Field CE GIS Reference Guide

for

Field CE GIS 09

Field CE GIS Reference Guide Table of Contents

Foreword about Field CE GIS

This reference guide covers the use and function of Field CE GIS software version 09.

General Overview
Field CE GIS combines CMT's proven **GPS project management** utilities with **powerful mapping** functions. Field CE GIS is a field data collection program meant to be used on a handheld PDA and a built-in or external GPS receiver, along with the associated CMT desktop PC software (such as PC-GIS, PC-GPS or PC-Mapper).

With Field CE GIS you have the tools to:

"Build" Maps
Field CE GIS allows you to create and edit electronic map files (*.PMP) using data collected from a GPS receiver or 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.

Navigation
Field CE GIS provides a tool for navigation to a specified location. Current position information and satellite information are also available to assist in navigation.

Overlaying Data on BaseMaps
Field CE GIS comes with the ability to display BaseMap information. Optional BaseMap CDs are available for all the States in the USA. The BaseMap data contains useful background information such as: roads, hydrology, points of interest, city/county boundaries, etc.

Before a 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 an entire county BaseMap may be converted and transferred to your Mobile Device for use with Field CE GIS. Please refer to the help found in the PC-GPS, PC-GIS or PC-MAPPER software for information on converting and transferring BaseMap files to your Mobile Device. The BaseMaps can be loaded into your Map View to assist in navigation or data collection.

Exchange Data between Field CE GIS and your PC
Field CE GIS allows you to transfer collected data to PC-GIS, PC-GPS or PC-Mapper software. After the data has been collected in Field CE GIS, it can be transferred back into your PC-GIS map for updating your master map files on your PC.

Section 1 - Getting Started with Field CE GIS

1.1 Hardware and Software Requirements

To effectively operate Field CE GIS, the following configuration is suggested:

a) Microsoft Windows® CE 3.0 or later - Mobile Device w/ Pocket PC 2002 or higher. Works with: HP iPAQ®, Dell AXIM® and other compatible Mobile Devices.

b) A minimum of 64 Megabytes of RAM.

c) At least 1 Megabyte of free program storage space on your Windows CE device is required.

1.2 Installing Field CE GIS on your Mobile Device

Before installing Field CE GIS, please do the following:

1. Uninstall any previously installed Field CE GIS software from your Mobile Device by deleting the 'cmtapp' folder found under the 'Program Files' folder on your Mobile Device.
2. Make sure that no other applications are open on your PC and your Mobile Device.

To install Field CE GIS on your Mobile Device, please follow these steps:

1. Insert the installation CD-ROM into your CD-ROM drive. This CD-ROM contains the following software:

    a) Microsoft Active Sync – this software is used for communication between Field CE and your PC. You may already have this software installed on your PC if you already own and have been using your Mobile Device.

    b) CMT Field CE GIS for use on your Windows CE PDA

    c) If you have purchased the PC-CE GIS Software Package then the installation CD will also contain the CMT PC-GIS application software, which is used to view/edit data collected by Field CE GIS. Also, you can use PC-GIS to convert existing GPS data, BaseMap data and raster map images (e.g. GeoTiff, GeoJPEG, MRSID, ECW) to the Field CE GIS compatible format for use in the Field CE GIS software.

2. Upon inserting the installation CD-ROM in your PC, a menu will be displayed. If it does not, click Start and then click the Run option. In the Run dialog box, enter the appropriate CD-ROM drive designation and "AUTORUN" in the "Command line:" or "Open:" field and click on the OK button. (Example: D:\AUTORUN).

3. If Microsoft Active Sync is not already installed on your PC, please click on the "Install Microsoft Active Sync" button. This will initiate the installation program. Please follow the installation instructions on the PC. If Microsoft Active Sync is already installed on your PC, please go to the next step.

4. Connect your Mobile Device to your desktop PC using the communication cable supplied with your Mobile Device.

5. To install Field CE GIS to your Mobile Device, click on the "Install Field CE GIS" button.

You will see the following message displayed:

"This program is from an unknown publisher.

> You should install it only if you trust its
> publisher. Do you want to continue?"

Select "**Yes**". (This step is essential for a successful installation.)

When you re prompted to choose a location to install the program, please select "**Device**". Click on "OK" at the upper-right-hand corner of the screen.

After installation of Field CE GIS, you will see a message indicating that Field CE GIS was installed successfully.

Next, the installation program will install the CMT fonts.

Please remember to select "**Yes**" when you see the message:

"This program is from an unknown publisher.

You should install it only if you trust its
publisher. Do you want to continue?"

Specify that the fonts be installed to "**Device**".

After installation of the CMT Fonts, you will see a message indicating that the Font files have been installed successfully.

1.3 Starting Field CE GIS

After you have installed Field CE GIS on your Mobile Device, click on the Field CE GIS icon to start it. If this icon is not on the "Today" screen then click on the Windows Icon and select Field CE GIS. Field CE GIS will start and the main window will be displayed. However, the software will need to be validated before you can use it.

1.4 Validation Numbers for Field CE GIS

CMT Windows CE software is protected by a "software key".

When execute the software for the very first time, you will see a dialog box appear with a **"User Key"** number. Copy this User Key number down so you may submit it to CMT to request a **Validation Number** for your Mobile Device. After you have obtained and entered the validation number, the program will start without prompting you for it again.

To obtain your validation number, please complete the Online Validation Form found at www.cmtinc.com. You can also e-mail the requested information to us at support@cmtinc.com.

Please make sure that you include the following information:
> **User and company name, address and phone number**
> **Software Serial Number printed on the program CD**
> **The User Key number**

1.5 Getting Help in Field CE GIS

Field CE GIS provides Help for many screens. Help may be accessed by clicking on the "?" icon in the upper right corner of the screen.

1.6 Technical Support for Field CE GIS

With the help of this reference guide, you should be able to run Field CE GIS without much problem. Please email support@cmtinc.com if you need extra help.

Section 2 – Field CE GIS Fundamentals

In this chapter, the basic terminology and major concepts behind Field CE GIS are presented. <u>It is highly recommended you read through this chapter thoroughly for a clear understanding of the fundamental concepts</u>. The ideas and examples presented will be used and built upon in subsequent chapters.

2.1 Field CE GIS Definitions

In this section, definitions of the terms used in Field CE GIS will be presented.

2.1.1 Spatial Data

Field CE GIS 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 is collected with the GPS receiver. Spatial data can also be created within Field CE GIS 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 Field CE GIS. 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 further described with **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 Data Organization- Feature Topics & Individual features

Data in Field CE GIS is organized into **feature topics**. A feature topic is a group of individual features that are defined by the same attributes. 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 by default. 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 Field CE GIS, it is recommended that you spend time organizing data collection **BEFORE** collecting GPS/GIS data in the field.

There is no right or wrong way to organize your data. Your application is unique and your data collection goals are different from those of another user. Ideal data organization for your purposes may be a matter of trial and error. However, time invested in planning and studying how your data should be organized beforehand will be extremely worthwhile.

2.2.1 General Data Organization Suggestions

Provided below are some general suggestions for the process you might use to organize your data. As mentioned above, there are no hard and fast rules, however, these guidelines should be helpful.

1. **Experiment with your data organization**.
   Analyze any existing data structure for GIS data collection.

2. **Avoid describing a feature using the feature name alone**.
   Use attributes and values to further describe the feature being mapped.

3. **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.
   c. Organize features, attributes and values.

4. **Create a Feature List according to your data collection plan.**
   a. Design the Feature List so that it can be used easily in the field.
   b. Limit the amount of data (features/attributes/values) you enter "on the fly". Data entered manually may conflict with your data organization plan. Consider using the feature check, and value check functions described in Section 4.6 of this manual.

Please note: The "features" named in the Feature List correspond to the "feature topics" listed in your Job file.

2.3 Working with Field CE GIS Tools and Menus

The main Field CE GIS screen is shown below. The menus and tool bars are labeled.
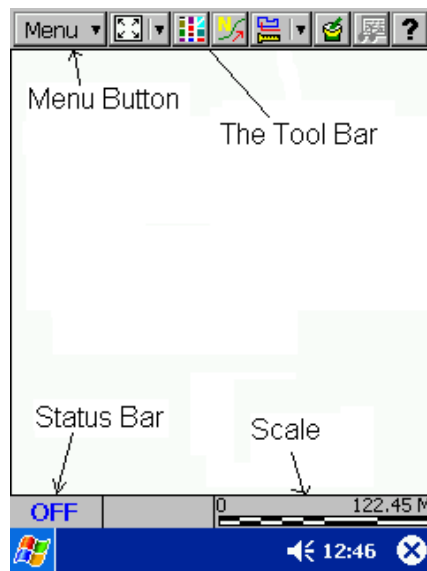
2.3.1 Menu Button

The Menu Button is located at the top of the main Field CE GIS window.
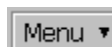
The Menu Button provides access to most of the active Field CE GIS commands. These menu options can be activated by first clicking on the menu button to pull down the menu list, and then clicking on the desired selection.

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

2.3.2 Tool Bar

The Tool Bar is located at the top of the Field CE GIS main screen.

The Tool Bar contains standard Windows button icons for quick access to Field CE GIS 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 Field CE GIS function.

2.3.3 Map Scale

The Map Scale bar is located at the bottom of the Field CE GIS display. The current map display scale bar is shown in this box.

2.3.4 Status Bar

The status bar is located at the bottom of the Field CE GIS display to the left of the Map Scale Bar. This bar shows current GPS status information, current feature topic information for adding data manually and distance-to-target information when in navigation mode.

2.4 Map View and Collect Data View Modes

Data in the Map file can be viewed and edited using different view modes. Two of these modes are represented by a "view mode button" located within the Tool Bar. These two view mode buttons can be toggled back and forth. They are shown as follows:

Map View -   The Map View provides a graphic representation of your Job file.

Collect Data View -   The Collect Data View provides options for collecting features using the GPS.

2.4.1 Map View

The Map View provides a graphic representation of the Map file. All spatial data (features) and BaseMap data are represented in the Map View.
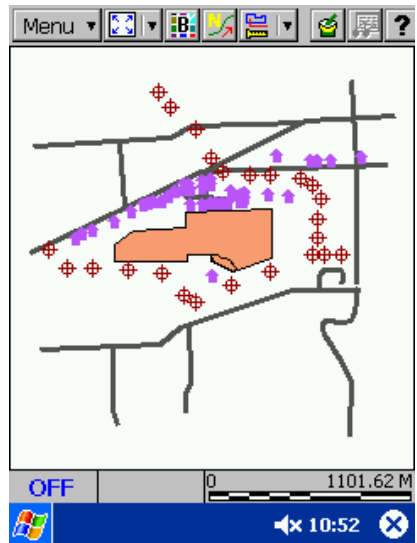
Example: In our example map, SWCVO.PMP, the Map View shows the features individually: Houses, Samples, Streets, and Spray Areas.

Displaying Data in the Map View:

Features are displayed in the Map View according to the rules below. When you first open your Job file, the <u>default </u>symbol or 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 Pattern)

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 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.

Symbols and Patterns for your features:

A number of different symbols and patterns can be used for the Map View and Feature Topic View representation of your points and lines. Field CE GIS offer a number of special point symbols, and two line styles.

- For information on using symbols and patterns, see Section 3.5 in this manual.

Zoom Tools in the Map View
Field CE GIS provides five different tools for viewing your data at different levels of magnification. These tools are found in the **Map Tools** pull-down menu in the Tool Bar. The different zoom tools are identified and defined below:

Zoom Fit   Zoom to fit all of the objects on the page.

Zoom In   Zoom-in to the selected area.

Zoom Out   Zoom out from the current view.

Pan   Click and drag the map to bring the region of interest into view.

Zoom To GPS   Zoom to current GPS position.

2.4.2 Browse Features Screen: Feature Topic Order

Features in your map are organized into feature topics or layers. The feature topics in the map are listed in the Browse Features Screen in Field CE GIS. The order in which feature topics are listed in the Feature Topic View directly affects the display of features in the Map View. To access the Browse Features Screen, choose Menu/Jobs/Browse Jobs. A screen similar to the following will be displayed:
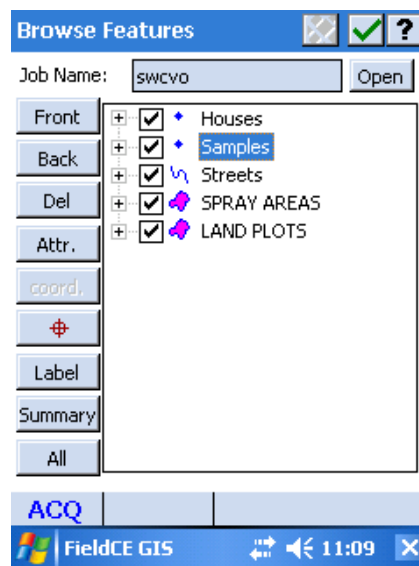
In general, feature topics should be arranged by type and size. Point feature topics and line feature topics should be listed first. Small or medium size area feature topics should be listed next. Large area feature topics should be listed last. (An area feature topic on top of a point feature topic may prevent you from seeing the points.)

You can **change the order** of the feature Topic View by clicking on the desired feature topic name and then clicking on the "Front" or "Back" button to move the feature topic to a different location in the feature topic List. Normally, the most recently acquired Feature are listed at the bottom.

Marking Feature Topics for Display in the Map View

The mark box to the left of each feature topic name listed in the Browse Features screen 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.

Houses Feature Topic toggled ON

Houses Feature Topic toggled OFF

You can toggle the display of a feature topic ON and OFF by clicking on the mark box. Toggling the feature topic mark box OFF will hide the features of the feature topic in the Map View. Upon exiting Field CE GIS or opening a different Job file, Field CE GIS will **automatically store the feature topic display information for your current file**. There is no "Undo" function available.

Feature Topic Icons

A feature topic icon, describing the feature type, is located to the left of each feature topic name. The default icons for point feature topics, line feature topics, area feature topics and Shape feature topics, are shown in the following table.

Icons as shown in the Browse Jobs View:

Icon Definitions:

Point feature topics

Line feature topics

Area feature topics

Feature Labels

With a Feature Topic selected, you may click the "Label" button then specify the type of labels to display for the Features in the active Topic. If you have defined Attributes for the Features then you may choose one or more Attributes to be displayed as labels. Click the "Hide Labels" buttons to turn off the labels. To remove the labels altogether, click the "Delete Labels" button.

2.4.3 Browse Features Screen: Feature Order

The features associated with each feature topic may be viewed in the Browse Features Screen. To access the listing of features associated with a feature topic, either double-click on the feature topic name or click on the "+" sign next to the feature topic name. A tree listing of all the features listed under the feature topic will be displayed. Editing functions for the features listed under each feature topic only apply to the selected feature.

The feature records in the Browse features screen for the active feature topic will be numbered beginning with number one (1). The feature number, displayed with each feature record, is for reference only. The feature number represents the current order of the features in the active feature topic. To change the order of features in a feature topic, highlight the feature Record and then use the "Front" or "Back" button to move it down or up, respectively. This is useful for proper display or selection of area features when several overlapping areas of different sizes are all listed in the same feature topic.

2.4.4 View Attributes/Values

The Browse Features screen also provides access to the attributes and values for Feature topics and features.
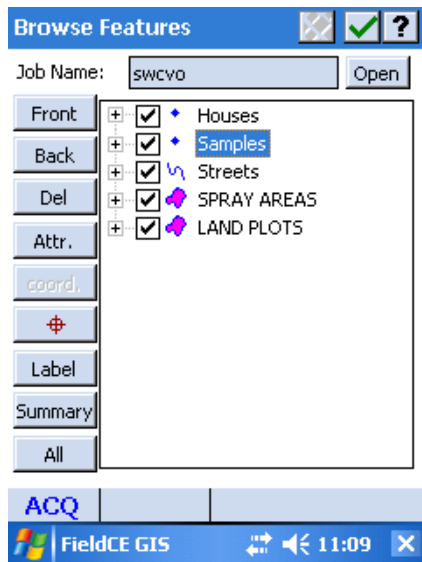
Options for Browse Features screen:

Back: Moves the selected feature or feature topic up one position (if it's not already at the very top). **Front:** Moves the selected feature or feature topic down one position (if it's not already at the very bottom). Normally, the last recorded Feature is at the bottom of the list of Features (the front end).

Del: Deletes the selected feature or feature topic

Attr. / Value: If a feature topic is selected, the **Attr.** button will be displayed and when clicked will go to the Attribute Editor screen for the selected feature topic. If a feature is selected, the **Value** button is displayed. When clicked, the feature properties "attribute and value" information will be displayed.

Coord: Coordinate information can be accessed for a selected feature by clicking on the **coord.** button.

Click the button showing the **symbol** to select a different symbol.

Summary: Display a summary for the active job.

All: Toggle the selection of all Feature Topics or Features.

For example, click on the Feature record you want to see information for in the Browse Features screen and then click on the "Value" button. The attributes and values for the specified Feature ID will be displayed: For the Field CE GIS file SWCVO.PMP, in the **Attribute/Value view,** the record for Spray Area feature 1 lists "Crop" as "Mustang Fescue" and "Condition" as "Fair-some broadleaf" and also the inspection date. The **Coordinate information view** displays coordinates for the selected feature as well as data quality information.

Attribute/Value view
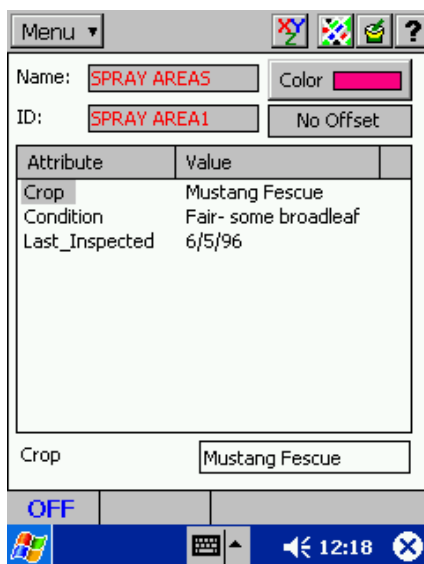
Coordinate information view
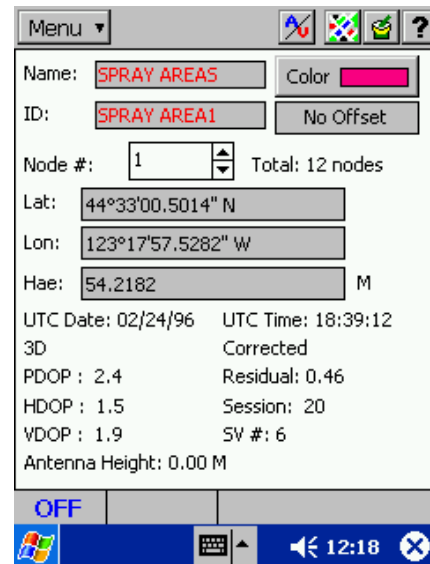
Section 3 - Working with Your Feature Data

Useful functions for working with your feature data are presented in this section. Examples are provided where applicable. The Field CE GIS file used for the examples in this section is SWCVO.PMP. The SWCVO.PMP file should be listed on your Mobile Device after successful installation of Field CE GIS. A PARK.FBR file is also provided as a sample feature list.

