iCMTGIS II
User Manual

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Overview

This reference guide covers the use and functionality of the iCMTGIS II, a field data collection application program designed for use on an iPad® mobile digital device. The data collected using iCMTGIS II can be loaded into the CMT desktop PC software (such as PC-GIS, PC-GPS or PC-MAPPER) for analysis, map enhancement, master map file update and printout.

Please note:

Use of this real-time GPS application is at your sole risk. Location data depends on the GPS receiver used and may not be accurate.

With iCMTGIS II you have the tools to perform the following tasks:

Collect GPS Data

You can use iCMTGIS II to record geographic locations as Point, Line and Area Features. A built-in Feature/Attribute database structure allows you to set up a Feature List so you may easily tag the locations with the appropriate descriptions. You may collect data for separate Topic layers (groups of Features sharing the same types of characteristics).

View GPS Data

The recorded GPS Features are represented graphically on the color display of the iPhone® device. A Topic View is provided to let you select the active topic layer. You can then use the Sheet View to look at the Attributes of each Feature in the active Topic.

Your iPhone® device is equipped with GPS. Therefore the GPS location marker will be displayed when the GPS function is turned on. The 3G functionality will help get the GPS receiver to start tracking sooner, but is not necessary for the GPS receiver to function. Therefore, you will still be able to get GPS position outside of cellular coverage. If you bring your Shapefiles or raster image files along, you can still use your iPhone® device to collect GPS/GIS data on top of a background map in remote areas.

Display Area Information

Whether the Area Feature was recorded by using a GPS receiver or by manual digitization, iCMTGIS II can readily report the area of the polygonal shape.

Build Maps

iCMTGIS II allows you to create and edit electronic map files (*.pmp) using data collected from a GPS receiver, as well as by "heads-up" digitizing. In the coordinate system of your choice, you can display "features" (points, lines or areas) tied to their geographic positions. Descriptive information (attributes and values) for each feature is also displayed for quick reference and editing.

Overlay Data on a Background Map

A background map for your job site can assist in location determination and data collection. iCMTGIS II comes with the ability to import Shapefiles and display a native Map, a raster image, or a CMT BaseMap.

Before a raster image or a CMT BaseMap can be used on your Mobile Device, it must be transformed using another optional software package such as PC-GPS, PC-GIS or PC-MAPPER. Portions of a map image, or the entire map image, may be converted and transferred to your Mobile Device for use with iCMTGIS II. Please refer to the help found in the PC-GPS, PC-GIS or PC-MAPPER software for information on converting and transferring such map files to your Mobile Device.

The optional county-based DRG and DOQQ files for the USA are available from various map image providers. The optional CMT BaseMap CDs are available for all the States in the USA. The CMT BaseMap data contains useful background information such as: roads, hydrology, points of interest, and city/county boundaries.

PC-GPS, PC-GIS or PC-MAPPER can load background image files in TIFF, JPEG, GeoJPEG, MRSID and ECW formats. These software programs also provide a function that lets you geo-reference your own aerial photos or scanned images.

Manage Data Files

iCMTGIS II lets you create multiple job data files as well as Feature Lists. It provides functions to let you transfer your data files to and from your desktop computer or store them with the iCloud® online service.

iCMTGIS II can import and export Shapefiles from and to its "Documents" folder, respectively.

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

Section 1 - Getting Started

1.1 Hardware and Software Requirements

iCMTGIS II was designed for use on the Apple® iPad® mobile digital device. You will also need the Apple® iTunes® application program for transferring files between your iCMTGIS II and your PC or Mac® computer running in PC mode.

iCMTGIS was primarily designed for collecting GPS data. If your device does not come with a GPS receiver, you could join a Wi-Fi network and use its Location Services to obtain position information, which is not as accurate as that obtained from a GPS device.

As the iPad® mobile digital device has a capacitive touch screen, you could use your thumb and fingers or a capacitive stylus to perform the actions of data entry, option selection, panning around, and zooming into and out of a displayed area.

1.2 Installing the Application on your Mobile Device

Please connect to iTunes® application program to download and install iCMTGIS II on your iPad® mobile digital device.

The End User License Agreement for the iCMTGIS II application software program is covered under the standard Apple® App Store Terms of Service.

1.3 Running the Application

After you have installed iCMTGIS II on your Mobile Device, click on the iCMTGIS II icon to start it.

The files used by the application program are stored in the Documents folder for the application. To access the Documents folder, you will need to connect your Mobile Device to the iTunes® program. Please see Section 6.1 in this manual for details.

1.4 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 Degrees- Minutes-Seconds format, 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 91º09'26.082"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.

1.5 Restarting the Application

If you modify the name of a data file, or if you send a new set of symbols libraries to your iCMTGIS II, you will need to restart the application so that it will be able to make use of the updated symbols libraries. Occasionally, you may need to restart iCMTGIS II for some other reasons, such as the built-in camera suddenly quits working.

To do so, first press the **Home** button to go to the Home screen. (The Home button is the one and only button on the face of the iPad® device.)

Then double-tap the Home button, and the application icons will be displayed at the bottom of the screen. Hold down the iCMTGIS II icon briefly until a "-" symbol shows up by the application icon.

Tap on the "-" symbol by the iCMTGIS II icon to turn it off.

Press the Home button to complete the action.

1.6 Getting Help in the Application

This User Manual may be accessed by tapping the **Main Menu** icon at the upper-left corner of the screen then selecting **Help**.

1.7 Technical Support

With the help of this user manual, you should be able to run iCMTGIS II without much problem. Please email support@cmtinc.com if you need extra help.

Section 2 – Fundamentals

In this chapter, the basic terminology and major concepts behind iCMTGIS II are presented. It is highly recommended that you read through this chapter thoroughly for a clear understanding of the fundamental concepts. The ideas and examples presented will be used and built upon in subsequent chapters.

2.1 Definitions

In this section, definitions of the terms used in iCMTGIS II are presented.

2.1.1 Spatial Data

iCMTGIS II files are created using spatial data and are called Job files. **Spatial** data is tied to a specific location defined by a set of coordinates (e.g. Latitude, Longitude and Altitude).

Spatial data in a Job file can be collected with the GPS receiver. Spatial data can also be created within iCMTGIS II by manually digitizing data.

Spatial data includes coordinates as well as descriptive Geographic Information Systems (GIS) terms such as features, attributes, and values.

Features, Attributes and Values

A **Feature** is a GIS term used to describe an object. A Feature is tied to a specific coordinate position or a set of coordinates and therefore is spatial data. For example, a Feature could be a Tree at a specific coordinate location.

Three Feature types can be defined in iCMTGIS II. Feature types include: **Point** Features, **Line** Features and **Area** Features. A Point Feature is an object with one associated coordinate position such as a tree. A Line Feature is an object associated with a series of coordinates connected together such as a stream. An Area Feature is an object associated with a series of coordinates connected together to form a closed area such as the boundary of a parcel of land.

Point feature: •   **Line** feature: | **Area** feature: ⬤

Features can be assigned **Attributes** and **Values**. An Attribute is a specific descriptor such as Species. The value quantifies or qualifies the attribute. The Attribute can be considered the question with the Value of the Attribute as the answer.

Example: A fir tree may be recorded as follows:

    Feature: Tree •
    Attribute: Species
    Value: Fir

Coordinates: 44 33 46 N
                          123 15 45 W

2.1.2 Feature Topics & Individual Features

Data in iCMTGIS II is organized into **Feature Topics**. A Map file may contain a number of different Feature Topics. The rules that define a Feature Topic are:

1. A **Feature Topic** is a grouping of one or more individual Features that are defined by a common set of Attributes.

2. **Individual Features grouped together under a Feature Topic should be of the same type**: Point, Line or Area.

3. The **Feature Name** is used as the **Feature Topic name**. Individual Features are identified by a unique **Feature ID**. For example, the first feature in the TREE feature topic will be assigned the Feature ID: TREE001.

2.2 Data Organization

For the optimal use of iCMTGIS II, it is recommended that you spend time organizing data collection **BEFORE** collecting GPS/GIS data in the field. Your application is unique and your data collection goals are different from those of another user. A well thought out data organization for your purposes will help increase efficiency in data collection and facilitate data analysis.

Provided below are some general suggestions for the process you might use to organize your data.

1. **Pre-plan how the data should be organized and collected in the field.**

   a. Examine any existing GIS and database structures covering similar data collection jobs.

   b. Decide what type of data needs to be collected. This applies to both Feature and Attribute data.

2. **Organize Features, Attributes and Values.**

   a. Features are the objects at the geographic locations of interest. You can assign **Attributes** and **Values** to describe the features being mapped.

   b. Features that share the same set of attributes and values should be grouped into the same **Feature Topic** with a unique **Feature Name** for each group.

3. **Create a Feature List according to your data collection plan.**

   a. Design a Feature List based on your data organization to facilitate data collection. Each Feature List provides a set of predefined data collection parameters as well as Feature Topics, Attributes and Values that the user may easily select by the point-and-shoot method in the field.

   b. By default, iCMTGIS II will still permit you to enter Features/Attributes/Values "on the fly". As data entered manually may conflict with your data organization plan, you may wish to disallow such a data entry mode. Consider using the Feature Lock function described in Section 4.2 of this manual.

2.3 Working with Tools and Menus

The main iCMTGIS II screen is called the **Map View**, which provides a graphic representation of any Features and background map there are in the currently active job. It is the first screen you see when you start the iCMTGIS application.

2.3.1 Main Menu Icon

The Main Menu icon is located at the upper-left corner of the main iCMTGIS II screen. This button provides access to a number of iCMTGIS II commands. You can active a menu option by first clicking on the Main Menu icon to pull down the menu list, and then clicking on the desired selection. Most of these selections provide a submenu of commands or option selections.

Please note: In this manual the convention "Menu option/Submenu option" will be used. For example, "Menu/Setup" means you should tap the Main Menu icon and then click on "Setup".

To see the software version number, first tap the Main Menu icon then select **About ICMTGIS II**.

2.3.2 Main Tool Bar

The Main Tool Bar is located across the top of the iCMTGIS II main screen.

This Tool Bar contains button icons for quick access to a number of iCMTGIS II functions. Tool Bar functions can be activated by clicking once on an active icon. Buttons with inactive functions have icons that appear dull and gray. Simply click on an active button icon to access the associated iCMTGIS II function.

2.3.3 Bottom Tool Bar

Some of the functions will display an associated tool bar at the bottom of the iCMTGIS II display to provide buttons for option selection or additional software commands.

2.4 Data View Screens

Data in the Map file can be viewed and edited using different view modes.

