

## **iCMTGIS PRO**

### **Help**

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## Overview

iCMTGIS PRO is a professional GPS/GIS data collection and mapping app designed for use on the iPad and iPhone devices. You can use it to record position data from the built-in GPS of the iPhone and some models of iPad, or from a compatible external GPS receiver. You can select the coordinate system and distance and angle units in which to display the data. You can add other Points, Lines and Areas by importing them from Shapefiles or by drawing them on the screen. You can tag the Features with descriptions and change the symbols used for representing these Features. You can modify the Line and Area Feature shapes by adding or deleting nodes. You can add a background map to your job file. In particular, you can load a GeoTiff map image for off-line use. You can import and export Feature data in various formats. This app also provides the Point Stakeout and Line Stakeout functions to help you locate points of interest and property boundaries. All the functions are described in this Help document.

When you start the app for the first time, it will ask you if you wish to open this Help document. You may read the document now, or you can access it later by tapping on **Help** under the Main Menu.

The app needs to have a file to work on. Therefore, when you start the app for the very first time, it will prompt you to create a Job file. As an example, tap the little "down arrow" for the **File Name** field and select the "**cmittut**" sample job. Tap on the **OK** button to confirm.

The Feature List provides a convenient way to tag Features with pre-defined relevant information during GPS data collection, but it is not necessary to have a Feature List to do a data collection job.

The app will display the main screen that shows any spatial data (**Features**) and/or background map present in the currently active job. This is called **Map View**. When you tap on a Feature, it will be highlighted in the **default orange color**. The Feature ID and the location coordinates will pop up in Map View. The map scale will be displayed in the active distance unit. Later, you will see that you can assign different symbols to represent your Point, Line and Area Features.

A number of tool icons are displayed at the top in Map View.

Tap on the **Zoom Fit** icon on the Toolbar to display all map elements:



Tap the **pull-down arrow** beside the Zoom Fit icon to reveal additional **Map Tools**.

Tap the **Main Menu** tool to see a menu of functions:



The **Topic Menu** provides functions related to Feature Topics:



The **GPS** menu icon pertains to data collection:



Tap the **Topic View** toggle to select an active Topic:



Tap the **Sheet View** toggle to display data in a spreadsheet:



You may also select a Feature by selecting the corresponding Feature record in the Sheet View.

With a Feature selected, you will be able to view its coordinates as well as any Attribute and Values by using the **Feature Properties** tool:




For an Area Feature, you will also be able to see its area and perimeter.

Tap the **pull-down arrow** beside the **Utilities Menu** icon to reveal the tools for measuring areas and distances:



## On-screen keyboard

An on-screen keyboard will automatically pop up when the focus is on a data entry screen. After entering data, tap the **Return** button on the pop-up keyboard. If a **Next** button is displayed in the data entry dialog, then tap that button to go to the next step. To hide the keyboard, tap the **Hide Keyboard Key** on the pop-up keyboard.

When entering numeric data, you will notice that there is a **Special Key**  showing several symbols on it. This key will facilitate data entry in several ways.

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.

Similarly, to enter angles in **Decimal Degrees**, instead of filling in the leading zeros, you could tap the special key after entering the desired number of digits in the integer part of the value. For example, if you wish to enter the slope angle of,

say 10, for a Traverse or Side-shot Point, remember to tap the special key after entering the 10. Otherwise, you will have entered a slope angle of 100. Alternatively, you could enter “010” to fill all the integer places.

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## **Set up a Job & Import Feature Data**

The application software requires a job file to be open for it to work with. After creating or opening a job, you will be able to specify the default settings for the coordinate system and units to be used for displaying the GPS/GIS Features, for labeling the Features and for GPS data collection.

If you have geographic features (points, lines or area shapes) in Shapefiles or DXF format, you may import them into the active Job map.

### **Opening or Creating a Job File**

To open an existing job file, tap the **Main Menu** icon, select **Job** then select **Open Job** . Select a job file to open, such as **corners.pmp**. (The job files for this app have the **.pmp** file name extension.)

To create a new job file, tap the **New** button. Accept the proposed file name or enter a unique file name then tap the **OK** button. (Yes, it's okay to type over the displayed file name.)

You may select a Feature List to be associated with the Job. Doing so will permit you to easily assign pre-defined Attribute/Values to a GPS Feature that you are recording. You may also copy predefined Topics from the Feature List associated with the Job so that you may easily assign pre-defined Attribute/Values to the imported or digitized Features as well. The procedure for defining a Feature List is provided under **Set up Feature List**.

Once the proper files have been selected and any optional information has been entered, click on **OK**. If you have selected an existing job, your job data will be displayed.

If you are working with a job file and want to open another job file instead, select **Main Menu**, select **Job**, select **Open Job** then select the desired file name. This action will automatically close the previously opened file.

If you are not sure which job file you are working on, select **Main Menu**, select **Job** then select **Open Job** to view the File Dialog screen. The name in the **File Name** box is that for the currently open file.

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

### **Saving the Job File**

The app will automatically save newly added Features to the Job file when

feasible.

To manually 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.

Let's save the **corners.pmp** example file that you have just opened to a different name, such as "mypoles". This way, you can work with **mypoles.pmp** and keep the original corners.pmp file intact for later use.

It's a good idea to save your job under a different name as a back-up. **The newly saved file will be the active job file. Therefore, you will need to remember to open the original file to continue working with it.**

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

### Accessing the Documents Folder

The data files, such as the \*.pmp job files, will reside in the **Documents** folder for the application. To access your data files outside of the application, first sync your device with the iTunes® program. Then you should see an **Apps** tab for your device. Click on that tab then scroll down to the **File Sharing** section. Click on the **iCMTGIS PRO** app name. After a while, the data files associated with this app will show up on the right-hand side.

You may copy files between the Documents folder for the app and your desk-top computer. You can drag files into or out of this Documents folder. You may use the **Add** button on the iTunes® screen to select and add files from your computer to the Documents section. You may use the **Save to** button on the iTunes® screen to save the selected files to a folder on your PC. **Make sure the job file you are copying is not the working job file.** In other words, open a different job file to make it the working job file.

To delete a file, first highlight it then press the **Del** button on your computer.

**Caution: A deleted file cannot be recovered.** Always make sure you really want to delete a file before proceeding.

### **Please note:**

**Before updating to a new version of iOS, first back up all you apps and data files and close the app.** 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.

### Set up Coordinate System

To set up or change the coordinate system for displaying Feature data, first tap **Menu**, select **Setup** then select **Coordinate System**.

Click the pull-down arrows to select the datum, datum conversion epoch and coordinate system in which to display the position data. Also specify the **Region** and **distance unit** to use.

The app will transform the **WGS84(1150)/ITRF00 datum** in which the coordinates are stored internally to the **Datum** that you select. The app employs time-dependent datum transformation parameters and performs the datum conversion at the date you enter in the **Epoch** data field.

Please note that if the currently active Datum is WGS84(1150)/ITRF00, no transformation will be performed when you change the data in the Epoch field. In fact, no transformation will be performed if you keep the Datum the same and just change the Epoch.

This calls for special attention to certain situations. For example, suppose the Coordinate System screen originally showed NAD83 \_CORSS96/CSRS98 with Epoch 1997, and you changed it to WGS84(1674)/ITRF08 at Epoch 1/20/2017. Now you wish to go back to NAD83 \_CORSS96/CSRS98 with Epoch 1997. What you should do is to keep the Epoch at 1/20/2017 and select NAD83 \_CORSS96/CSRS98. This will exactly reverse the previous transformation and display the original coordinates in NAD83 \_CORSS96/CSRS98. Then you may change the Epoch to 1997 and call it good. Had you entered NAD83 \_CORSS96/CSRS98 with Epoch 1997 to go back to the original datum, then the datum conversion would have been performed at Epoch 1997 and result in a shift from the original coordinates.

If your GPS receiver outputs data referenced to a datum other than WGS84(1150)/ITRF00, and you have selected that datum under **Setup - GPS - Datum** and entered the GNSS Measurement Epoch, then to have the coordinates correctly displayed in the same datum, you must select that datum and enter the same epoch under **Setup - Coordinate System**.

For a map job involving high-precision position data, it would be best that the job only contains data recorded in the same epoch year. It would not be possible for the app to transform the datum at different epochs for different groups of Features.

**Caution:** Make sure the **coordinate system** and **distance unit** are correct before tapping on **OK** to confirm. For UTM, make sure the UTM Zone is correct. For SPC, make sure the State, Region and Zone are correct. For a user-defined coordinate system or a local NEZ plane, be sure to select the name of the proper system to use.

This app can work with a **user-defined coordinate system** that you have defined using the optional PC-GIS software. After defining the user-defined coordinate system, use iTunes to copy the **user\_cor.sys** file (in lower-case letters) from the PC to the Documents folder for your iCMTGIS PRO app. From the Main Menu of iCMTGIS PRO, select **Setup** then select **Coordinate System** then select **User Defined** to access the new coordinate system.

This app will let you calibrate a local NEZ coordinate system. You could use such a system for doing stakeout work. You could also use it to georeference a design drawing (\*.dxf) that does not refer to any actual coordinate system.

To create a local NEZ coordinate system, first select Setup from the Main Menu then select Coordinate System. Tap on **NEZ** then tap on OK.

Tap on **Edit** then enter a name for the coordinate system into the Plane Name field..

Mark the **Control Point** option.

Select **Reference Point** and enter the corresponding GPS and NEZ coordinates. Then select **Control Point** and enter the corresponding GPS and NEZ coordinates. You may use the **Pick** button to select an existing GPS point as the Reference Point or the Control Point, and its coordinates will be automatically entered. The resultant calibration angle and scale will be displayed.

If you have an accurate GPS receiver, you could use the **GPS - Collect** function to record Points to use as the reference points.

If you know the angle and scale for calibrating the local coordinate system against the LLA system, then unmark the **Control Point** option and enter these parameters directly.

The **Y-axis** ("N") of an NEZ plane will be displayed on the screen as pointing "up". This is generally different from the direction of the North Arrow in Map View. The NEZ **X-axis** ("E") will point to the "right".

### Set up Elevation and Angle

Select **Elevation and Angle** under **Main Menu - Setup** to specify the desired angle unit (**DMS**, **Degree**, **Mils**, **Grads**) and azimuth system (**Azimuth** or **Bearing**). If Azimuth is chosen, also specify **North** or **South**.

This setup screen will also let you select the elevation system used for displaying, importing or exporting elevation values. Select **Orthometric(MSL)** when working with Mean-Sea-Level elevations. Select **Ellipsoidal(HAE)** when working with elevations based on the ellipsoid.

By default, the app uses the built-in 30'x30' grid files to convert the HAE recorded by the GPS receiver to orthometric height. With an applicable geoid file (1'x1') available, the app will use it for the orthometric height computation. To use a Geoid12B binary geoid separation file (referenced to NAVD88, e.g. g2012bu0.bin) provided by **NGS** for your region of interest, please transfer it from your PC to the Documents folder for this app then close this app and run it again. If you have the PC-GIS X software program, then you can copy the .g1 file for your region to the iCMTGIS PRO Documents folder. The **CMT \*.g1** files take up less space than the NGS binary files.

### Set up GPS

You may inform the app from where to get the GPS data, what datum the GPS receiver uses and what the antenna height is. To do so, select **GPS** under **Main**



## Menu - Setup.

This app is able to get GPS data directly from a few specific external GPS receivers. To use the position and satellite information provided by one of these external Bluetooth GPS devices, mark the check box for **Enable the external GPS**. Select the **Device** from the pull-down list then select or enter the desired parameters for checking position accuracy.

For example, here are the general instructions for using an **EOS Arrow GPS receiver** with the iCMTGIS PRO:

- 1) Make sure your Arrow device is paired and connected with your iPhone/iPad as per the manufacturer's instructions.
- 2) Under Setup - GPS mark the check box for **Enable the external GPS**, select the EOS GNSS receiver and use the protocol named **com.eos-gnss.positioningsource**. Setup the threshold values accordingly (PDOP, RMS, etc) based on required accuracy.
- 3) If doing RTK with an RTK network, you can use the **EOS Tools Pro** app to connect to the network.

If you are using a **Geneq iSXBlue II or iSXBlue III** GNSS receiver, then please follow these instructions:

- 1) Make sure your iSXBlue II + GNSS device is paired and connected with your iPhone/iPad as per the manufacturer's instructions.
- 2) Under Setup - GPS mark the check box for **Enable the external GPS**, select the iSXBlue device and use the protocol named **com.geneq.sxbluegpssource**. Setup the threshold values accordingly (PDOP, RMS, etc) based on required accuracy.
- 3) If doing RTK with an RTK network, you can run the **iSXBlue RTN NTRIP** app to connect to the network.

Please note that here "**External GPS**" refers only to those GPS receivers for which this app is able to parse the **NMEA** stream. To use any other iOS compatible external GPS, please turn off "Enable the external GPS".

**With the "Enable the External GPS" box marked**, and a compatible GNSS device and protocol selected, this app will let you select a value for the **PDOP Mask** to limit the acceptable level of dilution of precision. Generally, a PDOP value of 4 or 5 is fine.

If you would like to record only positions for which the elevation is also computed, then mark the check box for **3D Only**.

You may turn on **Check RMS Limit** and enter a limit value for the horizontal RMS. Then you will be able to record GPS data only when the horizontal RMS errors are within this limit.

If you will be working with differentially corrected GPS data, then you may select

one of the **DGPS** options: DGPS only, RTK Fixed/Float, RTK Fixed or Any.

**For all GPS receivers**, tap on the **Datum** tab to select the datum as well as the Region in which you are working.

Please select the datum to which the data from your GPS receiver is referenced. For example, if the GPS data is referenced to ITRF05, then select this datum for the **Datum** field. On the other hand, if the GPS data is differentially corrected by using the base data from a local base station, then the rover output will use the datum of the base station. Therefore, if the base station coordinates are referenced to the NAD83\_CORS96/CSRS98 datum, then select this datum for the **Datum** field.

The **GNSS Measurement Epoch** field is for entering the central epoch of the measurement data from the GNSS receiver. For example, if you will be collecting data in 2017, then enter 06/15/2017.

Internally, the app stores position data in the **WGS84(1150)/ITRF00** reference frame. Therefore, if the datum you select is not WGS84(1150)/ITRF00, a datum transformation will be automatically performed. Historically, various WGS84 and NAD 83 datum realizations were referenced to the then current ITRF realizations. For example, the reference epoch for NAD83\_CORS96/CSRS98 is 01/01/1997. To account for the time-dependent nature of the ITRF realizations, the app will transform the datum using the parameters applicable at the reference epoch, then apply the annual rate of change to achieve the datum conversion at the GNSS Measurement Epoch.

If the datum you select is WGS84(1150)/ITRF00, then there will be no transformation performed before the data is stored. In this case, what you enter into the GNSS Measurement Epoch makes no difference.

iCMTGIS PRO does not account for changes in coordinates due to earthquakes and the tectonic plate movements over time. Therefore, if your RTK data is referenced to NAD83\_CORS96/CSRS98 at epoch 01/01/1997, and you need to know the absolute value of the coordinates, you can go to the NGS website and use the HTDP tool to determine the shift vector and apply it to all the coordinates of your data.

Tap on the **Antenna** tab to go to the Antenna Height setup page. The antenna height is the distance of the GPS receiver (antenna) above the ground. If you are using a small GPS receiver (antenna), simply enter its distance from the ground into the **Slant Height** field.

If your antenna has a large base and you are unable to measure its height at the center, then you would measure the distance from the antenna's rim to the ground below the center of the antenna and enter it into the **Slant Height** field. And you enter the radius of the antenna into the **Radius** field. The app will compute the vertical distance to display it as the **Antenna Height**.

The Antenna Height value will be applied to all functions that use locations obtained from the GPS receiver, except for those functions that provide their own Antenna Height data entry field. In this app, the Point Stakeout and Line Stakeout

screens provide an Antenna Height input field. Be sure to enter the actual antenna height in this field when using the Point Stakeout or the Line Stakeout function if it is different from the value you entered under Setup - GPS - Antenna..

### **Set up GPS Data Collection**

You may set up the **default data collection parameters** for Point, Line and Area Features by tapping the **Menu** button, selecting **Setup** then selecting **Data Collection**.

For each of the items in the pull-down list for the Logging Mode field, you can specify the default parameter to use.

Select whether you wish to have UTC time or local time displayed. Enter the Local Time Offset so the time can be correctly converted. For example, the UTC time offset for Pacific Standard Time is -8. It is -7 for Pacific Daylight Saving Time.

### **Set up Navigation**

Under Setup - Navigation Settings, you can specify the color of the various markers as well as turn the beeps on or off.

You can also specify how to keep the screen focused on your location by selecting an option for the **Navigation Zoom Mode**.

In the **Auto Scroll** 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 **Auto Zoom** 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 **Move Map** mode does not apply to the built-in Map, which is fixed in the "up" direction. Close the built-in Map when you would like to work in the moving map mode. The Move Map mode will work with the \*.tif geo-referenced map images and the \*.pim map images prepared by using the PC-GIS software program. Such a background map will re-orient itself to align with your direction of motion in the Move Map mode. When you are moving at a high speed (such as in an aircraft), and you don't want the map to be constantly reorienting itself while you are collecting data, you could mark the check box for **Margin** and specify a boundary within which the map will stay still. When you cross the boundary, then the map will re-orient to align itself with your direction of motion.

### **Set up Color - Pattern**

You can set up the default symbols and colors to be used for displaying the Point, Line and Area Features.

**Selection Color** is the color that will be used for displaying the currently selected Feature. The **orange** color makes the selected Point, Line or Area stand out from the other Features in the job map.

**Default Point Pattern** is the symbol/color that will be used by default for

displaying newly added Point Features.

**Default Line Pattern** is the line style/color that will be used by default for displaying newly added Line Features.

**Default Area Pattern** is the pattern/color that will be used by default for displaying newly added Area Features.

### **Set up Feature Labels**

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

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.

### **Set up Auto Label**

You will also have the option of having the all Features in the selected Feature Topic labeled with their ID information and/or Attribute Values.

You can define the default font color and size as well as the placement of these labels with respect to the Features after selecting **Auto Label** under **Main Menu - Setup**.

These settings will be applied to newly created labels. They will not affect any existing labels.

### **Set up iCloud**

To specify which types of files to enable iCloud® storage for, mark the check boxes for the corresponding file types:

**Job:** **.pmp** files and Shapefiles

**Feature List:** **.fbr** files

**DXF/TXT/XLS/KML/GPX:** **.dxf**, **.txt**, **.xls**, **.kml**, **.gpx** files

**Basemap/Registered Image:** **.pbm** Basemap files and **.pim** registered images

**PDF:** **.pdf** files

**Deed Calls:** **.dcf** files

**Photo:** **.png** photo files


When you mark one or more check boxes and tap on **OK**, the corresponding files

will be **moved** to iCloud storage. They will no longer be in the local Documents folder for the app.

When you unmark one or more check boxes and tap on **OK**, the corresponding files will be **copied** back from iCloud storage.