Field CE GIS files:
Feature data collected in Field CE GIS is stored as a Job file (***.PMP**).

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 entry 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 BaseMap file can be loaded along with your Job file in the Map View. For creation of BaseMap files to the Field CE format, please refer to the help section in PC-GPS, PC-GIS or PC-Mapper.

3.1 Opening your 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.

Select a Job file 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 icon ▦▲ is available at the bottom of the screen to enter information into these fields.

Once the proper files have been selected and any optional information has been typed in to the available fields, click **OK** in the Tool Bar to return to the Map View. If you have selected an existing job, your job data will be displayed.

You may select Menu/Basemap/Load BaseMap to select the BaseMap to be loaded with the job.
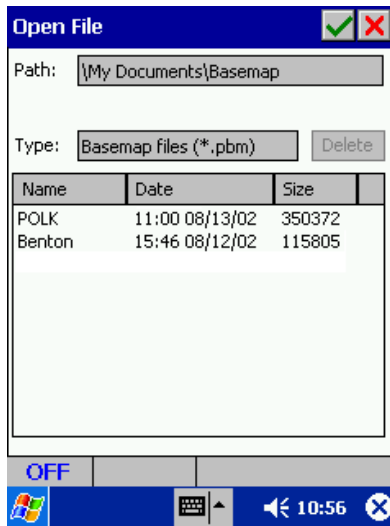
Click on the BaseMap file you wish to load with the Job file and click OK in the Tool Bar.

The following main Field CE GIS window is displayed when you open the SWCVO.PMP file with the Benton County, Oregon BaseMap:
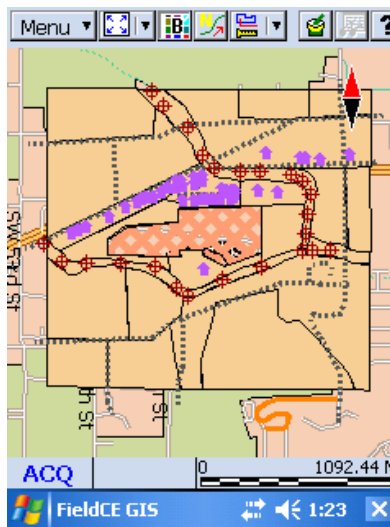
3.1.1 Importing Shape (SHP) files

Field CE GIS has the ability to import data in the ESRI Shape file format into your Job file. Any Shape files that you wish to import must already be transferred to your Mobile Device. To import a Shape file, choose **Menu/Shape File/Import.** A dialog will be displayed that lists all available Shape files in the specified directory. Click on the desired Shape file or select multiple Shape files for import by drawing a "rubber band" box around them (alternatively you can click on the keyboard icon and use the Shift function to select multiple Shape files). Once the desired files have been selected, click on the ☑ button. A dialog will pop up asking you to confirm the Coordinate System, Datum and Units of Measurement for the imported data. The correct Coordinate System and Datum must be chosen in order for the data to be imported correctly into the existing Job file.

3.2 Saving your Data

New data or changes in your Job file are saved automatically in one of four situations:

1) When you exit the Field CE GIS software.
2) When you change current Job files using the **Menu/Current Job** function.
3) If either of the above methods of saving data has not been performed after 10 minutes, Field CE GIS will automatically save your Job file. You may change this time interval for the automatic data saving. (See Section 3.9.6.)
4) When transferring your Job file to your PC using PC-GIS, PC-GPS or PC-Mapper, Field CE GIS will automatically save your Job before transferring the file.

3.2.1 Exporting to Shape file

In Field CE GIS, you have the option of exporting your Job data to the ESRI Shape file format. To export your Job data to Shape file format, follow these steps:

1. Save your Job.
2. Choose **Menu/Shape File/Export**.
3. A dialog will pop up that displays all of the available topics for export.
4. By default, all available topics will be selected for export. You can specify the path where you want the Shape files to be created by clicking on the ⟦...⟧ button.
5. Place a check mark in the "3D" box if you wish to include elevation (Z coordinate) information along with X and Y coordinates for each exported topic.
6. The topic name and Table names are displayed. The exported Shape files will use the topic names and Table names displayed in this dialog. The topic name may not be changed, but the Table name may be changed in the field at the bottom of the screen using the keyboard function.
7. Individual topics may be selected or unselected by clicking on the desired row and then placing a check mark in the "Select" box. Topics marked for export will have a "Y" displayed next to the topic name. Topics excluded from the export will have a "N" displayed next to the topic name.
8. Once the desired topics have been selected for export, click on the ⟦✓⟧ button.
9. A dialog will appear notifying you that the Job has been successfully exported as a Shape file.

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 name and the coordinates will be displayed briefly.

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.

Field CE GIS will also temporarily display coordinates for any location (non-feature related) in the Map View. To obtain the coordinates for a location on the map, simply click once on the map at the location and the coordinates will be displayed for a few seconds. The coordinates shown will reflect the specified Coordinate System in the **Menu/Setup/Coordinate System** screen (see section 3.8).

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

3.3.1 "View Selection" Feature

Field CE GIS comes with a function that allows you to quickly select and view features in your Map View for editing and reviewing coordinate information or attributes/values. To access this function, choose **Menu/Browse Jobs** to access the Browse Features screen. Double-click on the feature topic of interest to see a listing of all the features listed under the feature topic. Then, click on the "Display Selection View" icon in the Tool Bar ▦ to go to the "View Selection" window.

> **Example:** I want to select the third Light Post in the file: CMTTUT.PMP. To select the feature, I go to the Browse Features screen and click on the ID: LIGHT PO003. Then, I click on the "Display Selection View" icon ▦ to go to the "View Selection" window. The following screen is displayed:
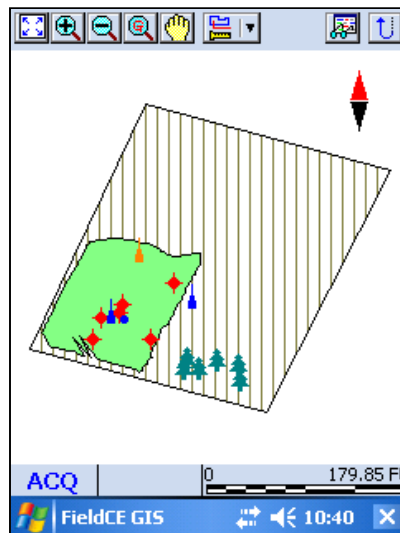
> The Feature ID: LIGHT PO003 is highlighted in orange in the above screen.

It is now easy to get important feature property information about this feature (see section 3.6.1) by clicking on the Feature Properties button ▦. Alternatively, you can use the zoom tools to get a closer look at the feature. If the selected feature is a line or area, you can use the "Measure Length/Area" button ▦ (see section 3.6.1) to get length or area information about the feature. To toggle back to the "Browse Features" screen, click on the ▦ button.

3.4 Adding Features to your map

The functions of the **Map Tools** have the option to manually add new features to the current Job file. You can add a new point, a new line or a new area feature.

The Map Tools can be accessed from the Map View and is located next to the "Menu " button. The following diagram shows the **Map Tools**:

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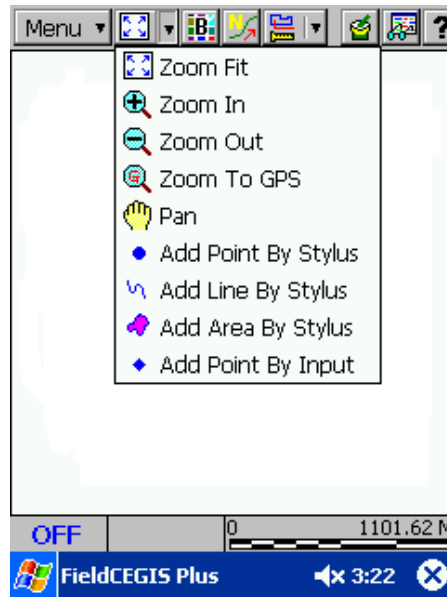
3.4.1 Adding Point Features

The **Map Tool/Add Point by Stylus** option is used to add a new point to the map by clicking on a location in the Map View with your stylus (digitizing).

Steps for the Add Point function:

1. Select the **Map Tool** pull-down list and choose: **Add Point by Stylus.**
2. Select a feature topic for the new point on the Status bar at the bottom of the screen. Click on the feature topic name at the bottom to see a pop-up list of all feature topics for the current job. Select a feature topic from the list, or choose <<NEW>> to create a new feature topic for your feature.
3. Click the stylus on the location for the new point. Multiple points may be added by clicking in the locations of the new point features.
4. Click on the **Map Tool** button again to de-activate this function.

Immediately, your Map file will be changed in three ways:

1) A new point will be displayed at the coordinates of the stylus click in the Map View.
2) A blank feature record will be appended to the Attribute/Value View for the feature.
3) The new feature will be added to the active feature topic and the Feature ID will be listed under that feature topic.

An example of the Add Point by Stylus function is shown:

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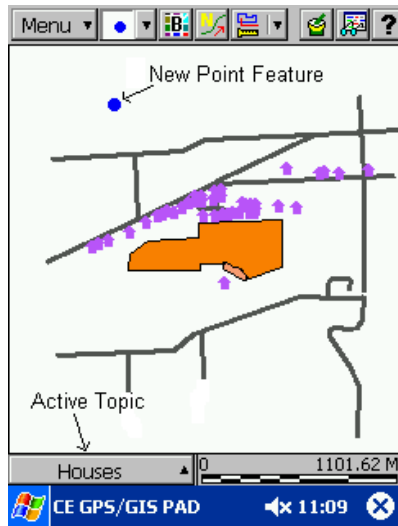
Example: A new House feature has been added to the House feature topic in the example SWCVO.PMP. A new feature record has been added to the Attribute/Value View.

3.4.2 Completing the new Feature Record in the Attribute/Value View

The feature record for each feature in the map can be viewed in the Attribute/Value View. The Attribute/Value screen can be viewed by selecting the feature, then clicking on the Feature Properties button. Then Attribute/Value screen or Coordinate Information screen will be displayed. If the coordinate information screen is displayed, you can toggle to the Attribute/Value screen by using the Attribute/Value View icon.

When a new feature is added to the map file, a blank record is appended to the Attribute/Value Screen of the active feature topic. To complete the feature record, click on the blank attribute cell of the feature record and enter the appropriate value in the blank provided.
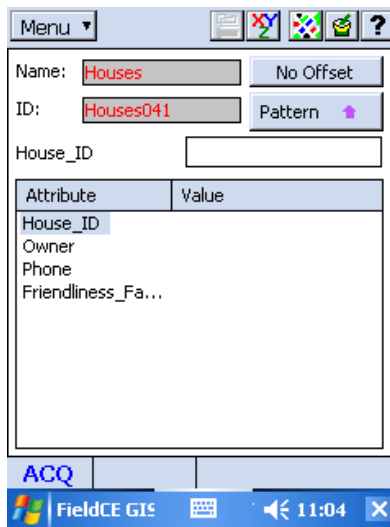
Example: The file shown is SWCVO.PMP. A new point feature has been added to the Houses feature topic. The record may be updated by highlighting the attribute name and then typing in the appropriate value information.

3.4.3 Adding Line Features and Area Features

The **Map Tool/Add Line by Stylus** option is used to add a new line feature to the Job file. The **Map Tool/Add Area by Stylus** option is used to add a new area feature to the Job file.

The procedure for adding a line or area feature is outlined below:

Steps for the Add Line or Add Area function:
1. Select the **Map Tool** pull-down list and choose: **Add Line by Stylus or Add Area by Stylus.**
2. Select a feature topic for the new line or area by clicking on the Status bar and selecting the appropriate feature topic name.
3. Tap the stylus on the starting position of the line or area in the Map View, then move the stylus to each subsequent coordinate position and tap once with the stylus.
4. At the last coordinate position, click on the **Map Tool** button again to de-activate this function.
5. Complete the feature record for the new feature as described above in Section 3.4.2.

3.4.4 Adding Point Features by Input

The **Map Tool/Add Point by Input** option is used to add a new point feature to the Job file by manually typing in the coordinates for the point. When this option is selected, the Create Point window appears and prompts you to choose the topic in which to create the point. Also, you are prompted to enter the coordinates for the new point using the current coordinate system and units of measurement for the current Job.

3.5 Using Feature Symbols and Patterns

Point features in your map can be displayed in a variety of symbols. Field CE GIS provides a library of point symbols for point features, which are shared by all features and all jobs. A simple library of two different line styles is available for line features. There is no library of fill patterns for area features in Field CE GIS.

Assigning Symbols and Patterns:
When you select a point or line 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.

Summary of Steps for selecting symbols or patterns for your features:

1. Select your feature and display the Coordinate Information screen.
2. From the Coordinate Information screen, click on the "Pattern" button. The selected symbol will be highlighted by a selection box. 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.
3. Click on the Color button to select a symbol display color.
4. Click on the button to accept the symbol.

3.5.1 Symbols for Point Features

When the feature you have selected is a point, click on the Feature Properties button and then the **Pattern** button to display the Select pattern Page:
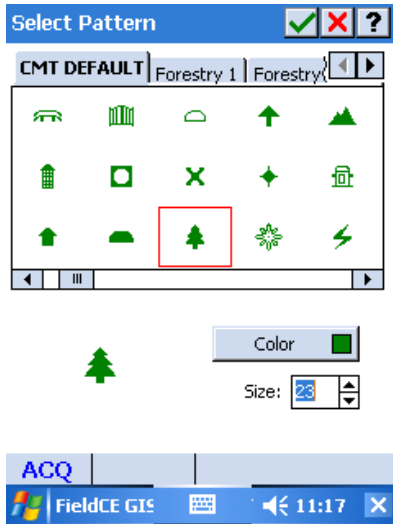
Options for Point Symbols:

Color: Click on the color button to select a symbol display color.

Size: Input a symbol size between 1 and 32.

Several point symbol pattern libraries are available for you to select.

To select a symbol: Click on the symbol you wish to use. The selected symbol will be indicated by a selection square. If desired, click on the Color button to assign a different display color to the selected symbol. Click on the ✅ button to save your selection and return to the Feature Properties screen.

Please note: PC-GPS, PC-GIS and PC-Mapper will use the same symbol library index as Field CE GIS. This is to ensure that Symbology will not change when opening *.PMP files on your PC.

3.5.2 Patterns for Line Features

When the feature you have selected is a line, click on the Feature Properties button and then the Pattern button to display the Line Pattern dialog box:
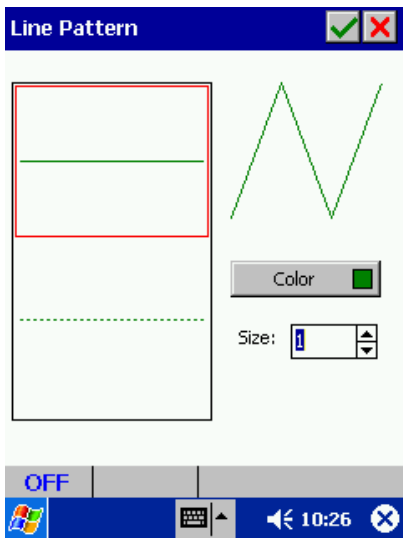
Options for Line Patterns:

Color: Click on the color button to select a line pattern display color.

Size: For solid line patterns, input a size between 1 and 5. Size may not be changed for dashed line patterns.

To select a pattern: Click on the pattern you wish to use. The selected pattern will be indicated by a selection square. If desired, click on the Color button to assign a different display color to the selected pattern. A preview of the line pattern is displayed in the upper right area of the Select Line Pattern Dialog Box. Click on the ✅ button in the Select Line Pattern dialog box to save your selection and return to the Feature Properties screen.

3.5.3 Patterns for Area Features

To select a pattern: Click on the pattern you wish to use. The selected pattern will be indicated by a selection square. If desired, click on the Color button to assign a different display color to the selected pattern. A preview of the line pattern is displayed in the

Select Area Pattern screen. Click on the to save your selection and return to the Feature Properties screen.

You may adjust the transparency of an area. You may also opt to display a **Border** for the Area Feature.

3.6 Editing Data in the Map View

The properties of features can be easily viewed using the methods described in the following sections.

3.6.1 Feature Properties: Checking & Changing

The properties of your features can be viewed or modified using the functions of the Feature Properties button. The table below summarizes the methods for accessing feature property functions after the desired feature has been selected in the Map View.

Feature Property Function	Steps for Accessing Function:	Tool Bar icon:
Color	1. Select Feature Properties button. 2. Select **Pattern** button. 3. Select **Color** button.	1. 2. 3.
Symbol/ Pattern (only available for points and lines)	1. Select Feature Properties button. 2. Select **Pattern** button	1. 2.
Offset	1. Select Feature Properties button. 2. Select **Offset** button.	1. 2.
Coordinate Information	1. Select Feature Properties button. 2. Select **Coordinate Information** button.	1. 2.
Attributes/Value Information	1. Select Feature Properties button. 2. Select Attributes/Values button.	1. 2.
Area/Length Information	1. Select Feature Properties button. 2. Select **Area/Length** button.	1. 2.

