job.

The *.pmp files will reside in the **Documents** folder for the application. To access your *.pmp files outside of the application, first sync your device with the iTunes® program. Select your device then scroll down to the **File Sharing** section. Click on the **Grid & Stakeout** app name. After a while, the data files associated with this app will show up on the right-hand side.

Please note:

Before updating to a new version of **iOS**, first back up all you apps and data files. Also, should you decide to remove an application software for some reason, beware that all the associated data files will be deleted. If you wish to save the data files, please save a copy to your desk-top computer before removing the app.

Export to PDF

To export the Point Features, Area Feature and grid data to a PDF file, first tap the Zoom-Fit icon to fit the map elements to the screen, then tap the **Main Menu** icon, select **Export to PDF**.

To export to a new PDF file, tap on the **New** button. Rename the file, if you wish then tap on **OK** to confirm

The contents of the PDF file will be displayed. The first page will show the map drawing. The following page(s) will show the boundary coordinates and area of the digitized Feature as well as the coordinates of the Point Features and grid points or the starting and ending nodes of the grid lines. (If you wish to have all Features included in the drawing then first zoom out sufficiently to have the Features displayed on the screen before exporting to PDF.)

If you wish to overwrite an existing PDF file, then select that file from the list. **Beware that doing so will erase all the existing contents of the selected PDF file when you tap on OK.**

To make sure you really want to overwrite an existing PDF file, tap on the **View File** check box then select the file you wish to view. In this mode, instead of the **OK** button, you will see a **View** button. Tap the **View** button to display the contents of the highlighted PDF file. Then tap the **Back** button to return to the File Dialog. When you are ready to overwrite the file, unmark the **View File** check box then tap on **OK** to overwrite the file.

If you have an AirPrint Printer, you may tap on the **Printer** icon then confirm

to print the contents of the PDF to that printer.

The exported PDF files will reside in the Documents folder for the application. To access the PDF files exported from the application, first connect to the iTunes® program then look in the Documents folder for the **Grid & Stakeout** app.

Export to DXF

The Features in the working job file may be exported to a DXF file. The exported DXF file will reside in the **Documents folder** for this app. The DXF file can be used with exernal programs such as PC-GIS PRO and AutoCAD® .

To export the Features to a DXF file, select **Export to DXF** from the **Main Menu** .

Select the name of the file into which to export the Feature data then tap on the **OK** button. If you wish to export the data into a new file then tap on the **New** button. You may confirm the displayed new file name or overwrite it with your own new file name.

The Feature data will be exported in LLA WGS84(1150)/ITRF00 and Epoch 01/01/2014.

Email the Files

You may email a Job file (*.pmp), a PDF file (*.pdf) or a DXF file (*.dxf) by tapping the **Main Menu** icon then selecting **EMail Files**.

To output a file to email, first enter the destination email address, select the file type, mark the checkbox for the files you wish to send, then tap the **Send** button.

When the email is displayed with the attachment, tap the **Send** button at the top to send the email, or tap **Cancel** to cancel the action.

Point Stakeout

The **Point Stakeout** function in conjunction with GPS can help you locate a Point Feature or a node along the perimeter of an Area Feature.

As this app will let you enter the coordinates of the first node, you could use this capability to locate an old survey marker on your property. You could use the same method to locate an old well overgrown by brushes if you have a record of its coordinates. For this reason, it is helpful to use GPS to record the coordinates of important locations or structures for future reference.

The accuracy of the stakeout will depend on the accuracy of the GPS receiver used.

Keep in mind, though, that GPS elevation errors are usually twice or three times the horizontal position errors.

You must activate GPS before you can access the Point Stakeout function. Tap the GPS menu icon ![GPS] ▼ then select **GPS ON** to turn the GPS on. From the same menu, select **Point Stakeout**.

Select a Feature from the map when the **Target Feature** field is highlighted. Alternatively, you can tap the **Browse** button then select from the listed Features.

If you have selected a Grid Line or an Area Feature, you may select which Node you would like to stakeout. Type in the desired Node #, or tap the little right arrow button to change the Node # to another node in the same Feature.

Tap the ![cogo] icon to turn it off when you need to perform gestures on the screen. Tap this icon to turn it back on when you wish to select a Target Feature from the screen.

In the **Antenna Height** field, enter the height of your antenna above the ground.

Click the **Settings** button to setup how the stakeout will be graphically displayed. In the **Stakeout Setup** screen you may turn off the Navigation Beep if the constant beeping bothers you.