### **Importing Shapefiles**

You may import the data from Shapefiles for use within this app. As each Shapefiles job has several files associated with it (e.g. the .shp, the shx, the .dbf, and the .prj files), please make sure all these files are present in the **Documents folder** for the application. If iCloud is activated for Job files, then the app will look for the Shapefiles in iCloud storage.

To import Shapefiles, first open the desired Job file, or create a new Job file. Choose **Job**, select **Import**, then select **Import Shapefiles**, select the desired Shapefiles then tap the **OK** button. For your convenience this app provides the option to load Shapefiles from the selected file folder .

If the app prompts you for coordinate system information, then select or enter the Datum, the datum conversion Epoch, Coordinate System, Unit and Region in which the data was saved in the Shapfile then tap the **OK** button. If the selected Datum and Coordinate System do not match those in the Shapefiles, the data may fail to come in or it may not be properly displayed.

The shapes in the Shapefiles will be displayed in the default symbol and color for the Point, Line and Area Features.

### **Importing an Excel file**

If you have exported the Feature data from a job to an Excel (.xls) file, you may import the .xls file into a new map job. To do so, select **Job - Import - Import Excel file** then select the .xls file from the displayed list. Please make sure the Excel file you wish to import is present in the **Documents folder** for this app. If iCloud is activated for XLS files, then the app will look for the .xls files in iCloud storage.

Please open an exported .xls file (e.g. by using Excel or OpenOffice) to see how the data is organized in the various Sheets. To import Feature data from an Excel file into iCMTGIS PRO, the Feature data must be properly formatted in the same way.

Select the proper Datum, the datum conversion Epoch, Coordinate System, Unit and Region before importing the Excel file.

### **Importing a DXF file**

You may import the shapes from a DXF file and work with them in this app.

To import a DXF file, first open the desired Job file, or create a new Job file. Select **Job -Import - Import DXF**. The Import DXF screen will list all the DXF files present in the **Documents folder** for this app. Select the desired DXF file then tap

the **OK** button. If iCloud is activated for DXF files, then the app will look for the .dxf file in iCloud storage.

Select or enter the Datum, the datum conversion Epoch, Coordinate System, Unit and Region in which the data was saved in the DXF file then tap the **OK** button. If the selected Datum and Coordinate System do not match those in the DXF file, the data may fail to come in or it may not be properly displayed.

The imported shapes will be displayed in the default symbol and color for the Point, Line and Area Features.

### **Importing a KML file**

You may import Feature data from a .kml file into iCMTGIS PRO. To do so, select **Job - Import - Import KML** then select the .kml file from the displayed list. If iCloud is activated for KML files, then the app will look for the .kml file in iCloud storage.

Please make sure the .kml file you wish to import is present in the **Documents folder** for this app.

The app expects the data in the .kml file to be based on the **WGS84 datum and the LLA coordinate system**.

The imported shapes will be displayed in the default symbol and color for the Point, Line and Area Features.

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### **Set up Feature List**

In this app a geographic feature is regarded as an object at a location. Such an object is called a Feature, which can be one of three types: **Point Feature, Line Feature, Area Feature**. For example, a house could be represented by a Point Feature, a road could be represented by a Line Feature, and a tract of land could be represented by an Area Feature. Besides recording the position information for a Feature, we usually also want to record a description and other relevant information for that Feature.

This app will let you set up one or more **Feature Lists** to define the data collection parameters for each type of Features as well as the database containing the descriptions with which you can tag each Feature.

Although you do not need a Feature List to start collecting GPS/GIS data using this app, using a properly set up Feature List will greatly facilitate the data collection task. You may skip over this section on the first reading of this document, if you wish, but we recommend that you come back later and study it well.

### **Features, Attributes and Values**

A good data organization practice is to place Features of the same type that share the same characteristics together into one group. Such a group of Features is called

a **Feature Topic**, or simply a **Topic**. Each Feature Topic is placed on a separate **GIS map layer**. This will permit certain operations to be carried out on the entire map layer when so desired. For example, if there are three barns on a farm, we would put those three Point Features under the Feature Topic named "Barns". When we don't want those barns to show on the map, we could simply turn off the "Barns" Feature Topic.

A **Feature** can be described by a set of **Attributes** and **Values**. An Attribute is the name of a specific descriptor. The Value is the actual quantitative or qualitative description.

**Example:** A tree may be recorded as follows:

Feature: Tree  
Attribute: Species  
Value: Fir

The app will automatically record the position data.


The Feature List serves as a "look-up" table that makes it very easy to attach descriptions to the GPS position information you collect.

You can set up one or more **Feature Lists** to pre-define the Feature/Attribute/Value database. When you associate a job with a Feature List, you will be able to add Feature Topics from that Feature List along with the pre-defined Attribute and Values. This will speed up the process of tagging the Features with descriptions. Instead of typing all the descriptions, you will simply pick and choose the appropriate description for each Feature.

A Feature List can be used by one or more jobs. Therefore, if you will be doing a number of similar jobs, you could define a Feature List containing the Features, Attributes and Values that can be shared by all of these jobs.

The file name extension for Feature Lists is **.fbr**.

### **Viewing a Feature List**

To use the Feature List function, tap on the **GPS** Menu icon  then select **Feature List**. The "New" option is for creating a new Feature List. The "Open" option is for opening an existing Feature List to view or to modify.

Tap on **Open**.

If there is a Feature List associated with the active Job, its contents will be displayed. Otherwise, the **Select Feature List** screen will pop up to display the existing Feature List files.

As you have not yet associated a Feature List with mypoles.pmp, you will see the **Select Feature List** screen.

Your app comes with a sample Feature List named **utilities.fbr**. Select **utilities.fbr** then tap on the **OK** button to display the Feature List definition screen. We will be using this Feature List for a meter reading data collection job as an example. You

could fashion your own point data collection job after this sample job and its associated Feature List.

Tap the **Save As** button then enter "myutil" to save the Feature List as **myutil.fbr** to work with. This way the original utilities.fbr will remain intact should you want to view it again as an example in the future. The **Save As** function is very useful if you need to create a new Feature List that has a similar setup as the currently active Feature List. Instead of adding all the Attributes and Values again, you will only need to make the necessary changes.

The Feature List screen contains three main sections for entering data. The active section is colored grayish blue.

For the **myutil.fbr** Feature List, the **Feature section** shows a number of Feature Topics.

As you can see, the "**Feature Lock**" check box is not marked for this example. This means that your data collection will not be limited to the Feature Topics defined in the Feature List associated with the Job. While collecting data, if you encounter a new type of Features, you could create a new Feature Topic on the fly and log GPS data for it. On the other hand, if you wish to restrict data collection only to the Feature Topics defined in the associated Feature List, then you would mark the check box in the Feature List definition screen.

The "**Pole**" Topic will contain Point Features. Therefore it is assigned a Point Type and a representative point symbol. Its GPS data collection mode is "Static Time" with a session duration of 20 seconds.

The "**R1-**" and "**R2-**" Topics are also of Point Type and each is represented by a point symbol. The GPS data collection mode is "Static Time" with a session duration of 20 seconds.

The "**Fence**" Topic is assigned a Line Type and a representative line style. Its GPS data collection mode is "Dynamic Time" with an interval of 1 second between the nodes.

Tap on "**Pole**" to highlight this Topic. In the **Attribute section** below, you can see three Attributes that have been defined for this Topic.

Tap on "**Condition**" to see the three pre-defined Values for the utility poles in the **Value section**. Having pre-defined Values for an Attribute facilitates assigning descriptions to a Feature. Instead of having to enter the description for a Feature, you can simply select it from the displayed list. Feature attribution can be performed during GPS data collection or via the **Sheet View** or the **Feature Properties** function.

We did not define any Values for the "**Last checked**" Attribute as you will be entering the actual date in this field. Similarly, we did not define any Values for the "**Remark**" Attribute as the observations will vary. However, if the observations usually fall into a few categories, then you could set them up as Values for the Remark field. We've made this field of **Text** Type, with a **Length** of 127



characters.

In the same way, you can tap on the "**Fence**" Topic or the "**R1-**" Topic in the **Feature** section to view their Attributes and the corresponding pre-defined Values.

Below the Value section, there is a checkbox named **Activate Pattern**. When this checkbox is marked, a column titled **Pattern** is displayed in the **Value** section. This gives you the option of assigning a different symbol for each Value to help differentiate the Features in the Map View. In the **myutil.fbr** example, we are making use of this capability to use symbols of different colors to represent the various conditions of the poles, whether a meter has been read, as well as the different types of fences and land plots.

**Please note:** Activate Pattern can be active for one Attribute only. If you had this check box marked for an Attribute then decide to mark a different Attribute, the first Attribute will lose its Activate Pattern status. The currently active color/pattern scheme will apply automatically to newly added Features. However, you will need to take care of updating the color/pattern assignment for any existing Features if they have been previously assigned a different set of color/patterns.

The **Type** box below the Value section is for specifying the data type of the Values. The "**Text**" type is for text descriptions. You may specify in the **Width** box the maximum number of characters that can be entered for the text description. For the "Last checked" Attribute, we set the width to "10" as we expect to enter dates in the mm/dd/yy format.

If the pre-defined Values for an Attribute will be decimal values, you should select "**Decimal**" and specify in the **Dec. Digits** box the number of decimal digits that can be entered.

For the "**R1-**" and "**R2-**" Topics, we have set the Type for the "**Reading**" Attribute to be "**Range**", and defined a subrange of blank values to assume a purple symbol. We have set the Value Type to be "**Integer**" and the corresponding **Int. Digits** to be "6". An unread meter on the meter route will be represented by the purple symbol. Once a reading has been entered for a meter, its symbol will change to the default blue color for the Features in the meter route Topics.



## Editing a Feature List

You may open an existing Feature List and change it as appropriate. The following commands are shared by the **Feature**, **Attribute** and **Value** sections:

**Add:** Add a new blank record at the end of the list.

**Insert:** Add a new blank record above the currently highlighted record.

**Delete:** Delete the selected record.

Let's add a new Feature Topic to the **myutil.fbr** file that we saved in the previous subsection, and define its Attributes and Values. To do so, first open **myutil.fbr** if it is not already open. Tap anywhere in the **Feature section** to activate it then tap the **Add** button.

The Feature Topic you will be adding is an Area Topic that represents land plots. Enter "**Plot**" as the Feature name and select **Area** as the Feature Type. Double-click in the cell for **Pattern** then choose an area pattern to represent the land plots on the map. The second pattern on the first row looks like a nice pattern to use. Accept "Dynamic Time" as the Collect Mode and "1" as the Intvl/Sess value.

With the "**Plot**" Feature Topic selected, tap anywhere in the **Attribute section** to activate it. Tap the **Add** button then enter "**Zone**". Tap the **Add** button again then enter "**Price**". Tap the **Add** button again then enter "**Price/acre**".

If you need to edit a data field, first **double-tap** that cell then type over or change its contents. Leave the **Type** field as **List** for all of the Attributes in this example.

Tap the **Save** button from time to time to save what you have entered.

Now select "**Zone**" then tap anywhere in the **Value section**. To populate the List of pre-defined Values, tap the **Add** button then enter "**Farm**". Tap the **Add** button again then enter "**Industrial**". Tap the **Add** button again then enter "**Residential**".

Mark the **Activate Pattern** checkbox to see the **Pattern** column displayed in the **Value** section. Double-tap the pattern for Farm and assign a green color to it. Assign a blue color to Industrial, and assign a hot pink color to Residential.




Leave the "Price" and "Price/acre" Attributes without pre-defined Values. You will be entering the prices of the land plots, and we will let the app calculate the price per acre based on the acreage of the plots.

As we will be entering numeric values for the "Price" Attribute, such as 900,000.00 (dollars), tap on "Price", select **Decimal** for the **Type** box, and enter "2" for **Dec. Digits**. As we expect the computed price per acre to be a decimal value, tap on the "Price/acre" Attribute, select **Decimal** for the **Type** box, and enter "2" for **Dec. Digits**.

Tap on **OK** to save any changes and close the Feature List function. If you tap the **Cancel** button, then the screen will close without saving the last changes to the data.

### Creating a New Feature List

Now you can try and create a Feature List of your own after thinking about what types of Features you will be recording and what Attributes and Values might be useful to store with these Features.

Tap on the **GPS** Menu icon  then select **Feature List**. If there is no Feature List associated with the active Job, the **Select Feature List** screen will pop up to display the existing Feature List files. If there is a Feature List associated with the active Job, its contents will be displayed. In that case, tap the **Open** button to display the **Select Feature List** screen.

Tap the **New** button then enter a meaningful name in the "FileName:" box, then press the **OK** button.

The **Feature** section will be active in your new Feature List. Tap the **Add** button to add the Feature Topics you wish to define. Assign a representative default symbol for the new Feature Topic.

You may define the Attributes and Value for each Feature Topic immediately after adding the Feature Topic, or you may add all the Feature Topics then define the Attributes and Value for each.

You may set up the **default data collection parameters** for Point, Line and Area Features by tapping the **Menu** button, selecting **Setup** then selecting **Data Collection**.

You may also define the **data collection parameters** for each specific Feature Topic in the Feature List. These parameters are described as follows:

**Type:** Point, Line or Area.

**Mode:** Select the mode of data logging.

**Static Time:** Logs a stationary Feature for the specified **Time Session** in seconds. This is the default for Point Features.

Lines and Area Features may be collected in Static mode. In this case, you would let the GPS receiver stay at each node of the Line or Area Feature for the duration of the Time Session. The software will join these nodes or vertices with straight lines.

**Dynamic Time:** Logs a Line or Area Feature at the specified **Time Interval** in seconds.

**Dynamic Distance:** Logs a Line or Area Feature based on the specified **Distance Interval** in the active distance unit. The result will be a Feature with equally spaced nodes.

In the **Attribute** section, tap the **Lock** checkbox for an Attribute if you wish to lock the Values associated with this Attribute. When this option is chosen, you may only select from the defined Values and not enter any odd Value to tag the Feature.

For the **Type** column in the Attribute section, select **List** if the Values to be defined are a group of discrete numbers or names. Tap on the Values section then use the **Add** button to add each Value to the list. You will be able to mark one of the Values as the **Default** Value. If most of the data you collect will have the same description, it will save time if you specify this as the default description for that Attribute in the Feature List.

Select **Range** if the Value entry will be a number between a lower limit and a upper limit. When you select **Range**, the **Lock** checkbox will be automatically marked for the Attribute. This means that the Values entered will always be checked against the defined Range for data validity. Enter the **Min** (lower bound) and **Max** (upper bound) Values. You will also be able to enter a **Default** Value to be displayed during data collection.

If you mark the **Activate Pattern** checkbox for an Attribute of Range type, you will be able to use the **Add** button to add the subranges after tapping on the **Pattern** button. The subranges must be between the minimum and maximum values for the main range and not overlap each other. You will be able to assign a different color for each subrange as well.

After defining the Attributes and Values for the Feature Topic that you have added,

if you need to define another Feature Topic with a similar Attribute and Value setup, then you can save time by using the **Duplicate** function. You will need to change the duplicate Feature Name to a new unique name yourself. To do so, **double-click** on one of the duplicate Feature Topic Names then type over it.

Tap the **Save** button from time to time to save what you have entered so far.

After completing the Feature List, tap on **OK** to save any changes and close the screen. If you tap the **Cancel** button, then the screen will close without saving the last changes to the data.

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## **Load Background Map**

You may load various types of background map into a Job file.

### **Built-in Map**

Whenever your iOS device is connected to the Internet and your location can be determined, the default built-in Map (provided by Apple®) for your device can be displayed as the background map for your job data. Make sure that **Location Service** for your device is turned on for the iCMTGIS PRO application software.

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, landmarks, and bus stops.

**Show Satellite** - Show satellite photos.

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

The map will be displayed on the screen.

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

When **Map** is turned on, you may not be able to zoom to a really small scale. If the background Map is not necessary, you could close it then reverse-pinch (pull) to zoom in further.

Should you lose wi-fi connection, the last displayed Map will remain available for you to use. Therefore, if you will be working in a remote area, you could first get the Map for that area displayed then head out to the work site.

### **Job Map**

You may select **Menu - Background Map - Load Map** to select another **.pmp** job file to be loaded as the background for the job.

When a job map is used as a background map, you will not be able to modify it or

to select a Feature from it.

## **Shapefiles**

Before loading Shapefiles, make sure the correct datum, datum conversion epoch, coordinate system and distance unit have been selected under **Menu - Setup - Coordinate System**.

To import a Shapefile that has been transferred to your Mobile Device, choose **Menu - Shapefile - Import**, click on the checkboxes for the desired Shape files to mark them for import then click on the **OK** button.

The imported shapes will be displayed in the default symbol and color for the Point, Line and Area Features. You may change the default symbol and color assignment by selecting **Menu - Setup** then selecting **Color - Pattern**.

You may export Feature data to Shapefiles by using **Job - Export - Shapefile**. Select one or more Topic layers to export. Each Feature Topic will be exported as a separate Shapefile.

Each Shapefile consists of several files (e.g. the .shp, the .shx, the .dbf, and the .prj files).

The exported data files will reside in the **Documents folder** for the application. To access your exported Shapefiles outside the iCMTGIS PRO application, first connect to the iTunes® program then click the **Apps** tab. In the File Sharing section select the Documents folder for iCMTGIS PRO to see the data files for this app.

If you need to use the Shapefile data with another GIS application, please copy the .shp, the .shx, the .dbf, and the .prj file by the same job name to your desktop computer.

## **Geo-referenced Image in .pim format**

You may select **Menu - Background Map - Load Registered Image** to select a geo-referenced image in the **.pim** format to be loaded as the background for the job.

You may use PC-GIS, PC-GPS or PC-MAPPER to convert raster images (\*.tif, \*.jpeg, \*.sid, \*.ecw) into the **.pim** format. These are mapping software programs designed for use on a PC or on a Mac operating in PC mode.

Before loading a .pim file, make sure the correct coordinate system and distance unit have been selected under **Menu - Setup - Coordinate System**.

Click on the .pim file you wish to load into Map View then tap on **Select**.

A sample DRG file named **squawcreek.pim** is included with this app. You could open the **cvoarea.pmp** Job file then load this registered image to view the Features displayed on top of this background map.

## Geo-referenced image in .tif format (Cached Image)

You can use **Menu - Background Map - Load Registered Image** to select a geotiff image (\*.tif) to load into this app. Click on the desired **.tif** file then tap on **Select**.

Select the Datum, Coordinate System, distance Unit and Region in which the raster image was prepared.

When you select a tif file, the app will decompress the image file, load it, and list it under the **Cached Images** tab. If a cached image already exists for the tif file that you select, the app will load the cached image.

To clear a cached \*.tif file to reclaim the file storage space used, select **Menu - Setup - Clear Cache**. After choosing the file name, tap on the **Delete** button.

**Caution:** Before loading a geo-referenced .tif file, make sure the correct coordinate system and distance unit have been selected under **Menu - Setup - Coordinate System**.