Using the Feature Properties button:
The Feature Properties dialog box can be accessed by clicking on a feature in the Map View and then

clicking on the Feature Properties button . An example of this process is provided below. The file for this example is SWCVO.PMP.
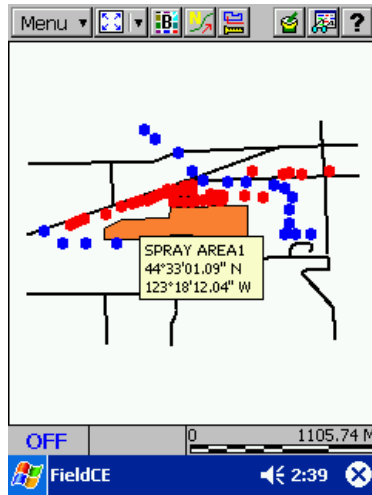
Example: The example file SWCVO.PMP is displayed. The Spray Area feature is selected. When the **Feature Properties** button is clicked the feature properties information for the selected Spray Area feature will be displayed:

Attribute/Value view

Coordinate Information view
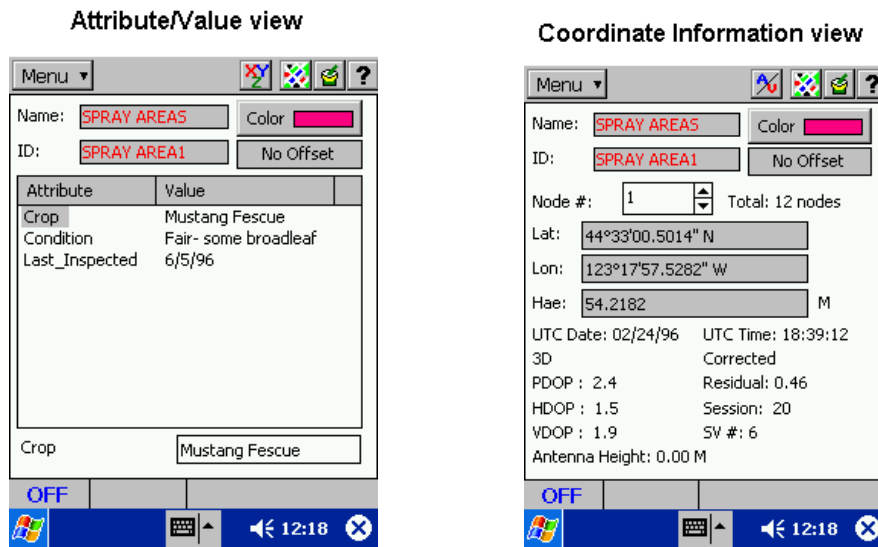
The feature name and Feature ID are listed in the Name and ID fields. Feature property functions apply to the highlighted feature only.

Accessing Length/Area Information

Field CE GIS provides the capability of providing **length** or **area measurements** for a selected line or area feature. The Measure Area/Length button is available in both the Feature Properties screen and the Map View. When clicked, it will provide length and area information for the selected line or area feature. The screen below shows the Area/Length information for the previously selected area feature: Spray Area1 (when accessed from the Map View).
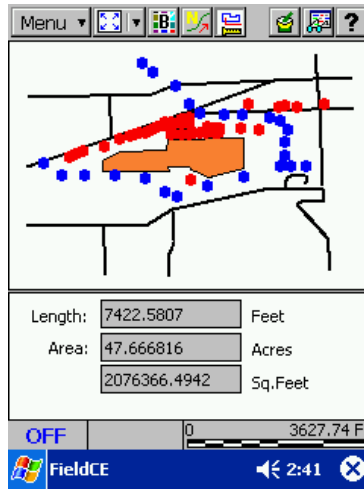
When accessing the Measure Length/Area button from the Map View, you will see the area/length measurement appear in the lower portion of the Map View. This is a dynamic display that will automatically update the length and area information as you click on other line or area features. To turn off the length and area information, simply click on the Measure Length/Area button again.

3.7 Coordinate Information

The coordinates of the selected feature are listed in the coordinate position fields shown in the Coordinate Information view in the previous section. 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 viewed by using the "Up" and "Down" arrows in the **Node #:** box.

Coordinate positions recorded by GPS, created by offset or traverse functions (available in Field CE GIS only) may not be edited. Coordinates, which are manually entered by hand, may be edited.

Example: For the Coordinate Information dialog box displayed on the previous page, the position and properties of the coordinate fix are listed. In this case, the coordinate node is a corrected, 3D coordinate fix, with PDOP of 2.4, HDOP of 1.5, and VDOP of 1.9. In addition, the number of satellites used was 6, the calculated average residual for the position is 0.46 and the session time was 20 seconds.

The coordinate information is displayed for an individual coordinate node or point feature. The coordinate information for a point feature is the average of all of the GPS fixes which were stored for the point.

Date/UTCTime: The date and UTC time the coordinate position was computed is listed.

Coordinates: The coordinate information based upon the Coordinate System selected under **Menu/Setup/Coordinate System** will be listed in this section.

2D/3D: If 2D is displayed, it is a two-dimensional coordinate position. This indicates that fewer than four satellites were used to compute the coordinate position.

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

Corrected/Uncorrected: 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.

The values for **DOPs**, **Average Residual** and **# Satellites Used** are important quality indicators.

DOP stands for Dilution of Precision. DOP is an indicator of quality of the GPS position based upon the geometry of the satellite constellation. Lower DOP values indicate more favorable satellite-constellation geometry. (The term satellite constellation refers to the group of satellites tracked by the GPS receiver.) In general, we have more confidence in the accuracy of positions with lower DOP values. (Please see Section 3.7.1.)

PDOP: Positional dilution of precision is used as a general measure of the quality of coordinate fix. The PDOP is derived from the HDOP and the VDOP:

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

HDOP: Dilution of precision in the horizontal axis.
VDOP: Dilution of Precision in the vertical axis.
Session: The number of GPS fixes used to compute the coordinate value. If the feature is a static point, the number of fixes is averaged to compute the coordinate position.
SV #: The number of satellites tracked.
Average Residual: A residual value is computed for a corrected position with more than four satellites. The residual is an indicator of error that could not be corrected during differential correction. Lower residual values indicate a smaller degree of uncorrectable error. (See Section 3.7.1)

Note: The residual will be reported as "N/A", if there were only 4 satellites tracked for the position.

3.7.1 Estimated Quality Indicators for Coordinates (C/A Code Jobs)

These general guidelines can be used:

Indicated "Quality"	Average Residual	PDOP
Very Good	< .5	1 - 3
Good	.5 – 1	3 - 5
Fair	1 – 2	5 - 6
Suspect	> 2	>6

PDOP & Residual are independent indicators.

3.7.2 Feature Offset

The offset of features can be viewed and modified using the Offset button | **Offset** | from within the Feature Properties screen. 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. Offsets are used when the GPS receiver cannot be placed at the actual location of the feature due to blockage of GPS reception.

The Edit Offset dialog box is shown as follows after clicking on the "No Offset" button from the Feature Properties screen:

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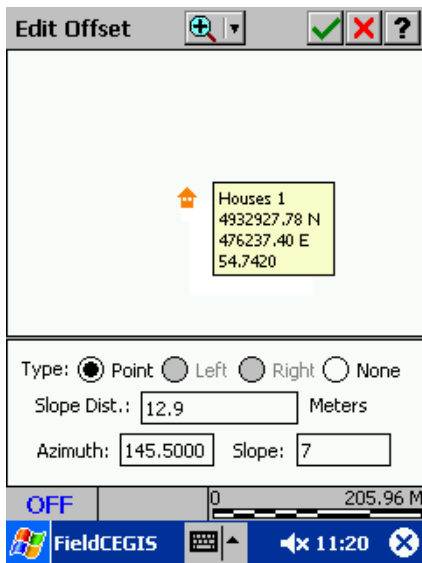
Type: Offset by point, left or right. Select None for no offset.

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

Azimuth: Azimuth from current position of GPS receiver to desired location.

Slope: Slope angle from current position of GPS receiver to desired location.

The selected feature is highlighted and shown along with the offset information. The offset information may be edited and changed from this screen by selecting the appropriate field and using the keyboard function to change the offset information. After entering an offset, the button displayed in the Feature Properties window will change to read: "With Offset".

Offset of a point: Point will be shown as the offset type and the appropriate values will be shown for the distance, azimuth and slope fields.

Left/Right Offset of a line or area: Left or right is the offset type of a line or area feature. The appropriate values are shown in the Distance field. Example: If your line proceeds North and you would like to move it to the West you would select "left" as the offset direction.

Point Offset of a line or area: The point offset function is used for lines and areas to offset the entire feature based on the first coordinate position.

3.7.3 Traversed Features

Features that have been recorded using the traverse function (section 5.2.6) can be viewed and modified using the Traverse button from within the Feature Properties screen. When the traverse function is used in the field, the position of the selected feature is calculated based upon a distance, slope and azimuth from the reference feature (either the initial GPS point or the previous traverse point). Traverse is used when the GPS receiver cannot track satellites along the actual location of the boundary due to blockage of GPS reception.

The "Edit Traverse" dialog box is shown as follows after clicking on the "Traverse" button from the Feature Properties screen:
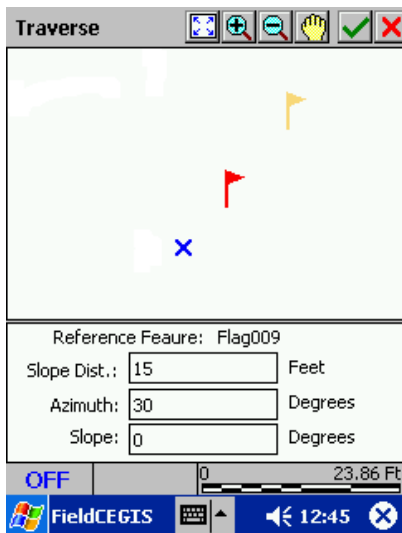
Reference feature: The last feature from which you have traversed to the selected feature. In this example the selected feature is highlighted in yellow. The reference feature is the red flag.

Slope Distance: Distance from reference feature.

Azimuth: Azimuth from reference feature.

Slope: Slope angle from reference feature.

The selected feature is highlighted in yellow and shown along with the traverse information. The traverse information may be edited and changed from this screen by selecting the appropriate field and using the keyboard function . In the above example, a blue "**X**" represents the original GPS point. The first traversed point is shown as a red flag. The yellow flag is the selected feature. The information shown in the Edit Traverse screen pertains to the traverse information between the red flag (reference feature) and the yellow flag (selected feature).

3.8 Menu/Setup Coordinate System: Changing Your Coordinate System

The **Menu/Setup/Coordinate System** option is used to change the coordinate system and datum in which your map is displayed and stored. When the **Menu/Setup/Coordinate System** option is selected, the following Coordinate System Information dialog box will be displayed:
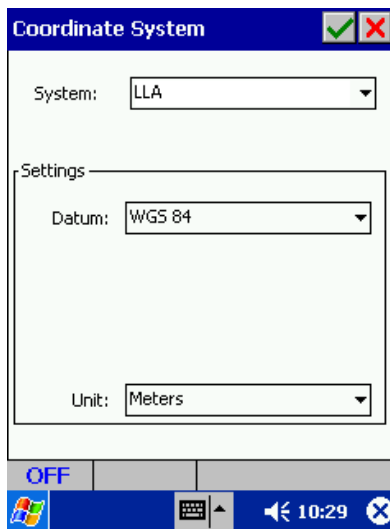
To change the coordinate system of your map, simply select the coordinate system, datum and unit of measure you wish to use. After you click on the button, your map will be converted into the coordinate system, datum and unit of measure selected.

Coordinate System: Field CE GIS offers five coordinate system options: **LLA** (Latitude, Longitude, Altitude); **UTM** (Universal Transverse Mercator); **SPC** (State Plane); **NEZ** and **User Defined.** The **NEZ** and **User Defined** coordinate systems are only available in Field CE GIS.

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. Specify the Datum, State, Region, Zone, and Unit of measure in the corresponding State Plane Coordinate Information fields.

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 must first be created in PC-GPS or PC-Mapper and then transferred to your Mobile Device.

User Defined Coordinate System: The User Defined option allows you to select a user-defined coordinate system or datum that was created in PC-GPS or PC-Mapper.

- For information on creating User Defined Coordinate System or NEZ planes, see the Help topics in PC-GIS, PC-GPS or PC-Mapper and search on "Coordinate Systems and Datums".

<u>Steps for converting the Coordinate System, Datum, and Unit of Measure</u>:

1. Open your Job file using the **Menu/Current Job** option.

2. Use the **Menu/Setup** option and then click on the **Coordinate System** button. The current Coordinate System, Datum and Unit of the map will be shown in the Coordinate System dialog box.

3. Select a different Coordinate System by clicking on the pull-down menu to the right of the Coordinate System name. If you select SPC or UTM, you will also need to enter the corresponding SPC or UTM Zone in the Settings box.

4. Select a different Datum by pulling down the arrow to the right of the Datum field and clicking on the Datum name.

5. Select a different Unit of Measure by pulling down the arrow to the right of the Unit field and clicking on the Unit desired. Field CE GIS supports: US Survey Feet, International Feet, Meters, Miles, and Kilometers.

6. Click on the ☑ button to convert your map to the selected Coordinate System, Datum and Unit of Measure and return to the Setup screen. Click ☑ again to return to the Map View.

3.8.1 NEZ Planes for your Map

The Menu/Setup Coordinate System, **NEZ** option is used to define a local plane that allows you to work in an XY plane instead of latitude, longitude. NEZ planes are supported by the CMT-Z33 dual frequency GPS system.

Note: If a Job is collected using an NEZ plane in Field CE GIS, the plane information will be sent to PC-GPS when the Job is downloaded.

Defining the NEZ plane in Field CE GIS

To define the NEZ plane in Field CE GIS, 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: Select the GPS reference point or enter its coordinates. Then enter the corresponding NEZ reference coordinates. Enter the known local angle and scale parameters.

Control Point Method: Mark the check box for 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 calculated based on these two pairs of points.

Click on ✔ to complete the definition.

Selecting an NEZ Plane from the Coordinate System dialog box:

To select an NEZ plane, first use the **Menu/Setup Coordinate System** option. The Coordinate System Information dialog will be displayed. Click on the NEZ pull-down option. A pull-down selection field will be displayed. Use the 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 in blue. Click on the ✔ button to return to the Setup screen.

3.9 Map View Display Options

Several options are available for viewing data. These options include: coordinate system, selection color, and default display of point, line and area features.

The options under the **Menu/Setup** menu can be used to change various settings in Field CE GIS. When the **Menu/Setup** option is selected, the Setup dialog box is displayed:
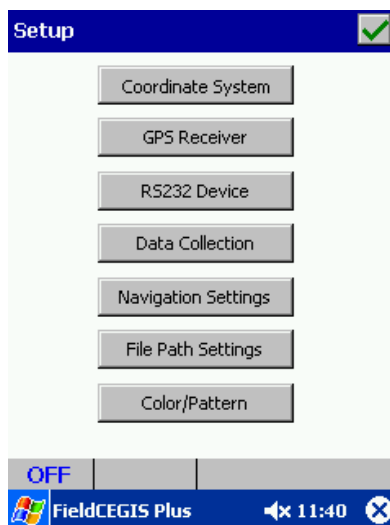
The dialog box is divided into several buttons - **Coordinate system**, **GPS Receiver, Data Collection, Navigation Settings, File Path Settings, Color/Pattern and RS232 Device**. The options for each button are discussed in the following sections.

3.9.1 Coordinate System Options

The Coordinate system page of the **Setup** dialog box allows you to define the coordinate system for an open Job file. When you first start Field CE GIS, the default coordinate system is set to LLA/WGS84. You may have noticed that when you open a new Job file, the coordinate system is automatically set to LLA/WGS84. If you want to use UTM or the State Plane Coordinate system, simply choose **Menu/Setup/Coordinate System** to change the coordinate system. This process is described in detail in **Section 3.8.**

Please note: Changing the Coordinate System does NOT change the <u>default</u> Coordinate System of Field CE GIS. This function only affects the current Job file.
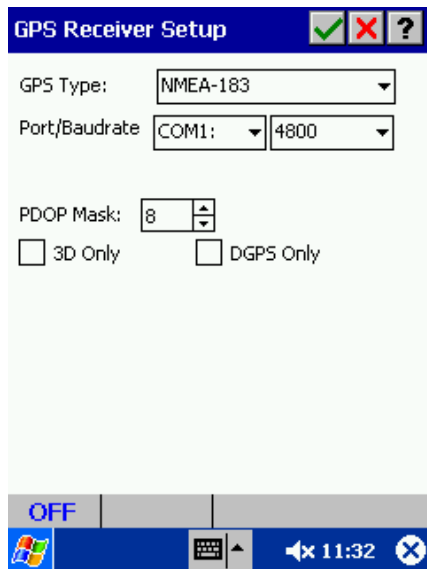
3.9.2 GPS Receiver Options

The GPS Receiver page of the **Setup** dialog box allows you to define the communications and quality settings for your GPS Receiver. After choosing **Menu/Setup/GPS Receiver**, the following screen is displayed:

GPS Type: Use the pull-down menu to select which type of GPS Receiver you will be interfacing with Field CE GIS. Unless you are using a CMT GPS data collector connected to your PDA, please select NMEA-183 as the GPS Type.

Port: Select the port in which the GPS is plugged/installed. When using a CF Port GPS card, the port selected from this screen will be the CF port. For example, on iPAQ the CF Port would be COM5: and on Panasonic 01, the CF port would be COM 2:. If interfacing GPS via RS-232, the port would be COM1:. For Bluetooth GPS, the port may be COM 7: or COM 8: (see Bluetooth Setup handout).

Baudrate: Set the speed or rate of communication between your GPS and your Mobile Device. Consult your GPS Receiver specifications to determine the correct setting to be used.

PDOP Mask: This setting is used for quality control. GPS positions that exceed the specified mask setting will not be used by Field CE GIS for navigation or position calculation. The default PDOP Mask is 8.

For more information about different GPS Receiver Setup options, please see Section 4.1.

3.9.3 RS-232 Device

External devices such as laser rangefinders and barcode scanners may be used to directly input information into Field CE. To choose settings for your external device, choose **Menu/Setup/RS232 Device**, to display the following screen:
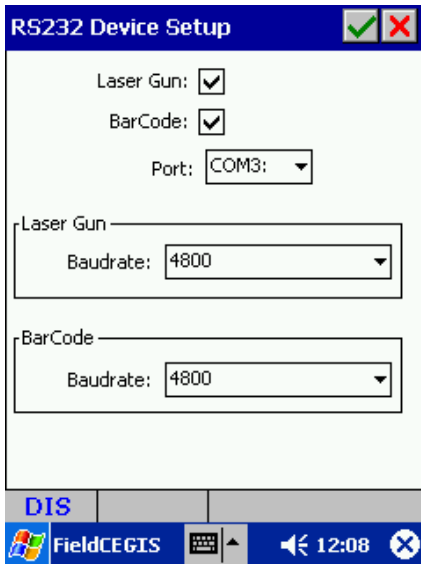
Laser Gun: Put a check mark in this box if you want to interface a laser rangefinder with Field CE GIS.

Bar Code: Put a check mark in this box if you want to interface a barcode scanner with Field CE GIS.

Port: Choose the port on your Mobile Device to connect your external device

Baudrate: Set the speed or rate of communication between your external device and Field CE GIS.