2.4.1 Map View

The Map View is the main screen that shows any spatial data (Features) and/or background map present in the currently active job.

Looking around in Map View

When a map is displayed in iCMTGIS II, you may use a capacitive stylus or a finger on the touch screen to pan around the map. Pinch on the screen using two fingers to zoom out of the map, or pull two fingers apart to zoom in. You may tap on the **Zoom Fit** button on the Main Tool Bar to fit all map elements into the display:

The icon on the left side is the **Zoom Fit** tool. Tapping the pull-down arrow on the right side will reveal additional **Map Tools** that will be described later in this manual.

Example: In our example map, swcvo.pmp, the Map View shows all of the Features in the job: Houses, Samples, Streets, and Spray Areas.

Symbols and Patterns for your Features

When you first open your Job file, the default point symbol, line style or area pattern will be used.

Point Features: ● (Default Symbol)

A Point Feature, such as a House, is represented in the Map View by a small colored circle as shown above. A Point Feature can be selected from the Map View by clicking on the map representation of the individual Point Feature.

Line Features: (Default Line Style)

A Line Feature, such as a Stream, is represented in the Map View by solid line as shown above. The line will be connected via all of the nodes (coordinates) within the line feature. A Line Feature can be selected from the Map View by clicking on the map representation of the individual Line Feature.

Area Features: (Default Area Pattern)

An Area Feature, such as a Land Plot, is represented in the Map View by a solid "area" in the shape of the feature bounded by a thin black border. An Area Feature can be selected from the Map View by clicking on the map representation of the individual Area Feature.

A number of other symbols and patterns can be used for representing your points and lines. For information on using symbols and patterns, see Section 3.5 in this manual.

2.4.2 Topic View and Topic Menu

The Features in your map are organized into Feature Topics (Topic layers). To see a list of all the

Feature Topics you have in the currently active job file, tap the **Topic View icon** .

By the Main Menu icon is a **Topic Menu icon** . This pull-down menu contains a few functions that apply actions to the currently active Topic.

The Currently Active Feature Topic

When you tap on one of the Topics listed in the Topic View, that Topic becomes the currently active Feature Topic.

Another way to activate a Topic is to tap on one of the Features in Map View. The Topic, to which that Feature belongs, becomes the active Topic.

Zoom to Topic

The Zoom to Topic tool is grouped with the Zoom Fit tool under **Map Tools**. By default the Zoom Fit icon is displayed as the active Map Tool.

To zoom to a specific Topic, first select the Topic of interest as the active Topic, then tap the pull-down arrow beside the **Map Tools** icon and select **Zoom to Topic**. The screen will now be zoomed to the Features in the active Topic, rather than to the full extent of all the Features displayed on the map.

Please note: When GPS is turned on, the focus will be on your current GPS position. Therefore, if you intend to look for a Feature far removed from the GPS location, it will help to first turn off the GPS.

Marking Feature Topics for Display in the Map View

The mark box to the left of each feature topic name is used to specify which feature topics are displayed in the Map View. When you first open your Job file, all of the feature topics in the Feature Topic View will be marked with a check and all of the features assigned to that feature topic will be displayed in the Map View.

You can toggle the display of a Feature Topic ON and OFF by clicking on the mark box.

Changing the Order of Feature Topics

In general, Feature Topics should be arranged by type and size. Point Feature Topics and Line Feature Topics should be listed first. Small or medium size Area Feature Topics should be listed next. Large Area Feature Topics should be listed last. An Area Feature Topic on top of a Point Feature Topic may prevent you from seeing the points, although iCMTGIS II does allow you to change the transparency of an Area Feature to see through it.

You can **change the order** of the feature Topics by moving a Feature Topic up or down. To do so, first activate the Topic View then tap the **Topic Menu icon** and select **Move Topic**. A handle will appear by each Topic Name. Now you may grab a Topic by the handle and drag it to a different location in the Feature Topic List.

Feature Topic Symbol

A Feature Topic Symbol, describing the feature type, is located to the left of each Feature Topic Name. By default, all the Features added to a Feature Topic will be represented by the same Feature Topic Symbol.

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.

If you wish, you could change the symbol assignment for each individual Feature as well. This will be discussed later in Section 2.4.4.

Feature Labels
You have the option of displaying the Features in Map View along with the Feature ID and Attributes as labels. You may change the font size and color for the text labels. Please see Section 3.8 for details about the Auto Label function.

2.4.3 Sheet View

After selecting a Feature Topic, you may tap the **Sheet View** icon at the top of the screen to list all the Features in that Topic. The Sheet View presents the Features and their Attributes in a tabular format.

The Sheet View also provides an alternative way for you to select the desired Feature for viewing or editing. Simply tap a record in Sheet View and watch the corresponding Feature get highlighted in Map

View. After you have selected a Feature then you may tap the **Feature Properties** icon to call up the Coordinates and Attribute pages. The Feature Properties icon is described in Section 2.4.4 of this manual.

The Feature records are sequentially numbered, beginning with the number one (1). This Feature Number represents the current order of the Features in the active Feature Topic.

You may change the order of Features in a Feature Topic by highlighting the Feature record and then using the "To Front", "To Back", "Forward" or "Backward" buttons at the bottom.

To delete a Feature, first highlight it then tap the **Delete** button.

Caution: Always make sure you really want to delete a Feature before confirming the Delete action.

The following sample screen shows the Map View with both Topic View and Sheet View activated.
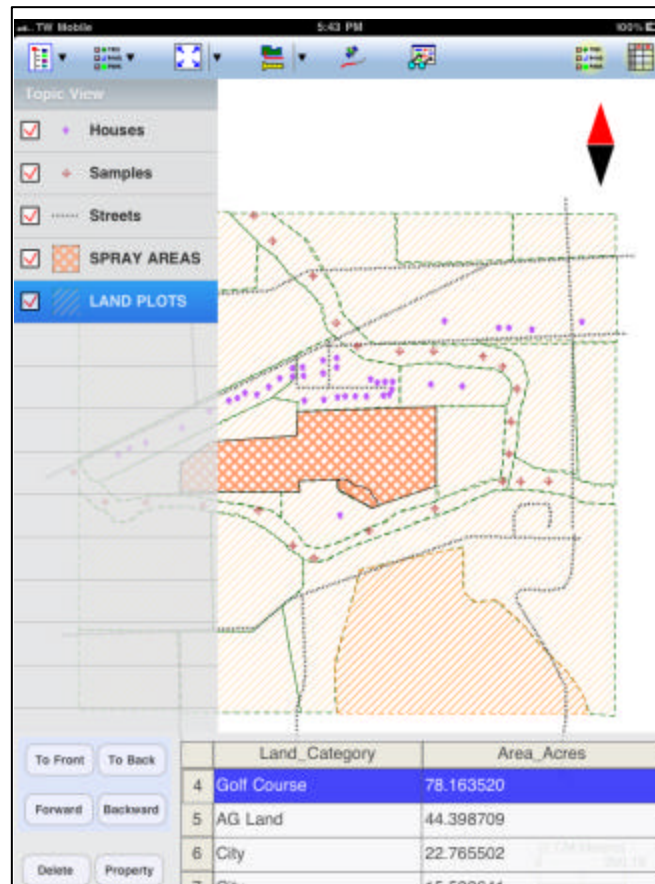
2.4.4 Feature Properties

With a Feature selected from the Sheet View, or highlighted in the Map View, you may tap the Feature

Properties icon ![icon] to view the relevant information.

The Feature Properties screen shows the Feature Name and the Feature ID for the current active Feature. It also provides a button for you to change the symbol assignment.

Three pages are provided for displaying the properties of the Feature.

Tap on the **Coordinates** button at the bottom of the screen to see the coordinate information for the Feature. The displayed coordinates are based on the active coordinate system. Coordinate system setup is discussed in Section 3.6.

Tap on the **Attribute** button at the bottom of the screen to see the Attribute/Value information for the Feature or change the description of the Feature.

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

Please see Section 3.5 for details about the functions provided in the Feature Properties screen.

Section 3 - Working with Your Feature Data

To familiarize yourself with working with Feature data, you may use the sample job named swcvo.pmp that is provided with your iCMTGIS II. A park.fbr file is also provided as a sample Feature List.

Please note that iCMTGIS II uses lower case for file names. If you have created a .pmp file in PC-GIS, PC-GPS or PC-MAPPER, or if you have a set of Shapefiles on your desktop computer that you wish to import, please make sure the file names are in lower case before transferring the files to your iCMTGIS II.

If a file name in the application document folder on the iTunes® application program is not in lower case, you can double-click on it then edit it to be lower case.

Also, whenever you restart your iCMTGIS II application, all the file names in the app document folder will be automatically changed to lower case. The procedure for restarting iCMTGIS II was described in Section 1.6 of this manual.

iCMTGIS II can work with the following types of files. It can accommodate multiple files of each type. However, only one file of each type may be loaded at a time. To make the files accessible for use by the application, please place them in the **Documents folder** for iCMTGIS II. (See Section 6.1 for details.)

Job Files

Feature data collected in iCMTGIS II is stored as a Job file (***.pmp**).

Shapefiles

You may import the Features in a Shapefile (***.shp**) into a job. These Features will be stored along with any GPS or digitized Features when you save the job file.

Feature List Files

Pre-defined lists of features, attributes and values can be stored in a Feature List file **(*.fbr**) to assist in data collection. This useful tool greatly reduces the amount of data that must be manually typed in while collecting data in the field.

BaseMap Files

BaseMap files (***.pbm**) are files that contain background information such as streets, railroads, hydrology, city limits, etc. to assist in navigation and data collection. The CMT BaseMap file can be loaded into your Job file in the Map View. For creation of the *.pbm files, please refer to the help section in PC-GPS, PC-GIS or PC-MAPPER.

Raster Image files

Raster Map Image files (***.pim**) are background map images prepared for use with iCMTGIS II. For creation of the *.pim files, please refer to the help section in PC-GPS, PC-GIS or PC-MAPPER.

3.1 Opening/Closing a Job file

Use **Menu/Job/Current Job** to open a new or existing Job file on your Mobile Device. Once this option has been selected, the Job Setup screen will be displayed. The job files have the ".pmp "file name extension.

Select a Job file, such as swcvo.pmp, to open by either entering the file name in the **File Name** box or by clicking on the drop-down arrow and selecting the appropriate file name listed in the drop-down list.

To create a new job, click the "**New**" button then enter the name for the new job.

You may select a **Feature List** to be associated with the job. Doing so will facilitate the specification of the data collection parameters as well as the entry of the Feature Attributes during data collection.