If the .tif file is displayed in the wrong location because the wrong coordinate system was used, you will need to remove it from the cache after selecting **Menu - Setup - Clear Cache**. Then you can select the correct coordinate system and unit and re-load the .tif file.

## CMT Basemap

You may use **Menu - Basemap - Load BaseMap** to select a CMT BaseMap to load into iCMTGIS PRO. Click on the desired **.pbm** file then click **OK**.

You can use PC-GIS to prepare the .pbm Basemap file.

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## **Collect GPS Data**

This app will let you create a Job and select a Feature List to use, collect location data for Point, Line, and Area Features, and tag them with descriptions. Feature data may also be collected in the **Offset** or **Traverse** mode.

You may view the data collected for each feature in textual or graphic format.

Please make sure you have selected the datum, datum conversion epoch, the coordinate system and the distance unit under **Menu - Setup - Coordinate System**.

## Job Setup

After tapping the **Menu** button, select **Job** then select **Current Job**.

You can select an existing Job to open it.


If this is a new job you are starting, tap the “**NEW**” button and accept the default Job name or enter the desired Job name.

You may select an existing Feature List to be associated with the Job.

Press **OK** to confirm the screen.

### **Turn the GPS ON**

If you are using an external Bluetooth GPS, make sure your iOS device has been properly paired with it.

Tap on the **GPS** menu icon  then select **Turn GPS On**. To save power, tap on the **GPS** icon then select **Turn GPS Off** when you are not actively collecting GPS data.

If you have selected **Enable the external GPS** under Menu - Setup - GPS, then on the GPS menu the choice would be **Turn External GPS on** or **Turn External GPS off**.

Make sure you have turned on **Location Services** under Privacy in the **Settings** of your device. Also, on the Location Services page, find **iCMTGIS PRO** and turn the switch on to make Location Service available for this app.

The following conditions will generate the error message: "Can't open the session".

- 1) The proper Device and Protocol have not been selected for the External GPS used.
- 2) You executed the "Turn External GPS on" command before connecting the external GPS to your iPad device and turning on the External GPS.
- 3) Another app is using the internal GPS of your iPad device.
- 4) Bluetooth connection is broken, which may happen from time to time.

If the "Can't open the session" error remains after you have taken care of the above issues , try closing then restarting the app.

By default, the iPad device will try to use the external GPS connected to it. When Bluetooth connection is lost, the internal GPS will be used when you turn on GPS in the app. To make sure the app will use the external GPS, please do the following:

Turn off Bluetooth on the iOS device.

Turn off the external GPS.

Turn on Bluetooth.

Pair with the external GPS again. Pair with the external GPS again. The status maybe shown as "Connected", but just tap on the GPS device name again to reconnect.

When GPS is turned on, there is a GPS marker to indicate your position. If you



walk at a brisk pace, the arrow inside the circle will point in the direction you are walking.

The large arrow in the GPS marker indicating your current position will be a gray color when your speed is very slow (e.g. less than 1 m/s). The arrow will change to a red color when your speed is above 1 m/s. The direction of the arrow indicates your current direction.

If you are using a GPS receiver with which this app can interface directly, then in the "**Enable the External GPS**" mode you will see the GPS status indicator at the upper-left corner of Map View. For example:

**N3D4** shows that the External GPS is navigating and able to compute a 3D position. The last digit indicates the PDOP value. If you see **N3F4**, then it means that you are receiving corrected GPS positions with **fixed** ambiguity. A lowercase "f" indicates **floating** ambiguity.

**TRK** means that the GPS receiver is still tracking satellites.

**Sats:#** is the number of satellites used for computing the position.

If you have entered a **RMS** limit in the setup screen for the External GPS receiver, then you will be able to record GPS data only when the horizontal RMS errors are within this limit. Out-of-limit horizontal RMS values will be displayed in red color.

**PDOP:** shows the positional dilution of precision as a separate value. The lower this value, the better.

### **Position Information**

To view your current position and GPS accuracies, tap on the **GPS** icon then select **Position Info**.

### **Satellite Status**

To view the information, such as Azimuth, Elevation and signal strength Status, for the satellites used by your GPS, tap on the **GPS** icon then select **Satellite Status**. Such information is available only for a few specific models of GPS receivers.

### **Navigation Setup**

Under **Setup - Navigation Settings**, you can also specify how to keep the screen focused on your location by selecting an option for the **Navigation Zoom Mode**.

In the **Auto Scroll** 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 **Auto Zoom** 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 **Move Map** mode does not apply to the built-in Map, which is fixed in the "up" direction. Close the build-in Map when you would like to work in the moving

map mode.

If you have loaded a .tif geo-referenced image or if you have used PC-GIS to prepare a .pim background map, that background map will re-orient itself to align with your direction of motion in the Move Map mode.

When you are moving at a high speed (such as in an aircraft), and you don't want the map to be constantly reorienting itself while you are collecting data, you could mark the check box for **Margin** and specify a boundary within which the map will stay still. When you cross the boundary, then the map will re-orient to align itself with your direction of motion.

If you don't want to hear the beeps when GPS is turned on, you can disable them. **Navigation Beep** is the once-per-second beeping that you hear whenever your GPS is able to compute a position. When you are using the **GPS - Collect** function to record a Feature, the app will sound the **Featuring Beep**. To disable either or both types of beeps, simply unmark the corresponding check boxes in the Navigation Setup screen.

### **Select a Feature Topic**

Tap the **GPS** icon then select **Collect**.

Tap the **New** button to call up the **Store Feature** screen.

The Features that you record will need to be placed on a Feature Topic layer. Therefore, the first thing to do is to specify the **Feature Topic** to use.

If you have already created one or more Topic layers in the job, or if the Job has a Feature List associated with it, then the app will let you select from a list of available Feature Topics.

Alternatively, you could enter a new Feature Topic name and select the Topic Type. To record one or more points, specify a **Point-type Feature Topic**. To record a line, specify a **Line-type Feature Topic**. To record an area, specify an **Area-type Feature Topic**.

The **ID** (for the individual Feature to be logged, e.g. **Tree001**), **Feature Type**, **Log Mode** and **Time Session** or **Time Interval** data fields are automatically filled. You may override these default settings, if you wish.

When done specifying a Feature Topic for which to collect data, tap on **OK**.

If you would like to define a new Attribute for the Feature Topic, tap the **Attribute** button.

### **Feature Attribution**

If a Feature List is active for the Job, the Attributes associated with the Feature will be automatically displayed.

For an Attribute of the **List** type, click on the pull-down button to select the desired

value.

For an Attribute of the **Range** type, enter a Value within the allowed range. If the Attribute is not locked, then you may enter any Value.

If the Feature Topic is not from a Feature List, you may manually enter the Values for the Attributes created in the Topic Editor to characterize it.

If you wish to assign a specific symbol or color for the Feature, then click on the **Pattern** button and make the desired choices.

### **Data Logging**

To log GPS data, press the **Store** button from the **Collect** screen. Data will be recorded per the Feature type and the data logging parameters specified for the Feature.

To halt data logging temporarily, tap the **Pause** button. When ready to continue, tap the **Continue** button.

The Map View is “North” oriented unless you are working in the Move Map mode. (You can select the Move Map mode under Main Menu - Setup - Navigation Settings.) If the position moves off the screen, the screen will automatically scroll or zoom to show the current position.

If your external GPS receiver provides GST NMEA message, then the **Nxxx** indicator on the GPS status line at the top of the screen will show **Fxxx** while you are actively logging GPS feature data (i.e. Featuring and not just navigating).

Following are the procedures for recording various types of position data.

### **Storing STATIC Points**

Each Static Point is a stand-alone Feature.

1. Stay at the feature location and **do not move around** while you are logging data for a Point Feature.
2. Select or enter the description (Attribute Value) for the Feature.
3. Press the **Store** button to log GPS data.
4. When the time is up, and the data collection session ends, the Point Feature is recorded and the Feature ID advances by 1.

If necessary, you may press the **Stop** button to stop the data logging process at any time. The point will be recorded with fewer coordinate fixes to average.


5. Walk or drive to the location of the next point you wish

to record then select the description, and press the **Store** button to log a second Point for the same Feature Topic.

6. Repeat Step 5 for any additional static points you wish to log.

To start collecting data for a different Point Topic, first tap the **New** button then go to Step 1 above.

If you incorrectly logged a Point Feature and wish to correct it, first select the Point Feature in question from Map View or from Sheet View. Tap the **Feature**

**Properties** icon  then tap the **Update** button. Specify the desired time session then tap the **Start** button to record the correct position.

### **Storing a Static Line or Area**

For a Static Line or Area Feature, you would occupy each vertex (node) for the duration of the Time Session to record its location. And nothing will be recorded while you walk or drive from one vertex to the next. The nodes for the Static Line or Area will be automatically connected by the software.

Go to the beginning node of the Static Line or Static Area Feature. Stay there and **do not move around** while logging data for this node.

Press **Store** from the **Collect** screen to record the Feature descriptions and GPS data for the Feature. The steps are identical to the Static Point data logging procedure described above, except that pressing the **Stop** button will just stop the data logging process for the current node, and will not end the data logging for the Static Line/Area Feature.

When the first node has been collected, move to the next node of the Static Line/Area Feature, then press **Store** again to log data for that point.

Repeat Step 3 until you have finished logging data for all nodes of the Static Line/Area Feature.

Tap **New** if you wish to collect data for another Topic.

### **Storing a Dynamic Line or Area**

For a Line or Area feature logged in Dynamic mode, data will be collected while you are moving along the Line feature or the perimeter of the Area Feature. There are two options for the dynamic mode.

**Dynamic Time:** Log a position based on the specified time interval.

**Dynamic Distance:** Log a position based on the specified distance interval.

1. Go to the beginning node of the Line or Area Feature for which you wish to collect data. Assign Feature information to the new Feature (Feature name and description).
2. Press **Store** from the **Collect** screen.
3. Start moving (i.e. walking, driving) along the Line Feature or the perimeter of the Area Feature.
4. Press the **Stop** button when you have reached the ending point of the Line feature or the beginning point of the area feature. You may also use this button to abort the data logging process at any other time.

Tap **New** if you wish to collect data for another Feature Topic

To end the GPS data collection, tap the **Exit** button. Tap the **Zoom Fit** icon at the top to see all the Features displayed on the same screen.

### **Nested Points**

iCMTGIS PRO allows you to interrupt a Line or Area Feature (without terminating it) to record a nearby Point Feature. This kind of Point Feature is called a **Nested Point**.

The process of logging a Nested Point is similar to that for logging a regular Point Feature. You may log one or more nested points for a Line or Area Feature.

Following is the procedure for recording a Line or Area Feature with Nested Points:

1. Begin logging a Dynamic Line or Area Feature.
2. From the **Collect** screen, press the **Nested** button. A list of Point Topics in your Feature List will be displayed. (The app will show the last used nested point Topic as the default .)
3. Highlight the appropriate Point Topic or create a new one. When done, press **OK**.
4. Optionally select or enter descriptions for the selected Nested Point Feature.
5. Press the **Store** button. Stay at the Point location and do not move around while you are logging data.

If necessary, you may press **Stop** to stop the data logging process for the Nested Point Feature.

6. When data has been logged for the Nested Point Feature,

you may choose to log another Nested Point or to continue logging the original Line or Area.

If you need to log another nested point, press the **Nested Point** button.

To continue with logging the Line or Area, depress the **Continue** button and start moving again along that Feature.

7. Press the **Stop** button when you have reached the ending point of the Line feature or the beginning point of the area feature. You may also use this button to abort the data logging process at any other time.

### **Offset Mode**

For a Feature that is not directly accessible, you can log data for one that is accessible and record the offset information along with the Feature data.

To access the **Offset** function and enter an offset for a Feature, press the **No Offset** button from the **Collect** screen. (“No Offset” indicates that there is currently no offset associated with the Feature.)

This app provides for two types of offset computations.

#### **Left/Right Offset**

You can offset a **Line** or **Area** Feature to the left or to the right.

Select “**Left**” or “**Right**” to indicate whether the target is to the left or right, respectively, of where you are collecting GPS data.

Select the **Angle** mode if you will be indicating the elevation by specifying a slope angle.

#### **Slope Distance:**

Enter the distance between the GPS receiver and the target in a plane perpendicular to the direction of motion.

#### **Slope Angle:**

Enter the angle between the horizontal plane and the line joining the GPS receiver and the target in a plane perpendicular to the direction of motion.

Select the **Distance** mode if you will be specifying the horizontal and vertical offset distances.

#### **Horizontal Distance:**

Enter the horizontal distance between the GPS receiver and the target. This distance should be parallel to the ground, perpendicular to the direction of motion.

#### **Vertical Distance:**

Enter the difference in elevation between the GPS receiver and the target.

After specifying the offset information, tap on **OK** then log the line data as described above.

### **Point Offset**

You can offset a **Point Feature** to another point location.

Select the **Angle** mode if you will be indicating the elevation by specifying a slope angle.

#### **Slope Distance:**

Enter the direct distance from the GPS receiver to the actual target point.

#### **Azimuth/Bearing:**

Enter the azimuth or bearing for the target with respect to the GPS receiver.

#### **Slope Angle:**

Enter the angle between the horizontal plane and the line joining the GPS receiver and the target.

Select the **Distance** mode if you will be specifying the azimuth and the horizontal and vertical offset distances.

#### **Horizontal Distance:**

Enter the horizontal distance between the GPS receiver and the target. This distance should be in a horizontal plane.

#### **Azimuth/Bearing:**

Enter the azimuth (or bearing) for the target with respect to the GPS receiver.

#### **Vertical Distance:**

Enter the difference in elevation between the GPS receiver and the target.

After specifying the offset information, tap on **OK** then log the GPS point data as described above.

### **Append Coordinates**

If you wish to add GPS data to an existing Line or Area Feature, press the **Existing Line/Area** button from the **Store Feature** screen.

Then click on the pull-down menu under “Name” and choose the Feature Topic that contains the Line or Area Feature to which you want to append coordinates. Next, click on the pull-down menu for the “ID” field then select the ID for the specific Line or Area Feature to which you want to append coordinates.

After you press the **OK** button, proceed to collect data as described above for Line/Area data logging.

## Traverse Mode

The **Traverse** function lets you continue mapping **several** Point Features when GPS signal is not available. The application will record the following information that you enter for each traverse leg:

**SLOPE DIST:** The slope distance from the reference position to the location of the new traverse point.

**AZIMUTH:** The direction from the reference position to the new traverse point (0 to 359 degrees).

**SLOPE:** The slope from the reference position to the new traverse point (-90 to 90 degrees).

You may record traverse points in two different modes, as described below.

**Side mode:** Use this method to perform a radial traverse by taking multiple “side shots” from the same reference point. The following diagram refers to a known GPS reference point.


**Traverse mode:** Use this method to traverse to a new point that will then be used as the reference point for the next traverse point. This method can be used for storing lines or area boundaries.

iCMTGIS PRO will permit you to take multiple side shots from each point on a traverse.

The general steps for using the Traverse function are as follows:

1. Tap on the **Traverse** button from the **Collect** screen.
2. In the **Traverse New Feature** screen, select an existing Point Feature as the **Reference Point Feature**.
3. In the **Topic Name** box, enter or select the name of the Point Topic into which the new Point Feature will be stored. The ID will automatically be entered for you. Tap on **OK**.
4. Choose the method for defining the new point by tapping on **Side (mode)** or **Traverse (mode)** button below the ID field.
5. Optionally enter the descriptions for the newly defined Traverse Point Feature. Optionally assign a symbol for the new Point Feature to be stored.
6. Tap the **Store** button to display the traverse data entry fields.
7. Enter the Slope Distance, Azimuth, and Slope for the



point to be created with respect to the reference point. The reference point is shown with a **circle** around its symbol. The target point will be displayed with the temporary symbol .

Click the **OK** button to record the new point.

8. If you are working in the **Traverse mode**, the newly stored Traverse Point will automatically become the next Reference Feature.

If you are working in the **Side mode**, the Reference Feature will stay the same.

To continue working in the same traverse or side-shot mode, repeat the above steps 5 through 7.

To switch to the other mode, first tap on **Side (mode)** or **Traverse (mode)** button below the ID field then repeat the above steps 5 through 7.

**Please note:** If you would like to store the new point to a different Feature Topic, tap the **New** button to call up the **Traverse New Feature** screen then enter or select the new Topic name. Click **OK** then continue with the above steps 5 through 7.

When GPS signal can be received again, you may return to normal GPS data collection mode by clicking the **GPS** button in the data collection screen.

When done with data collection, tap on **Exit**.

### **The GPS Track**

If you wish to record your GPS track in the background while performing other tasks in this app, turn on the GPS then select **GPS - Tracklog On**. A dialog will be displayed for you to set the desired **time interval**.

The recorded track will be stored in the **Tracklog Topic**.

To stop recording the track log, select **GPS - Tracklog Off** or turn off the GPS by using **GPS - GPS Off**. Whenever you turn off GPS or Tracklog, this action ends the track that was being logged.

You may record one or more tracks in this manner.

The Tracklog function is available only while GPS is turned on. Also, the logged track becomes a Feature that you can select or zoom (into or out of) only after the data logging has been completed by selecting **GPS - GPS Off** or **GPS - Tracklog Off**.


If you don't see the new Tracklog record in **Sheet View**, please turn the Sheet

View off then on. Then the new Tracklog record will display.

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## Topic View

The Features in your map are organized into Feature Topics, or Topics for short. The Features in each Topic are placed on a separate map layer.

To see a list of all the Feature Topics you have in the currently active job file, tap the **Topic View** icon . This icon is a toggle tool for turning the Topic View on or off. The Topic View is displayed on the left side of the screen.

When you tap on one of the Topics in the Topic View, that Topic becomes the **active Feature Topic** and it will be highlighted.

Also, when you to **tap on one of the Features in Map View**, the Topic, to which that Feature belongs, becomes the active Topic.

For example, after you open the **mypoies.pmp** job, you will see that there is one Topic named "Corner" that contains three Point Features represented by the blue dots. When you tap on , you will see "Corner" listed in the Topic View panel on the left side of the screen. You can tap on "Corner" to highlight it and make it the active Topic.

You can toggle the **display** of an individual Topic ON or OFF by clicking on the mark box to the left of each Topic name.

To change the **symbol** assignment for a Topic, simply **double-tap** the existing symbol displayed by the Topic name in Topic View then select the new symbol.


## Moving a Feature Topic

In general, you will want to have Point Feature Topics and Line Feature Topics placed above the Area Feature Topics so that the Area Feature layers won't block out the Points and Lines underneath.

You can **change the order** of the Topic layers. To do so, hold down on a Topic then drag it to the desired position. As an exercise, move the Tree and Corner Topics to be above the Plot Topic.

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## Topic Menu

The **Topic Menu**, represented by the **Topic Menu icon** , provides the function to create a new Topic, as well as a number of other functions that operate on the currently active Topic.