3.9.4 Data Collection Settings

The default settings for GPS Data Collection may be defined to reduce data entry time in the field. A feature list is highly recommended for this purpose (discussed in Section 4.6), but the information in this screen i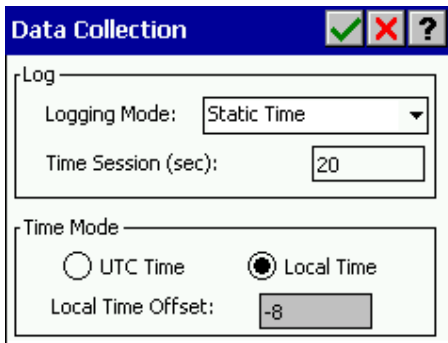s used to define defaults for data collection when a feature list is not present. After selecting **Menu/Setup/Data Collection** the following screen is displayed:

Logging Mode: Defines how the GPS data will be collected. There are three options:
a) Static Time: Logs a static feature for the specified time session.
b) Dynamic Time: Logs a dynamic feature for the specified time.
c) Dynamic Distance: Logs a dynamic feature based on the specified distance interval.

Time Session/Distance Interval: When logging mode is based on time, defines the length of time (in seconds) for the specified logging mode. When logging mode is based on distance (dynamic mode only), this option specifies the distance interval to be used.

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

Auto Save: You may change the time interval for automatic data saving. You may also turn this option off altogether.

GPS data collection is discussed in detail in Section 5.

3.9.5 Navigation Settings
Settings used for GPS Navigation can be chosen in the **Menu/Setup/Navigation Settings** screen. The following screen is displayed after choosing this option:
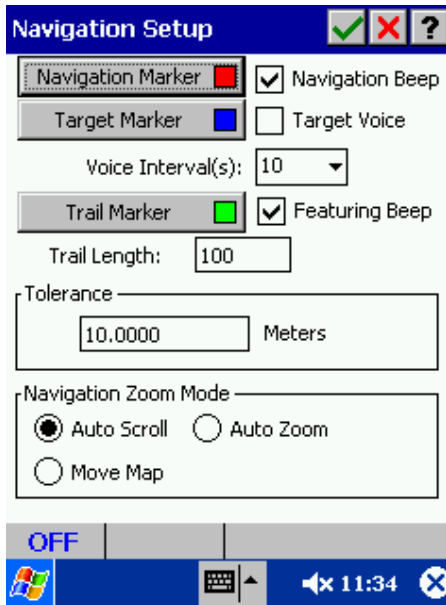
Navigation Marker: Sets the color of the maker used to identify your current position while navigating.

Target Marker: Sets the color of the marker used to identify the target during navigation.

Navigation Beep: When on, an audible beep notifies you that the GPS is calculating a position during navigation.

Target Voice: When on, an audible voice will notify you when you have arrived within the specified tolerance of the target.

Featuring Beep: When on, an audible beep notifies you that the GPS is calculating a position during feature data collection.

Tolerance: Creates a circle with radius at the specified length around the navigation target. An audible alarm will sound when the user navigates inside the tolerance area.

Auto Scroll Mode: Sets screen to automatically scroll the display when the navigation marker reaches the edge of the display during navigation. Will not change the zoom level.

Auto Zoom Mode: Automatically zooms to fit the navigation marker during navigation.

Move Map: Map will rotate so your position is always pointing up.

Navigation is introduced in Section 6.

3.9.6 File Path Settings

File storage can be set so Field CE GIS will remember where to store and access your data. Select **Menu/Setup/File Path Settings** to access the following screen:
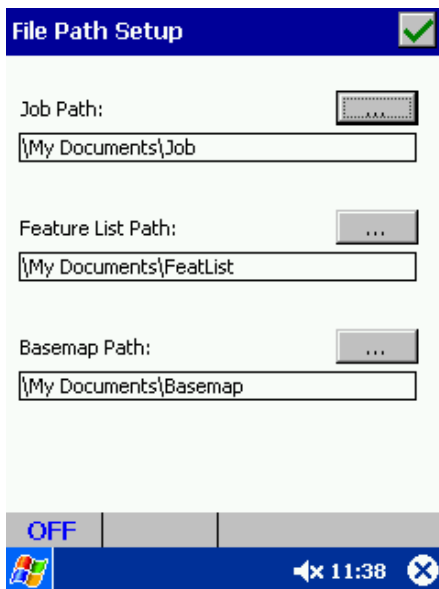
Job Path: Sets the directory path for Job files (*.PMP) to be stored and accessed.

Feature List Path: Sets the directory path for Feature List files (*.FBR) to be stored and accessed.

Basemap Path: Sets the directory path for BaseMap files (*.PBM) to be stored and accessed.

3.9.7 Color Setup

Various default color and pattern information can be changed by choosing the **Menu/Setup/Color/Pattern** option. The following screen is displayed:
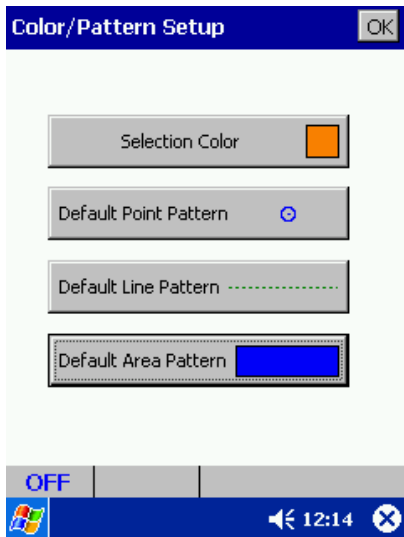
Selection Color: Used to change the default Map View selection color. When a feature on the Map View is selected, the map representation of that feature (point, line or area) will be displayed in the selection color. The default selection color is orange.

Default Point: Chooses the default symbol and color to be used for points when adding point features to your map.

Default Line: Chooses the default pattern and color to be used for lines when adding line features to your map.

Default Area: Chooses the default color to be used for areas when adding area features to your map.
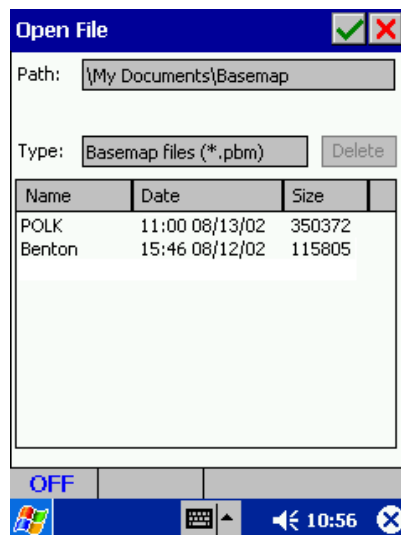
3.10 BaseMaps

Field CE GIS comes with the ability to display BaseMap information. The BaseMap data contains useful background information such as: roads, hydrology, points of interest, city/county boundaries, etc. BaseMaps to be used in Field CE GIS must be created using the PC-GIS software provided with Field CE GIS. Portions of an entire county BaseMap may be created and transferred to your Mobile Device for use with Field CE GIS. Please refer to the help found in the PC-GPS or PC-GIS software for information on creating and transferring BaseMap files to Field CE GIS.

Once the BaseMap has been transferred to Field CE GIS, it is ready to be loaded into your Map View to assist in navigation or data collection. BaseMaps may be either loaded with a job or loaded separately.

Steps for loading a BaseMap with a Job:

1. Load the job by choosing **Menu/Current Job.** Select the job from the list and choose ✓.
2. Load the BaseMap by choosing **Menu/Load BaseMap**. After choosing this option, the following screen is displayed:

3. Select one of the BaseMaps in the list by clicking on it once so it is highlighted in blue, and then choose ✅.
4. The BaseMap will be loaded and displayed along with your current job. After the BaseMap is loaded, it may be toggled ON and OFF using the "Display BaseMap" button 🔳.

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-GPS software or PC-GIS software that was used to create the BaseMap and make sure the BaseMap is large enough to cover the Job data.

3.11 Background Maps and Image Data

Field CE GIS comes with the ability to display background maps (in .PMP format) and geo-referenced imagery (in .PIM format).
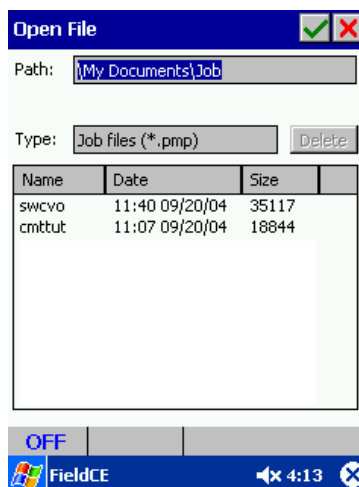
3.11.1 Background Maps

The background map can be used as a backdrop for your current job to help identify locations of features to be mapped and to easily see which features have been mapped in previous jobs.

The background map to be loaded must be in .PMP format and, once loaded, will be treated as an image or a "picture" of the map in the background. Features contained in the background map may not be selected to obtain feature properties. However, you may specify the layering order and turn on/off specific topics for viewing that are contained in the background map.

Steps for loading a background map (PMP file) with a Job:

1. Load the job by choosing **Menu/Current Job.** Select the job from the list and choose ✅.
2. Load the background map by choosing **Menu/Background Map/Load PMP**. After choosing this option, the following screen is displayed:

3. Select one of the Jobs in the list by clicking on it once so it is highlighted in blue, then choose ✅ to accept the selection.

4. The Job will be loaded and displayed in the background along with your current job. After the background map is loaded, it may be toggled ON and OFF using the **Menu/Background Map/Show** option. If there is a check mark next to the word "Show", this means that the background map is currently ON.

Background maps to be used in Field CE GIS may originate as a previously collected job on the Field CE GIS software. Therefore, the job is already in the .PMP format. You may also create background maps using the PC-GIS software provided with Field CE GIS. Current versions of PC-GPS or PC-Mapper software are also capable of saving data to the .PMP format. Please refer to the help found in the PC-GPS or PC-GIS software for information on saving files in the .PMP format and transferring data to your Mobile Device. Once background map has been transferred to Field CE GIS, it is ready to be loaded into your Map View to assist in navigation or data collection. Background maps may be either loaded with a job or loaded separately.

3.11.2 Using images in Field CE GIS

Field CE GIS also comes with the ability to display geo-referenced images (in .PIM format) in the background. The image can also be used as a backdrop for your current job to help identify locations of features to be mapped and to easily see prominent features in the image. Images may also be used to "digitize" new features without using a GPS receiver to capture the location.

The images to be loaded must be in .PIM format and, once loaded, will be displayed behind the current job data. Image data may be used in conjunction with background maps. You may specify the layering order between any images and background maps and turn on/off specific topics for viewing that are contained in the background map (see Section 3.11.3).

Images to be used in Field CE GIS must be prepared and converted using the PC-GIS software provided with Field CE GIS. You may also use current versions of PC-GPS software or PC-Mapper software for the image conversion. Supported image formats for the PC software include: Geo-referenced Tiff format (Geotiff) and also the MRSID® format images.

Entire images or portions of the image may be clipped, converted and transferred to your Mobile Device for use with Field CE GIS. 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 or PC-GIS software for information on creating and transferring image files (*.PIM format) to Field CE GIS. Once the image has been transferred to Field CE GIS, it is ready to be loaded into your Map View to assist in navigation or data collection. Background maps and images may be either loaded with a job or loaded separately.

3.11.3 Changing the layering order of background maps or images

The order in which the background maps and images are displayed may easily be changed in Field CE GIS. This employs the same concept as topics contained in a Job. Topics listed first will be displayed on top of the other layers.

To change the ordering of the topics, select **Menu/Background Map/Browse Topics**. The following screen is displayed and is very similar to the "Browse Jobs" screen discussed earlier in Section 2:
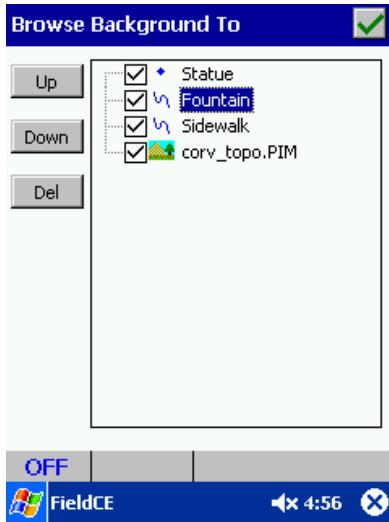
Up: Move the highlighted topic up one position.

Down: Move the highlighted topic down one position.

Del: Delete the highlighted topic.

In addition to rearranging the topic order, individual topics may be turned ON/OFF using the check mark listed next to each topic name. For reference, the topic types are indicated with a symbol next to the topic name. As mentioned in Section 2, it is recommended to list point topics first, followed by lines, areas and then images.

Please note: Individual features contained within each topic may not be turned ON/OFF; only the entire topic may be turned ON/OFF. Patterns and colors of the background maps cannot be changed.

3.12 Obtaining measurements from the Map View

Field CE GIS comes standard with tools for distance measurement and area measurement. Volume measurements are also available in Field CE GIS. The **Measure** icon is located on the Tool Bar. By default, the Measure Area icon ⬚▾ is displayed. To select another measurement type, first click on the pull-down arrow by this icon then select the desired option.

3.12.1 Measure Distance function

The Measure Distance function can be used 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 lower portion of the Map View.

To get a distance measurement, click in the Map View once at the beginning of the desired distance measurement and once at the end of the desired measurement. The distance information will be displayed under the "Current Segment" portion of the dialog. To hide the distance information, simply click the Measure Distance icon again to turn it off.

The measure distance dialog is defined:

> **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 units of measurement (e.g. M = meters)

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

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

3.12.2 Measure Area function

The Measure Area icon can be used to get area and perimeter measurements in the Map View by clicking on an area feature in the Map View. If you select a Line Feature for this function, then it will be considered an open area. To hide the area information, simply click the Measure Area icon again to turn it off.

 To get an area measurement, click on the area feature of interest in the Map View once. The area and perimeter information will be displayed in the dialog.

Length: Displays length of currently selected line feature or circumference of currently selected area feature.

Area: Displays area of currently selected area feature.

Please note: Area measurements are displayed in the current unit of measurement for the map. To get area measurements in acres and square feet, change the units of measurement to "US Feet" under the **Menu/Setup/Coordinate** System window.

3.12.3 Measure Volume function

The Measure Volume function can be used to get volume measurements in the Map View by clicking on a line or area feature in the Map View.

To get a volume measurement, select the target feature using the button to click on a feature in the Map View or the button to select the feature from a textual list. Once the desired feature has been selected, the feature name will appear in the "Boundary Feature" box as shown below:

Select the appropriate method for defining the base height:

-Choose "Constant" if the volume is to be calculated from a flat plane of a specified elevation.
-Choose "Base DTM" to use elevations obtained from other features that fall within the area boundary.
-Choose "Ramp" to define the X,Y and Z coordinates of three known positions to define an inclined plane that will be used for the base height.

Once you have completed the necessary parameters, click on the button to calculate the volume.

Please note: The volume measurements are estimates only. The PC-Mapper software computes volume measurements more accurately. For best results, use ALTO-G12, HP-GPS-L4 or CMT-Z33 to collect point location data with elevations to be used for the volume calculation.

Also note: Volumes are displayed in the current unit of measurement for the map. To get volume measurements in a different unit of measurement, change the units under the **Menu/Setup/Coordinate** System window.

Section 4 - Working with the GPS—Preparing to Collect Data

Field CE GIS allows you to use GPS for both data collection and navigation. This section deals with GPS Receiver Setup, Job Setup, Data Collection, Feature Lists, and Navigation.

4.1 GPS Receiver Setup

Field CE GIS can accept NMEA-0183 input from any compatible GPS receiver. Communications and quality settings for your GPS Receiver may be specified by selecting **Menu/Setup/GPS Receiver.** The following screen is displayed:
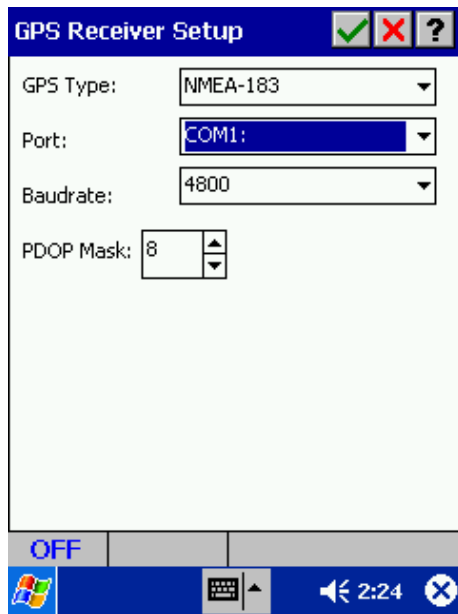
GPS Type: Use the pull-down menu to select which type of GPS Receiver you will be interfacing with Field CE GIS. Unless you are using a CMT GPS data collector connected to your PDA, please select NMEA-183 as the GPS Type.

Port: Select the port in which the GPS is plugged/installed. When using a CF Port GPS card, the port selected from this screen will be the CF port. If using a CMT GPS unit (e.g. MARCH, MC-GPS, HP-GPS-L4) the COM port will automatically be set to COM1:. If using a Bluetooth GPS, see section 4.1.1. If using a built-in GPS receiver, enter the port assigned to the built-in GPS.

Baudrate: Sets the speed or rate of communication between your GPS and your Mobile Device. Consult your GPS Receiver specifications to determine the correct setting to be used. For most NMEA GPS receivers, the baud rate is 4800.

PDOP Mask: This setting is used for quality control. Field CE GIS will not use GPS positions that exceed the specified mask setting for navigation or position calculation. The default PDOP Mask is 8.

Other fields may be displayed when selecting different GPS receivers, e.g. settings that will assist in GPS Initialization (Lat., Lon. and Elevation) as well as Real-Time correction.