You may also specify the **Tolerance** range as well as the type of notification you wish to receive when you get within the tolerance range of the target.

If you mark the checkbox for **Display Message,** then when you are inside the target range, the "Target!" message will flash on the screen.

If you mark the checkbox for **Target Beep**, then when you are inside the target

range, beeps will be sounded.

To use the tolerance range for checking only the horizontal distances, select **2D** for **Stakeout Mode**. If the the tolerance range is to be applied for checking the elevation, then select **3D**.

You can also specify how to keep the screen focused on your location by selecting an option for the **Stakeout Zoom Mode**. In the **Autoscroll** mode, the job map will scroll to keep your position displayed on the screen while you are moving along. The map scale will not change. In the **Autozoom** mode, when you hit the border of the screen, the app will automatically zoom out to let you see more of the job map.

Your position is represented by the GPS marker on the screen. The app will report your GPS position in relation to the target location.

Bearing or **Azimuth** is the direction from your GPS location to the specified Target Stake Point or Node.

Range is the direct distance from the GPS location to the Target Stake Point or Node.

Cut or **Fill** is the difference in elevation from the current location to the Target Stake Point or Node. "Cut" indicates that your current position is higher than the Target. "Fill" indicates that your current position is lower than the Target.

You may use the values displayed in the **Go** field to help ou reach the target. On the GPS marker, the solid grey arrow points in the direction you are moving, and the hollow blue arrow points in the direction of the Target. When you are moving in the right direction, these two arrows will coincide.

After you have successfully reached your target location, you can drive a stake into the ground at this location.

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Line Stakeout

You may use **Line Stakeout** to find your position relative to a Line Feature or the boundary of an Area Feature. This function will come handy when you need to lay out fences along the property boundary or move along a grid line. The accuracy of the stakeout will depend on the accuracy of the GPS receiver used.

You must activate a GPS Receiver before you can access the Line Stakeout function. Tap the GPS menu icon then select **GPS ON** to turn the GPS on. From the same menu, select **Line Stakeout**.

Select a Grid Line or an Area Feature for the **Target Feature** field.

Select or enter the **From Node** and **To Node** on the target Feature.

Tap the COGO icon to turn it off when you need to perform gestures on the screen. Tap this icon to turn it back on when you wish to select a Node from the screen. Please note that you can only select a node when the cursor is in the Stakeout Node field.

If you are interested in the direct line between the beginning and ending nodes, then select **Direct** for the **Mode** field, as shown in the above screen. On the other hand, if you are interested in the line segment on the Area Feature, then select **Path**.

Your position is represented by the GPS marker on the screen. The **Target** for Line Stakeout is the projection of your GPS position on the selected line segment. As you move along in the vicinity of the Grid Line or Area Feature, you will see information displayed about your position relative to the target line segment. Such information will not be displayed if your position cannot be projected onto the target line segment.

In the **Antenna Height** field, enter the height of your antenna above the ground.

Click the **Settings** button to setup how the stakeout will be graphically displayed. In the **Stakeout Setup** screen you may also specify the **Tolerance** range as well as the type of notification you wish to receive when you get within the tolerance range of the target.

If you mark the checkbox for **Display Message,** then when you are inside the target range, the "Target!" message will flash on the screen.

If you mark the checkbox for **Target Beep**, then when you are inside the target range, beeps will be sounded.

To use the tolerance range for checking only the horizontal distances, select **2D** for

Stakeout Mode. If the the tolerance range is to be applied for checking the elevation, then select **3D**.

You can also specify how to keep the screen focused on your location by selecting an option for the **Stakeout Zoom Mode**. In the **Autoscroll** mode, the job map will scroll to keep your position displayed on the screen while you are moving along. The map scale will not change. In the **Autozoom** mode, when you hit the border of the screen, the app will automatically zoom out to let you see more of the job map.

The first stakeout location on the target line segment is called the **Initial Station.** Enter the distance of this initial station from the From Node.

The **Range** field shows your perpendicular distance from the line segment, ie. the distance between your GPS and the Target. Therefore, you could use the Line Stakeout function to help ensure that you are always moving parallel to a line or boundary at the desired distance.

Station is the distance between the From Node and the Target.

Distance is the distance between the Initial Station and the Target.

Cut or **Fill** is the difference in elevation from the GPS location to the target. "Cut" indicates that your current position is higher than the target. "Fill" indicates that your current position is lower than the target.

Again, if the GPS location cannot be projected on the target Line or Area Feature, then the data fields on the Message page will be blank.

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