## Creating a New Feature Topic in a Job

Before adding a Feature to the map by digitization, you will need to select the appropriate Feature Topic into which that Feature will be placed. If such a Feature Topic does not exist, then you will need to create it.

To create a new Feature Topic in a job file such as **mypoles.pmp**, tap the **Topic**

 **Menu** icon, then select **New Topic**. Enter a Topic Name, such as **Tree**, on the **Topic Structure** page. Since trees are regarded as point objects, select **Point** for the **Type** field. You can add one or more **Attribute Names** (title of description) for this Topic and specify the data type and parameter. Let's tap the **Add** button, double-tap on the blank cell and enter "Species" as the (Attribute) Field Name. This Attribute is a Text descriptor. We can leave the **Width** at 23 to accommodate certain long species names.

Notice the little pull-down arrow in the **Field Name** cell after you tap the **Add** button? This app comes with a number of **Built-in Attributes** that you may incorporate into a Topic as an Attribute. To add such an Attribute, tap on the pull-down arrow then select the desired item, such as the **Position\_X** or **Position\_Y for the points in a Point Feature Topic** or the GPS data **Quality**. If you select the **Elevation** Attribute, the MSL or HAE elevation will be used depending on what you've selected for the Unit and Angle System Setup. The GPS **Quality** Attributes are defined as follows:

**G** = GPS (uncorrected GPS position)

**D** = DGPS (Differentially corrected GPS position)

**F** = Fixed (Real Time Kinematic solution with fixed ambiguity)

**f** = float (Real Time Kinematic solution with floating ambiguity)

**Date/Time Stamping:** You may add the Date and Time built-in Attributes to the Topic Structure. The name of the added Attribute will depend on the Time Mode setting (UTC Time or Local Time) under **Setup - Data Collection**. The Date format will reflect the **Region** you've selected under Settings - General - Language and Region on your device. Please note that if you select a different Region after the Date Attribute has been added to the Topic, you will need to call up **Setup - Data Collection** and tap on **OK** in order to see the change reflected in the date format.

The Attributes that you add to the Feature Topic will be displayed in **Sheet View** and can be exported along with the Features to Shapefiles and DXF files. For Point Features, these Attributes can also be exported to text files.


If a **Feature List** is associated with the active job, you can tap on the down arrow for the Topic Name field and see a list of the pre-defined Feature Topics. You may select one of these pre-defined Topics to include in the active job.

**Please note:** A Topic copied from a Feature List will inherit the associated predefined Attributes/Values. However, the copied Topic is not related to the Feature List. Therefore, if you add a new Attribute to the Feature List for that Feature Topic afterwards, the change will not be reflected in the Topic in the Job. If you would like the Topic to have the newly added Attribute/Values, you may use the **Edit Topic** function discussed below to do so. After you add a new blank

Attribute record on the Topic Structure Page, you can select the new Attribute from the pull-down list. The pull-down list will include all the Attributes from the Feature List associated with the Job.



Tap on **OK** to close the Topic Structure screen.

We have previously created a Feature List named **myutil.fbr**. We will associate this Feature List with our sample job. To do so, select **Job** from the Main Menu then select **Open Job**. For File Name select "**mypoles**". For Feature List select "**myutil**". Tap the **OK** button to confirm and return to Map View.



Tap on  then select **New Topic**. Tap on the pull-down arrow for the Topic Name field to see the available Topics to add from myutil.fbr. Select "**Plot**" then tap the **OK** button to confirm. In the same way, add the "**Fence**" Topic and the "**Pole**" Topic from myutil.fbr.

When done, tap the **OK** button to close the Sheet Update screen.

### Editing a Topic

To edit an existing Topic, first tap on  and select that Topic from the Topic View panel. Tap the **Topic Menu** icon  then select **Edit Topic**. You may make changes to the **Topic Structure**, such as by adding more Attributes to the Topic. Or you may tap the **Sheet Setup** tab and change the order in which the Attributes will be displayed in **Sheet View**.

The **Sheet Setup** table provides a **Lock** checkbox that you could use to prevent accidental changes to certain data fields. **For example, you would normally lock the meter number and address fields for a meter route, and just make the meter reading data field available for the meter reader to enter data.**

Let's add a built-in Attribute to the "**Plot**" Topic in the **mypoles.pmp** job. Tap on  then tap on "**Plot**" in Topic View. Tap on  then select **Edit Topic** to display the Sheet Update screen.

Tap the **Add** button then tap on the pull-down arrow by the highlighted "Name1" to display the built-in Attributes. Select "**Area\_Acres**" and enter "2" for Decimal Digits. Tap **OK** to confirm. This Attribute will automatically compute the acreage of an Area Feature you place in the Plot Topic.

If you will be attaching photos to the Features and want the photo file name to be included as an Attribute, then you will need to add the built-in Attribute **Photos**. The data field for displaying the photo file name(s) is limited. If the string of file names is too long, it will be truncated. Therefore, it is advisable to keep the photo file names short.



### Defining a Formula

While creating or editing a Feature Topic, you may enter a formula for an Attribute

based on the Values of other Attributes for the same Feature Topic.

The reason we added the "**Area\_Acres**" Attribute to the "**Plot**" Topic in **mypoles.pmp** job is so that we can compute the price per acre for each land plot. In other words, we want to define for the "**Price/acre**" Attribute the following formula:

### **Price / Area\_Acres**

To do so, first tap on  then tap on "**Plot**" in Topic View. Tap on  then select **Edit Topic** to display the **Sheet Update** screen.



Highlight the **Price/acre** Attribute then tap the **Formula** button.

Tap the **Select Attribute** button and select "**Price**". Enter the division operator "/" then tap the **Select Attribute** button and select "**Area\_Acres**". The resultant formula will be displayed in the Formula box.

Tap on **OK** to save the formula.


Specifying a formula for an Attribute means that the Value for that Attribute will be automatically computed from the Values of the Attributes used in the formula.

### **Deleting a Feature Topic**

To delete an existing Topic, first tap on  and select that Topic. Then tap on  and select **Delete Topic**. This will delete the Topic definition as well as all the Features on that Topic layer.

**Caution: A deleted Topic and the Features in that Topic cannot be recovered.**

### **Auto Label**

If you wish to have the Features displayed in Map View along with one or more of its identification labels or descriptions, first tap the **Topic Menu** icon  then select **Auto Label**.

You may opt to show the Feature's **Topic Name**, **Sequence#** or **Feature ID**.

You may select one or more **Attributes** to be displayed.

Select **Delete Labels** if you wish to have the labels deleted.

Select **Hide Labels** if you only want to hide the labels but not delete them.

Tap on the **Font** tab to change the font size, font type face, or the **Freeze label size in zoom** setting.

You can set the default size, color and placement of these labels with respect to the

Features by using **Main Menu - Setup - Auto Label**.

The settings under **Main Menu - Setup - Auto Label** will only be applied to newly created labels. They will not affect any existing labels. If you wish to have the new settings applied to all existing auto labels then you should use the **Delete Labels** button to remove all existing auto labels then create the auto labels again.

You may adjust the placement of an auto label by tapping on it to select it in **Map View** then dragging it to the desired location.

You may change the properties of an auto label by tapping on it to select it then tapping on the **Feature Properties** icon.

### **Goto a Feature**

The **Goto** function on the Topic Menu will let you search on the active Topic layer for a Feature that meets the specified search criterion. A successful search will result in the Feature being highlighted in Map View and the corresponding record being highlighted in Sheet View.

If you select **Feature ID** as the search criterion, you cannot select another criterion at the same time because the Feature ID is a unique entity.

To select some other Attribute as the search criterion, first tap on the checkbox for Feature ID to unmark it then select the desired Attribute Name and enter the Value you are looking for. You may use up to five Attributes as search criteria. If you select multiple Attribute as search criteria, the app will take you to the Feature that meets **all** of the specified criteria. If there are several Features that satisfy the search conditions, then you can tap the **Find Next** button to go to the next one. You will also have the option to start the search from the Top (first record) or from a Start Number (record number).

### **Sort Features**

This function will sort the Features by its Attributes. You may select a single Attribute as the basis for sorting the Feature records. If you select **Feature ID** as the criterion, you cannot select another criterion at the same time because the Feature ID is a unique entity. To select some other Attribute as the criterion, first tap on the checkbox for Feature ID to unmark it then select the desired Attribute Name.

If there are multiple records that share the same Attribute Value, you may wish to select an additional Attribute by which to sort each subgroup. The Index number denotes the sort level. If you wish to change the sort levels, tap on the **Index** button, then tap on the Attribute to be used for the highest sort level. When the Index button changes to Index (02), tap on the Attribute to be used for the second sort level, and so on.

By default, the Features are sorted in an ascending order. If you wish, mark the **Descend** checkbox for a descending sort order.


## Statistics

To display the statistics for a numeric Attribute for a Feature Topic, first select that Topic to make it active then tap on the **Topic Menu** icon  and select **Statistics**.

## Export Text File

This function will export the data from the currently active **Point Feature Topic** to a text file that you might later import into a database management program. The exported file name will have the file name extension **.txt**.

To get an idea of how the text file export works, you could open the sample job file named cvoarea.pmp and select the Houses Point Topic to work with.

When you tap on the **Topic Menu** icon  and select **Export Text File**, the text file name will default to the active Point Topic name. You may tap the **New** button and enter a different file name, if you wish.

If you wish the first line in the exported text file to contain the field names (i.e. the Attribute names), then mark the checkbox for **First line contains field names**.

If you wish to include the Feature ID field in the exported text file, then mark the checkbox for **Export Feature ID field**. The Feature ID is a unique identifier for each Feature in a Topic and can serve as a key in sorting, searching and updating a Feature/Attribute/Value database.

If you wish to have the data in each field wrapped between double quotes in the text file, then mark the check box for **Wrap Text field in double quotes (")**. Please note that if any data value contains a comma (such as "Paul Burns, Jr") or a quotation mark, you must select this option. Otherwise, the data will not be correctly parsed by the importing software.

If your external software program expects data with fixed field lengths, then mark the check box for **Fixed field length**. In this case, the field length of the exported data will be based on the Topic structure. You can call up Topic - Edit Topic to change the length of the Attribute Value field. For an Attribute of **Decimal type**, the field length will be set to 15. In case the field name itself is longer than 15 characters, then the field length will be set to match the number of characters in the field name.

When exporting angles in **degrees-minutes-seconds** format, the app will use the caret symbol (^) to represent degrees.

**You may use the Feature ID field for selecting the data records to export to the text file.** If you wish to export all the records, then leave the Field Name in the Filter section as "None". Otherwise, select "Feature ID" as the Field Name for the filter. You may specify one criterion or two criteria for selecting the data records based on Feature ID. For example, if you wish to export all the TREE Features after TREE005, then select ">" and TREE005 as Criterion 1, and select "None" for the Logical field. As another example, if you wish to export the TREE Features after TREE005 and up to and including TREE020, the use the same Criterion 1 as

above and set Logical to "AND". Then for Criterion 2 select "<=" (less or equal to) and TREE020.

If you do not want to export all the Attribute data for the selected Feature Topic, tap on the "**Select Attribute**" tab, then mark the check boxes for the Attributes you wish to export. If there are lots of Attributes for the Topic, you can use the "**Select None**" button to deselect all of them, then select the few Attributes you wish to export.

Tap on **Export Preview** to see how the text file will look like.


Tap on **OK** to complete the export.

### **Import Text File**

This function will let you import **Point Feature** data into a Job from a text file. This is a very useful function for importing data into a Point Topic layer in the app. For example, you could use it to set up a meter reading route in this app if you already have the meter records set up on your desk-top computer and are able to export it as a text file. This function can also serve as a quick way to update the Attribute data for an existing Topic layer in the app.

#### **Please Note:**

- 1) Each Point Feature must have coordinate information in order for it to be placed on the Map View. **To generate new Point Features at the correct locations on a new Topic layer, the import text file should either include the coordinate fields or street address fields.** If you just wish to update the Attribute Values of the existing Point Features on a particular Topic layer, then do not provide the coordinates in the import text file. Rather, select a **Relation Key** to correlate the incoming data with the existing data, as described later in this section.
- 2) If you import coordinates and date time values, make sure your app is set up with the matching coordinate system and time format (UTC or Local Time). Also make sure your device is set to the matching Region for the correct date format.
- 3) The app will convert the imported coordinates when you switch to a different coordinate system later. However, the app will not convert the imported date and time when you change the Region or the UTC/Local Time setting. It will only do so for the date/time values of the GPS points that you record using the app.

To import data from a text file, first tap on the Topic Menu icon  then select **Import Text File**.

On the **Select File** page, select the text file you wish to import after selecting the file name extension **.txt** or **.csv**. (Suppose you have exported the Houses Features to a text file while going through the section titled "Export Text File". Then you could create a new Job and use the Import Text File function to import the Feture data from that text file.)

To have the location data fields interpreted as geographic coordinates (such as longitudes and latitudes), you must give them the field names **Position\_X** and



**Position\_Y**, respectively.

If the text file contains **angles in degrees-minutes-seconds format**, the caret symbol (^) should be used to represent degrees. The minutes are to be represented by a single straight quote ('), and the seconds are to be represented by a double straight quote (").

Mark the checkbox for **First line contains field names** if the first line in the text file indeed contains the field names.

If the data for each field is wrapped between double quotes in the text file, then the app will mark the check box for **Text field is wrapped in double quotes (")**.

The app will use your settings as the default for future text file imports. Please select the proper options for your import text file so that the app can correctly interpret the data fields.

Tap on **Next Step** to continue to the **Set Topic** page..

You will need to name the **Topic** into which the data will be imported. The Topic name will default to the text file name. You may give the Topic some other name, or you may select a Topic from the drop-down list. All the Point Topics in the active Job and the associated Feature List are available for selection.

If you wish to make use of the Attribute assignments for a Topic in the Feature List associated with the active Job, make sure you select that Topic name from the drop-down list during the import process. If you import the data under a different Topic name and later rename it to be the same as the one in the Feature List, it won't be possible to relate that Topic to the Feature List.

Depending on the case (as discussed below), you may or may not be prompted to select a **Relation Key** and to specify whether or not to **Overwrite** the existing data.

If, on the previous page, the **First line contains field names** checkbox was not marked or the **Delimiter** is **None**, then the app will prompt you to specify the **Field Names**. In the case where the **Delimiter** is **None**, you will also need to specify the number of character spaces occupied by each field in the text file.

Tapping on **Next step** will take you to the **Data Format** page.

There are a number of cases to consider.

**A.** If the Topic name you specify for the imported data is a new one that does not exist in the active Job nor its associated Feature List, the app will create the new Topic, and the Data Format table will be populated with the field names, field types and field lengths based on the text file.

**B.** If you have selected the name of a Topic that exists in the active Job, but the Topic does not contain any Features, the app will import the data from the text file into the selected Topic.

C. If you've selected the name of an existing Topic that contains one or more Features, this indicates that you may wish to modify or add to the existing Topic. The app will prompt you to select a **Relation Key** to correlate the incoming data with the existing data. The relation key is an Attribute that exists in both databases and that has **unique values** (no duplicates). For example, if you have a list of people with their occupations, and the same list of people with their favorite hobbies, you will be able to use the peoples names as the relation key to find out both the occupation and hobby of a certain person on the list. By default the app will use the **Feature ID** as the relation key.

If you don't select a Relation Key, or if no field name is eligible to serve as a relation key, the app will ask you if you wish to add all new fields and data from the import text file. If you answer **No**, then the app will return to the screen for selecting the Relation Key. You can cancel out if you wish. If you answer **Yes**, then the app will display the fields and data to be imported.

If a **Relation Key** is selected, the app will let you choose whether or not to replace the existing data with the new data.

If you select **Overwrite**, the incoming data will replace the existing data for the records with matching relation key value. This will happen to the shared Attributes in the two databases. Any extra records in the incoming database will be added to the existing database. Any Attribute in the incoming database that is not in the existing database will be added to the Topic.

If you select **Leave intact**, the existing data will not be replaced. Any new Attributes will be added to the existing database.

If you are importing street address fields and would like the app to **convert the address information into coordinates**, then mark the check boxes for these fields in the **Address** column. Make sure the Street name, City name and State name are specified in this order. An example of the corresponding data record would be:

**"375 SW Monroe Ave", "Corvallis", "OR"**

Tap on **Next Step** to go to the **Coordinate Sys** screen. You will be asked to select the correct coordinate system for importing the points in the text file.

Tap on **Next Step** to go to the **Preview** screen that shows the data in the form it will be imported.

If the data to be imported does not look right, tap on **Cancel** to abort the import operation.

If everything looks okay, tap on **OK** to import the points into the active Job. The coordinates of the Point Features will automatically be converted to the active coordinate system.

### **Batch Delete by Text File**

If there are many Feature records that you no longer need in a **Point Topic**, you can have them deleted all at once by preparing a text file containing the Relation

Key field to be used as the basis for deleting the unwanted records. An Attribute must not have duplicate Values if it is to serve as a Relation Key.

To use this function, select **Menu - Topic - Batch Delete by Text File** then select the **text file** containing the Values for the Attribute used as the Relation Key. For example, this might be a list of Feature that you wish to delete based on the Feature IDs.

"Feature\_ID","TREE001","TREE003","TREE005"

You will need to inform the app whether the first line in the text file contains the field name(s). If it does (recommended), mark the checkbox for **First line contains field names**. If it does not, then you will need to specify the field names for the data fields. You may tap the little down arrow for each Field Name record to select the appropriate Attribute of the active Topic.

On the **Set Relation** page you will select the Attribute to be used as the key (such as Phone). For an Attribute field to be used as the key, it must not contain any duplicate Values. The app will display the valid Attribute fields from which you can make a selection.

Then the **Preview** page will show the records in the currently active Topic that will be deleted. For example, all the records that have phone numbers that match the phone numbers in the phone number list are subject to deletion.


You will be given a chance to confirm the deletion or to abort the action.

### **Warning:**



**If you answer Yes, all the listed records will be erased and cannot be recovered.**

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### **Sheet View**






After activating a Topic either by selecting it from the Topic View or by selecting one of the Features in that Topic, you may tap the **Sheet View** icon  to list all the Feature records in that Topic. The Sheet View presents the Features and their Attributes in a tabular format based on the Feature Topic setup.

As an example, select **Main Menu - Job - Open Job**. For **File Name** select **mypoles.pmp**. For the **Feature List** box, select **myutil.fbr** then tap on **OK**.



Tap on  then tap on the "Plot" Topic name in Topic View. When you tap the **Sheet View** icon , you will see the spread sheet for this Topic. You may drag the border of a heading field to adjust the displayed field width. To expand the cells to show their full contents, double-tap on a column heading then tap on **OK**.





Sheet View provides an alternative way for you to select the desired Feature for


viewing or editing. Tap a record in Sheet View and watch the corresponding plot get highlighted in the map.

With the **View** icon  displayed at the upper-left corner of Sheet View, you can tap on any cell to highlight it. You can double-tap on an Attribute cell to edit its value. When you tap on the **View** icon , it changes to the **Edit** icon . In the edit mode, whenever you tap on an Attribute cell, the keyboard will pop up for you to edit the contents of the cell. Therefore, when you just want to view the data and will not be entering anything, remember to tap on the  icon to change it to the  icon.