4.1.1 Bluetooth GPS receiver setup and troubleshooting

Bluetooth Setting for WidComm Stack

1. Go to the Start screen.

2. Turn on Bluetooth
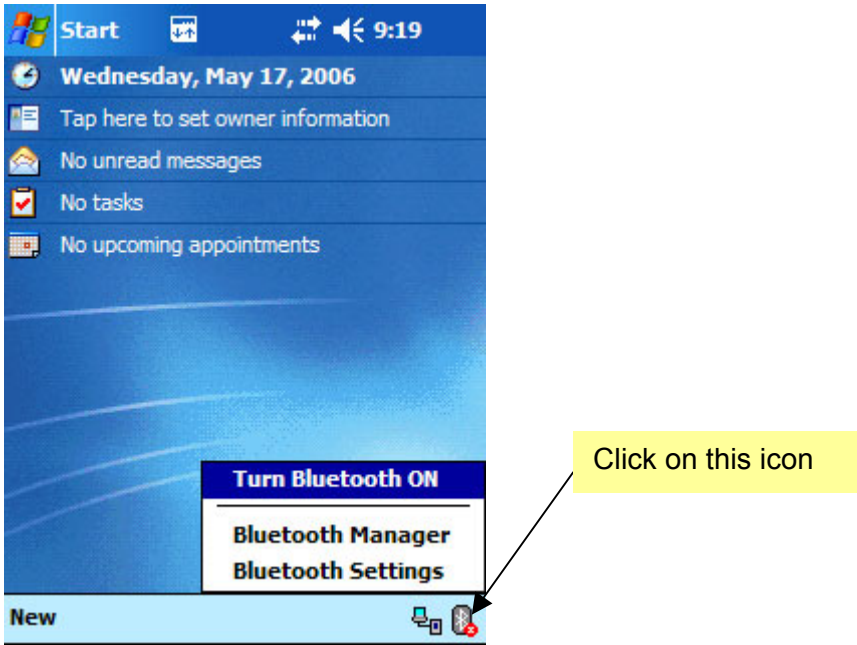
Click on this icon

3. Bluetooth Manager

Tap New to access other devices via Bluetooth

Click on this Icon to find a Bluetooth

4. Connection Wizard

Select this item then click on
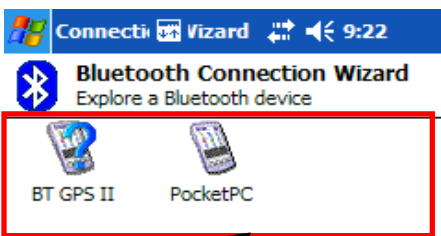
Select your Bluetooth device then click

Bluetooth
Authentication

Device: BT GPS II

Passkey: ****

Cancel

— **How to use this screen** —

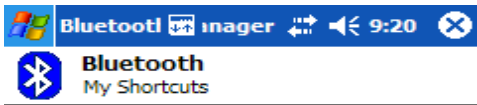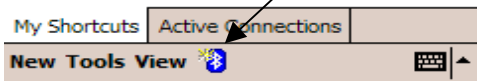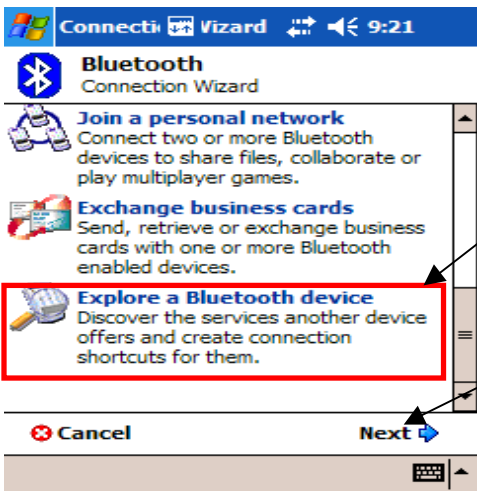The Bluetooth pairing procedure establishes a secret key that is used in all future connections to authenticate

123	1	2	3	4	5	6	7	8	9	0	-	=	←
Tab	q	w	e	r	t	y	u	i	o	p	[	]	
CAP	a	s	d	f	g	h	j	k	l	;	'	
Shift	z	x	c	v	b	n	m	,	.	/	↵	
Ctl	áü	`	\					↓	↑	←	→

Enter the Pin Code and click "**Enter**" key when finished

Bluetooth Connection Wizard
Explore a Bluetooth device

BT GPS II
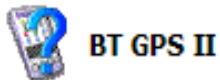
— **Service Selection** —

SPP slave

Please select the service(s) offered by this device you would like to create connection shortcuts for.

— **Security** —

☐ Use a secure, encrypted connection

❌ Cancel   ◀ Back   Next ▶

Select "**SPP slave**" then click on "**Next**"

Click on "**Finish**" to exit wizard

5. Connect to your Bluetooth device
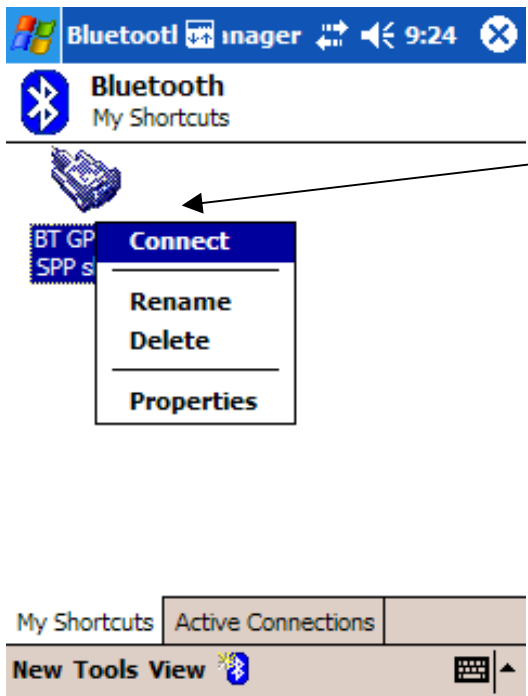
Double click on your Bluetooth device or Tap on it and hold for a while, select "**Connect**" from the popup menu.

Bluetooth

Bluetooth
My Shortcuts

BT GPS II:
SPP slave
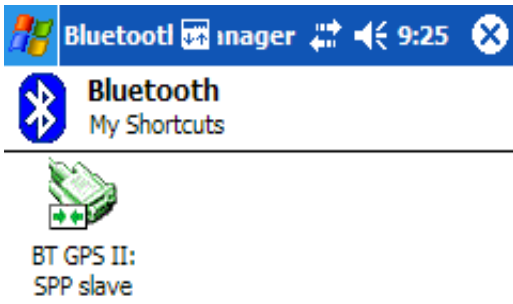
Click on "**X**" to exit Bluetooth Manager.
Now you can run Field software to use the Bluetooth device

My Shortcuts | Active Connections

New Tools View

6. Select your Bluetooth device from GPS Receiver Setup on Field software.
   It should work now.

GPS Receiver Setup

GPS Type: NMEA-183

Port: Serial Cable on COM1:

Baudrate: Serial Cable on COM1:
USB Cable:
COM3:
PDOP Mask: BT GPS II: SPP slave

☐ 3D Only   ☐ DGPS Only
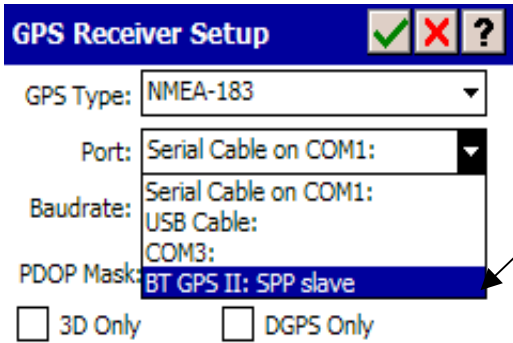
Select your Bluetooth device.
The same name as it in Bluetooth Manager.

Bluet OFF

FieldCESurve   10:48

1. Start

Click on this icon

2. Turn on Bluetooth

Select "**Mode**" page and check on the "**Turn on Bluetooth**".
Then, select "**Devices**" page.

3. Find Bluetooth Device

Click on "**New Partnership…**" to find your Bluetooth device
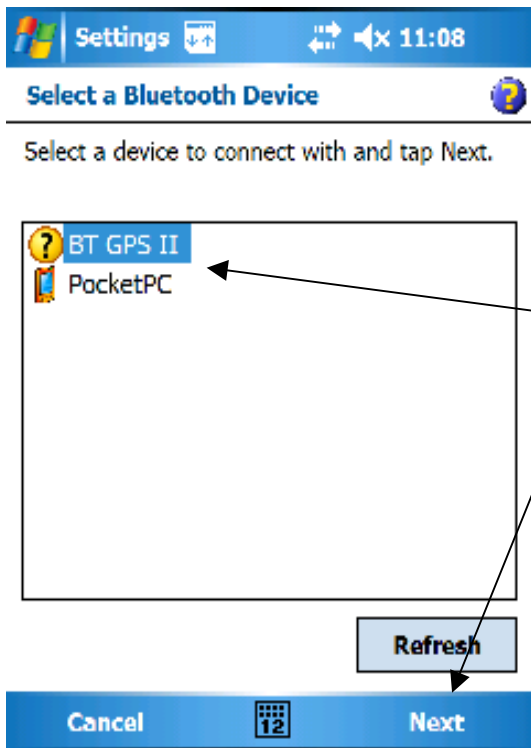
Select your Bluetooth device then click on "**Next**".

Enter the Pin Code then click on "**Next**"

Check on "**Serial Port**" then click on "**Finish**"

4. Set the Outgoing Port
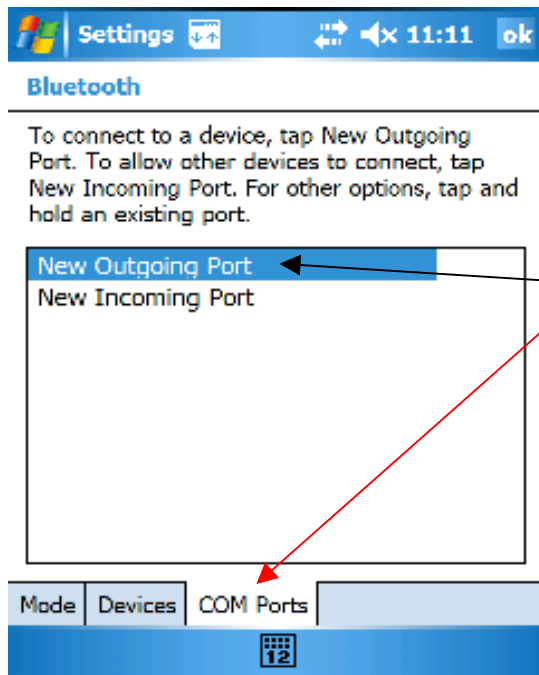
a. Select "**COM Ports**" page.
b. Click on "**New Outgoing Port**"
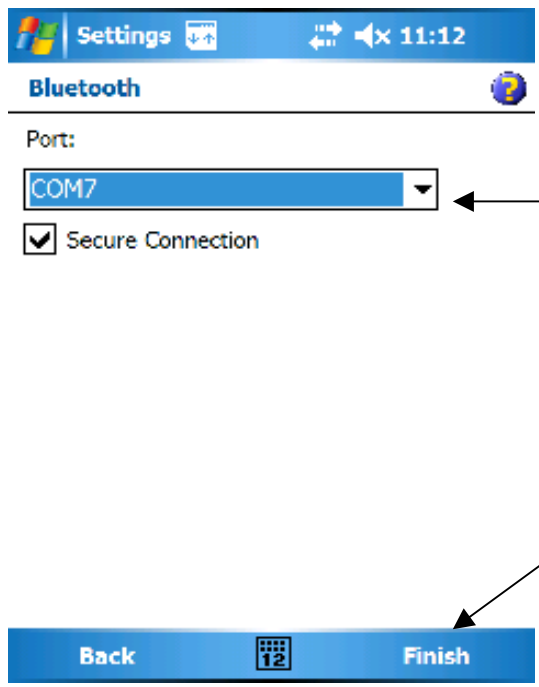
Select COM port then click on "**Finish**".
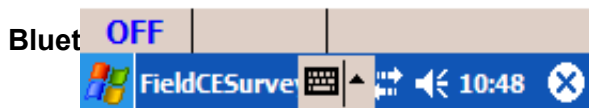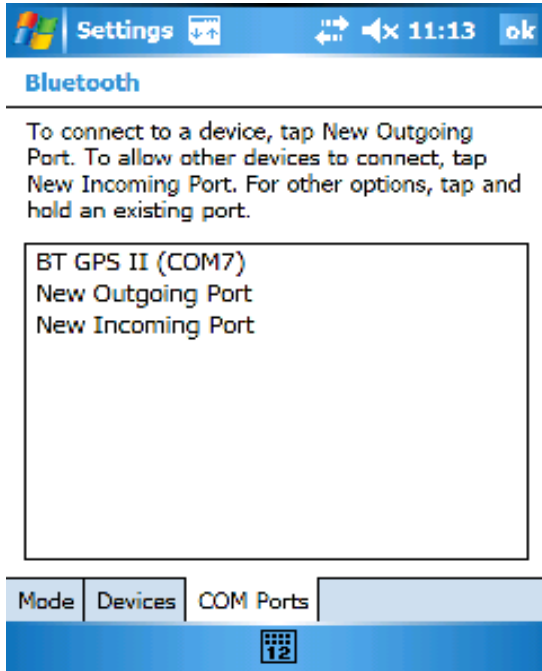
Click on "**ok**" to exit setting.
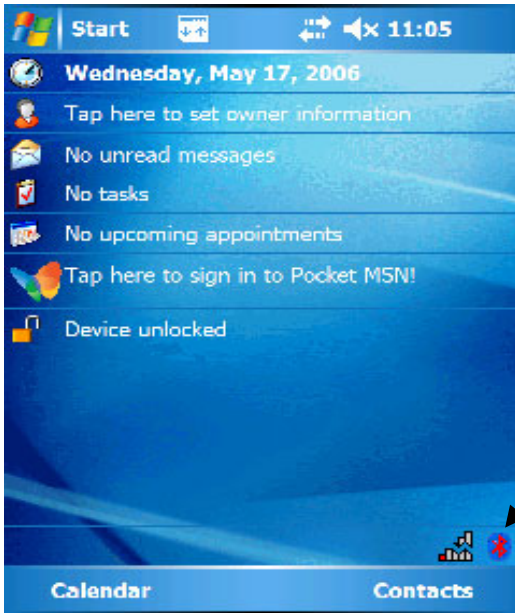Now you can run Field software to use the Bluetooth device

5. Select your Bluetooth device from GPS Receiver Setup on Field software. It should work now.

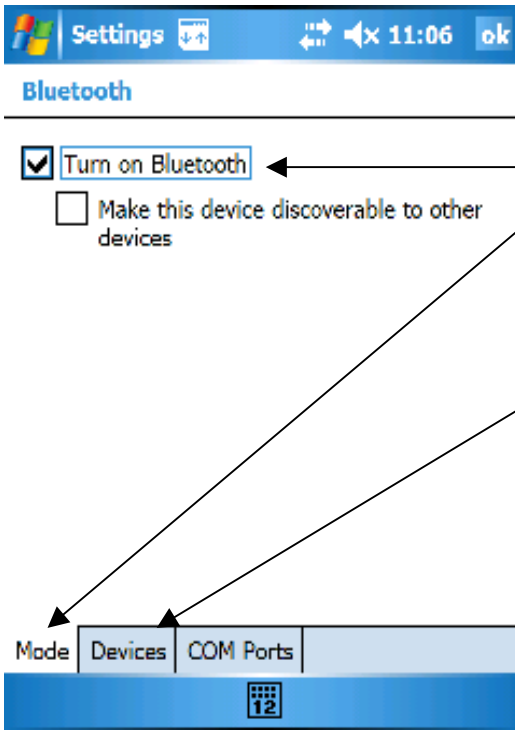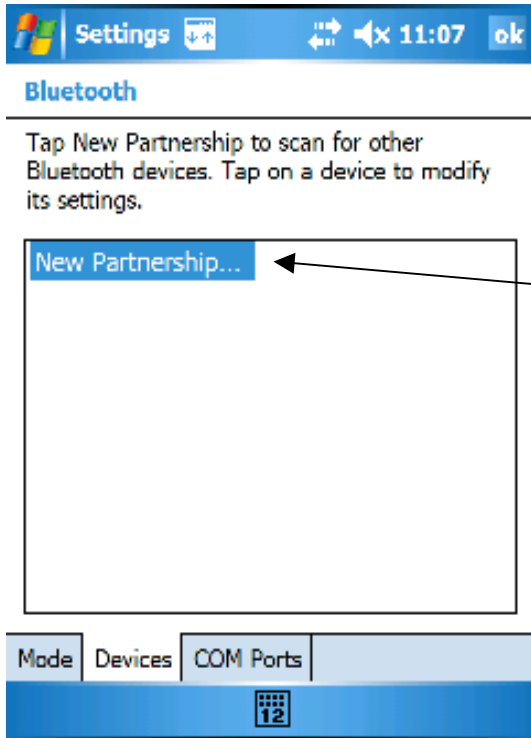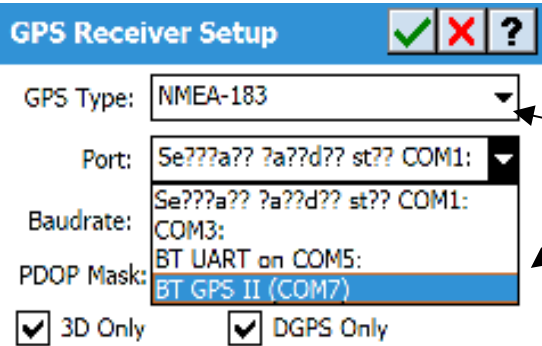Select your Bluetooth device. The same name as it in Bluetooth Settings

To set up Bluetooth connection between the **BT-GPS II Bluetooth-enabled GPS Receiver** and a Dell AXIM or HP iPAQ PDA running **PocketPC 2003**, follow the procedures **A and B** below.

To set up Bluetooth connection between the BT-GPS II Bluetooth-enabled GPS Receiver and an HP iPAQ PDA with **PocketPC 2002**, follow the procedures **A and C** below.

A. Set up the Bluetooth GPS Receiver

1. Turn on the GPS receiver. The BT-GPS II has a Bluetooth LED, a GPS LED and a Battery LED indicator.

2. Make sure there is adequate power in the GPS receiver. The Battery LED of the BT-GPS II would show a GREEN color. If the Battery LED turns RED, you should recharge the BT-GPS II for 5 hours or more. The Battery LED shows an ORANGE color while the GPS receiver is being charged.

3. The GPS LED should show a GREEN color, indicating that it is active. This LED will blink once every second when the GPS position is fixed.

4. The first time you set up the BT-GPS II to use with a master Bluetooth-enabled PDA, push the PAIR button to make the BT-GPS II available for pairing. The Bluetooth LED will blink rapidly while waiting to be paired. Follow the procedure below to make the PDA search for a device to pair with.

   The Bluetooth LED will be a solid BLUE when the GPS Receiver has been properly paired with a Bluetooth-enabled PDA and is communicating with the latter. If the GPS Receiver has been paired with a Bluetooth device, but the master PDA is not active, the Bluetooth LED will blink slowly while waiting for the PDA to communicate with it.

5. At any given time, the Bluetooth GPS Receiver may only be paired with one master PDA.

   To prepare the Bluetooth GPS Receiver for pairing with a different PDA, follow these steps:
   1) Turn off the Bluetooth GPS Receiver.
   2) Turn on the Bluetooth GPS Receiver.
   3) Press the PAIR button.