Optional information such as "Crew", "Department", and "Description" may be typed in here to help identify the Job. A Keyboard will automatically pop up to let you enter information into these fields.

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.

3.1.1 Displaying Map

iCMTGIS II can display the native Map for a valid current location. If you open an existing job that contains one or more Features, those Features will provide a location reference for loading the Map.

However, when you create a new job, initially there will be nothing in Map View to give a clue as to where you are. You will need to first get a location reference before you can load the Map.

If your device comes with GPS, tap on the GPS icon then select "GPS On" to turn on the GPS function. The GPS location marker will be displayed to indicate your current location.

If you don't have GPS for your device then you will need to connect to a Wi-Fi Network and turn on the Location Services under Settings on the device. Then you will be able to get a location marker on the screen.

Now that the Map View is properly situated, tap the **Main Menu** icon at the top of the main screen in iCMTGIS II then select **Map**.

Select the type of Map you wish to see, and the map will be displayed on the screen. Zoom in or out to a comfortable scale for your data collection job.

3.1.2 Loading a Basemap

You may use **Menu/Basemap/Load BaseMap** to select a CMT BaseMap to load into iCMTGIS II. Click on the .pbm file, such as benton.pbm, you wish to load into Map View then click **OK**. You will need to use the optional PC-GIS, PC-GPS or PC-MAPPER software to prepare the CMT Basemap files for use in iCMTGIS II.

Please note: If the BaseMap is not displayed with the Job data after loading the BaseMap, it may be because the BaseMap file does not cover the same geographical area as the Job. Check the BaseMap in the PC-GIS, PC-GPS or Pc-MAPPER that was used to create the .pbm file and make sure it is the one that covers the location of the Job data.

3.1.3 Importing a Background Map

You may select **Menu/Background Map/Load Map** to select another .pmp job file to be loaded as the background for the job. Click on the .pmp file you wish to load into Map View then click on **OK**.

Or, you may select **Menu/Background Map/Load Registered Image** to select a registered (geo-referenced) image in the **.pim** format to be loaded as the background for the job. Click on the .pim file you wish to load into Map View then click **OK**.

Images to be used in iCMTGIS II must be prepared and converted using the optional PC-GIS, PC-GPS or PC-MAPPER software. Entire map images or portions of the image may be clipped, converted and transferred to your Mobile Device for use with iCMTGIS II. We recommend to use portions of images whenever possible to minimize the amount of memory usage on your Mobile Device. Please refer to the help found in the PC-GPS, PC-GIS or PC-MAPPER software for information on converting the image files to *.pim format.

3.1.4 Importing Shapefiles

iCMTGIS II has the ability to import data in the Shapefile format into your Job file. Any Shape files that you wish to import must already have been transferred to your Mobile Device.

To import a Shapefile, choose **Menu/Shapefile/Import**. A dialog will be displayed that lists all available Shapefiles (*.shp) in the specified directory. Click on the checkboxes for the desired Shape files to mark them for import then click on the **OK** button.

If you don't see any Shapefiles listed, that means you have not transferred any Shapefiles to your iPad® device. You will need to synch your iPad® device to iTunes® application program and copy the desired Shapefiles to the Documents folder for the iCMTGIS II application.

Please remember that Shapefiles actually consists of several files and make sure the .shp, the .shx, the .dbf, and the .prj files by the same job name are all present in the Documents folder for iCMTGIS II.

3.1.5 Closing a Job File

When you switch to another Job file, the original Job file stays open. You may use **Menu/Job/Close Job** to close the currently active Job. This action is necessary if you would like to replace a Job file with an updated Job file (having the same name) from your computer. Unless you first close the open Job file, it cannot be replaced by another file with the same name.

3.2 Saving or Exporting Your Data

You may save the Feature data in a job file (*.pmp), or you may export it in Shapefile format (*.shp). The *.pmp files and *.shp files can be used with PC-GIS, PC-GPS and PC-MAPPER. The *.shp files can also be used with many other commercial mapping software programs.

3.2.1 Saving the Job File

iCMTGIS II will automatically save the recorded data in your currently active job so long as your hardware device is working properly. In addition, any time you wish to save the data or changes in your Job file, you can use **Menu/Job/Save** to do so. If you wish to save the data under a different job name then use **Menu/Job/Save As**. The job files take on the file name extension **".pmp"**.

3.2.2 Exporting Shapefiles

The geographic Features that you have logged or digitized by using iCMTGIS II can be exported in Shapefile format. To do so, first activate the **Menu/Shapefile/Export** command then enter the desired Shapefile name.

You may select one or more Topic layers to export. Each Feature Topic will be exported as a separate Shapefile consisting 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 in the iTunes® program. To access your exported Shapefiles outside the iCMTGIS II application, first connect to the iTunes® program then look in the Documents folder for iCMTGIS II.

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.

The Feature symbol assignment is not recorded in Shapefiles. Suppose you have assigned various symbols to the Features in a job map. If you export the Feature data in Shapefile format then re-import data from the Shapefile, the Features will assume the default symbols.

However, when you save the Feature data in a .pmp job file, the symbol assignments will be preserved.

3.3 Selecting Data for Edits and Other Operations

In order to edit a Feature, the Feature must first be selected. An individual Feature can be selected by clicking once on the Feature in the Map View. The Feature selected will be displayed in orange and the Feature ID and the coordinates will be displayed briefly. Try tapping on the Spray Area Feature in swcvo.pmp and notice how the selected Area Feature turns to an orange color. Tap on an empty area in the screen to deselect the Feature.

BaseMap features can be selected in the same manner. The BaseMap feature selected will be displayed in orange and the BaseMap feature name will be displayed briefly.

Please note: Orange is the default selection color for features in the Map View. The selection color can be changed using the **Menu/Setup/Color/Pattern** option.

The coordinates shown will reflect the currently active coordinate system. You may specify a different Coordinate System by using the **Menu/Setup/Coordinate System** screen, which is discussed in section 3.6 of this manual.

Alternatively, as discussed in Sections 2.4.2 and 2.4.3, you may select a Topic from the Topic View, and then activate the Sheet View to select the desired Feature.

Once a Feature is selected, the properties of the Feature may be accessed by pressing the **Feature Properties** button found on the Tool Bar .

3.4 Digitizing Features on your map

Grouped with the Zoom Fit icon are a few other **Map Tools**. Among these are tool icons for manually adding new Features to the current Job file. You can add a new Point, a new Line or a new Area Feature. GPS is not needed for the digitizing functions.

The default symbols will be used for digitizing Points, Lines and Areas. After creating the Feature Topic, you may call up Topic View and select a different symbol to represent your new Feature Topic. Subsequently digitized Features for that Feature Topic will display as the symbol you have assigned.

Although iCMTGIS II does not provide navigation functions, you could still digitize your destination location on the iCMTGIS II and use it as a guide to help you get to it.

For example, for geocaching, you are given the coordinates of a location where the treasure is hidden. You could start a job file and create a Point Topic in it then use the Add Point Manually function to add a new point (Section 3.4.1). With that point highlighted, select the Feature Properties tool to display the coordinates of the newly added point. Now, overwrite the displayed coordinates with those of the desired location. Your goal would be to approach the target location. Of course, it will help tremendously if you

also load a background map that shows the streets, the hills, the rivers, etc. The more detailed the background map, the better.

3.4.1 Adding Point Features

Sometimes you may wish to digitize one or more point locations to highlight them on the displayed background map to help with navigation, to put in the vertices of a poly-line or an Area Feature that you will be adding later, or to add attribute descriptions to places you have visited or inspected. Like the GPS Point Features, the digitized Point Features may be saved in Shapefile format.

The digitizing functions are grouped under the **Map Tools** icon next to the Main Menu icon. By default, the **Zoom-Fit** Tool is displayed.

Except for the Zoom-Fit Tool, the **Map Tool** functions are context-sensitive. For example, when a Point Topic is active, you will be able use the **Map Tools/Add Point Manually** option to add a new point to that Point Topic by clicking on a location in the Map View.

Therefore, the fist 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, such as "Corners". Make sure the Type field shows: **Point**. Add one or more **Attribute Names** (title of description) for this Topic. Then tap **OK** to confirm the screen.

To activate an existing Point Topic to add points to it, tap the **Topic View** icon on the upper-right corner of the main screen then select the desired Point Topic. Tap the Topic View icon again to hide the list of Topics.

Now, tap the pull-down arrow beside the **Map Tools** icon. Select **Add Point Manually**. A **blue dot**

● will be shown as the toggle-tool icon.

Tap the points on the desired locations on the background map to drop the points onto the map. If you intend to mark the corners of a rectangular area then tap the four corner points.

You will notice that there is an **Add** tool at the top. This is a toggle switch that you can use to halt the point digitization and reactivate the regular **touch-screen** mode. For example, when you wish to use two fingers to zoom into or out of the map, you will first need to tap on this toggle to prevent unwanted points to be added to the map whenever you touch the map. Tap on this toggle again when you are ready to digitize additional 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 **SnapTo Node Tool** . When the SnapTo Node toggle is on, the point you add will be dropped on top of the nearest Point or 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. This means that you may digitize Point Features into different Point Topics within the same digitizing session. If you have assigned different symbols for the various Point Topics, these will be reflected by the new Point Features that you digitize.

When done with the point digitization, tap the **Back** icon to end the digitizing session.

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 **Map Tools** icon then select **Add Point by Coordinates**. Enter the known coordinates then confirm the screen. See Section 3.6 if you need to switch to a different coordinate system.

3.4.2 Adding Line Features

If you wish to have the length computed for a section of a road, a river, or a property boundary on a map, you must first digitize it into a Line Feature. Line Feature is a vector shape and can be saved in the Shapefile format.

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

To create a new Line Topic, tap the Main Menu, select **Topic** then select **New Topic**. Enter a Topic Name, such as "Path". Make sure the Type field shows: **Line**. Add one or more **Attribute Names** (title of description) for this Topic. Then tap **OK** 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 on the upper-right corner of the main screen 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 **Map Tools** icon, you will see that the **Add Line manually** tool is active (not grayed out). 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.

While you are digitizing, if you need to zoom in or out, first tap on the **Add** tool . This will halt the digitization mode and reactivate the regular **touch-screen** mode. Tap on this toggle again when you are ready to continue with the digitization.

If there are existing Features on the map and you want a node to snap to one of the existing Features,

then tap the **SnapTo Node** tool . When the SnapTo Node toggle is on, the node you add will be dropped on top of the nearest Point or node. Try adding a Line Feature that joins a few existing Point Features in Map View.

If you wish to add another Line Feature, first tap the **Add Line manually** tool to toggle it off then tap this icon again to reactivate it.