Normally only a few records will be visible along with the map display. You may drag the top of the Field Name cell up or down to change the number of rows displayed.

You may also click on the **Full Sheet View** icon  to have the entire screen dedicated to Sheet View. To return to the normal view, tap on the  icon.

You may change the order of Features in a Feature Topic by highlighting the Feature record in the Sheet View and then using the , ,  and  icons.

To delete a Feature, first highlight it then tap the **Recycle Bin** icon .

**Caution:** Always make sure you really want to delete a Feature before confirming the deletion action. **A deleted Feature cannot be recovered.**

### **Feature Attribution**

Sheet View provides a convenient way for you to add or change the description for each Feature record. You may edit the displayed Value if it is not a Value computed by using a Formula, or a Value for a built-in Attribute (such as ID and Area\_Acres).

To change a Value displayed in a cell of the Sheet View, double-tap on the cell then type over the existing data. You may do so as soon as each Feature position has been recorded. Or, you could enter the descriptive data after all the Features in a Topic have been recorded.

If a Feature belongs to a Topic added from the Feature List associated with the job, then the pre-defined Values will be available for you to select. For an Attribute of the **List** type, you may click on the **pull-down arrow** in the cell to select the desired value. If the Attribute is not locked, then you may also enter any Value. For an Attribute of the **Range** type, you may only enter a Value within the allowed range.

Go ahead and enter data in the empty cells for the Features in the **Pole** and **Fence** Topics. Because the **Pole** and **Fence** Topics were copied from the **myutil.fbr** Feature List associated with this job, which contains pre-defined Values for some of the Attributes, you will see a pull-down arrow for the cells in those columns,

and you will be able to select the appropriate Value instead of having to type in the data.

Notice how the pole you mark with "Danger" shows up in red color, and a "Wood" fence is displayed in brown? These are exactly the colors we have assigned in the Feature List to the symbols representing those Values. Similarly, a "Farm" land plot will be colored green, and an "Industrial" land plot will be blue.

For the **Plot** Topic, notice how the "Area\_Acre" field is automatically populated with the acreage of the land plots. Also, as soon as you have entered a value for the "Price" Attribute, the price per acre is automatically computed and displayed in the "Price/acre" column.

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## Feature Properties

With a Feature selected in the Map View, you may tap the Feature Properties icon



to view the relevant information.

A few pages are provided for displaying the Feature properties.

Tap on the **Coordinates** button to see the coordinate information for the Feature. MSL is the Mean-Sea-Level value, and HAE is the elevation referenced to the ellipsoid. You will also see the date and time the Feature was recorded and whether the position was differentially corrected.

**PDOP** is the positional dilution of precision. **HDOP** and **VDOP** are the horizontal and vertical components of PDOP, respectively.

**SV#** is the number of satellites used in computing the GPS position.

For a Point Feature, the **Session** field shows the number of seconds during which you occupied that point location. For a Line or Area Feature, the value in this field is the time interval between the successive nodes.

Tap on the **Attribute** button to see the Attribute/Value information for the Feature.

For a **Point Feature**, you may use the **Update** button, if necessary, to redo the data collection at this point.

For a Line or Area Feature, tap on the **Area and Length** button to see the line length or the perimeter and acreage of the area in the currently active units of measurement.

To attach one or more photos to the Feature, tap on the **Photos** button. You may link photos from the Photo Library or a folder on your device. And, you may tap the **Camera** button to snap a picture and have it automatically linked to the Feature.

If you would like the app to show the file name of the attached photo in Sheet view, you must add the built-in Attribute **Photos** in the Topic Structure page for

the Feature Topic. If you have not yet added this Attribute, you can use **Topic - Edit Topic** to get to the Sheet Update screen to do so. The data field for displaying the photo file name(s) is limited. If the string of file names is too long, it will be truncated. Therefore, it is advisable to keep the photo file names short.

### **Assigning a Feature Symbol or Pattern**

By default, a Feature added to a Topic will assume the same symbol and color as those for the Topic. However, you may use a different symbol to represent an individual Feature if you choose to do so.

On the **Coordinates** page of the Feature Properties screen for the selected Feature, you may pick a symbol or pattern and a display color after clicking on the **Pattern** button. You may also specify a line style as well as the color and size for the border of an Area Feature.

After making the desired changes, click on the **OK** button to accept the settings.

### **Area Transparency**

You can adjust the transparency of an Area Feature within the Area Pattern Dialog.

To do so, simply enter a percentage value into the **Transparency** field, or tap the little arrows to scroll either way.


### **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)

For example, in **mypoles.pmp** job, tap on one of the two land plots then tap on  and mark the **Show Area label** checkbox. Do the same for the other land plot.

You can change the size and color of these labels by using **Main Menu - Setup - Feature Labels**.

### **Feature Offset**

You can view and modify the offset of a Feature by using the **Offset** button from within the Feature Properties screen.




This button will be labeled “**No Offset**” if there is no offset information associated with the Feature.

When you click this button, the **Edit Offset** dialog box will be displayed. The

offset options are the same as for Data Collection in Offset Mode.


### **Edit Feature Attribution**

If a Feature has Attributes associated with it, the Attributes and the corresponding Values will be automatically displayed when you tap the **Attribute** tab. To change the Value for an Attribute, double-tap that cell then type over any existing Value. Alternatively, place the cursor at the appropriate position then change a few characters as needed.


In the **View mode**, with the  icon displayed, the cells are not editable until you double-tap on them. To switch to the **Edit mode**, represented by a  icon, tap on the  icon. In the **Edit mode**, each cell is ready to receive input (i.e. the keyboard will pop up) unless that Attribute is non-editable, such as a built-in Attribute or an Attribute with a Formula defined for it.

If a Feature belongs to a Topic added from the Feature List associated with the job, then the pre-defined Values will be available for you to select. For an Attribute of the **List** type, you may click on the pull-down button to select the desired value. If the Attribute is not locked, then you may also enter any Value. For an Attribute of the **Range** type, you may only enter a Value within the allowed range.

On the **Photos** page, you can view any photos that have been attached to the currently selected Feature. You may also use the Link Photo function on this page to add one or more photos to the Feature.

The **Link Photo** function can also be accessed from the Map Tools menu. It is represented by the Link Photo icon .

### **Edit Auto Label Text**

In the Map View, after you have selected a label created by using the Auto Label function, you may tap the Feature Properties icon  to view the relevant information.

You may change the label properties such as the font size and orientation. Specify the label orientation in degrees in the clockwise direction.

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### **Classify a Feature Topic**

The **Classify** function on the **Topic Menu** will let you classify the Features in a Topic into sub-groups based on the Values for a particular Attribute.

The steps for classifying the Features in a Topic are:

1. In Topic View select the Topic you wish to work with.
2. From the Topic Menu select the Classify function. The Classify Topic dialog

box will be displayed.

3. Select the Attribute based on which to classify the Features.

4. Choose a Classify Method:

a) If you use the Equal Interval, Quantile or Custom method, specify the number of classes.

b) If you use the Custom method, tap the Custom button and define the range of classes in the Custom dialog box.

5. Choose a Color option.

a) If you use the **Ramp** option, select the **Beginning Color** and the **Ending Color**.

b) If you select the **Random** option, you can tap the **Assign Color** button to have random colors assigned to the various classes.

6. Tap the **Classify** button. The results of the Classification will be displayed in the Class Item field.

7. Click the **OK** button to exit the dialog box. The result of the Classification will be shown in Map View. In addition, you should see the sub-classes listed under the selected Topic Name In Topic View.

In Topic View you may toggle an individual class of Features on or off.

The various classification methods are described below:

### **Unique Value Classification**

The Unique Value classification creates an individual class for each unique Attribute Value. This classification method can be used with all Value types: string, integer and real number. The number of classes equals the number of unique Attribute Values there are for the Features in the Topic.

Features with the same Values are assigned to the same unique-value class.

### **Equal Interval Classification**

Features with Values that are integers or real numbers can be categorized into classes of equal intervals of values. In other words, each class has an equal range of values. The number of classes is defined by the user.

The Value Interval is the difference between the Maximum Value and the Minimum Value divided by the Number of Classes.

**Please note:** The Equal Interval classification cannot be used with text Attributes. If you wish to use this method to classify numbers that are of text type, you must first change the Field Type of the Attribute to either integer or Decimal number. You can do so after selecting Edit Topic from the Topic Menu to call up the Sheet



Update screen.

### **Quantile Classification**

The Quantile classification is used for placing an equal number of Features into each class. The number of classes is defined by the user. Enter this value into the "No:" field. The number of Features per Class equals the total number of Features in the Topic divided by the number of classes.

Features are distributed between the established classes according to the range of numerical Attribute Values. Features are allocated in ascending order- Features with the lowest Values are assigned to the first class.

### **Custom Classification**

The Custom classification option allows you to create user-defined classes. Enter the desired number of classes in the "No:" field. When you tap on "Classify", a window will pop up to let you define the minimum and maximum values for each class.

For example, you might wish to define the following classes for grouping streets in different width ranges:

Width Class 1 30 - 40

Width Class 2 45 - 50

Width Class 3 60 - 65

If you wish to assign a code to each class, then mark the Show Prefix checkbox after tapping the Classify button. You may manually assign a prefix to each class, or you may specify a starting number or letter then click the **Assign Prefix** button to have consecutive prefixes automatically assigned to the classes.

The Prefix serves as an additional identifier. For example, you may use it to indicate the Zone to which a class of tree stands belong.

Tap the **OK** button after the prefixes have been assigned. (Do not tap the **Classify** button as **the prefix information will be erased when you reclassify the topic.**)

This app will let you reassign **colors/symbols** to the various classes . It also provides the Up and Down buttons to let you change the order of the topic classes.


**Please note:** Whenever you change the name of an Attribute, any classification based on that Attribute would be cancelled. In that case, simply reclassify by specifying the new Attribute name. If you made changes to any Attribute Values, you may also need to reclassify to correctly present the updated Values.


### **Digitize Features**

You may manually add new Features to the current Job file. GPS is not needed for the digitizing functions.

## Adding Point Features

The first step in digitizing a Point Feature on a background map is to create or activate a **Point Topic**.


To create a new Point Topic, tap the **Topic Menu** icon  then select **New Topic**. Enter a Topic Name. Make sure the Type field shows: **Point**. Add one or more **Attribute Names** (title of description) for this Topic. Then tap the **OK** button to confirm the screen.


To activate an existing Point Topic to add points to it, tap the **Topic View** icon  then select the desired Point Topic. Tap the Topic View icon again to toggle the list of Topics off.


Now, tap the pull-down arrow beside the **Zoom Fit** icon. Select **Add Point**

**Manually** .

Tap the points on the desired locations on the background map to drop the points onto the map.

The **Add** tool  at the top is a toggle switch that you can use to halt the point digitization and reactivate the regular **touch-screen** mode. Tap on this toggle again when you are ready to add more points.

If there are existing Features on the map and you want a new point to snap to one of the existing Features, then tap the **SnapToNode** tool . When the SnapToNode toggle is on, the point you add will be dropped on top of the nearest Point or node.

To place a node precisely at the desired location, tap on the donut-shaped **Node tool** . A 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.

Now tap once in the donut hole to drop the node. You could also keep holding down on the purple donut and use another finger to touch outside of the donut area to drop the node.

If you wish to digitize a point for another Point Topic, simply tap the **Topic View** icon on the upper-right corner of the main screen and select that other Point Topic.


When done with the point digitization, tap the **Back** icon to end the digitizing session and go back to Map View.

If you wish to log the actual GPS position for a digitized Point Feature, then select that Point Feature and tap the **Feature Properties** icon from Map View. Then tap the **Update** button.

Specify the desired time session then tap the **Start** button to record the GPS position.

## Add Point by Coordinates

If you know the coordinates for the point you wish to add to the map, you may add the point by using this information. To do so, tap the pull-down arrow by the

**Zoom Fit** icon then select **Add Point by Coordinates** . 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.


## Adding Line Features

To digitize a Line Feature in iCMTGIS PRO, first select an existing Line Topic or create a new Line Topic.

To create a new Line Topic, tap the **Topic Menu** icon  then select **New Topic**. Enter a Topic Name. Make sure the Type field shows: **Line**. Add one or more **Attribute Names** for this Topic.

Then tap the **OK** button to confirm the screen.

To activate an existing Line Topic in order to add a new Line Feature to this group, tap the **Topic View** icon then select the desired Line Topic. Tap the Topic View icon again to hide the list of Topics.

When a Line Topic is active, and you tap the pull-down arrow for the **Zoom Fit** icon, you will see that the **Add Line manually** tool  is active. Tap this selection, and the Add Line manually tool icon will be displayed.

Now, tap to drop nodes along the line or drag to trace the curvilinear line.

You could do a line quickly by tapping on the line to drop a few nodes. Or, you could make a more faithful reproduction of the desired line by using the **Node tool**




The **Add** tool, the **SnapToNode** tool and the **Node** tool work in the same way as for digitizing Point Features.


When you have digitized the last node for the Line Feature, tap the **Add Line manually** tool again.


## Adding Area Features

To digitize an Area Feature, first select an existing Area Topic or create a new Area Topic.

To create a new Area Topic, tap the **Topic Menu icon**  then select **New Topic**. Enter a Topic Name, such as "Fields". Make sure the Type field shows: **Area**. Add one or more **Attribute Names** (title of description) for this Topic. Then tap the **OK** button to confirm the screen.

To activate an existing Area Topic in order to add a new Area Feature to this group, tap the **Topic View** icon then select the desired Area Topic. Tap the Topic View icon again to hide the list of Topics.

When an Area Topic is active, and you tap the **Map Tools** pull-down arrow beside the Zoom Fit icon, you will see that the **Add Area manually** tool  is active. Tap this selection, and the Add Area manually tool icon will be displayed.


Now, tap the vertices of the desired polygon, or trace the curvilinear outline of an irregular area. You could make a more faithful reproduction of the desired area boundary by using the **Node tool** .

The **Add** tool, the **SnapToNode** tool and the **Node** tool work in the same way as for digitizing Point Features.

When you have digitized the last node for the Area Feature, tap the **Add Area manually** tool again. The software will automatically close the gap between the first and the last digitized nodes.



### **Adding Description for Digitized Features**

To be able to enter descriptions to a Feature that you have digitized manually, you must first set up the Attribute Names for the Feature Topic, if you have not already done so when creating the Topic.

To set up Attribute Names for the active Feature Topic, tap the **Topic Menu icon**  then select **Edit Topic**. Select an existing Topic Name.

Tap the **Add** button to add a new Attribute, such as "ID". Tap the **OK** button.


Now tap the **Feature Properties** icon for a selected Feature then tap the **Attribute** button. For each listed Attribute you may double-tap the corresponding Value field and enter a value or change the displayed value.

If you wish to stay in the edit mode, then tap the  icon (**View mode**) to switch to the **Edit mode** represented by a  icon.

**Please note:** If you digitized a Feature into a Feature Topic that was set up in a **Feature List**, then the Attribute fields assigned to the Feature Topic will be automatically displayed.

## Deleting a Feature

You can delete a Feature by deleting the corresponding record in **Sheet View**.

Alternatively, you can delete a Feature from **Map View** by tapping on the Feature to select it then selecting the **Delete Feature**  from the **Tools** menu.

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## **Create Deed Calls**

This app will automatically generate a list of directions and distances describing a Line Feature or the boundaries of an Area Feature. This list is referred to as the deed calls.

In addition, this app will let you create a Line Feature or an Area Feature by entering the deed calls for that Feature. This means you will be able to get a drawing of a parcel of land by using the directions and distances provided in the legal description of that property.

The deed plot can be converted to a Line or Area Feature. This means that you will be able to get a plot of multiple deeds within the same Job.

## Viewing the Deed Calls for a Line or Area Feature

Please open the sample job named **cvoarea.pmp** and save it as **cvoarea1.pmp**.

Use **Main Menu - Close Map** to turn off the map.

Tap on the purple SPRAY AREA1 to select it. Tap the down arrow for the **Map Tools** menu then select **View Deed Calls**. (If you did not select a Line or Area Feature before tapped the pull-down arrow for the **Map Tools** menu, you would have seen the **Create Deed Calls** function listed.)

The first node is highlighted in green color. Its coordinates are shown in the **Lat** and **Lon** boxes.

Tap on the **Calls** tab to view the deed calls for the selected area. You may scroll the deed call records up or down.

To view the details of the currently highlighted call record, double-tap on that record or tap the **Edit** button. In landscape mode, you will need to scroll to see the Edit button.

Tap the **Calls List** button from the editing screen to return to the list of deed call records.

Tap the **Back** button to return to the main Map View.

## Entering Deed Calls to Create a Line or Area Feature

The following example illustrates the procedure for entering bearing and distance calls for each segment of a boundary to create the deed drawing.

First, let's create a new job named **mydc.pmp** and set **Map** to **Show Satellite**.

For this example, we will be using **US Feet** as the distance unit in **LLA**, and we will be entering **DMS** angles in the **BEARING** mode. Please call up **Menu - Setup - Elevation and Angle System** and set up the system accordingly.

Now tap the pull-down arrow for the **Map Tools** menu then select **Create Deed Calls**. (If you had selected a Line or Area Feature then tapped the pull-down arrow for the **Map Tools** menu, you would have seen the View Deed Calls function listed.)

As we will be entering the deed calls for a closed Area Feature, leave the **Area** tab highlighted. If you were entering the deed calls for a Line Feature, then tap on the **Line** tab to select it.

We will use the default **Topic Name** "DeedCall". If you wish, you could tap on the **Pattern** button to change the line style for the line plot or the fill pattern for the area plot.

In the **First Node** section on the **Feature Information** page, enter **44°11'49.773"N** into the **Lat:** box, and enter **123°30'48.818"W** into the **Lon:** box. The node that shows up at the southwest corner of the plot will be our point of beginning.

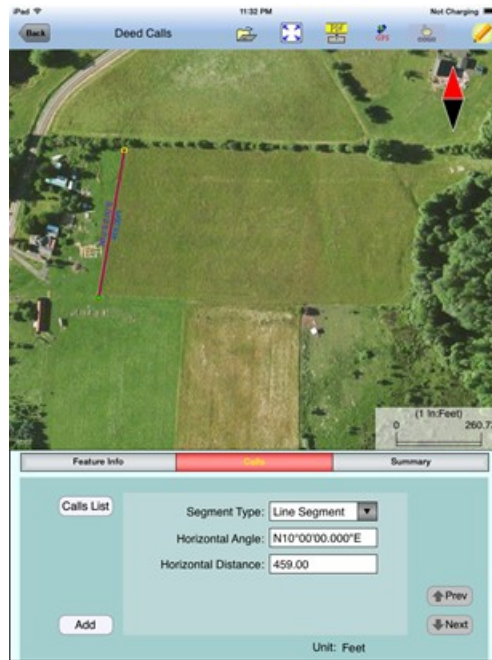
We will leave the **Orientation** field at 0. If you enter an angle value into the Orientation field, the entire deed plot will be rotated by that amount. Therefore, this functionality could be used to re-orient a completed deed plot to line up with the background map. It will also be handy for entering deed calls that refer to the magnetic north.