B. Set up Bluetooth Connection on a Dell AXIM or HP iPAQ PDA running PocketPC 2003

1. Tap the **Bluetooth** icon at the lower-right corner of the Today screen. If you see "Turn Bluetooth ON", then tap this item to turn on Bluetooth.

2. Select **Bluetooth Manager**.

3. The "My Shortcuts" page lists the shortcuts to previously established Bluetooth connections. To establish a new Bluetooth connection, tap **Active Connections** then tap **New**.

4. Select **Explore a Bluetooth Device**.

5. Tap the BT-GPS icon.
   (You may need to tap and hold on this screen and then tap **Refresh** to see all the currently available Bluetooth devices.)
6. Select the **SPP slave** service for the BT-GPS.

7. Tap **Finish**. The **BT-GPS: SPP slave** connection is created.

8. Tap and hold the **BT-GPS: SPP slave** connection shortcut, then tap **Connect**.

9. When prompted for a Passkey, enter "**0000**". The Bluetooth LED should be a solid BLUE.

10. Run Field CE GIS. Please make sure the Bluetooth connection has been successfully established with the GPS Receiver before starting Field CE GIS. Then follow these steps to set up the communications link with the GPS receiver.

1) Select Setup then select GPS receiver.
2) Select NMEA-183.
3) Select **COM7:** for the Dell AXIM PDA or **COM6:** for the HP iPAQ PDA.
4) Any baud rate will work for this virtual port.
5) Tap on the green check mark to confirm the setup.

If the Bluetooth GPS receiver has been set up properly and is active, you should see the engine tracking status displayed at the lower-left corner of the screen within a few seconds.

C. Set up Bluetooth on a HP iPAQ PDA with PocketPC 2002

1. Tap the **Bluetooth** icon at the lower-right corner of the start-up screen. If the "Wireless" item has not yet been turned on, then tap on it to turn on Bluetooth.

2. Select **Bluetooth Manager**.

3. The shortcuts to any previously established Bluetooth connections will be displayed.
   To establish a new Bluetooth connection, tap the **Search** button to look for available Bluetooth devices.

4. Select the BT-GPS and tap the **Store** button to save this device in the shortcut list. You may save the shortcut to the desired group. Tap OK.

5. Tap the BT-GPS shortcut icon twice.

6. When prompted for a Passkey, enter "**0000**".

7. If the SPP service is found, tap the **Action** button then select "Connect to **SPP slave**".
   Upon successful connection, the Bluetooth LED becomes a solid BLUE.

8. Run the Field CE GIS. Please make sure the Bluetooth connection has been successfully established with the GPS Receiver before starting Field CE GIS. Then follow these steps to set up the communications link with the GPS receiver.

   1) Select Setup then select GPS receiver.
   2) Select NMEA-183 and **COM8:**. The baud rate does not matter in this case.
   3) Tap on the green check mark to confirm the setup.

   If the Bluetooth GPS receiver has been set up properly and is active, you should see the engine tracking status displayed at the lower-left corner of the screen within a few seconds.

D. Troubleshooting the Bluetooth Connection

1. Bluetooth LED on the GPS Receiver is off.

Turn off the power on the GPS Receiver then turn it back on.
If the Bluetooth LED still does not turn on after several attempts, it may be broken.

2. Bluetooth LED continues to blink rapidly.

This means the selected connection shortcut does not work with the selected Bluetooth GPS Receiver. There are three possibilities:

a) The Bluetooth GPS had been paired with another master device before. You can reset the pairing by pressing the **PAIR** switch on the Bluetooth GPS. If the Bluetooth GPS becomes "locked" for any reason, turn off its power then turn it on again; then press the PAIR switch.

b) The shortcut was set up for another Bluetooth device. In this case, you should create a new shortcut. To avoid confusion, it is better to first delete the old shortcut by tapping and holding down the stylus at the old shortcut then selecting the **Delete** function. For the AXIM PDA, also remove the old pairing by selecting the "Tool" button then selecting "Paired devices". (Remember to tap and hold on this screen and then tap **Refresh** to see what Bluetooth devices are actually available at this moment.)

c) The Bluetooth GPS is in a "locked" state. Please see Item 3.

3. Bluetooth GPS is in a "locked" state.

Following are some indications that the Bluetooth GPS may be in a "locked" state:

a) The Bluetooth LED is off even when the GPS Receiver power is on.

b) The Bluetooth LED is a solid BLUE even when no master device is connected with it.

c) Bluetooth LED blinks rapidly but does not permit pairing connection to be made.

To solve this problem, turn off the power then turn it back on. Sometimes it is necessary to press the PAIR switch to abandon the old pairing and form a new connection.

4. Bluetooth connection was established before but you still get prompted for the passkey.

The original pairing information may have been lost. Please depress the pairing switch to abandon the old pairing and form a new connection. To avoid confusion, it is better to first delete the old shortcut by tapping and holding down the stylus at the old shortcut then selecting the **Delete** function. For the AXIM PDA, also remove the old pairing by selecting the "Tool" button then selecting "Paired devices". (Remember to tap and hold on this screen and then tap **Refresh** to see what Bluetooth devices are actually available at this moment.)

5. More than one Bluetooth GPS with the same type and name are used in the same area.

How do you select the appropriate device in the "search" list If more than one Bluetooth GPS with the same type and name are used within an organization? The best way is to setup the Bluetooth pair one-by-one.

1) Affix labels on the slave and master device pair.

2) Turn on the power only for the pair of Bluetooth GPS Receiver and PDA you are setting up. To avoid confusion, do not set up more than one pair at same time.

3) Follow the above instructions to establish the connection between the GPS Receiver and the PDA after deleting the existing connections.

4) Turn off both the GPS Receiver and the PDA.

5) Repeat the procedure for the second pair of devices.

6) After all pairs have been set up, each pair will be able to work independently at the same time. They will be able to find each other even after they are turned off then on.

6. How to create shortcuts for multiple GPS Receivers with the same type and name

You may set up your PDA to use one of a number of available Bluetooth GPS Receivers.

1) Label each GPS Receiver with a unique ID.

2) Clear the shortcuts and pairing information.

3) Create the first shortcut for the first GPS Receiver.

4) Connect to the GPS Receiver and make sure the Bluetooth LED is a solid BLUE.

5) Disconnect the GPS Receiver then **rename** the shortcut with its ID.

6) Create the second shortcut for the second GPS Receiver.
Do not select the connection icon showing a check mark by it. That connection is already assigned to the first shortcut.

7) Connect to the GPS Receiver and make sure it works.

8) Disconnect the second GPS Receiver then **rename** the shortcut with its ID.

9) Repeat the process for any additional GPS Receiver to be used with the same PDA.

10) To use any of these GPS Receivers, simply select the appropriate shortcut and issue the connection command.

7. **Field CE GIS displays "DIS" as the GPS status for the BT-GPS.**

If you see the disconnection status "DIS", choose "Retry". If the problem persists,
select "NO retry" for the connection then select Menu/Exit to close the Field CE GIS software.
Turn off the BT-GPS then repeat above steps A and B (for Dell AXIM and HP iPAQ PDA running PocketPC 2003) or Steps A and C (for HP iPAQ PDA with PocketPC 2002).

4.2 Turning ON the GPS receiver

When you first start Field CE GIS, the GPS receiver is automatically turned on. You can manually turn the GPS receiver on and off by selecting **Menu/GPS ON** to turn the GPS on or **Menu/GPS OFF** to turn the GPS receiver off.

4.3 Tracking Status Indicator

The Tracking Status Indicator will be displayed in the lower-left hand corner of Field CE GIS in the Status Bar. The Tracking Status Indicator gives you an idea of the quality of the constellation of the satellites being tracked by the GPS receiver.

The Tracking Status Indicator is updated frequently and displays the following status information:

???   The GPS receiver is in an unknown state for a brief period of time.

DIS: Disconnected   The GPS receiver is not being recognized by Field CE GIS. Make sure the settings are correct under Menu/Setup/GPS Receiver Setup.

ACQ: Satellite ACQuisition The GPS receiver is acquiring signals from one or more satellites.

TRK: TRacKing   The GPS receiver is tracking at least one satellite.

N2D: Navigating in 2D   The GPS receiver is navigating in 2D and is tracking at least 3 satellites. The altitude value used will depend on your selection in the ALT. CONTROL field of the SETUP RECEIVER screen.

N3D: Navigating in 3D   The GPS receiver is navigating in 3D and tracking 4 or more satellites.

F2D: Featuring in 2D   Field CE GIS is logging 2D feature data.

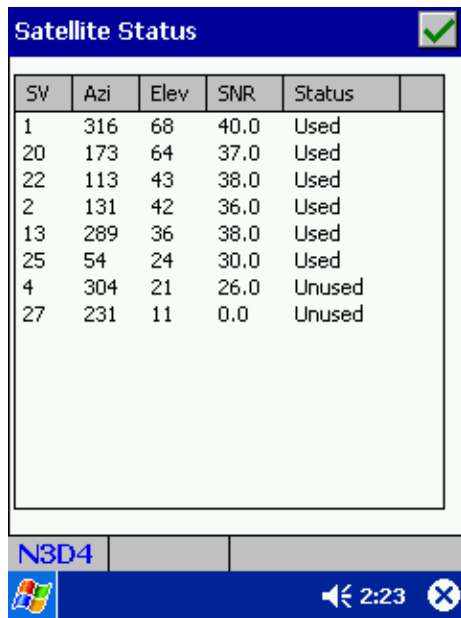**F3D**: Featuring in 3D   Field CE GIS is logging 3D feature data.

When Field CE GIS are navigating or logging data, the Tracking Status Indicator will display the current PDOP (Position Dilution of Precision) as the last character. PDOP values are displayed to the nearest

whole number. For example, **"N3D4" means the GPS receiver is navigating in 3D and tracking 4 or more satellites, and the PDOP is 4.**

If you are using RTCM correction or WAAS correction to receive GPS correction data, the "D" in the Tracking Status Indicator will become a "C" when the RTCM message is being received and used by the GPS receiver.

4.4 Satellite Information

Use the following method to view information about the status of the satellites being tracked by the GPS receiver. **The SV STATUS screen will display only if the GPS receiver is turned on.** Select **Menu/Satellite Info** and the following screen is displayed:

Satellite Status					✓
SV	Azi	Elev	SNR	Status	
1	316	68	40.0	Used	
20	173	64	37.0	Used	
22	113	43	38.0	Used	
2	131	42	36.0	Used	
13	289	36	38.0	Used	
25	54	24	30.0	Used	
4	304	21	26.0	Unused	
27	231	11	0.0	Unused	

N3D4   ◀€ 2:23 ⊗

SV: Identification number of the GPS satellite being tracked on that channel.

Azi: Shows the direction of each satellite from North (azimuth).

Elev: Shows the elevation (in degrees) of the satellite above the horizon.

SNR: Signal-to-noise ratio level of the satellite indicates how strong the signal is from each satellite. Low signal strength can be due to a faulty connection with the antenna or blockage between clear sky and the antenna.

Status: Current state of the satellite as it pertains to the position calculation. The satellite is either being tracked or used in the position calculation or it is unused.

All data on the screen is updated once per second.

4.5 Current Position Information

While you are actively logging data or navigating, you may display your GPS position as it is updated once a second. Information about your current location and quality of the GPS position can be obtained by selecting **Menu/Position Info**. All of the information shown on this screen is for display only. The coordinates displayed are those most recently computed by the GPS receiver. The following dialog is displayed:

Latitude: Current latitude is displayed of the last computed position in Degrees, Minutes and Seconds.

Longitude: Current longitude is displayed of the last computed position in Degrees, Minutes and Seconds.

Altitude: Current elevation is displayed in height above Mean Sea Level (MSL). The units shown depend on the selection made for the UNITS field in the Setup/Coordinate System screen.
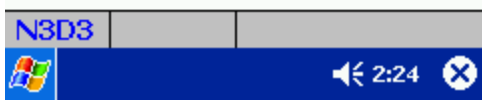
HDOP: Current HDOP value.

VDOP: Current VDOP value.

PDOP: Current PDOP value.

 # SAT Visible: The number of GPS satellites visible to the GPS receiver. In some cases, this number may not match # SAT Tracked.

 # SAT Tracked: The number of GPS satellites being tracked and used to compute a position.

4.6 Feature Lists, Attributes and Values

A Feature List is a file listing the features, attributes, and values, which can be used to describe the GPS positions, collected by the GPS receiver.   Each GPS position can be described by a feature name as well as attributes and values.

Feature	An identifying name for the position - Examples: Tree, Road, Field, etc…
Attribute	A characteristic of the feature- Examples: Species, Name, Type, etc…
Value	A specific description of the attribute - Examples: Oak, Fir, Maple, etc…

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 logging.**

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 field.

Feature lists can be created in PC-GPS or PC-Mapper and downloaded to Field CE GIS. Feature Lists can also be created within Field CE GIS. The file created by the Feature List function has the file extension .FBR.

Field CE GIS gives you the capability of storing a large number of Feature Lists for use with different GPS Jobs.

When you set up a new Job, you may specify a Feature List to be associated with it (Section 4.7). The Feature List serves as a "look-up" table that makes it very easy to attach descriptions to the GPS position information you collect.

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

4.6.1 Maintaining Feature Lists

Creating a new Feature List

To create a new Feature List, select **Menu/Feature List**. The following screen is displayed:
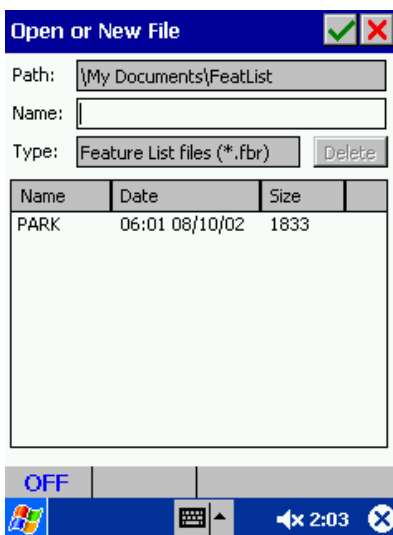
Name your Feature List in the dialog window by typing the name of your Feature List in the "Name:" box. Enter up to eight characters or digits as a name for the Feature List. Field CE GIS will reject duplicate Feature List file names or names containing a slash "/". Press ✓ to create your Feature List file.
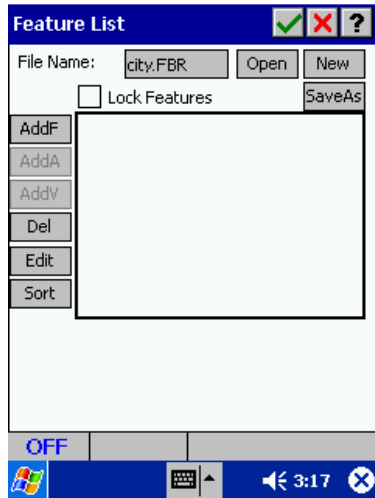
The EDIT Feature List screen will be displayed. The EDIT Feature List screen is described in the following subsection.
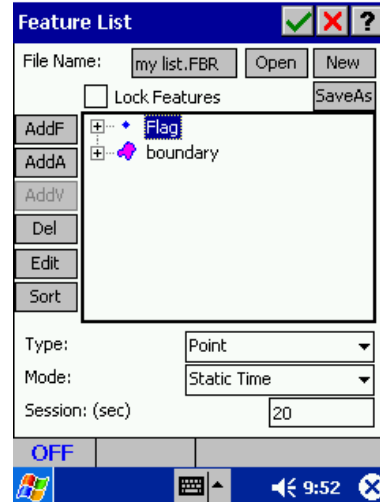
Editing a Feature List

The EDIT Feature List screen is displayed when you highlight an existing Feature List and press ✓, or after you select "NEW" and enter a new file name and press ✓.

Editing a new feature list   Editing an existing feature list

Field Descriptions:

File Name: This is the name of the selected Feature List. This field is for display only.

Open: This will display the "Open Feature List" dialog window to select a different Feature List.

New: This button will display the "New File" dialog to create a new Feature List file.

Save As: Saves changes to the selected Feature List by saving to an existing Feature List file (select one from the list) or by typing in a new file name.

Lock Features: Toggle a check mark in this field to if you would like Field CE GIS to error-check feature names. This will force you to select a feature from the Feature list for tagging GPS data. While feature error-checking is active, feature names can not be manually entered. However, you may assign a different data logging time parameter to the feature you entered. The default is no error-checking.

AddF: Adds a feature topic to the Feature List. After pressing this button, a "new" feature will be added. For Feature Lists already containing feature topics the new feature topic will be inserted below the currently selected feature. Up to **15** characters may be entered for each feature topic name. When adding a new feature, the feature type, mode and session can be entered at the bottom of the screen.

AddA: Adds an attribute to the selected feature topic. This button is only active when the Feature List contains features.

AddV: Adds a value to the selected attribute. This button is only active when the selected feature contains an attribute.

Del: Deletes the selected feature topic, attribute or value.

Edit: Activates the editing function for the name of the selected feature topic, attribute or value.

Sort: Sorts the selected item alphabetically. To sort feature topics, click on one of the feature topics so it is selected and then click on the sort button. To sort the attributes for a specific feature, click on one of the attributes listed under that feature and then click on the sort button. To sort the values for a specific attribute, click on one of the values listed under that attribute and then click on the sort button.

If an existing feature list is opened, there will be additional information about the highlighted feature at the bottom of the screen:

Type: This field describes the type of feature. The available options are: point, line or area.

Mode: This field defines the mode of data logging to be performed for the associated feature. The data logging mode defined for each feature overrides that specified in the global default Data Logging settings (Section 3.9). The options are:

-STATIC TIME mode; default for point features
-DYNAMIC TIME mode
-DYNAMIC DISTANCE mode (Field CE GIS only)

Line and area features may be collected in Static or Dynamic mode. Point features are always Static. In Dynamic mode, GPS fixes for the feature are taken while the GPS receiver is moving. In Static mode, GPS fixes for the feature are taken while the GPS receiver is stationary.

Session/Time Interval: This field defines an important parameter for the data collection session. For STATIC mode data logging, enter the number of position Fixes to be recorded at each point feature. For DYNAMIC TIME mode data logging, specify the time interval between successive position fixes as you move along a line or the perimeter of an area feature. The session parameter defined for each feature overrides the setting specified in the global default Data Logging settings (Section 3.9).

Distance: For DYNAMIC DISTANCE mode data logging (Field CE GIS only), specify the distance interval between successive position fixes as you move along a line or the perimeter of an area feature. The distance parameter defined for each feature overrides the setting specified in the global default Data Logging settings (Section 3.9).