When done, tap the **Back** icon to end the digitizing session.

3.4.3 Adding Area Features

If you wish to have the area computed for a region of land or water on a raster image, you must first draw the boundary line around that region and save it as an Area Feature. An Area Feature is a vector shape and can be saved in the Shapefile format.

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 Main Menu, select **Topic** 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 **OK** 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 on the upper-right corner of the main screen then select the desired Area Topic, such as Spray Areas in swcvo.pmp. Tap the Topic View icon again to hide the list of Topics.

When an Area Topic is active, and you tap the pull-down arrow for the **Tools** icon next to the Main Menu icon, you will see that the **Add Area manually** tool is active (not grayed out). 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.

While you are digitizing, if you need to zoom in or out, first tap on the **Add** tool . This will halt the digitization mode and reactivate the regular **touch-screen** mode. Tap on this toggle again when you are ready to continue with the digitization.

If there are existing Features on the map and you want a node to snap to one of the existing Features,

then tap the **SnapTo Node** tool . When the SnapTo Node toggle is on, the node you add will be dropped on top of the nearest Point or node. If you have created the corner points mentioned in Section 3.4.1, you could use them to create a rectangular Area Feature in this mode.

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.

Add another Area Feature, if you wish. When done, tap the **Back** icon to end the digitizing session and go back to Map View.

3.5 Viewing or Editing Feature Properties

You can view the information about a Feature by clicking on it in Map View then clicking the **Feature**

Properties tool icon .

The Feature Topic Name and Feature ID are listed in the **Name** and **ID** fields. These are not editable. As shown in the relevant subsections below, you may change the symbol assignment, Feature descriptions and the coordinates of manually digitized points through the Feature Properties screen.

You may not edit the GPS data recorded by using iCMTGIS II. This is to protect the integrity of the field data. If you really need to change the position of a GPS Point Feature or a node on a GPS Line or Area Feature, you may do so after transferring the data to PC-GIS, PC-GPS or PC-MAPPER.

3.5.1 Coordinate Information

The coordinates of the selected feature are listed in the coordinate position fields on the **Coordinates** Page. For a Point feature only one coordinate position will be listed. For a Line or Area feature the coordinates of each node will be listed. The coordinates of each node may be scrolled into view by using the arrows for the **Node #:** box.

The displayed coordinates reflect the Coordinate System selected under **Menu/Setup/Coordinate System**, discussed in Section 3.6.

HAE is Height Above Ellipsoid or Ellipsoidal Height. It is the elevation above the ellipsoid used to represent the Earth.

MSL stands for Mean Sea Level, which is the elevation above the sea level.

Tap on the **Attribute** button at the bottom of the screen to see the Attribute/Value information for the Feature or change the description of the Feature.

The **UTC Date** and **UTC Time** are recorded for each coordinate position.

If **2D** is displayed, it indicates that fewer than four satellites were used to compute the 2-dimensional coordinate position.

If **3D** is displayed, it indicates that at least four satellites were used to compute the 3-dimensional coordinate position.

The coordinate position will be marked as either **Corrected** or **Uncorrected**. Corrected means that the

coordinate position was corrected by a Differential Correction process. Uncorrected means that the coordinate position was not corrected by a Differential Correction process. Please note that the GPS positions recorded by using iCMTGIS are uncorrected positions.

The **Session** value pertains to data collection. For Point Features, it indicates the data collection session time in seconds. For Line and Area Features, it indicates the time interval in seconds at which data is collected along the line or the perimeter of the area. (See Section 3.7.1.)

DOPs and **SV #** are quality indicators.

SV # is the number of satellites tracked. At least four satellites need to be tracked for a 3-dimensional GPS position to be computed.

DOP stands for Dilution of Precision, which indicates the error introduced by the relative positions among the satellites tracked by the GPS receiver. Lower DOP values indicate more favorable geometry in the group of satellites used for position computation, hence better accuracy.

PDOP is positional dilution of precision. It is used as a general measure of the quality of coordinate fix. **HDOP** is the Dilution of precision in the horizontal plane. **VDOP** is the Dilution of Precision along the vertical axis. PDOP is derived from the HDOP and the VDOP:

$$PDOP = \sqrt{HDOP^2 + VDOP^2}$$

The following general guidelines can be used for estimating the quality of the recorded GPS positions.

Indicated "Quality"	PDOP
Very Good	1 - 3
Good	3 - 5
Fair	5 - 6
Suspect	>6

Once or twice a day, the relative positions of the GPS satellites may be such that the location solution cannot be precisely determined. If you have the CMT PC-GPS or PC-MAPPER software, you can use the Mission Planning function to find out ahead when those peaks occur on the day you plan to do your field work. Otherwise, when you see that the horizontal/vertical accuracy displayed in iCMTGIS II is not good, you could try waiting half an hour then resuming your data collection job.

Please note: Coordinate positions recorded by GPS or those created by Offset may not be edited. Coordinates that are manually entered by hand may be edited.

The **Update** button on the **Coordinates** page applies only to Point Features. If you need to replace the Point Feature position by redoing GPS data logging at that point, you may tap this button to do so. The newly logged location will overwrite the original one for the Point Feature concerned.

3.5.2 Assigning Feature Symbols and Patterns

iCMTGIS II provides a library of point symbols, line styles and area patterns for representing the Point, Line and Area Features in your job map.

When you select a Feature and click the **Feature Properties** button, the Coordinate Information screen for your point or line will be displayed. From the Coordinate Information screen, you may select a symbol or pattern and a display color by clicking on the **Pattern** button.

Scroll through the displayed symbol library until the desired symbol is found. Click on the desired symbol so it is highlighted by the selection box.

For Point Features, you may select the desired Color and Size for the Symbol.

For Line Features, you may select the desired Color and thickness for the Line Style.

For Area Features, you may select the desired Area Color and Border Line Style, Color and Size, as well as adjust its transparency.

Click on the **OK** button to accept the settings.

Some applications, such as Orienteering Mapping, use a specific set of topics to represents each terrain feature. You can use PC-GIS, PC-GPS or PC-MAPPER to create your own point symbols, line styles or area patterns to represent these specific Topics. If you have created new symbols by modifying a number of symbols in one of the CMT customizable **symbols library** files (e.g. Forestry 1), then you can transfer the **.lib** files that start with "CMT" from the PC-GIS, PC-GPS or PC-MAPPER program folder to your Mobile Device so that the new symbols are available for use in iCMTGIS II. The procedure is as follows:

1. Terminate iCMTGIS II.

To do so, first press the Home button to go to the Home screen. (The Home button is the one and only button on the face of the iPad® device.)

Then double-tap the Home button, and the application icons will be displayed at the bottom of the screen. Hold down the iCMTGIS II icon briefly until a "-" symbol shows up by the application icon.

Tap on the "-" symbol by the iCMTGIS II icon to turn it off.

Do not restart the application at this point.

2. Load all the .lib files from the PC-GIS, PC-GPS or PC-MAPPER program folder to the Documents folder for your iCMTGIS II via the iTunes® program.

3. Run iCMTGIS II to restart it.

If you have the PC-GIS, PC-GPS or PC-MAPPER program, then you would also be able to save your Topic setup on your desktop computer as a .pmp job file and transfer it to your iCMTGIS II. Then you don't even need to redo the symbol assignment in iCMTGIS II.

3.5.3 Adjusting Area Transparency

You can adjust the transparency of an Area Feature.

To do so, first select the Area Feature and click the **Feature Properties** button. From the Coordinate Information screen, click on the **Pattern** button to display the **Area Pattern** screen.

Now, enter a percentage value into the **Transparency** field, or tap the little arrows to scroll either way. Making an Area Feature more transparent will allow you to better see the background map layer below it.

3.5.4 Adding Descriptions for 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 a Feature Topic, tap the **Topic menu icon** then select **Edit Topic**. Select

an existing Topic Name, such as "Corners".

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

Now tap the **Feature Properties** icon 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 editing mode then tap the **View mode** icon ⊕ to switch to the **Edit mode** represented by the ✏️ 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.

If you wish to change the Attribute setup for a Topic, first select that Topic in **Topic View**. Then call up the **Main Menu** and select **Topic**. Now, select **Edit Topic** to display the Topic Editor screen. You may add a new Attribute at the end of the list of Attributes, insert a new Attribute before the highlighted Attribute, or delete an Attribute.

Caution: Always make sure you really want to delete an Attribute before confirming the Delete action.

3.5.5 Feature Offset

Offsets can be entered when the GPS receiver cannot be placed at the actual location of the feature due to blockage of GPS reception. When the offset function is used in the field (see section 5.2.5), the position of the actual feature is calculated based upon a distance, slope and azimuth from the GPS receiver.

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 software provides for three offset options:

Point Offset: To record an inaccessible Point Feature, you could record the position of an accessible point and enter the offset data into the Distance, Azimuth and Slope fields.

       Slope Distance: Distance from position of GPS receiver to desired location.

       Azimuth: Azimuth (angle) of the line from the GPS receiver to desired location.

       Slope: Slope (angle) of the line from GPS receiver to desired location.

Left Offset: To record a Line or Area to the left of the line or area boundary on which you are walking, enter the horizontal distance offset into the Slope Distance field. For example, if your line proceeds North and you would like to move it to the West you would select "Left" as the offset direction.

Right Offset: To record a Line or Area to the right of the line or area boundary on which you are walking, enter the horizontal distance offset into the Slope Distance field. For example, if your line proceeds North and you would like to move it to the East you would select "Right" as the offset direction.

3.5.6 Viewing Length/Area Information

The Feature Properties screen provides a Length/Area tab to display the length and area information for the selected Line or Area Feature in both the British and metric units. For a Line Feature, the Area information is for the shape that would be formed if the line closed on itself. For an Area Feature, the Length information is for the perimeter of the Area Feature.

You can use iCMTGIS II to determine the acreage of a region as follows:

1. Create the Area Feature for the region.

    You may do by digitizing the area over a background map. If feasible, you could also map the area by walking around it and using the GPS data collection function to record the Area Feature.

2. In Map View, tap the Area Feature to select it.

3. Tap the **Feature Properties** tool icon then tap the **Area/Length** option to display the perimeter and area in various units.

    Alternatively, tap the **Utilities Menu** then tap the **View Area/Length** tool to display the length and area information in a floating dialog. You may drag this dialog box around if it is obscuring the screen area you wish to view.

Similarly, you can use iCMTGIS II to determine the length of an existing Line Feature as follows:

1. In Map View, tap the Line Feature to select it.

2. Tap the **Feature Properties** tool icon then tap the **Area/length** button to display the length of the Line Feature. The program will also display the area for the region that would be formed if the start and end nodes of the line were joined together by a straight line.