When the cursor is in the **Orientation** field, you will see a guide line originate from the first node. You could tap on the screen to change the direction of the guide line and have the direction value automatically entered into the Orientation field.

When the cursor is in the **Orientation** field, you will also see that the **Angle by 2 Nodes** icon  and the **COGO mode** icon  are activated. In this mode, you can tap the  icon then specify the direction by selecting two existing nodes in the map. After you have selected the second node, the orientation angle will be automatically entered. The icons associated with the direction specification will be automatically turned off to prevent this angle from being inadvertently changed.

Tap the **Calls** tab to go to the page that lists the existing deed calls records. Initially there are no records shown.

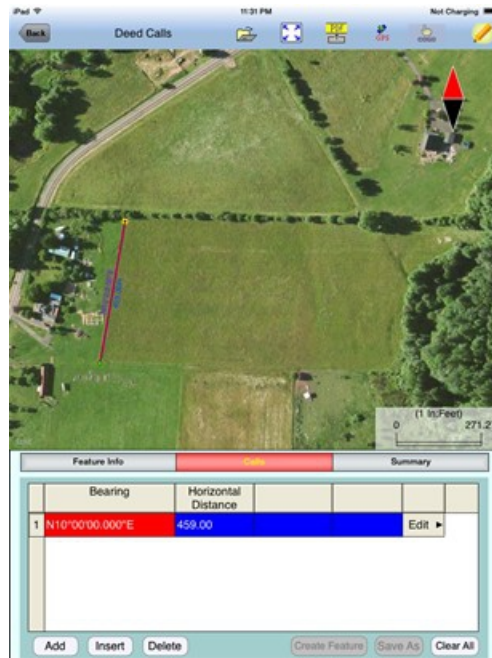
Tap the **Add** button to add a new call record and display the data entry screen.



First, specify the type of segment you will be adding. Choose between **Line Segment** for straight lines or **Arc Segment** to define an arc.

Our first call is a straight **Line Segment**. We enter the horizontal distance of 459 US Ft from the **green** starting point and also specify the bearing of N 10 E.

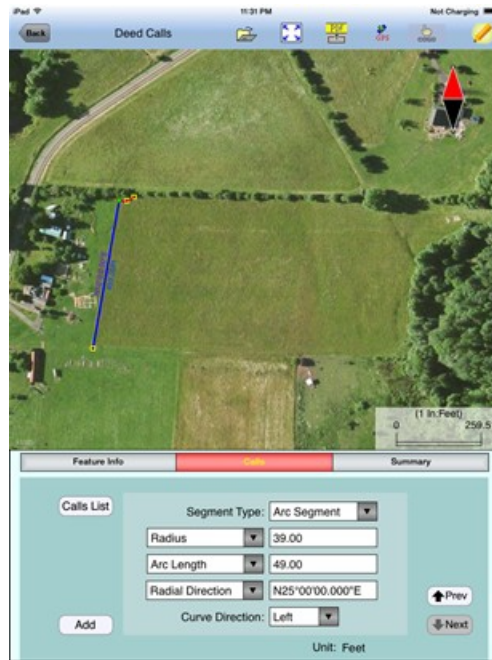
Tap the **Calls List** button to return to the listing of the Deed Calls records.



If you need to change the data entered for any record, simply tap the **Edit** button for that record to call up the data entry screen then enter the correct data. In landscape mode, you will need to scroll to see the Edit button.

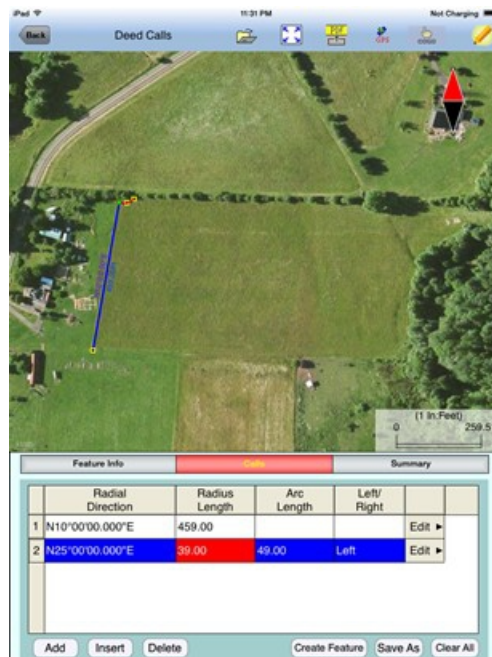
Tap **Add** and enter an Arc Segment as shown below. Tap the pull-down arrow for

each field to select the appropriate option.



For an Arc Segment, specify the size and length of the arc by entering a combination of the **Radius** and one of the following: **Arc Length**, **Chord Length**, **Central Angle**. Also specify the orientation of the curve by entering the **Chord Direction**, the **Tangent Direction** or the **Radial Direction** (from the first node of arc to the center of the circle, of which the arc is a part). Select the **Continuous** option if the curve is to continue in the direction of the last defined curve or line segment. Finally, specify the **Curve Direction** to indicate whether the arc turns left or right.

Tap the **Calls List** button to return to the listing of the Deed Calls records.



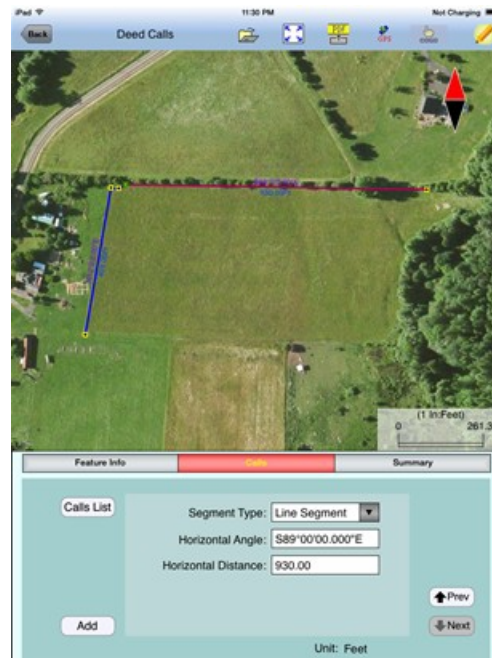
The last entered segment is highlighted in red in the graphical view.



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. To fit the drawing to the screen, simply tap the **Zoom-Fit** icon. 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.

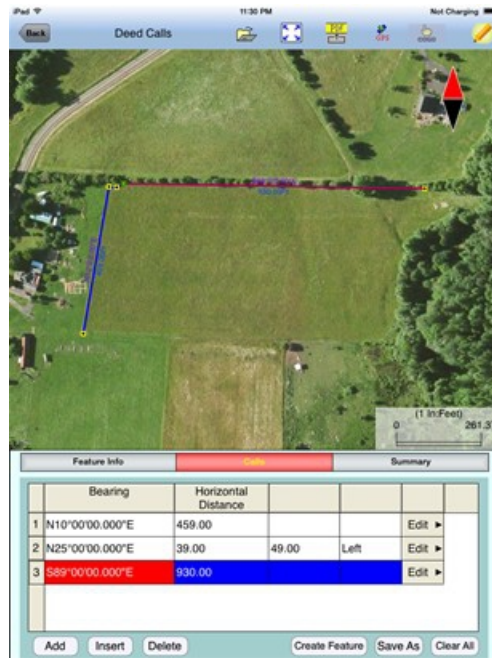
As there could be line segments as well as curve segments in your deed drawing, please note that the column titles for the list of deed calls records will correspond to the highlighted record.

Now tap the **Add** button to add a Line Segment as shown below:




If you wish to add a new segment, you could as well tap the **Add** button on this screen. This button will permit you to quickly add one segment after another without having to go back to the previous screen.

We will tap the **Calls List** button to review all the records that we have stored so far:



Whenever the Deed Calls records are displayed, you may tap the **Insert** button to insert a record before the highlighted record, tap the **Delete** button to delete the highlighted record, or tap the **Clear All** button to clear all existing deed calls from the list and start a new deed call drawing.

**Caution:** Make sure you really want to delete a record or clear all records before confirming to do so. Deleted records cannot be recovered.

When you tap the lit **Edit** icon  to turn it off, any drawing you have made so far will be displayed in **full screen**.

**Complete the drawing by entering the following data.** Remember to tap the **Add** button before entering a new call, and pay attention to the N, S, E, W designation.

#### **Line Segment**

Horizontal Distance: 172

Horizontal Angle: S82°00'00.000"E

#### **Line Segment**

Horizontal Distance: 120

Horizontal Angle: S60°00'00.000"W

#### **Arc Segment**

Radius: 200

Arc Length: 170

Chord Direction: S58°00'00.000"W

Curve Direction: Left

#### **Arc Segment**

Radius: 170

Arc Length: 188

Continuous

Curve Direction: Left

### Arc Segment

Radius: 90

Arc Length: 185

Continuous

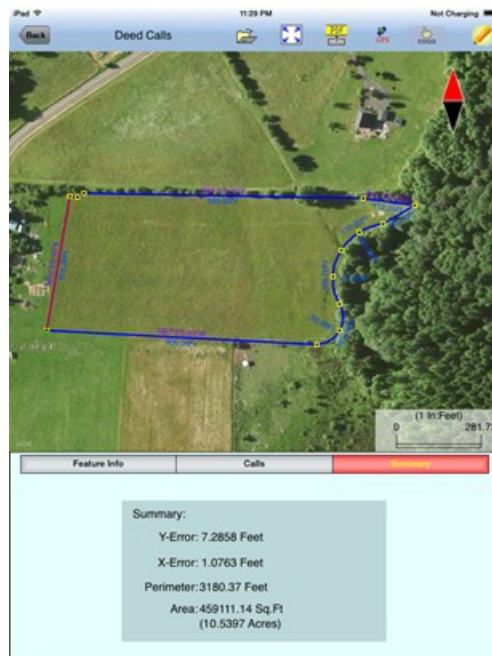
Curve Direction: Right

### Line Segment

Horizontal Distance: 900

Horizontal Angle: N87°23'00.000"W

Tap the **Summary** button to see the closure errors and the perimeter and area that you would get when the figure is closed.



Options are provided to perform an adjustment using the compass method or the transit method.

If the result is satisfactory, tap the **Back** button then **confirm to create the Feature**.

**Caution:** Please note the the Feature is the deed plot representing the deed calls. If you delete the Feature from Map View, the associated deed calls will also be lost (unless you have saved the deed calls to a text file, as described in the following sections).

### Editing the Deed Calls

To modify the deed calls for the Area Feature that you have just created, first tap on that Area Feature in Map View then tap the **Map Tools** menu and select **View**

**Deed Calls** .

You may change the location of the Feature by changing the position of the First Node. If there are points or nodes in your job, you could tap the **Pick** button then

select one of them as the first node.

You may change the area pattern and color for the Area Feature represented by the deed calls.

On the Calls Page, you may **Add**, **Insert** or **Delete** a deed call record.

Be careful with the **Clear All** button as this will delete all the deed call records.

To edit a record, double-tap on it or tap the **Edit** button. ( In landscape mode, you will need to scroll to see the Edit button.) Make sure you know what you are doing before changing the distance or angle values.

If the data viewed is not the first or the last deed calls record, the **UP** and/or **DOWN** arrows will be active. You may tap the appropriate button to view or change the previous or next data record, if you wish.

To return to the display of the deed call records, tap the **Calls List** button from the editing screen. From this page you may tap the **Save As** button to save the deed calls to a text file. Enter a names such as "mycvoarea". The app will automatically add the file name extension **.dcf** (deed calls file).

If you intend to have the changes applied to the original Area Feature, then tap the **Update Feature** button. Otherwise, tap the **Back** button to return to the main Map View.


If you are at the last deed calls record, you may tap the **Add** button to add a new call.

To return to the list of deed calls records, tap the **Back** button.

### **Saving the Deed Calls to a Text File**

To save the deed calls to a file, tap the **Save As** button on the page listing the Deed Calls records and specify the name of the file. The file extension is **\*.dcf (deed call file)**. This is a text file that you will be able to read by using a text editor.

### **Opening a Deed Calls Text File**

You may open a .dcf file that you have previously created by using this app or a text editor. To open the deed calls file, tap the **Open File** icon  on the **Deed Calls** page.

Then you may view and edit the deed calls, re-save them to a .dcf file, or create a new Feature based on the deed calls.

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### **Create Grid**

The Grid you create for a selected Area Feature is placed in the **Non-Spatial Data** Topic layer. To place a grid over an Area Feature, first click in that Area Feature

then tap the pull-down arrow by the Zoom Fit icon and select **Create Grid**.

The **Start Point** page lets you specify the reference location for the grid. You may enter the coordinates for that point or tap the **By Pick** button to select the location from Map View. If the reference point is a known point but you want to shift the grid a distance from it then tap the **Offset** checkbox to display the relevant data entry fields. The software will compute the new grid reference point.

You may specify an azimuth or bearing as the **Orientation** of the grid. If you would like the grid to go parallel to a line segment of the selected Area Feature, tap the **By Segment** button then tap on the desired line segment. If you would like to have the grid go parallel to a line joining two existing points or nodes in the active job, then tap the **By 2 Nodes** button and select the two nodes.

Select the **Grid Nodes** option if you wish to just see the grid nodes. If you wish to see the grid lines then select **Lines**.

The app will display the default grid parameters. You may change them, if you wish. .

You may specify the **Boundary** line style and line width. You may also dictate whether Point Features should be created from the grid nodes, or Line Features should be created from the grid lines.

If you selected the **Grid Nodes** mode, you have the option to mark the **Create Points from Grid** checkbox to have Point Features created at the grid nodes. Accept the default Grid Points Topic, or select another point topic in which to store the new Point Features. Point Features thus created from grid nodes are often used for collection soil samples or timber cruising data.


If you selected the **Lines** mode, you have the option of marking the **Create Lines from Grid** checkbox to have Line Features created at the grid lines. Accept the default Grid Lines Topic, or select another line topic in which to store the new Line Features.

Tap the **Preview** tab to view the grid. When you confirm the **Grid Property** screen by tapping the **OK** button, you will see the grid points or the grid lines displayed in the map.


Each time you confirm the **Grid Property** screen, a new grid will be created. To avoid confusion, it's best to just keep one grid for an Area Feature. To delete the extra grids that you don't need anymore, first tap the **Topic View** icon and select Non-spatial Data. Then tap the **Sheet View** icon, select the unwanted grid then tap the **Delete** button.


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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 **Utilities** 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.

If your device has GPS capability, you could tap the **GPS icon**  to turn on GPS then tap the **Pick GPS icon** to add a node for the line to be measured.

Tap on the **Snap to Node icon**  to turn it on when you wish to snap to an existing Point or node by tapping in its vicinity.


To back-step, tap the **Undo icon** . To delete all the nodes made in this measurement session, tap the **Reset icon** .


Please note that the Measure Distance tool will not retain the **temporary** shape you have delineated for computing the distance unless you tap on the **Create Feature** button to convert it to a Line Feature.


To return to Map View, tap the **Back** button to close this screen.


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## Measure Area

The **Measure Area tool**  on the **Utilities** 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.

If your device has GPS capability, you could tap the **GPS icon**  to turn on GPS then tap the **Pick GPS icon** to add a node for the area to be measured.

Tap on the **Snap to Node icon**  to turn it on when you wish to snap to an existing Point or node by tapping in its vicinity.

To back-step, tap the **Undo icon** . To delete all the nodes made in this measurement session, tap the **Reset icon** .

Please note that the Measure Area tool will not retain the **temporary** shape you have delineated for computing the distance unless you tap on the **Create Feature** button to convert it to an Area Feature.


To return to Map View, tap the **Back** button to close this screen.


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## Move Node

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

The steps for moving a node of a Feature are as follows:

1. Tap on the Feature to select it then tap on the Map Tools 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.


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


2. Drag the **Crosshairs** to the node you wish to move then tap once in the center of the donut to mark the node.

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

When you wish to snap to an existing Point or node by tapping in its vicinity,

remember to first tap on the **Snap to Node** icon  to turn it on

If the Crosshairs have moved off the screen, you could tap on the  icon to bring the Crosshairs back to the center of the screen.


You may turn off the instruction text by tapping the **View Hint** icon . This will free up more screen space for displaying the job data, especially when you are using your device in landscape mode.

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

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## Insert or Delete a Node

As you know, this app will let you change the shape of a Line or Area Feature by moving one or more of the nodes on the line or the area boundary. In addition, this app will also let you add one or more nodes to the Feature to better delineate it or to serve as a handle for modifying the shape of the Feature.

To insert a node into a Line or Area Feature, select the Line or Area Feature then select **Insert Node**  from the Tools menu.

Tap the existing node to be used as the reference node.

Select "**After**" if you would like to place the new node after the reference node.

The app will use a blue cross symbol to indicate the next node after the selected node.


Select "**Before**" if you would like to place the new node after the reference node. The app will use a blue cross symbol to indicate the next node before the selected node.

Tap on the **Next Step** button.

Specify how you will be creating the new node. "**by tapping**" means you will define the position of the new node by tapping on a location on the screen. "**by point feature**" means you will be tapping on an existing Point feature to define the location of the reference node.

Now move the Node Tool to the location at which you wish to insert the new node. Tap once in the center of the Node Tool. Tap on the **Apply** button to complete the action.


Tap on the **Back** button to return to the main Map View.

Sometimes you may wish to remove a node from a Line or Area Feature. You can do so by selecting the Line or Area Feature then using the **Delete Node**  function on the Tools menu. The app will let you select a single node or a range of consecutive nodes to delete.

Once a node has been removed, it cannot be recovered. To re-create the node, you could insert a new node then try to move it to the approximate position of the deleted node.

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### **Disconnect or Join a Line/Area**

The **Disconnect**  function on the **Utilities** menu will let you disconnect a Line Feature into points or smaller line segments. The options for disconnecting an Area Feature are: "to points", "to lines" and "to sub-areas". When you disconnect a Line or Area Feature "to points", the nodes turn into Point Features. Please remember to select the desired Topic from the **Result Topic** pull-down menu so the resultant Features will be placed on that map layer.

If you wish to have the original Feature deleted, then mark the check box for this option.


Tap the **Disconnect** button to complete the action of disintegrating the original Feature.

Tap the **Back** button to return to Map View.

On the other hand, if you have recorded or digitized points along a road or along the boundary of an area then realized that you should have created a Line or Area Feature instead, you could use the **Join Line/Area** function to connect the points



into a Line or Area Feature. Another useful application of this function is for joining waypoints in a particular order then using the Point Stakeout function to visit each waypoint in the pre-defined sequence. This function can also be used for joining two Line Features together or for merging two Area Features that partially overlap.