Common Operations:

To edit a feature in a Feature List: move to the field to be changed, then press the edit button and type over the existing information. **Press** ✅ **if you wish to save the changes in this screen.**

To append a new feature to the Feature List: move the cursor to the last feature in the Feature List, then press the "AddF" button. This adds a new blank feature to the list, on which you may define the new feature.
To delete a feature, simply highlight it and then press the "Del" button.
If you wish, you may further characterize each feature with attributes and values (Sections 4.6.2 and 4.6.3).

4.6.2 Defining Attributes

To add an attribute to a feature or to modify one of the existing attributes of the feature, highlight the feature record in the Feature List screen and then press the "**AddA**" button to add an attribute or press "**Edit**" to modify the attribute. A listing of existing attributes (if any) for the selected feature will be shown in a directory tree style with the new attribute at the end of the list:
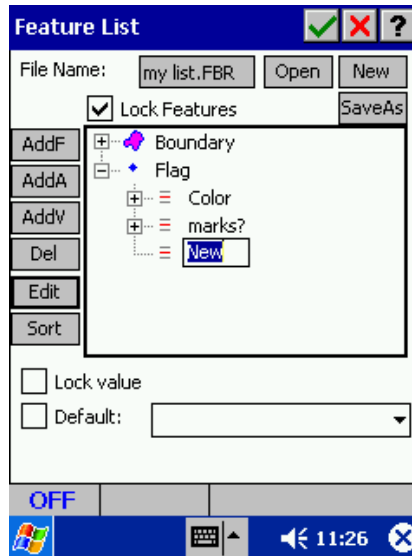
Use the keyboard function to enter the name of the attribute. Up to 19 characters may be entered for each attribute name.

The "Lock Value" option lets you lock the associated values for the attribute from further editing. When this option is chosen, the user will not be able to alter or add to the existing set of values listed for the attribute.

The "Default" option lets you define a default value. **The default value you specify must be from the values list for the selected attribute.** The default value will be automatically assigned to the associated attribute when you tag a feature with this attribute.

Choose to save any changes and return to the Map View or press to abandon the data.

To edit a displayed attribute: click on the attribute name to be changed, then press the "Edit" button and type over the existing attribute name.
To append a new attribute to the displayed list of attributes: click on the last attribute in the list, then press the "AddA" button. This adds a blank attribute to the list.
To delete an attribute, simply click on the attribute and then press the "Del" button.
To assign one or more values to an attribute: click on the attribute name, then press the "AddV" button (See Section 4.6.3.)

4.6.3 Defining Values

To assign an additional value to an attribute or to modify one of the existing values for an attribute, highlight the attribute in the "Feature List" screen and then press the "AddV" button to add a value or press "Edit" to modify the value. A listing of existing values (if any) for the selected attribute will be shown in a directory tree style with the new value at the end of the list:
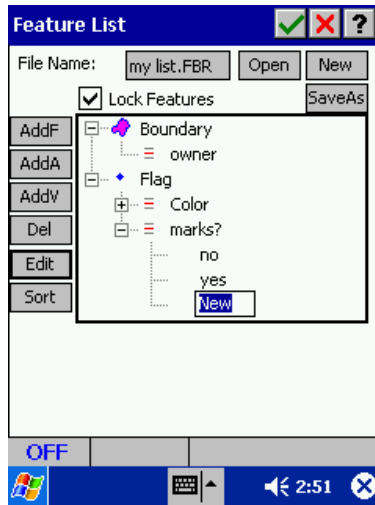
Use the keyboard function to enter the name of the value. Up to 19 characters may be entered for each value name.

To edit a value: click on the value name to be changed, then press the "Edit" button and type over the existing value name.
To append a new value: click on the last value in the list, then press the "AddA" button. This adds a blank attribute to the list.
To delete a value, simply click on the value and then press the "Del" button.

Choose to save any changes and return to the Map View or press to abandon the data.

4.6.4 Saving your Feature List

After you have entered the feature, attribute, value records into your Feature List, you may save the Feature List by clicking on the button or the Save As button. The Save As function allows you to save the Feature List under a different file name.

4.7 GPS Job Setup

The **Job Setup** function is used to configure a Job that will be used for GPS data collection within Field CE GIS. The Job Setup function establishes field data collection parameters for a specific GPS Job. The Job Setup function also can be used to check or verify the settings of an existing GPS Job.

The Job Setup screen is accessed by choosing **Menu/Current Job.** The following screen is displayed:

File Name: Choose the file name from the pull-down list or choose "New" to create a new job using the default file name. When selecting "New", the file name may be changed by accessing the keyboard button at the bottom of the screen and typing in the new name.

Prefix ID: Choose a letter or number as a unique identifier for each file name when it is created using the "New" button. This function is ignored if the file name is entered manually.

Feature List: Choose an existing Feature List from the pull-down list to be used with the specified Job during data collection.

Crew: Type in Crew identification information here.

Department: Type in Department name information here.

Description: Type in a brief description about the job or what it contains to help identify it.

After entering in all Job Setup information, choose to save the job and return to the Map View.

4.8 Time/Date and System Clock

The time and date setting used by Field CE GIS 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 with Field CE GIS.

Section 5 - GPS Data Collection

Once you have Field CE GIS properly set up, it is a simple matter to go out and collect GPS data. The Field CE GIS 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. Feature data may also be collected in the OFFSET or TRAVERSE modes.
- Review the data collected for each feature in textual or graphic format.

5.1 Identifying a Job

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
With the "File Name:" field highlighted, click on the pull-down arrow ▼ to scroll through the list of Job files in Field CE GIS. The default selection is "Untitled".

If this is a new job you are starting, select the "**NEW**" button. **Field CE GIS will automatically name the new Job with a GPS receiver ID code, the current UTC month, UTC day, UTC hour and a sequence number (A to Z)** as follows (ID code is "G", month is "06", day is "10", hours is "15", sequence number is "A"). Resulting file name: **G061015A.**

You may enter information into the **CREW**, **DEPT**, and **DESC** fields to further identify the Job if you wish. (These fields are fully defined in Section 4.7).

To select an existing Job, select the Job name from the list of Jobs under the "File name" pull-down menu.

Selecting a Feature List

Click on the "Feature List" pull-down menu, by pressing the down arrow ▼. Pick a Feature List to be used with your Job from the available Feature Lists. You may change the Feature List for the Job at any time. If you have used the database management functions discussed in Section 4.6 to define one or more Feature Lists, you can easily tag and characterize the GPS position data you are about to collect (Sections 5.2.1 and 5.2.2).

If you do not wish to associate any default Feature List with your Job, select "NONE". In that case, you will need to manually type in a feature name each time you want to map a feature (Section 5.2).

Press ☑ to accept and save the settings and return to the Map View. Keep in mind that Field CE GIS will not allow duplicate Job file names.

5.2 Collecting New Feature Data (Featuring)

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 name from a Feature List and optionally assign attributes and values to it.

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 coordinate points into 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.
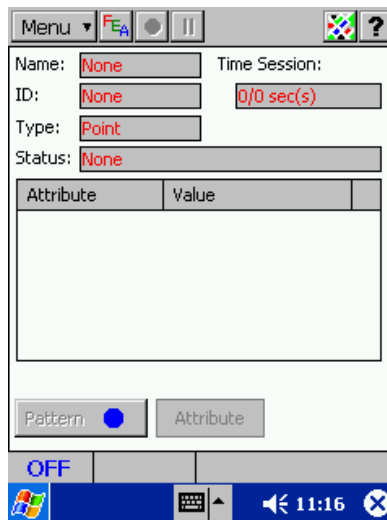
Line and **area** features can be logged in STATIC or DYNAMIC mode. In DYNAMIC mode, each position fix is recorded as a separate coordinate point. The coordinate points are recorded one after another at a preset interval as you walk along the line or around the area. **Static line/area features** are 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 connecting points and do not have to worry about walking a straight line between those points as you do with DYNAMIC line/area features. Note that the coordinate point number is displayed in the upper-right part of the screen.

While logging a line/area feature, you may stop at certain points of interest and record a point feature. Such point features are called **Nested Points** because they can be collected by briefly interrupting your line/area.

5.2.1 Selecting a Feature

With the appropriate Job and Feature List file names set in the Job Setup screen, press the Collect Data button from the Map View 🛠 to begin the Featuring process. After pressing the Collect data button, the following screen is displayed:

To store a feature, press the Select Feature button. 🔲 The Store Feature screen will be displayed:
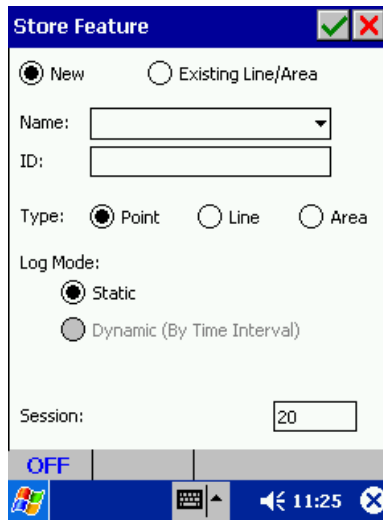
Selecting a New Feature from the Active Feature List

If you have selected a Feature List in the JOB SETUP screen (Section 4.7), then a listing of the features in the selected Feature List will be available in the Store Feature screen. Click on the pull-down menu ▼ under the "Name:" field to see the list of available features.

Click on the desired feature from the list. The fields for feature type, logging mode and session/interval are automatically filled in based on input when the Feature List was created:
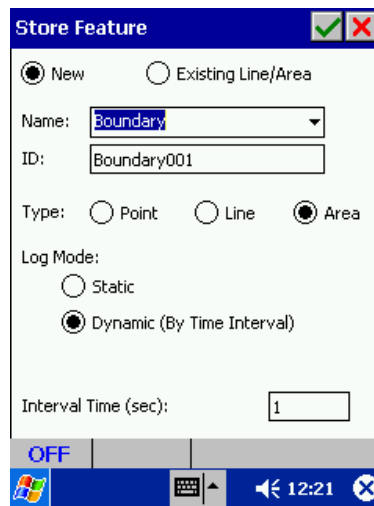
For example, if you wish to record the location of a boundary of a property line, select "BOUNDARY" from the list in the above sample screen. This feature is defined as an area feature to be logged in Dynamic mode by taking 1 second position fixes while you walk the boundary. When you find another boundary to map, select "BOUNDARY" again as the feature name.

If you wish to define a new feature to be used for the data you are about to collect (that is not in the Feature List), click on the "Name" field, then press the keyboard function button and type in the new name of the feature (press the keyboard function button again to close it). The "ID:" field will automatically be filled in for you as you enter the name for the new feature topic. Select the Feature Type, Logging mode, and Interval/Session to complete the feature information. When done, press the button to go to the Attribute Editor screen.

The feature name chosen here will be listed as a feature Topic in the "Browse Features" screen (section 2.4.2).

Please note: The new feature you just entered will not be saved into the Feature List. Note that if feature error-checking is active (Section 4.6.1), you may not enter any feature name unless it is identical to one of those in the active Feature List.

Selecting an Existing feature from the Active Feature List
Please see Section 5.3 "Appending Coordinates" for more information on this function.

<u>Entering a feature name when you are not using a Feature List</u>
If you have selected "NONE" for the FEATURE LIST field in the JOB DATA screen (Section 4.7) then click on the "Name" field, then press the keyboard function button and type in the new name of the feature (press the keyboard function button again to close it). The "ID:" field will automatically be filled in for you as you enter the name for the new feature. Select the Feature Type, Logging mode, and Interval/Session to complete the feature information. When done, press the button to go to the Attribute Editor screen.

Please refer to Section 5.2.2 for instructions on assigning attributes and values to the selected feature.

5.2.2 Attribute Editor Screen

In the Attribute Editor screen, you can choose to add attributes to the existing list, edit existing attributes or delete them:
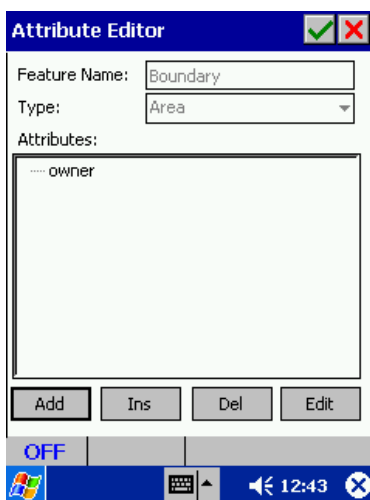
The "Feature Name" and "Type" are displayed for reference only. If no changes are desired to the existing attributes, press to accept the attributes and proceed to the FEATURING screen (see section 5.2.3). The FEATURING screen will then be displayed for you to enter the values for the attributes and continue with the data collection process.

- o To **Append** an attribute to the end of the list: Click on the **Add** button and type in the name of the new attribute using the keyboard function.
- o To **Insert** an attribute in the list: Click on the attribute in the list that you want to move down one slot and place the new attribute above so it is highlighted. Now click on the **Insert** button to

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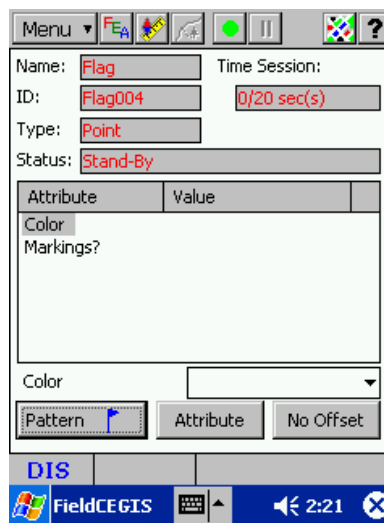
place a new attribute above the selected attribute. Type in the name of the new attribute using the keyboard function.

- o   To **Delete** an attribute, simply click on the attribute and then click on the **Del** button.
- o   To **Change the name** of an attribute: click on the attribute name so it is highlighted. Click on the **Edit** button and type in the new name or make changes using the keyboard function.

After any changes are made, press the ☑ button to accept the attributes and proceed to the FEATURING screen

5.2.3 FEATURING Screen

After pressing the ☑ button from the Attribute Editor screen, you are ready to enter values for your attributes. **If no values are desired, please skip to section 5.2.4.** The following screen will be displayed:

The name, ID and type of the feature are displayed for reference only at the top of the screen. Also the Time Session/Interval will be displayed for the current feature. Current data collection status is displayed in the "Status" field. Current status will be "Stand-By" which means no data is being collected. Status will change to "Storing" once data collection has begun (see section 5.2.4) and will show "Pause" if the pause button is clicked.

Use the following procedure to assign values to the feature.
- If a Feature List is active for the Job, the attributes associated with the selected feature will be automatically displayed in the FEATURING screen. The VALUE box is located in the lower left portion of the screen. Click on the pull-down menu using the ▼ button. The VALUES associated with the highlighted attribute will be listed. Simply click on the VALUE from the list. The VALUE will be selected in the value box and will also be automatically displayed next to the attribute. If value error-checking is not active, you may type in a value that is not on the list.
- Repeat the process until you have fully described the feature. If you wish to skip an attribute, press ☒ when its VALUE box pops up.
- If the active feature is not from a Feature List, you may manually enter the values for the attributes created in the Attribute Editor screen (section 5.2.2) to further characterize it. These additional attributes and any values you enter in the field will be used to tag the active feature but will not be saved into a Feature List.

- To EDIT a value, simply click on the associated attribute name and the value will be displayed in the value box ready to be edited. You may either pick a different value from the list or type in a new value (if value error-checking is not active) using the keyboard function.
- When you have completed the attribute/value assignment, you may select the color/pattern for the feature by clicking on the **Pattern** button. For area features, this button will change to say **Color.** The feature symbol/pattern and color in the Map View will reflect the chosen symbol/pattern and color chosen here.
- You may go back to the Attribute Editor screen by clicking on the **Attribute** button.

5.2.4 Data Logging

When you have entered the appropriate feature information (feature/attribute/value combination), you are ready to log GPS data. From the FEATURING screen, press the STORE button 🟢 to store the feature data and GPS positions.

- Field CE GIS will record data based on the feature type and data logging parameters specified for the feature. The parameters specified in the DATA COLLECTION setup screen will be used by default if you have not redefined them for the active feature.
- Please **make sure the GPS Tracking Status Indicator shows a steady "N3DX" status**. Then follow the appropriate procedure provided below for the type of feature you are working with.

Notice the change in the beeps and the Tracking Status Indicator in the lower-left corner when you begin or end featuring. When you are not logging feature data, the Tracking Status Indicator in the lower-left corner will display N2DX or N3DX. Once you begin logging feature data the Tracking Status Indicator will display either F2DX or F3DX. See Section 4.3 for a description of the Tracking Status Indicator.

If for whatever reason, the receiver is not tracking a sufficient number of satellites, or the DOPs have exceeded the limits you defined, the Tracking Status Indicator will show DOP, TRK or ACQ. The data logging will stop temporarily until the GPS starts tracking satellites again.

PAUSE: To halt data logging temporarily, press the Pause button ⏸. The Pause button will stay depressed until pressed again to continue storing data. Also, when the Pause button is pressed, the "Status" will change to PAUSE.

Plotting Position Data on Screen

When you press the Map View button 🗺 from the FEATURING screen, you will be taken back to the **Map View**. This can be done while collecting data to watch the features get created as you map them. For example:

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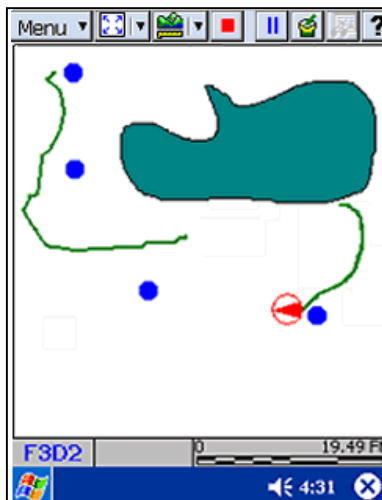
The current position is displayed as a on the screen. In the above example, a dynamic line feature is being mapped. The Map View is always "North" oriented. If the position moves off the screen, Field CE GIS will automatically adjust the display to show the current position. The position of the collected features will be displayed in their correct locations with respect to the current position.

Press the Pause button to halt the data logging temporarily. Press the STOP button to stop the data logging process. Press the COLLECT button to return to the FEATURING screen.

Storing STATIC Points

In a collection of STATIC points, each individual point is a stand-alone feature. The large dots shown below may represent three buildings on a college campus.
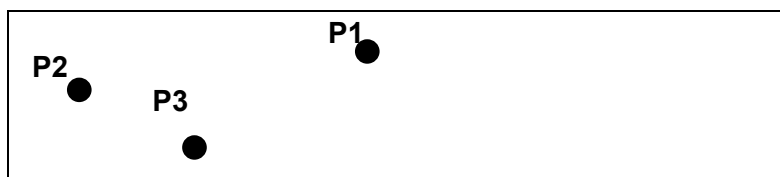
1. Stay at the feature location and **do not move around** while you are logging data for a point feature.