    Alternatively, select **Utilities Menu** then tap the **View Area/Length** tool to display the length and area information in a floating dialog.

3.6 Coordinate System Setup

The **Menu/Setup/Coordinate System** option is used to change the coordinate system and datum in which your map is displayed.

By default, most GPS receivers and application software use the Lat-Lon-Altitude (LLA) geographic coordinate system based on the WGS84 datum, which is the basic reference frame and geometric model for the earth provided by the World Geodetic Survey of 1984.

In this system, the horizontal positions are expressed in terms of angular measurements (degrees, minutes and seconds). As it is much easier to compute distances and areas using linear units in a Cartesian coordinate system, many GIS professionals and surveyors prefer to work with a plane projection, such as the State Plane system in the USA and the global UTM system.

If you will be using the native Map as a background map for data collection or navigation, then use the default LLA system because this is what the Maps are based on.

The LLA system and the UTM system default to Meters. If you wish to work with distances in feet, then for the Unit field select "US Survey Feet" or "International Feet". The difference between these two units is insignificant when working with non-survey grade GPS receivers.

After you click on the **OK** button, your map will be converted into the coordinate system, datum and unit of measure selected.

LLA: Select this option if you wish to use the Latitude, Longitude, Altitude (LLA) coordinate system. Specify the Datum and Unit of measure in the corresponding LLA Coordinate Information fields.

UTM: Select this option if you wish to use the Universal Transverse Mercator (UTM) coordinate system. Specify the Datum, False Northing, False Easting, Zone and Unit of measure in the corresponding the UTM Coordinate Information fields.

State Plane: Select this option if you wish to use the State Plane Coordinate (SPC) system. Select "NAD83_CORS96/CSRS98" as the Datum. Then select your State and the Region code, and enter the Zone number. Accept "US Survey Feet" as the distance unit.

NEZ: The NEZ coordinate system option allows you to use a local Northing, Easting, Z-value plane, as often used in surveying work. The NEZ plane could be created in PC-GIS, PC-GPS or PC-MAPPER and then transferred to your Mobile Device. The procedure for defining an NEZ plane using iGPGIS II is described in Section 3.6.1.

If you wish to use an NEZ plane created in PC-GIS, PC-GPS or PC-MAPPER, you will need to transfer the **user_pla.sys** file from your desktop computer to your Mobile Device. The file name must be in lower-case letters. After the file transfer, you must restart the iCMTGIS II application for it to recognize the change.

User Defined: The LLA and UTM coordinate systems are generally accepted coordinate reference systems worldwide. However, some states in the USA, such as Michigan, Mississippi and Oregon, adopt their own plane projection as a standard spatial reference for their state agencies to present their spatial data and maps. Other regions in the other countries may also have their own spatial projection standards.

PC-GIS, PC-GPS and PC-MAPPER will let you define your own datum and enter the specifications for a projection plane based on the Transverse mercator, Mercator, Oblique mercator, Lambert conformal conic, Albers Equal Area conic, Double Stereographic projection. The user-defined coordinate systems are stored in the file named **user_cor.sys**. You can add this file to the Document folder for the iCMTGIS II via the iTunes® program. The file name must be in lower-case letters for iCMTGIS II to use the file. After you have transferred these files from your desktop computer to your Mobile Device, you must restart the iCMTGIS II application for it to recognize the change.

Then you will be able to select your user-defined coordinate system and/or datum under the **User Defined** option.

3.6.1 Defining an NEZ plane

Some of you may wish to display the Feature coordinates in reference to a local Cartesian coordinate system. For example, you may wish to express the location of the buildings, wells or towers on a large complex in terms of their X-Y position with respect to a reference location on the campus. The reference location coordinates are usually set to values that permit all the locations on the resultant map to be expressed with positive X and Y values. For instance, if the map spans an extent of about 3500 ft both ways, and the reference location is set near the center of the campus, then the reference position could be assigned a value of (2000, 2000).

The local coordinate system is called an NEZ coordinate system with the N (Northing) corresponding to the Y value, the E (Easting) corresponding to the X value, and the Z (Z-value) corresponding to the vertical distance along the Z-axis.

To create an NEZ plane in iCMTGIS II, click on the "Edit" button under the NEZ option from the Coordinate System screen. Enter the **Name** for the new NEZ plane then use one of the two following methods to define it.

Angle-Scale Method

The relationship between the UTM plane, or the State Plane, and the NEZ plane consists of a rotation and a scale change. You could transform the UTM or State Plane coordinates to the NEZ coordinates by selecting a known reference location and specifying the applicable relative orientation and scale for the NEZ coordinate system.

Tap in the first data field under the **GPS Reference** section to start entering the coordinates of the reference control point in the currently active plane coordinate system, or tap the **Pick** button then select the reference point from Map View if that point has been digitized in Map View. Or you may tap the **Browse** button to select the desired Feature from a list.

Now, enter the **NEZ Reference** coordinates for that same point.

Enter the decimal values for the Angle and Scale fields.

Tap **OK** to save your settings. Tap **OK** again. When you tap on the map, you will see that the coordinates are now displayed in terms of the NEZ system.

Control Point Method

If you will not be using a known control point with known scale and angle for your locality, you could have the transformation scale and angle values computed based on two points - a Reference Point and a Control Point. It's best to select these two points near the two opposite corners of your work site. You will need to obtain the coordinates for these same two points in the two different coordinate systems.

To do so, first tap the **Control Point** checkbox in the NEZ System screen. The pull-down arrow on the same line of this option will show two modes: **Reference Point** and **Control Point**.

In the **Reference Point mode**, select the GPS reference point or enter its coordinates. Then enter the corresponding NEZ reference coordinates. Switch to the **Control Point mode**. Select the GPS control point or enter its coordinates. Then enter the corresponding NEZ control point coordinates.

The angle and scale parameters will be automatically calculated based on these two pairs of points.

Tap **OK** to save your settings. Tap **OK** again. When you tap on the map, you will see that the coordinates are now displayed in terms of the NEZ system.

3.6.2 Selecting an NEZ Plane to use:

To select an NEZ plane, first select the **Menu/Setup Coordinate System** option. The Coordinate System Information dialog will be displayed. For the **System** field, select the **NEZ** option. Click on the NEZ pull-down arrow to view the list of established NEZ planes. Select one of the available planes by clicking on the plane name. The selected plane will be highlighted. Click on the **OK** button.

3.7 Setup Defaults

The options under the **Menu/Setup** menu can be used to specify various default settings in iCMTGIS II. We have covered the Coordinate System Setup in Section 3.6. The other settings will be discussed in

this section.

3.7.1 Data Collection Settings

The default settings for GPS Data Collection may be defined to reduce data entry time in the field. The information in this screen is used to define defaults for data collection when a Feature List is not used.

Logging Mode: There are three options for defining how the GPS data will be collected:

Static Time: Logs a stationary Feature for the specified **Time Session** in seconds.

Dynamic Time: Logs a moving Feature at the specified **Time Interval** in seconds.

Dynamic Distance: Logs a dynamic Feature based on the specified **Distance Interval** in the active distance unit.

Time Mode: View time in either **Local Time** or **UTC Time**. **Local Time Offset** is determined by the System clock setup.

The local time and date used by the software is obtained from the System Clock settings on your Mobile Device. Please check and make sure the time and date settings are correct for your Mobile Device prior to collecting data.

3.7.2 Navigation Settings

Settings for the GPS Navigation marker can be chosen in the **Menu/Setup/Navigation Settings** screen.

Navigation Marker: Sets the color of the maker used to identify your current position while navigating.

Target Marker: This setting does not apply to iCMTGIS II.

Trail Marker: Sets the color of the trailer during navigation.

Trail Length: Limits the trail length to the specified number of seconds.

Navigation Zooom Mode: iCMTGIS II only provides the **Auto Scroll Mode**, in which the map will automatically scroll to keep the GPS marker on the screen.

Navigation Beep: Mark this checkbox to hear a beep per second when GPS is turned on.

Featuring Beep: Mark this checkbox to hear a distinct beep for each GPS fix during data collection.

When you hit the Home button, iCMTGIS II will continue to run in the background so that data logging will not be interrupted when you switch to another application. Therefore, in the background running mode, you will still hear the navigation or featuring beeps if GPS is active, even though you are in a different application. You may turn off these beeps by using the above settings.

3.7.3 Color/Pattern Setup

Use **Menu/Setup/Color/Pattern** to specify the various default color and pattern settings.

Selection Color: When a Feature on the Map View is selected, the map representation of that Point, Line or Area will be displayed in the selection color. The original default selection color is orange.

Default Point Pattern: Choose the default symbol and color for representing the Point Features when you add them to your map.

Default Line Pattern: Chooses the default line style and color to be used for the Line Features when you add them to your map.

Default Area Pattern: Choose the default pattern and color to be used for the Area Features when you add them to your map.

3.7.4 Default Label Setup

iCMTGIS II will let you display or hide the Feature labels. Section 3.8 describes the procedure for displaying text labels for the Features.

You may use **Menu/Setup/Label** to specify the default settings for displaying the Feature labels.

If you would like the labels to stay the same size while you zoom in or out of the Map View then mark the checkbox for **Freeze Label Size in Zoom**.

You may specify the **Font Name**, **Font Size** and **the text Color**.

You may also select the location of the labels with respect to the Features.

3.7.5 Default Grid Setup

If you will be sampling data at evenly spaced intervals in an area then you could create a grid to serve as a data collection guide. The procedure for creating a grid is discussed in Section 3.9.

You may set up a frequently used grid parameters as the default. To do so, select **Menu/Setup** then select **Default Grid**.

Enter the desired grid **Orientation**.

Specify whether you want **Grid Nodes** or **Grid Lines** generated.

Enter the grid spacing in the X and Y directions in the **Scale** section.

You may also specify the **Boundary** line style and color.

By default the grid will stay put after it is created. If you would like to be able to move the grid and the grid nodes then do not mark the checkbox for **Fixed on Map**.

If you would like to be able to select items under the grid layer then leave the checkbox marked for **Transparent**.

3.8 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 delete.

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

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

3.9 Create Grid

You can use your iCMTGIS II software to create evenly spaced grid nodes or grid lines on an Area Feature in your map. The Grids are placed in the **Non-Spatial Data** Topic layer.

To place a grid over an Area Feature, first click in that Area Feature then pick the **Map Tools** icon and select **Create Grid**.

The **Grid Property** screen provides a few tabs at the bottom of the screen.

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.

The **Mode** page will display the default grid parameters. You may change them, if you wish. You may define the grid orientation by using an existing line segment or two existing 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**.