To join a number of points into a Line or Area Feature, first select the **Join**  function on the **Utilities** menu. Then, with the **Tap on Map View** option selected, tap once on each of the Point Features you wish to join together. The Points will be joined together in the order selected.

If you wish to join all the points in the active Topic into a Line or an Area Feature, then mark the checkbox for **All Points of current Topic**. In this case, you do not need to select the points individually.

Select the Feature type (Line or Area) from the **Type** pull-down menu then select the the Topic for the resultant Feature from the **Topic** pull-down menu .


To join two Line Features together, you would select the two lines and the app will automatically join the tail (last node) of the first line to the head (first node) of the second line.

Two adjacent Area Features can be merged together by using the **Areas** option if they share a common portion.

Another way to join two Line Features together is to use the **Two Features** option of the **Join** function. You would select the two lines and specify how they are to be connected - Head to Tail, Head to Head, Tail to Head or Tail to Tail. The app will label the head and tail ends of the two Line Features to be joined together.

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### **Locate a Point by Address**


To look for a location on the displayed built-in Map by address or coordinates, tap on the pull-down arrow of the **Utilities Menu** icon  then select **Locate a Point by Address**. This function will only work when **Map** is turned on.



If you know the address of the location of interest, tap the **By Address** tab then enter the address.

If you know the coordinates of the location of interest, tap the **By Coordinate** tab then enter the coordinates. Make sure you have entered the correct N/S and E/W designations.

After tapping the **Go** button, you will see the target location marked on the screen. You may search additional locations by address or by coordinates. All the locations you searched for will stay marked before you exit this screen.

If you can recognize the desired location on the displayed Map, you could select

that location by tapping the **Pick** icon  then tapping on the target location. The relevant address information will pop up on the screen, and when you tap the **Go** button, that location will be marked. You can view its coordinates by tapping the **By Coordinate** tab.


Tap on  again to turn it off. Then you could tap on a marked location and save that location as a Point Feature by tapping on the **Save Result** icon . You may change the Feature ID and the symbol used to represent the new point before tapping on **OK** to create the Point Feature.

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

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## Create Buffer

You may create a buffer zone around a **Point Feature**, along a **Line Feature** or along the perimeter of an **Area Feature**. You may also create multiple buffers at a fixed interval, multiple buffers at different distances from the Feature, as well as **Area Strips** with specific starting and ending distances.

To use this function, tap on the **Utilities menu** pull-down arrow then select **Create Buffer** . The Buffering dialog will be displayed.


Suppose we wish to map the area to be mowed between the fence in **mycorners.pmp** and the stand of trees on its left side. Instead of digitizing this strip of land, we could create a 60 ft wide buffer zone for the **Fence001** Line Feature. Please set the distance unit to **Feet** for this example. (If you are working with meters then use 18.29 Meters for the buffer interval.)


With the cursor at the **Source** box, tap on the **Fence001** Line Feature to select it.

If you had selected this Feature in Map View before calling up the Create Buffer function, then the selected Feature would have automatically been placed in the Source box.

Enter 60 as the **Buffer Interval**. Tap on the button showing "**Left**". Leave the Resultant Topic as "Buffer".

We will keep the checkbox for **Entire Feature** marked because we want to create a buffer for the full length of our fence. If you wish to buffer just a part of a Line Feature, you could unmark the checkbox for **Entire Feature** then specify the starting and ending nodes.

When you tap the **Solve** icon , the buffer is created. Tap the **Back** button to return to the main Map View.

Tap on the buffer zone to highlight it then tap the Feature Properties icon  to


get to its **Area and Length** page and view its perimeter and area values.

You can use a similar procedure to create a single buffer or multiple buffers around an **Area Feature**.

For an Area Feature, you can create **Inside** buffers or **Outside** buffers. If you just wish to buffer a portion of the boundary of the area, then unmark **Entire Feature**, and specify the starting and ending nodes. As there are two possible routes to go from the starting node to the ending node on an Area Feature, a **Reverse** checkbox is provided.

The **Area Strip** option will let you create buffer strips with given starting and ending distances. For example, if you wish to create a 10 ft wide buffer strip that starts 20 ft from the Area Feature boundary, and another 20 ft wide buffer strip that starts 50 ft from the Area Feature boundary, you would turn off the **Equal Intervals** checkbox then enter the following values into the table:


	<b>Start</b>	<b>End</b>
1	20	30
2	50	70

After creating the buffer zones, tap on a buffer zone to highlight it then tap the Feature Properties icon  to view its perimeter and area values. Please note that the net area for each outside buffer is the total area less the area of the Area Feature.

If you create overlapping buffers, the newly created buffer will lie below the one created earlier.

You may find that you are unable to select an inside buffer for an Area Feature and view its area by tapping on the buffer area. This is because the inside buffers are placed underneath the Area Feature. You can reveal an obscured Feature in the following ways:

1. Each Feature belongs to a Feature Topic layer. You can move a Topic upward by holding down on it in Topic View then dragging it above the one obscuring it.
2. You could turn off the Topic layers obscuring the desired Topic layer.
3. Within a Topic layer, you can change the order of the Features by turning on the Sheet View, selecting the record for a Feature and using the “To Front”, “To Back”, “Forward” and “Backward” buttons.


Here is another way to view the area for a buffer that is covered by an Area Feature or another buffer. Turn on Topic View and select the Buffer Topic. Then turn on **Sheet View** to display the buffer records. Select the desired buffer record, and it will be highlighted in Map View. Then you can tap the Feature Properties icon  to get to its **Area and Length** page and view its perimeter and area values. Of course, you could also add the Area\_Acres or the Area\_Ha built-in Attribute to the Buffer Topic so that the buffer areas are automatically displayed in Sheet View.

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## Point Stakeout

You could use the **Point Stakeout** function in conjunction with GPS to help you get to any individual point or node on your map. This means that this function could be used to stake out a boundary line if you are using an accurate GPS device. Also, suppose you have created the Grid Points for an Area Feature, and you wish to visit the grid points in a particular order. **You could create a Line Feature by joining the grid points in the desired order then specify this Line Feature as your point stakeout target.** Then this function can help you get from one point to the next in the prescribed order.

You may add the stakeout targets to your job map in one of the following ways:



1. Enter the coordinates to create each point. Please refer to **Add Point by Coordinates** section under **Digitize Features**. If the elevations also matter to you, then include the correct elevation in the target coordinates.
2. Import a DXF file, Shapefiles or a text file containing the target Features. Please refer to **Set up a Job**.
3. Digitize a Point Feature, a Line Feature or an Area Feature.
4. Create Grid Points for an Area Feature.
5. Store GPS Features by using  in the screen for adding a Point, Line or Area Feature. Please refer to **Digitize Features**.

After finding a desired location, you may optionally stake it and store its coordinates. The Point Stakeout function can be used to stake out individual points, or points along a line or area.

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.


If you are using an External GPS receiver for which this app provides an interface, then the app can display the GPS status indicator at the upper-left corner of Map View. For example, **N3D4** means that the External GPS is **navigating** and able to get a 3D position, and the PDOP value is 4.

Tap the GPS Menu icon  then select **GPS On** to turn the GPS on. Then tap on  again and select **Point Stakeout**.

With the cursor in the Target Feature field tap on the target **Point, Line or Area Feature** of interest. Or, you may tap the **Browse** button to select a target Feature

ID in the active Topic.

If the selected Feature is a Line or Area, you can select which Node you would like to stakeout. Select the the desired Point Feature. Or, for a Line or Area Feature, type in the desired **Node #**, or tap the little right arrow button to change the Node # to the next node in the same Feature.

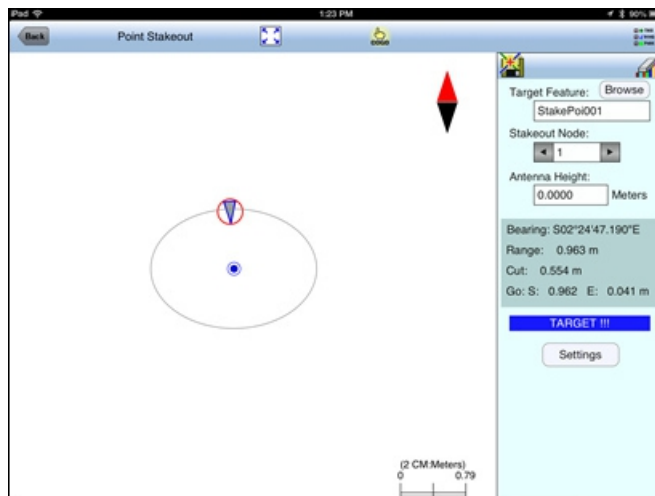
If you have tapped the  icon to disable Feature selection (so as to return to the normal touch screen mode), make sure you tap this icon again to turn it on before selecting a Feature for a data field.

In the **Antenna Height** field, enter the height of your antenna (GPS receiver) above the ground. This will be taken into consideration in computing the elevation. The Antenna Height for stakeout work will default to the value you entered in the GPS Setup section. What you enter in the Stakeout screen is a temporary value that will not be kept when you exit the Stakeout function.

Click the **Settings** button to set up or change the settings for stakeout. You can also access this screen by selecting **Stakeout Setup** on the GPS menu.

When you change the Tolerance value, you will see the target tolerance circle around the target change in size.

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



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

Your position is represented by the GPS marker on the screen. If you walk at a brisk pace, the arrow inside the circle will point in the direction in which you are walking. The large arrow in the GPS marker indicating your current position will be a gray color when your speed is very slow (e.g. less than 1 m/s). The arrow will change to a red color when your speed is above 1 m/s.

In the Point Stakeout screen, the bull's eye symbol indicates the target node.

An indicator showing the direction to reach the target is overlaid on top of your current position and is shown as a blue triangle. To reach the target, start moving in the direction of the target so the red arrow aligns with the blue arrow. Alternatively, follow the directions displayed by the app, e.g. Go N: 15.500 E: 20.450 ft.


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 you 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. Tap the **Save Result** icon  to store the GPS position as a stake point.



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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**, and to optionally stake and/or store the location. This function will come handy when you need to blaze a trail across thickets or to layout pipelines where landmark references are lacking. The accuracy of the stakeout will depend on the accuracy of the GPS receiver used.


You must activate **GPS** before you can access the Point Stakeout function.

If you are using an External GPS receiver for which this app provides an interface, then the app can display the GPS status indicator at the upper-left corner of Map View. For example, **N3D4** means that the External GPS is **navigating** and able to get a 3D position and the PDOP value is 4.

Tap the GPS Menu icon  then select **GPS On** to turn the GPS on. Then tap on  again and select **Line Stakeout**.

With the cursor in the Target Feature field tap on the target **Line** or **Area Feature** of interest. Or, you could tap the **Browse** button to select a target Feature ID in the

active Line or Area Topic.

If you have tapped the  icon to disable Feature selection (so as to return to the normal touch screen mode), make sure you tap this icon again to turn it on before selecting a Feature for a data field.

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

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

Your position is represented by the GPS marker on the screen. If you walk at a brisk pace, the arrow inside the circle will point in the direction in which you are walking. The large arrow in the GPS marker indicating your current position will be a gray color when your speed is very slow (e.g. less than 1 m/s). The arrow will change to a red color when your speed is above 1 m/s.

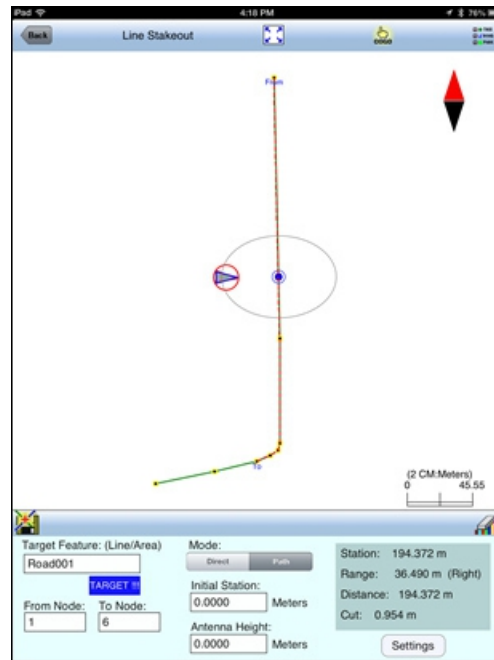
The **Target** for Line Stakeout is the projection of your GPS position on the selected line segment. As you move along in the vicinity of the line or area feature, you will see information displayed about your position relative to the target line segment. Such information will not be displayed if your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

In the **Antenna Height** field, enter the height of your antenna (GPS receiver) above the ground. This will be taken into consideration in computing the elevation. The Antenna Height for stakeout work will default to the value you entered in the GPS Setup section. What you enter in the Stakeout screen is a temporary value that will not be kept when you exit the Stakeout function.

Click the **Settings** button to set up or change the settings for stakeout.

When you change the Tolerance value, you will see the target tolerance circle around the projected target change in size.

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



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


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.

To store the GPS position as a stake point, tap once on the **Save Result** icon .

Following are our answers to some commonly asked questions about walking a property line to find the stakes:

**I. How can this up help me find my property line if I am walking alongside of it.**

If you have the deed calls from your property deed document and can determine the coordinates of the point of beginning and the local magnetic declination, you could use the **Create Deed Calls** function to plot the property boundary then use the **Line Stakeout** function in the app to help you walk along the boundary.

If you are able to identify the property boundary when you call up the Map in the



app, then you could use the **Add Area manually** function to digitize the boundary line, then use the **Line Stakeout** function in the app to help you walk along the boundary. If you can identify the corners of the property on the Map and digitize those points, then you could use the **Point Stakeout** function in this app to help you walk from one point to another.

That said, if you are not using a high-precision GPS receiver, the app will not be able to help you walk really close to the actual boundary line or corner points. The app in conjunction with the iPhone GPS could help you walk in the vicinity of the boundary to find the existing stakes or markers.

If you need to determine the actual location of the property line, then you will need to use a survey-grade GPS (such as EOS Arrow Gold or SXBlue Platinum) with this app.

## **II. I put my boundaries in. How do I go about setting up the app so it can help me walk along the boundaries and the app can guide me?**

1. Tap on the **GPS** icon and select "**Turn GPS on**".
2. Tap on the GPS icon and select "**Stakeout Setup**". You can set up the app to beep and/or display a message when you are within the **Tolerance Distance**. So, if Tolerance is "32" US Feet and you are walking a line, then the app will beep as long as you are with 32 ft from the line. If you are using an external GPS receiver that claims 2-5 m accuracy, then you could enter a smaller value, such as 10 ft.
3. Tap on the GPS icon and select "**Line Stakeout**". With the Target Feature box highlighted, tap on your boundary line. You want to have the "Path" tab in red (selected).
4. Look at the path on the screen and walk so that the GPS marker follows the path. Also read the information in the shaded area near the bottom. You want to walk close to the path so that the **Range** value is small. If this Range value is smaller than the Tolerance you set up in Step 2, then you should hear the app's beeps.
5. While walking along the path, look for any existing stakes.

## **III. The boundary of my property consists of straight line segments. How to find the corne stakes?**

In this case you could use the **Point Stakeout** function to help you get to the corner points. Turn on GPS and set up the Target Tolerance shown above. In the Point Stakeout screen, select the first corner node as the **Target Feature**. The information in the shaded area will tell you to go a certain distance in a certain direction to get closer to the target. The app will beep when the **Range** value is within the Tolerance distance of the selected corner node.

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### **Contour - Settings**

The Contour / Volume utility provides a way to help you visualize 3-diemsional



data and compute amounts based on the 3-D data. The three dimensions are the X-Y coordinates in the horizontal plane and the Z-coordinate along the vertical axis. As you will mostly be interested in how certain data varies across a geographic area, the X-Y coordinates will always correspond to a spatial location. The Z-coordinate could represent the elevation in space or some other variable of interest, such as pH value or amount of fertilizer to apply.


The contour map will be generated for the region enclosed within a boundary area. Therefore, a contouring job will contain Point Features representing the data of interest as well as the Area Feature that serves as the boundary. As mentioned previously, these Features could be created by manual digitization within this app, or they could be imported in the form of Shapefiles, DXF files or text files (for Point Features).

We will use the sample job called **pile.pmp** to show you how to set up for a contouring task.

Let's tap on the Main Menu icon , select **Job**, select **Open Job** then select "pile" from the pull-down menu for File Name. Tap on OK.

1. In Map View select the relevant Area Feature as the **Boundary Feature** for the area of interest. This sample file provides an Area Feature in the Boundary Topic. If the boundary area is not already highlighted, then tap anywhere among the points to select it. If you find it difficult to get to a bare spot, you could first tap

on  and turn off the pilepond Topic off temporarily. After selecting and highlighting the Boundary001 area, tap on  and turn the pilepond Topic back on.

2. Tap on the  icon, or tap on the pull-down arrow for the Utilities Menu then select **Contour / Volume**. This will take you to the **Setting** screen. The selected boundary area will be automatically displayed in the **Boundary Feature** field.

3. For **Data Source** select the Point Topic containing the X-Y-Z data of interest. For this example, it is the Point Topic named "pilepoint".

4. For **Data Type** you may select the elevation (MSL or HAE per the setup of Unit and Angle), or any **numeric** Attribute for the selected Point Topic.

5. Tap the X-Y Setting button to define the resolution of the contour grid. This app will automatically determine the X-Y extent of the Point Feature Topic you have selected for contouring. You can specify either the Grid Interval or the Grid Density, then the other parameter will be automatically computed.




Now you can tap on "**Goto Contour**" to go to the Contour screen to create colored contour regions and/or create contour lines. Or you can tap on "**Goto Volume**" to go to the Volume screen to view the calculated volumes. Or, you can tap the **Back** button to return to Map View.

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## Generate Contours

We will continue to use the pile.pmp job file to illustrate the contouring procedure. Please open the **pile.pmp** job if it is not already open.

Tap on the  icon, or tap on the pull-down arrow for the Utilities Menu then select **Contour / Volume**. Suppose you have already completed the setup in the **Setting** screen as previously instructed.

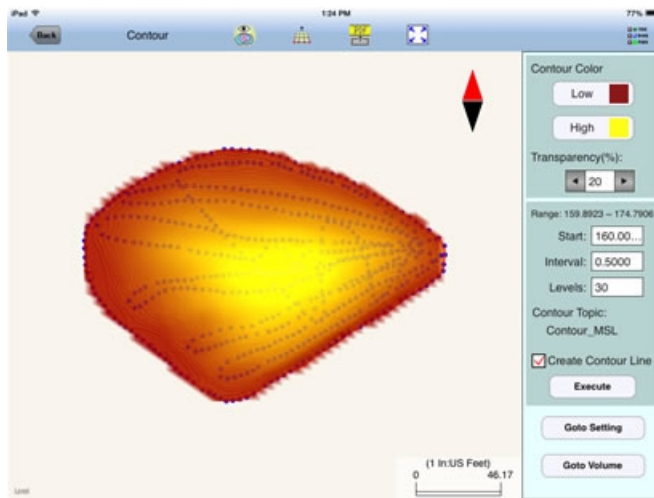
Tap on the "**Goto Contour**" button to call up the Contour screen.