On the **Boundary** page, 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.

By default the grid will stay put after it is created. If you would like to be able to move the grid and the grid nodes then do not mark the checkbox for **Fixed on Map**.

If you would like to be able to select items under the grid layer then leave the checkbox marked for **Transparent**.

The **Boundary Nodes** box shows the number of vertices on the boundary. This is a display-only field.

If you selected the **Grid Nodes** mode on the **Mode** page, 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 on the **Mode** page, 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. Please keep in mind that the first record is the newest grid.

3.10 Distance Measurement in Map View

The **Measure Distance** function is located under the **Utilities Menu**. You can use it to get distance, angle and cumulative distance measurements in the Map View by clicking on the map. When you select Measure Distance, the measure distance dialog will appear in the Map View. You can drag this dialog around if it is obscuring the area you wish to view.

To get a distance measurement, click in the Map View once at the start location and once at the end location. The distance information will be displayed under the "Current Segment" portion of the dialog.

Snap to Node: When clicking on the Map View, the measurements will only be taken from nodes that are part of a Feature. Place a check mark in the box to use this option.

Reset: Resets the measurement session to zero.

Unit: Displays current unit of measurement (e.g. M = meters)

Current Segment: Distance and angle measurement for last segment created. The displayed information includes horizontal distance (HD), slope distance (SD), azimuth (AZ) and slope angle (Slp Ang).

Total: Cumulative distance and angle measurements for all consecutive segments created. Cumulative distance information includes horizontal distance (HD) and slope distance (SD).

A sample screen is shown below. Tap the **Back** button when done measuring distances.

Section 4 - Feature Lists

iCMTGIS II is primarily a tool for collecting GPS/GIS data. To facilitate data collection, you can set up one or more Feature Lists to define the data collection parameters and the Attribute/Value database. You could do this within iCMTGIS II, or you could use PC-GIS, PC-GPS or PC-MAPPER to create the Feature Lists then transfer them to your Mobile Device.

Using a well defined Feature List with your GPS job will save much time during data collection. The Feature List serves as a "look-up" table that makes it very easy to attach descriptions to the GPS position information you collect. Instead of typing a description to characterize a Feature, all you have to do is to select the appropriate description from a displayed list. In addition, all entries with the same descriptions will be consistent and without typographical errors. Such collected data will lend itself well to analysis and data search operations.

Essentially, the Feature List embodies the design of your data collection job. A well-thought-out data collection design will produce well organized and consistent data that will be useful to your GIS analyst.

Once a Feature List is created, it may be used with different GPS jobs that involve similar types of Features. You may create and store a number of different Feature Lists for use with different types of GPS Jobs.

Files created by the Feature List function have the **file extension .FBR**.

A **Feature List** is a file listing the Feature Names, Attributes and Values, which can be used to tag the GPS positions collected by the GPS receiver. In a Feature List, the Feature Topic Name is simply referred to as Feature. It represents a group of GPS positions that have similar characteristics.

|	
Feature	An identifying name for a group of GPS positions - Examples: Tree, Road, Field
Attribute	A characteristic of the Feature- Examples: Species, Name, Type
Value	A specific description of the Attribute - Examples: Oak, Fir, Maple

A Feature may have multiple Attributes, each of which may have any number of values. However, Attributes and Values are not essential for GPS data collection.

A Feature may be one of three types: POINT, LINE, or AREA. A POINT is a discrete item, such as a telephone pole. A LINE is a series of connected points, such as a road. An AREA is bounded by a line that ends back where it began, such as a park.

The following example illustrates the relationship among the Features, Attributes, and Values in a typical Feature List.

FEATURE	TYPE	ATTRIBUTES	VALUES
Tree	Point	Species	Oak, Maple, Pine, Other
		Age	Old, Intermediate, Young
		Cut?	Yes, No
Road	Line	Lanes	1, 2, 4, Superhighway
		Paved?	Yes, No
		Travel	Heavy, Moderate, Light
Marsh	Area	Size	<1 ac., 1-5 ac., 5 ac.
		Beaver present?	Yes, No

4.1 Maintaining Feature Lists
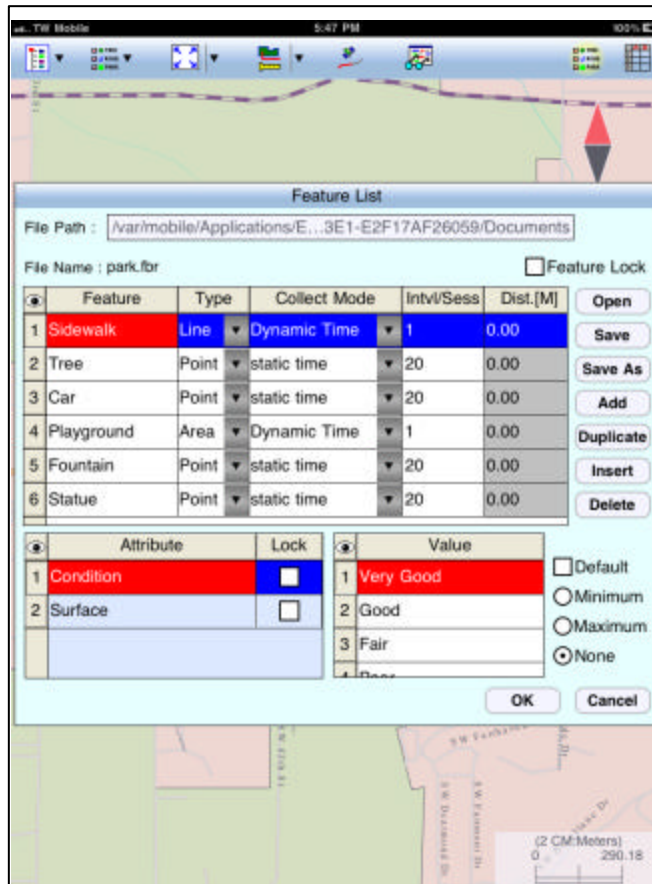
Creating or Opening a new Feature List

To work with a Feature List, first tap on **GPS**, then select **Feature List**.

To create a new Feature List, select **New**.

Name your Feature List in by filling the "FileName:" box. Enter up to eight characters or digits as a name for the Feature List. iCMTGIS II will reject duplicate Feature List file names or names containing a slash "/". Press **OK** to create your Feature List file.

If you do not wish to create a new Feature List at this time, you may tap on **Open**, then select the **park.fbr** Feature List that is provided with the application software to use as an example.

Feature List Editing Commands

The **Feature List screen** displays the **Name** of the currently active Feature List and provides three tabs at the bottom for defining the Feature Topic, its Attributes and the Values for each Attribute.

The following commands are shared by the **Feature**, **Attribute** and **Value** pages:

Open: Open a Feature List by selecting an existing one from the list.

Save: Save changes to the active Feature List.

Save As: Save the currently active Feature List as a new Feature List by typing in a new file name. This is 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.

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.

4.2 Defining Feature Topics

The **Feature** page shows the list of Feature Topics that have been defined in the currently open Feature List. For the **park.fbr** example, you will see Sidewalk, Tree and other Feature Topics, one of which will be highlighted. You may change the Feature Topic Name by double-clicking on it then typing over it.

Marking the **Feature Lock** checkbox will force you to select a Feature from the Feature list for tagging GPS data. While this Feature error-checking is active, Feature Names can not be manually entered. This will be helpful for keeping the Feature Names consistent during 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**.

In addition, you may define the **data collection parameters** for each specific Feature Topic in the Feature List. The data collection parameters for the highlighted Feature Topic are displayed near the bottom of the screen:

Type: This field defines the type of feature: Point, Line or Area.

Mode: This field defines the mode of data logging to be performed. The data logging mode defined for each Feature overrides that specified in the global default Data Logging settings (Section 3.7.1). The options are:

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 or vertex of the Line or Area Feature for the duration of the Time Session, and the software will automatically join these nodes or vertices with straight lines.

Dynamic Time: Logs a Line or Area Feature at the specified **Time Interval** in seconds. Use this method to record an irregularly shaped Line or Area Feature.

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.

After defining the data collection parameters and the Attributes/Values for the Feature Topic that you have added, if you need to define another Feature Topic with a similar Attribute/Value setup then you can save time by using the **Duplicate** function. Please change the duplicate Feature Name to the new name before confirming the screen.

The following two subsections describe the procedure for defining or changing the Attributes and Values for a Feature Topic.

4.3 Defining Attributes

To add an Attribute to a Feature Topic or to modify one of the existing Attributes, first highlight the Feature Topic record in the Feature List screen. Then tap the Attribute tab at the bottom.

A listing of existing Attributes (if any) for the selected Feature Topic will be shown.

When you tap the **Add** button, a new Attribute will be added at the end of the list. You may double-tap on the Attribute name then change it to a new name.

Tap the **Lock** checkbox if you wish to lock the Values associated with this Attribute. When this option is chosen, the user will not be able to alter or add to the set of Values defined for this Attribute. They may only select from the defined Values to tag the Feature.

For the **Type** field, select **List** if the Values to be defined are a group of discrete numbers or names. Select **Range** if the Value entry will be a number within between a lower limit and a upper limit. If you select **Range**, then the **Lock** checkbox will be automatically marked. This means that the Values entered will always be checked against the defined Range for data validity.

4.4 Defining Values

To see the Values (if any) that have been defined for an Attribute, first highlight that Attribute then tap the **Value** tab at the bottom of the screen.

If the Attribute is of **List** type, you will see a list of the existing Values, or you will be able to tap the **Add** button to add new Values to the list.

You will also 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.

If the Attribute is of **Range** type, you will be able to enter the **Max**. (upper bound) and **Min**. (lower bound) Values. You will also be able to enter a **Default** Value to be displayed during data collection.

Choose **OK** to save any changes or press **Cancel** to abandon the data.

Section 5 - GPS Data Collection

The iCMTGIS II data collection routines let you efficiently perform the following tasks:

- 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.
- View the data collected for each feature in textual or graphic format.

5.1 Job Setup

To begin a data collection job, select **Menu/Job/Current Job** from the Map View. The **Job Setup** screen will be displayed:

Selecting a Job

To select an existing Job, select the Job name (such as **cmttut.pmp**) from the list of Jobs from the "File name" pull-down menu.

If this is a new job you are starting, tap the "**NEW**" button. The **Job** will be automatically named by using the **GPS receiver ID code**, **the current UTC month**, **UTC day**, **UTC hour and a sequence number (A to Z)**. If you have entered the **ID code** "G", the month is "06", day is "10", hour is "15", then the resulting file name will be **G061015A**, with the sequence number "A".