You may select a different range of colors to represent the contour regions.


The app shows the **Range** of the Z values. In this case, these are the elevations of the data points. If you were contouring a numeric Attribute (such as pH values), the range for those values will be displayed. The app will contour the entire range by default, but you may specify a different starting value, if you wish. You may also change how many levels of contours to produce. A larger value corresponds to a finer contour resolution.

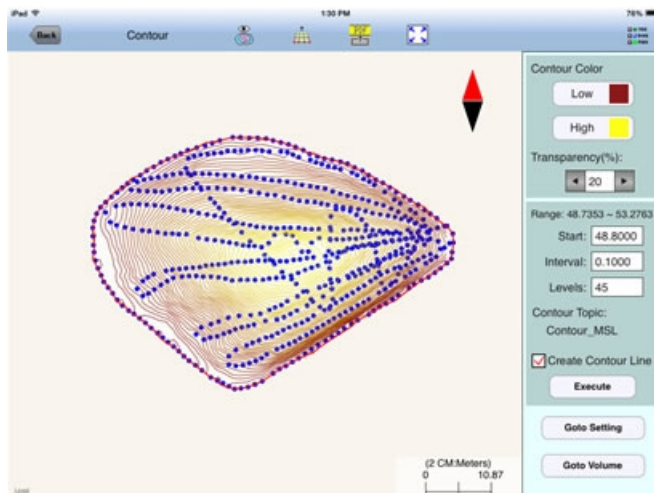
If you would like to have contour lines created, then mark the check box for "**Create Contour Line**" and tap the "**Execute**" button. The contoured variable has a constant value along each contour line. The larger the number of Levels, the more closely spaced the contour lines will be.

If you don't want the contour lines displayed, then unmark the check box for "**Create Contour Line**" and tap the "**Execute**" button.




In this example, the diagram indicates that the pile has one peak near the center. If you were contouring the amount of fertilizer to apply to your farm plot, then the colored contour map can serve as a guide in fertilizer application.

If you would like to turn off the display of the contour regions, you may do so by tapping on the **Show Contour Regions** icon . Use this icon to toggle the contour-regions display on or off. The following map is the result of having contour lines created and the Show Contour Regions option turned off.



You may tap on the **PDF** icon to send the screen to a PDF file along with the contour parameters.


To export the X-Y coordinates of the contour grid nodes and the computed (interpolated) values of the Z variable to a .csv file, tap the **Export Grid** icon .

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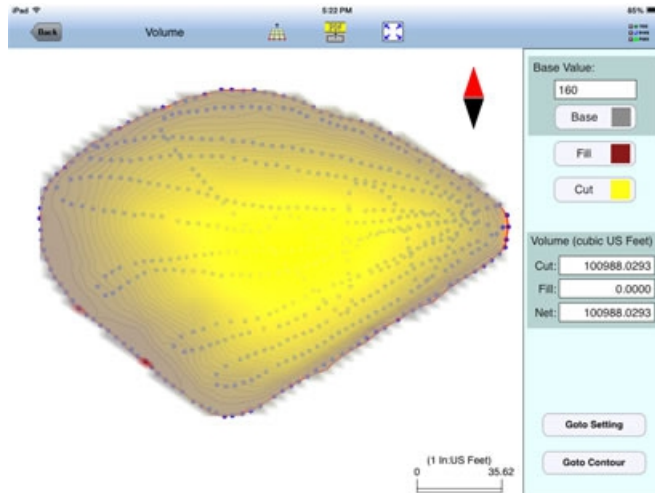
## Compute Volume

For the pile.pmp sample job, we would like to find out how big the pile actually is.

Please open the **pile.pmp** job if it is not already open.

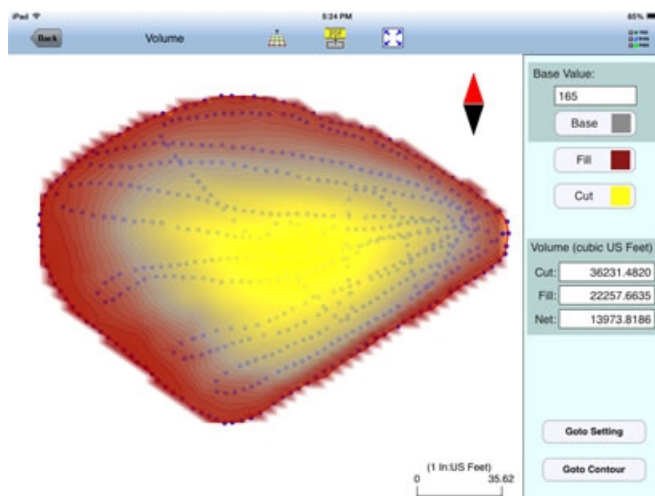
Tap on the  icon, or tap on the pull-down arrow for the Utilities Menu then select **Contour / Volume**. The setup in the **Setting** screen is the same as that described in the Section titled "Generate Contours".

Tap on the "**Goto Volume**" button to call up the Volume screen. (For this contour volume example, we have switched to using US Survey Feet as the distance length unit.)




As you can see, with the **Base** set at the bottom of the pile, all of the volume is shown in the **Cut** field. This means that if you were to bring the pile to the ground level, this much of it needs to be removed (or cut).

Now, let's enter 165 (ft) as the Base Value. To create level ground within the boundary area at that height, we will need to remove the top of the pile and fill in around it. The net volume is the amount of extra material that you could use to fill holes somewhere else.



You may tap on the **PDF** icon to send the screen to a PDF file along with the contour parameters and the computed volumes.

To export the X-Y coordinates of the contour grid nodes and the computed


(interpolated) values of the Z variable to a .csv file, tap the **Export Grid** icon .

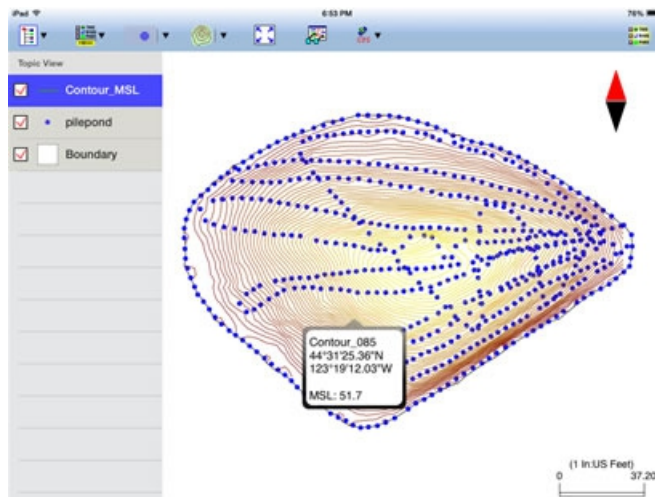
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## Contour Region Map

If you have the colored contour regions displayed when you exit the Contour screen or the Volume screen, then these will also be displayed in Map View.

You may turn off the contour-region display by unmarking **Show Contour Regions** from the **Utilities Menu**. When the contour regions are displayed in Map

View and **Show Contour Regions** icon  is active, you may use this icon to toggle the contour-regions display on or off.



While the contour-regions map is displayed, the bubble that pops up when you tap in the contoured area will contain some information relevant to the contour-regions map. For example, when the contour-regions map generated by the Volume function is displayed, the bubble will provide the cut or fill information for the spot you tapped, and it will be referenced to the Base plane used in the Volume computation.

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## Export Job Data

You may export all the Feature data in a Job in a number of formats.

### Export Shapefiles

To export the Features in the active Job to Shapefiles, tap the **Main Menu** icon, select **Job** then select **Export - Export Shapefiles**.

Select one or more Topic layers to export. Each Feature Topic will be exported as a separate set of Shapefiles. If you wish to export all of the Feature Topics in the active Job to a separate folder, please mark the "**Group**" check box.

Each set of Shapefiles consists of several files (e.g. the .shp, the shx, the .dbf, and

the .prj files). The exported data files will reside in the **Documents folder** for the application, unless you have setup the app to store files in iCloud. To access your exported Shapefiles outside this app, first connect to the iTunes® program then look in the Documents folder for this app in the File Sharing section. If you exported the Shapefiles in a group for a Job, then look for the corresponding folder within the Documents folder.

If you need to use the Shapefiles data with another GIS application, please copy the .shp, the .shx, the .dbf, and the .prj file by the same job name to your desktop computer.

As **there is a limit of 10 characters in the field name for the DBF file**, if an Attribute name exceeds 10 characters, it will be truncated.

This app provides the option for you to export the Shapefiles for a mapping job to an individual folder for better data organization. Mark the "**Group in <jobname>\_shp**" check box if you wish to have all the Shapefiles in the current job exported to one single folder named after the job file.

### **Export Excel file**

The Features in the working job file may be exported to an Excel file. The exported file will reside in the **Documents folder** for this app, unless you have setup the app to store files in iCloud.

To export the Feature data to an Excel file, choose **Job** then select **Export - Export Excel file**. Mark the Topics that are to be exported and select the desired options then tap the **OK** button.

To unmark all the checkboxes, tap the **Select None** button.

Data will be exported in the working coordinate system. The distances and angles will be exported in the active distance and angle units.

### **Export 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, unless you have setup the app to store files in iCloud storage.

To export the Feature shapes to a DXF file, choose **Job** from the Main Menu then select **Export - Export DXF**. Enter or select the destination file name then tap on **OK**.

Select the Feature Topics to be exported and select the desired options. If you wish to export the Attributes of the Features to the DXF file, then mark the checkbox for "**In Block**" then mark the check box for "**With Attribute**".

The app will create a DXF layer for each Topic marked for export.

If you wish to export the selected Topics to the same layer, then mark the **Export**

to **one layer** checkbox and enter the name of that layer in the **Layer name** box.

Data will be exported in WGS84(1150)ITRF00, and the current Epoch. The distances and angles will be exported in the active distance and angle units.

Tap the **OK** button to complete the DXF export.

### **Export to PDF**

To export the job data to a PDF file, tap the **Main Menu** icon, select **Job** then select **Export - Export to PDF**.

You may accept the displayed default name for the PDF output file, or you may type over it the name you wish to assign to the PDF file.


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.**

Tap the **OK** button to complete the PDF export. The contents of the PDF file will be displayed. The first page will show the drawing of the Features as they are displayed on the screen. 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.

The additional page(s) will show the boundary coordinates and areas of the Area Features as well as the coordinates of the Point Features or the starting and ending nodes of the Line Features.

If you wish to view an existing PDF file, then tap on the **View File** check box and select the desired file name. Then tap on the **View** button to display the contents of the PDF file.

The **View File** function is also useful for viewing any other PDF documents that you have placed in the Documents folder of this app. If you have a document or cheat sheet that you will need to refer to while working in the field, it is a good idea to save a copy of the file in the Documents folder of this app by using the iTunes® program.

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, unless you have setup the app to store files in iCloud. To access the PDF files exported locally, first connect to the iTunes® program then look in the Documents folder for this app.

**To delete a PDF file**, use the iTunes® program to access the Documents folder for the app then select the file and hit the **Delete** button on your desk-top computer. **A deleted file cannot be recovered.**



## Export to GPX

The Features in the working job file may be exported to a GPX file. The exported GPX file will reside in the **Documents folder** for this app, unless you have setup the app to store files in iCloud storage.

To export the Feature coordinates to a GPX file, choose **Job** from the Main Menu then select **Export - GPX**. Enter or select the destination file name then tap the **OK** button.

Please note that the Attributes of the Features will not be exported to the GPX file.

## Export KML

The Features in the working job file may be exported to a KML file. The exported KML file will reside in the **Documents folder** for this app, unless you have setup the app to store files in iCloud. .

To export the Feature data to a KML file, choose **Job** then select **Export - Export KML**. Enter or select the destination file name. Mark the Topics that are to be exported then tap the **OK** button.

The Feature data will be exported based on the **WGS84 datum and the LLA coordinate system**.

If you wish to also export the Attributes of the Features to the KML file, then mark the checkbox for "**With Attributes**"

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## **Manage Data Files**

iCMTGIS PRO stores the recorded data in its "Documents" folder on your device. Following are a few examples of the valid data file types.

The Points, Lines and Areas with their Attribute/Values and symbol assignment are saved in the CMT **.pmp** file format.

As mentioned under "Export Job Data", you may export the Feature data to Shapefiles by using **Menu - Shapefile - Export**. The Shapefiles will be represented by the **.shp** extension.

The Feature List have the **.fbr** file name extension.

If you make use of the CMT Base maps, they have file name extension **.pbm**.

Raster images prepared using a separate CMT PC mapping software take on the file name extension **.pim**.

## Accessing the Documents Folder

(We are repeating this section to help ensure you are able to find the information

about the Documents folder.)

To see the Documents folder, first connect your Mobile Device to the iTunes® program and select your Mobile Device.

Then you should see an **Apps** tab across the top of the screen. Click on that tab then make sure the iCMTGIS PRO application is synched with your computer. Scroll down to the File Sharing section. Select the iCMTGIS PRO application to see the files that are stored in its Documents folder, such as the .pmp files, the Shapefiles, the Basemap files and the raster map images.

You can drag files into or out of this Documents folder. You may use the **Add** button on the iTunes® screen to select and add files from your computer to the Documents section. Use the **Save To** button to copy files from the app to your computer.

To delete a file, first highlight it then press the **Del** button on your computer.

**Caution:** Always make sure you really want to delete a file before proceeding to do so.

**Please note: Before updating to a new version of iOS, first back up all you apps and data files and close the app.** 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.

### **Send or Get Job Files via email**

You may use iCMTGIS PRO to send or get job files via your email service. After you select **Menu - Job - Email Files**, you may tap on a tab to display the files of the selected file type:

**Job:** .pmp files

**Feature List:** .fbr files

**TXT/DXF/XLS/GPX/KML** .txt, .dxf, .xls, .gpx and .kml files

**Photo** photo files

**PDF/DCF** .pdf or .dcf files

**Shape file:** Shapefiles

You may mark the checkbox before a file name to select it.

If the files to be sent are in iCloud® Storage then mark the **on Cloud** checkbox. Enter the receiver's email address then click the **Send** button to attach the selected files to an email.

When you open an email using the Apple® Mail® application program, and tap on

an attached Job file (e.g. a .pmp file), the system will automatically forward the file to iCMTGIS PRO. In case there are multiple applications on your device that can use the same type of files, the Mail® program will pop up a menu for you to select the application to which you intend to forward the file.

You can select CMTGIS PRO from within the email to open a .pmp Job file then save it locally.

As Shapefiles data involves a number of files in different formats, you will not be able to use iCMTGIS PRO to open these files from an email.

### **Store or Retrieve Files via iCloud® Service**

The iCMTGIS PRO application supports iCloud® service for file storage. To make use of iCloud® Storage, make sure that Documents and Data is turned ON under the Cloud setting on your device that is running iOS 7. If you are running iOS8, turn on iCloud Drive under Setting/iCloud.

In iCMTGIS PRO, under **Menu - Setup - iCloud**, there are a number of options:

**Job:** .pmp files and Shapefiles

**Feature List:** .fbr files

**DXF/TXT/XLS/KML/GPX** .dxf, .txt, .xls, .kml, .gpx files

**Basemap/Registered Image** : Basemaps and registered images

**PDF** .pdf files

**Deed Calls** .dcf files

**Photo** photo image files

When you enable iCloud for a file type, the app will move the selected type of files to your iCloud® storage location whenever you tap the **OK** button on the iCloud Setup screen. Afterwards the app will look for that type of files only from the iCloud storage until you unmark the iCloud check box for that file type.

For example, if you select iCloud® storage for the “**Job**” file type under **Menu - Setup - iCloud**, the folder for loading and saving the .pmp files and for importing the Shapefiles would be on the cloud. Therefore the app would attempt to look for the files in iCloud. Unmarking the iCloud storage setting will permit the app to look for the .pmp files and the Shapefiles in the local Document folder for this app.

Helpful Tip: As there are two possible places for storing your files, when you are puzzled why you are unable find a certain file, be sure to inspect the iCloud Setup under **Menu - Setup - iCloud**.

To view the names of the files stored on cloud, tap the **Settings** icon on the Home page of your iOS device then select iCloud - Storage & Backup - Manage Storage - iGPSGIS II.

Both iCMTGIS PRO and iGPSGIS II share the same cloud name "iGPSGIS II".

The files stored at the iCloud® storage location can be shared with another iPad® or iPhone® device. They can be shared between the iGPSGIS II and iCMTGIS PRO applications. For example, if you use iCMTGIS PRO to load a **.pim background image to iCloud**, you could make use of that background image in iGPSGIS II or another iCMTGIS PRO using the same iCloud account.

A word of caution regarding sharing the **.pmp job files** or the **.fbr feature list files** using iCloud. As defined by Apple, if two apps use the same file on the cloud, these apps must synchronize the file automatically. Therefore, you must take care when using the same file in two different apps or **sharing files** with your colleagues if you will be making changes to the files. For example, suppose you open the same .pmp job (stored on iCloud) in both the iCMTGIS PRO and the iCMTGIS II apps. You add a Point Feature in iCMTGIS PRO, and you add a Line Feature in iCMTGIS II. When you save the job in iCMTGIS II, the job will be automatically loaded into iCMTGIS PRO from iCloud. As a result, iCMTGIS PRO will gain a new Line Feature but lose the newly created Point Feature that has not yet been saved.

### **Get/Send Files via FTP**

You could use iCMTGIS PRO to transfer files over the Internet using **File Transfer Protocol (FTP)**. FTP file transfer requires a FTP server and a ftp client. This app will use an **FTP client** to let you send or get files to or from the PC running the FTP server.

To access the FTP function, select **Main Menu - Job** then select **FTP**.

Enter the IP address of the ftp site you want to connect to. If a user name and password for accessing the ftp site is required, then enter them into the corresponding boxes. For an FTP site that provides anonymous FTP access, simply mark the Anonymous checkbox, and the User Name will be automatically filled in with "anonymous".

You may select the FTP Path and have it point to the desired folder on the PC. The files on the iPad and the files on the ftp site will be listed separately.

Select the files you wish to send from one side to the other then tap the corresponding large arrow button to complete the transfer.

If the files for your device are in iCloud® Storage then mark the **on Cloud** checkbox.

Some versions of CMT PC mapping software, such as PC-GIS X, provide an **FTP Server** to let an FTP Client get or send files from your computer. You may use this app to transfer files to and from your PC via FTP.

The steps for making an FTP file transfer using the CMT FTP Server are as follows:

1. In PC-GIS X run **Utilities - FTP Server**, and select the IP if you have more than

one network card. The FTP Client will connect with the FTP Server via this IP. If you don't want to allow the client to login as Anonymous, you should set User Name and Password.

2. Specify the FTP Path, i.e. the desired folder on the PC.
3. Click the "Start" button to start the FTP server.
4. In the iOS app enable the FTP function under Menu/Job then log in to the ftp site.
5. In the iOS app select the files to be sent, then tap the corresponding arrow button.

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