You may enter information into the **CREW**, **DEPT** and **DESC** fields to further identify the Job if you wish.

Selecting a Feature List

If you have created a Feature List as described in Section 4, you may select it from the available Feature Lists to associate it with your data collection job. You may change the Feature List for the Job at any time. As an example, you could select the **park.fbr** Feature List that came with your application software.

If you do not wish to associate any default Feature List with your Job, select "NONE". In that case, you will need to type in a Feature Topic Name each time you want to map a Feature. And you will need to type the descriptions for the individual Features.

Press **OK** to accept and save the settings. Duplicate Job file names are not allowed.

Turning the GPS ON

You can turn the GPS function on by clicking on **GPS** then selecting **GPS On**. To save power, you may turn the GPS off by selecting **GPS/GPS OFF** when you are not actively collecting GPS data.

When GPS signals are available, your current position will be represented in Map View by the **GPS location marker** (a circle enclosing an arrowhead that indicates your direction of motion when you are not stationary).

The iPAD 3G functionality will help get the GPS receiver to start tracking sooner, but is not necessary for the GPS receiver to function. Therefore, when you are outside of cellular coverage, your GPS will still

work. if you bring your shapefiles or raster image files along on your iPAD with GPS, you can still use iCMTGIS II to collect GPS/GIS data on top of a background map in remote areas.

When you log a Feature, its geographic location will be automatically recorded. You can tag the Feature with Attributes during data collection.

Position Information

To view your current position, select **GPS/Position Info**. When the GPS receiver is actively tracking satellites and is able to compute a position, the Position and Quality screen will display the coordinates using the currently active coordinate system. It will also display the horizontal and vertical accuracies.

5.2 Collecting New Feature Data

After you have selected a Job file, the data collection job involves recording location information for one or more features. This process is also referred to as "**Featuring**".

The general procedure is as follows:

1. Select a Feature Topic Name from the Feature List and optionally assign Attributes and Values to the Feature to be recorded.

2. Log position data in STATIC or DYNAMIC mode based on the definition of the selected Feature.

3. Select or define another Feature and repeat the above process.

4. If you wish, you may access a Line or Area feature that you have worked with before and log additional nodes for it.

Point Features are logged in STATIC mode. This means that you stay at the point of interest and let the GPS take a pre-defined number of position fixes from which it will compute the position of that location.

Line and **Area** Features can be logged in STATIC or DYNAMIC mode. In DYNAMIC mode, each position fix is recorded as a separate node. These nodes are recorded one after another at a preset interval as you walk along the line or around the area.

Static Line/Area Features are formed by a number of discrete points joined together in a given sequence by straight lines. Therefore, when logging a Line/Area Feature in STATIC mode, you will simply be logging coordinates at the vertices and do not have to worry about walking a straight line between those points as you do with DYNAMIC line/area features.

While logging a Line/Area Feature, you may stop at certain points of interest and record one or more Point Features. Such Point Features are called **Nested Points** because they are collected by briefly interrupting your line/area.

5.2.1 Selecting a Feature

Tap the **GPS** icon then select **Collect** to begin the Featuring process. The **Collect** screen will be displayed.

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

We assume here that you are logging a new Feature. If you would like to append nodes to an existing Line or Area, please see Section 5.2.6.

Selecting a Feature Topic from the Active Feature List

If you have selected a Feature List in the **Job setup** screen (Section 5.1), then a list of the predefined Feature Topics will be available for the **Name** field when you click on its pull-down button.

Click on the desired Feature Topic from the list (such as **Tree**). The fields for **ID** (for the individual Feature to be logged, e.g. **Tree001**), Feature **Type**, **Log Mode** and **Time Session** or **Time Interval** are automatically filled in based on how you defined the Feature in the Feature List. You may override these default settings, if you wish.

Defining a New Feature Topic on the spot

If you have selected "NONE" for the Feature List field in the Job Data screen, or if you wish to define a new Feature Topic that is not in the active Feature List, click on the **Name** field, then type in the name of the Feature Topic. The Feature **ID** field will automatically be filled in.

For example, if you enter "Hydrants" as the Feature Topic Name, then the first Feature ID would be "Hydrants001".

Select the **Topic Type**, **Logging mode**, and **Interval/Session** to complete the Feature information. Please refer to Section 3.7 for the definition of these data collection parameters.

For the "Hydrants" Topic, you would select "Point" as the Type of Topic. The default "Static Time" mode for Point Topics will be displayed. You may accept the default Time Session, or enter a different value. This is the number of seconds you are supposed to stay at each hydrant to record its GPS location.

Please note: The new Feature Topic you enter on the spot will not be saved into the Feature List. Note that if Feature Lock is ON (Section 4.2), you may not enter any Feature Topic Name unless it is identical to one of those in the active Feature List.

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

If you need to define a new Attribute for the Feature Topic, tap the **Attribute tab** at the bottom of the screen and **continue to Section 5.2.2**.

If you are using a Feature List and do not need to add any new Attributes for the Feature Topic, then **skip to Section 5.2.3**.

5.2.2 Topic Editor Screen

In the Attribute Editor screen, you can choose to add Attributes to the existing list, edit existing Attributes or delete them. The "Topic Name" and "Type" are displayed for reference only.

- o To **Append** an Attribute to the end of the list, click on the **Add** button and double-tap the data entry field then type in the name of the new Attribute.
- o To **Insert** an Attribute before a specific Attribute in the list, first click on that Attribute so it is highlighted, then click on the **Insert** button. double-tap the data entry field then type in the name of the new Attribute.
- o To **Delete** an Attribute, simply click on its name and then click on the **Del** button. Confirm if you really want to delete the Attribute record.
- o To **Change the name** of an Attribute, double-click on the Attribute name then type in the new name.

Press the **OK** button to accept the changes.

If you do not wish to tag the Feature with any description then **skip to section 5.2.4**.

5.2.3 Feature Attribution

Now you may enter the description for the Feature you are about to log.

The current Status shows "Stand-By", which means no data is being collected.

Use the following procedure to assign values to the Feature.

- 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 (Section 4.3).

- If the Feature Topic is not from a Feature List, you may manually enter the Values for the Attributes created in the Topic Editor screen (section 5.2.2) to characterize it. These additional Attributes and any Values you enter on the spot will be used to tag the active Feature but will not be saved into a Feature List.

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

Press the **OK** button to accept the changes.

 5.2.4 Data Logging

To log GPS data, press the **Store** button from the **Collect** screen. If GPS is not turned on, you will be prompted to have it turned on.

The **Status** field will change to "Storing" once data collection has begun. Notice the change in the beeps when you begin or end featuring.

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, then the "Status" will change to "Pause". When ready to continue, tap the **Continue** button.

5.2.4 GPS Data Collection

<u>Plotting Position Data on Screen</u>

While data is being logged, you can watch the Features get created in Map View.

The Map View is always "North" oriented. If the position moves off the screen, the screen will automatically scroll to show the current position.

<u>Storing STATIC Points</u>

Each Static Point is a stand-alone Feature. The large dots shown below might represent three mature trees on a college campus.
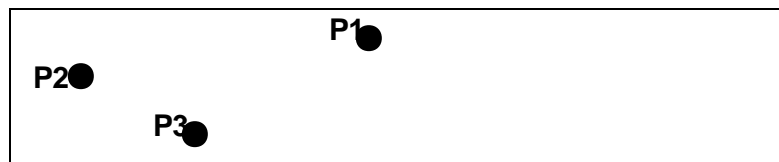
1. Stay at the feature location and **do not move around** while you are logging data for a Point Feature.

2. Select or enter the description for the Feature.

   For example, if you are using park.fbr and recording a pine tree for the **Tree** Feature Topic, then select "Pine" from the list of predefined species, select the desired Value for the Approx. Age field,

then enter a Value for the Diameter field.

If you do not wish to use the default symbol for Point Features, you could tap the **Pattern** button on the lower-left corner and select the tree symbol from the bottom row of the displayed symbol patterns. You could also assign a green color to the tree symbol.

3. Press the **Store** button from the **Collect** screen to log data for the Feature (Tree001) and record the associated Feature information. Hold the recording device still for the session time specified for the Feature Topic

4. The progress of Point data collection is indicated by the number of fixes recorded over the total session time (e.g. the default 20 seconds). When the time is up, the Tree Point Feature is recorded and the Feature ID advances to Tree002.

5. If necessary, you may press the **Stop** button to stop the data logging process at any time even if it has not finished the full session. The point will still be recorded, but with fewer coordinates to average.

6. Go to the next Feature (tree) then press the **Store** button again to log a second Point for the same Feature Topic. You will notice that the Feature **ID** has incremented by 1. Repeat the process for any additional static points you wish to log.

7. Proceed to collect data for another Feature Topic of Point, Line or Area type, if you wish. To start collecting data for a different Point Topic, first tap the **New** button then go to Step 2 above.

   If you will be collecting data for a Line or Area Topic, tap the **New** button then follow the relevant procedure outlined below.

   (If you wish 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.)

If you incorrectly logged a Point Feature and wish to update that position, you may use the **Update** button in the **Feature Properties** screen to do so. You can select the Point Feature in question from Map View or from Sheet View. After selecting the Point Feature, tap the Feature Properties icon then tap the **Update** button. Specify the time session then tap the **Start** button to record the GPS position.

Storing Static Line or Area

If you would like to record a polygon shape and do not care about the nodes between the vertices, then you would select "Area" as the Type and "Static Time" as the Mode. In this case, you would occupy each vertex (node) for the duration of the Time Session to record its location. And nothing would be recorded while you walk or drive from one vertex to the next. Similarly, for a Static Line Feature, you would only log data at the individual nodes that define the Line Feature. The nodes for the Static Line or Area will be automatically connected by the software.
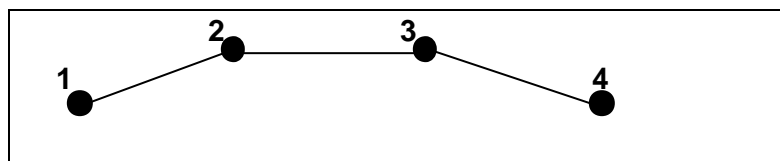
1. Go to the beginning node of the Static Line or Static Area feature. Stay there and **do not move around** while you are logging data for this node.

2. Press the **Store** button from the **Collect** screen to record the Feature descriptions and log data for the Feature. This procedure is 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 that is being logged, and will not end the data logging for the entire Static Line/Area Feature.

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

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

5. Proceed to collect data for another Feature Topic of Point, Line or Area type, if you wish. Remember to tap the **New** button to start collecting data for a different Feature Topic.

   (If you wish 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.)

Storing Dynamic Line/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.
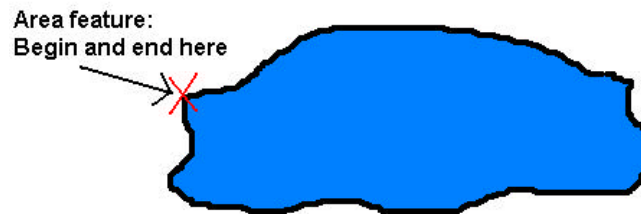
For dynamic data logging, there are 2 modes: Dynamic Time and Dynamic Distance.

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 the **Store** button 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 key to abort the data logging process at any other time.

5. Proceed to collect data for another Feature Topic of Point, Line or Area type, if you wish. Remember to tap the **New** button to start collecting data for a different Feature Topic.

   (If you wish 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 II 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**. For example, assume you are mapping a particular river, but wanted to also inventory all of the boat ramps along the banks. You can put your Line Feature (the river) on hold by clicking on the **Nested** button to record a Nested Point Feature and then resume logging the same river feature.
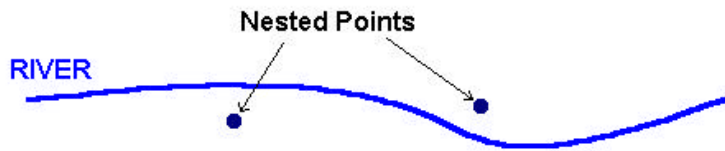
The procedure for logging a Nested Point is similar to that for logging a regular Point Feature:

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.

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 to record the Feature information and log data for the Nested Point Feature.

    Stay at the Point Feature location and do not move around while you are logging data. The logging mode of a Nested Point Feature always defaults to STATIC mode even though the current Line/Area feature may be recorded in DYNAMIC mode.

    If necessary, you may press the **Stop** button 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 feature.

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

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

5.2.5 Data Logging in 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. The position data for the location of interest can be computed by applying the **Offset** parameters to the position where data was actually logged. iCMTGIS II provides for two types of offset computations:

*   **Point Offset** - This method is useful when you can log a Point Feature at a given slope distance, azimuth and slope from the target point position. For example, to determine the location of the tip of an antenna tower, you would log data for a point on the ground after entering the Point Offset parameters into iCMTGIS II.

*   **Left/Right Offset** - This method is useful when you can log data to one side of the target Feature at a fixed horizontal distance. For example, to log area data for a marsh in the woods, you would move

parallel to its perimeter at a fixed distance. Specify a "Right" Offset if the target is to your right while you are moving parallel to its perimeter; specify a "Left" Offset if the target is to your left while you are moving parallel to its perimeter.

- **Point Offset for Line/Area** – This method is useful to offset a line or area feature when there is a difference in elevation between the desired location of the line/area and the actual path that you walk. This method should be used when the Left/Right offset cannot be used for the Line or Area Feature. For example, to map an underwater area within a lake, you would log data while boating around an area of the same shape and size and let iCMTGIS II figure out the coordinates for the actual area based on its depth under the water.

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.)

Left/Right Offset

Slope Distance   Enter the horizontal distance from where you are collecting GPS data to location of the target. This distance should be parallel to the ground and perpendicular to the direction you will be moving.

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

Point Offset:

Slope Distance   Enter the slope distance from where you are collecting GPS data to the corresponding point on the target.

Azimuth   Enter the azimuth of the target.

Slope   Enter the slope angle to the target.

After specifying the offset information, tap on **OK** then log the GPS data as described in the preceding subsections.

5.2.6 Appending 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. You will find this function very useful when you need to log additional data for a road you mapped earlier in the day, or when you need to continue working with the same feature after recharging/changing your battery.

After selecting the option for "Existing Line/Area", click on the pull-down menu under "Name" then 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 that you want to append coordinates to.

After you press the **OK** button, proceed to collect data as described in the previous subsections.

5.3 Data Collection in Traverse Mode

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

Slope Distance   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.

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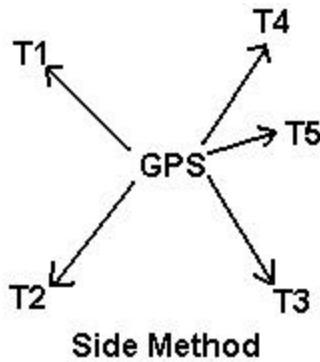
Traverse mode: Use this method to traverse to a new point that will then be used as the reference point for the next traverse point. This method can be used for storing lines or area boundaries.

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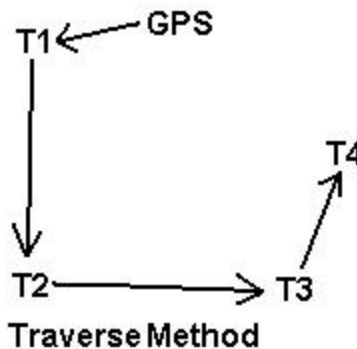
iCMTGIS II will permit you to take multiple side shots from each point on a traverse.

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

1. Click 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 **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. Click **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. Click 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 the **Exit** button.

The following sample screen shows the traverse measurements from the encircled reference point to the traverse point represented by the temporary symbol .
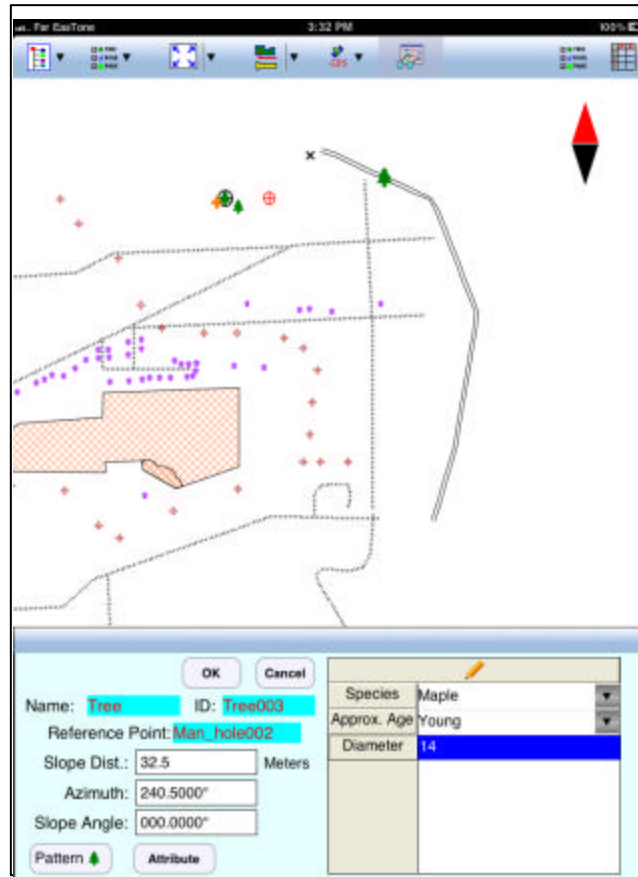
5.4 Recording the GPS Track

Sometimes you may wish to record your GPS track in the background without logging a Line Feature. To do so, 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**.

You may record one or more tracks in this manner.

Please note that 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**.

You may record one or more tracks in this manner.

Section 6 - Data File Transfer and Storage

After you are finished collecting and reviewing your data on the Mobile Device, you can transfer your data files to your PC or your Mac® computer to work further with them. For example, you can use the PC-GIS software to edit, modify or combine your data files. You can also use PC-GIS to preview the plot then print out the map.

The .pmp job files, the Feature Lists, the .pim image files and the Shapefiles are interchangeable between iCMTGIS II, PC-GIS, PC-GPS and PC-MAPPER.

The iCMTGIS II application software stores the recorded data in the "Documents" folder for the application on the iTunes® application program. All data files that iCMTGIS II uses must be stored in this same "Documents" folder.

6.1 Accessing the Documents Folder for the Application

To see the Documents folder, first connect your Mobile Device to the iTunes® program and select your Mobile Device.

After synching your device with your computer via the iTunes® program, you should see a "Apps" tab across the top of the screen. Click on that tab then click on the iCMTGIS II application. Scroll down to see the files that are stored in the Documents folder for iCMTGIS II, 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.

To delete a file, first highlight it then press the **Del** button on your keyboard. Always make sure you really want to delete a file before proceeding to do so.

6.2 Send or Get Job Files via email

You may use iCMTGIS II to send or get job files via your email service.

6.2.1 Sending Job Files via email

When you select **Menu/Job/Email Files**, a dialog will be displayed to provide three File Type options:

> **Job**: .pmp files
>
> **Feature List**: .fbr files
>
> **ShapeFile**: Shapefiles

The files listed in the displayed table depends on the file type selected. For example, if "Job" is selected, the table will only list the .pmp files for selection. If "ShapeFile" is selected, the table will only show .shp files for selection. The program will also attach the relevant .shx, .dbf, and .prj files with the selected .shp file.

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.

6.2.2 Getting a Job File via email

When you open an email using the Apple® Mail® application program, and click on an attached Job file (e.g. a .pmp file), the system will automatically forward the file to iCMTGIS II.

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.

6.3 Store or Retrieve Files via iCloud® Service

The iCMTGIS II application supports iCloud® service for file storage.

Under **Menu/Setup/iCloud**, three options are provided for selection:

> **Job**: .pmp files and Shapefiles
>
> **Feature List**: .fbr files
>
> **Basemap/Registered Image**: Basemaps and registered images

When you tap on **OK**, the program will move the selected type of files to iCloud® Storage location.

The files stored at the iCloud® Storage location can be shared with another iPad® or iPhone® device. They can be shared between the iCMTGIS II and iGPSGIS II applications.

6.4 Get or Send Files via FTP

The iCMTGIS II will let you use an FTP client to get or send files from or to another computer, respectively.

To access the FTP function, select Main Menu, select **Job**, then select **FTP**.

Enter the **IP** address of the ftp site. Mark the **Anonymous** checkbox for an anonymous user.

Enter the **Password** for the ftp site. Enter the **FTP Path**.

If the iPad Files are in the iCloud® Storage, then mark the **On Cloud** checkbox.

Select the files to be sent, then tap the corresponding **arrow** button.

Liability Statement

CMT makes no expressed or implied warranty with regard to this manual and the iCMTGIS II software or the fitness of the software for any particular purpose. The software and the manual are made available solely on an "as is" basis and the entire risk to their quality and performance is with the user.

CMT assumes no liability whatsoever with regard to the iCMTGIS II user and any hardware on which iCMTGIS II software is installed.

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