2. Press the STORE button from the FEATURING screen to record the feature information and log data for the feature. The FEATURING screen will display the progress of data logging.

3. When 100% of the data has been collected for this point feature, Field CE GIS will beep once with a noticeably different sound and stop logging data automatically. The FEATURING screen will still be displayed. 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 (e.g. 20 in the above screen). The point will still be recorded, but with fewer coordinates to average.

4. Repeat the above process for any additional STATIC points you wish to log. (**Note**: you may also log dynamic features in the same Job if you wish.)

5. **When done with the Job, turn off the GPS receiver.**

STATIC Line or Area

For a STATIC line or area feature, you only log data at the individual points that define the feature. These points are automatically connected by Field CE GIS.
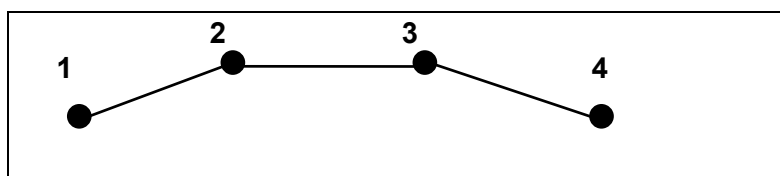
1. Go to the first point of the STATIC line or STATIC area feature. Stay there and **do not move around** while you are logging data for this point.

2. Press the STORE button from the FEATURING screen to record the feature information 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 stop the data logging process for the current point that is being logged. This action does not end the data logging for the entire STATIC line/area feature.

3. When 100% of the data has been collected for this point, Field CE GIS will issue an audible beep indicating the point is finished storing.

4. Move to the next point of the STATIC line/area feature, then press the STORE button again to log data for that point.

5. Repeat Steps 3 and 4 until you have finished logging data for all points of the STATIC line/area feature.

6. **When you are done with the Job, turn off the GPS receiver.**

DYNAMIC Line/Area

For a line or area feature logged in DYNAMIC mode, Field CE GIS collect data while you are moving along the line feature or the perimeter of the area feature.
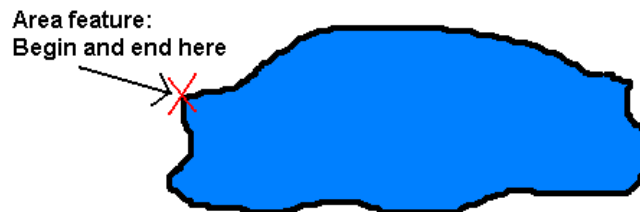
For dynamic data logging, there are 2 modes: Dynamic Time and Dynamic Distance (Field CE GIS only).

Dynamic Time: Logs a position based on the specified time interval.
Dynamic Distance: Logs a position based on the specified distance interval.

1. Go to the beginning point of the line or area feature for which you wish to collect data. Assign feature information to the new feature (feature name, attribute and value).

2. Press the STORE button from the FEATURING screen to record the feature information and log data for the feature.

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. **When done with the Job, turn off the GPS receiver.**

Nested Points

Field CE GIS allows you to interrupt a line or area feature (without terminating it) to record an associated point feature. This kind of point feature is called a **nested point feature**. 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 Point button to record a nested point feature and then resume logging the same river feature.

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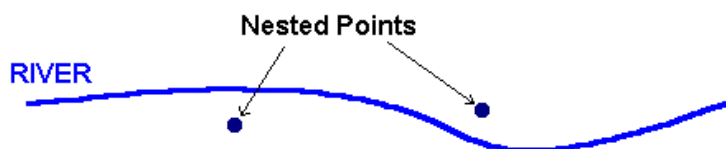
The procedure for logging a nested point is similar to that for logging a regular point feature:

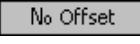1. Begin logging a Dynamic feature.

2. From the FEATURING screen, press the Nested Point button [icon]. A list of point features in your Feature List will be displayed:
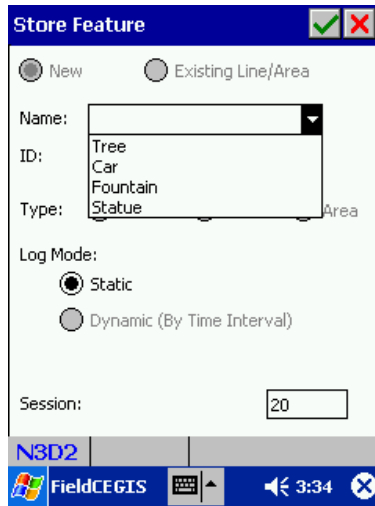

3. Highlight the appropriate point feature or create a new one. When done, press [✓].

4. The Attribute Editor screen will be displayed to enable you to describe attributes for the selected nested point feature. When done press [✓].

5. Select the appropriate value from the VALUE pull-down menu in the FEATURING screen for each attribute. Repeat until you have assigned all the attribute/value pairs with for this nested point feature.

6. 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. You may use [No Offset] to offset a nested point (Section 5.2.5). If you wish to abandon the data you have just logged and start another feature, press the Select Feature button [icon].

7. Press the STORE button [icon] to record the feature information and log data for the nested point feature. The progress of data logging in terms of the number of position fixes taken over the total number of fixes specified for logging the nested point will be shown in the FEATURING screen.
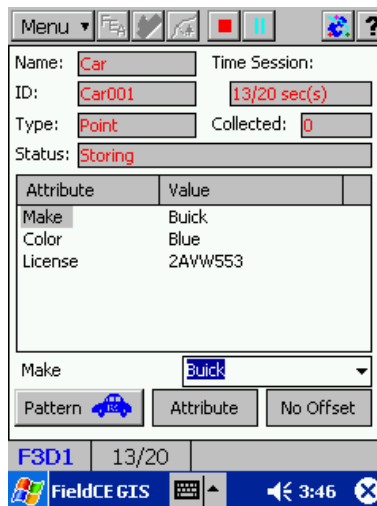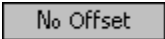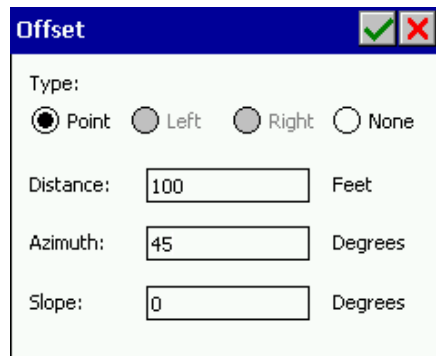
8. If necessary, you may press the STOP ![stop button] button to stop the data logging process for the nested point feature.

9. When 100% of the data has been collected for this nested point feature, Field CE GIS will stop logging data for the nested point feature. At this point, you may choose to log another nested point or to continue logging the original line or area feature. If you choose to continue logging the line or area feature, depress the PAUSE button ![pause button] and start moving again along that feature. If you need to log another nested point, press the Nested Point button again ![nested point button]. This will bring up the list of available point features as shown in step 1 above. Select the appropriate point feature and repeat the above steps to log the nested point.

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/Code 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. Field CE GIS provides for two types of OFFSET computations:

- **Point OFFSET** - This method is useful when you can log data at a fixed slope distance, azimuth and slope from the target 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 Field CE GIS. 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 Field CE GIS figure out the coordinates for the actual area based on its depth under the water.

- **Left/Right OFFSET** - This method is useful when you can log data to one side of the target feature. 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 line/areas.

To access the OFFSET function and enter an offset for a feature, press the "NO OFFSET" button ![No Offset] from the FEATURING screen ("No Offset" indicates that there is currently no offset associated with the feature) . The following screen will be displayed for OFFSET mode of a point feature:

Use the Keyboard function to enter the OFFSET information for the point.

If you have selected a line or area feature, the following screen will be displayed for the Left/Right OFFSET mode:
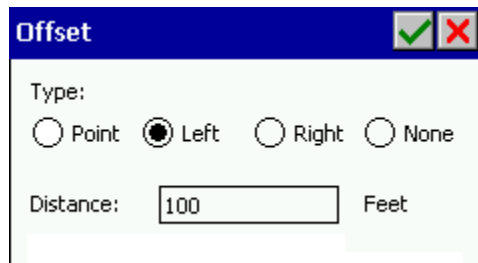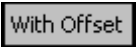

Field Descriptions:

Left/Right OFFSET (for line/area features):

DISTANCE   Enter the horizontal distance from where you are collecting GPS data to location of the target. For a line or area, this distance should be on a line 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:

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 to the target.

Following is the general procedure for logging a feature in OFFSET mode:
1. From the FEATURING screen, press **NO OFFSET** to bring up the OFFSET screen.

2. Select Left/Right offset for line/area features or point offset for point features.

3. Enter the appropriate OFFSET parameters via the keyboard function .

4. Press to save the OFFSET parameters and return to the FEATURING screen. Note that the "No Offset" button has changed to say "With Offset" now that an offset has been applied to the feature .

5. Press the **STORE** button from the FEATURING screen to begin data logging. When logging a point or nested point, stay at the appropriate location. When logging a line or area, move parallel to the target.

6. Press **STOP** when you have finished logging the line or area. For a point, the data logging will automatically end when the specified number of position fixes has been collected.

5.2.6 Data Logging 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 traverse parameters are defined in the following diagram.
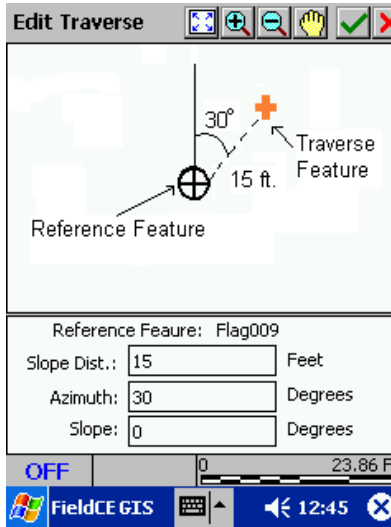

| **SLOPE DIST**	The slope distance from the reference position to the location of the new traverse point.
AZIMUTH	The direction from the reference position to the new traverse point (0 to 359 degrees).
SLOPE	The slope from the reference position to the new traverse point (-90 to 90 degrees).

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

1. Click on the **Traverse** button from the Collect Data screen to display the following dialog:

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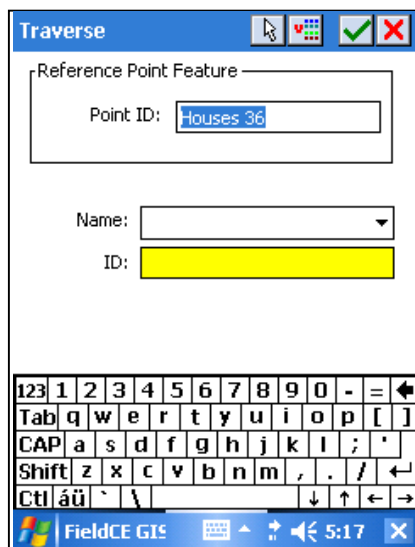
2. The first Traverse point must be an existing Point Feature. It is specified in the data input box, named **Reference Point Feature**. By default, the last GPS point recorded will automatically be input for you in the **Reference Point Feature** box. You may change it as appropriate for your job.

3. Enter the name of the new traverse point feature in the **Name** box. The ID will automatically be entered for you. Click on the ✔ button to accept the name and proceed to the **Attribute Editor** screen.
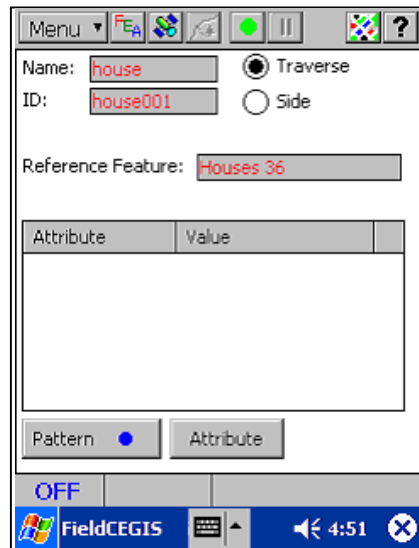
4. Use the Attribute Editor screen to define attributes for the newly defined traverse point feature. If no attributes are desired, click on the ✔ button to proceed to the data collection screen. The following screen is displayed:

5. Choose the method for defining the new point: **Side** or **Traverse**. These methods are defined below:

Side: Use this method to perform a radial traverse. Take multiple "sideshots" from the same (GPS) reference point. Enter slope, slope distance and direction to define the new point.

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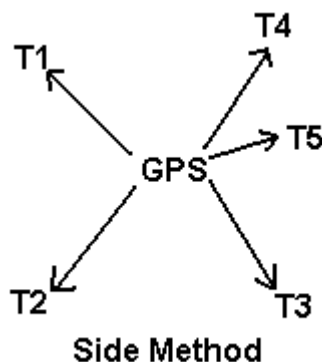
Traverse: Use this method to traverse to a new point that will then be used as the reference point for the next traverse point. This method is effective for storage of lines or area boundaries.

Traverse Method
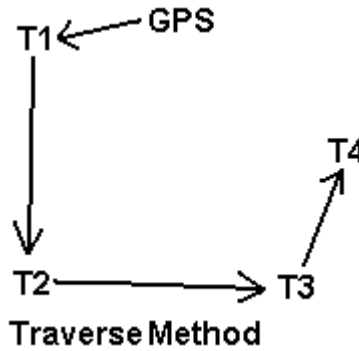
You may enter the distance and angle data by hand, or by triggering a compatible laser range finder connected to your PDA via a serial COM1: port or via Bluetooth. If you are using a laser range finder, select Setup from the Main Menu, then select RS232 Device and mark the checkbox for Laser Gun.

Traversing Using the Side Method

When at the data collection screen, select the **Side** option and then click on the [●] button to enter the Traverse offset information. The following screen is displayed:
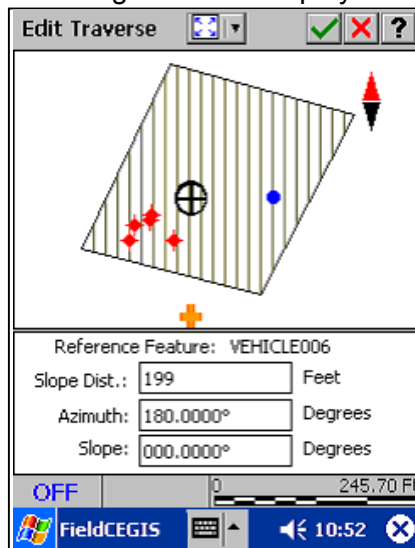
The reference point is shown as ⊕. Enter the slope distance, azimuth, and slope for the point to be created from the reference point. The target point will be displayed with the following symbol: ✚. After entering the traverse information, choose [✔] to return to the data collection screen to continue entering traverse data in either **Side** mode or **Traverse** mode. In the data collection screen, you can click the [⟳] button to return to the normal GPS data collection mode.

Traversing Using the Traverse Method

When in the data collection screen, select the **Traverse** mode option and then click on the [●] button to enter the traverse information. A screen similar to the following will be displayed:
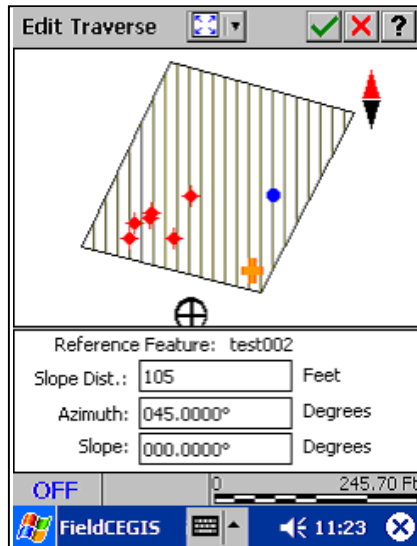
In the example shown, the reference feature has been defined as the last traverse feature. The new traverse information is then entered from the new reference point to define the location of the next desired point along the boundary. Click on the button to accept the input and store the point. Otherwise, click on the button to abort storage of the point and return to the data collection screen.

Repeat these steps as necessary to store points until the GPS signal can be received again. To return to normal GPS data collection mode, click the button in the data collection screen.

5.2.7 Editing Attributes and Values

While actively logging data for a feature, you may edit the attributes and values to be associated with it. Pressing the **Attribute** button will take you back to the Attribute Editor screen for modification of attributes (see section 5.2.2).

While in the FEATURING screen, a value may be changed by clicking on the attribute name and then changing the value listed in the VALUE Box (see section 5.2.3).

5.3 Appending Coordinates

If you wish to add GPS data to an existing feature, press the Select Feature button from the FEATURING screen to display 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.
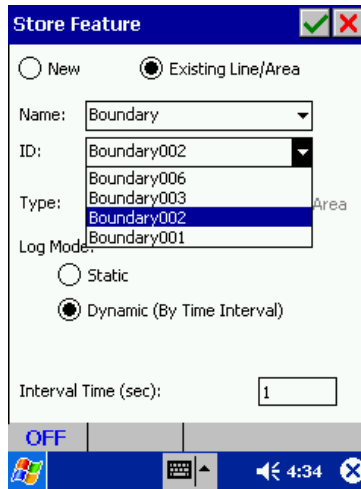
From the STORE FEATURE screen select the option for "Existing line/area". Click on the pull-down menu under "Name" to choose the feature to which you want to append coordinates. You will see a list of the names of all the line or area features collected so far for the selected Job. Click on the feature name.

Next, click on the pull-down menu for the "ID" field to select the specific Feature ID that you want to append coordinates to.

After you have selected the appropriate feature, press the [✓] button to proceed to the FEATURING screen. The procedure for logging additional data is identical to that described in Section 5.2.4. If you choose to also change the attribute/value assignments to the selected feature by using the procedure described in Section 5.2.2, the entire feature will be tagged with the new descriptions.

5.4 Post-Processing

After you are finished collecting and reviewing your data on the Mobile Device, you can transfer your data to the PC for further post-processing. For example, you can use the PC-GIS software to edit, modify or combine your data files.

Section 6 - Navigation

Field CE GIS is designed for the following navigation methods:

1) Manually type in a set of target coordinates for navigation.
2) Select the target coordinates by clicking on a location in the Map View.
3) Select an existing feature for navigation.
4) Navigation along a route or Autoroute.

Once you have populated the Target/Route list with the desired target points or routes, simply select the desired target and let the program guide you to the specified point or along the specified route.

6.1 Typing in a Set of Target Coordinates for Navigation

1. From the Map View in Field CE GIS, click on the **Navigation** button found on the Tool Bar ![icon]. to display the Select Target screen.
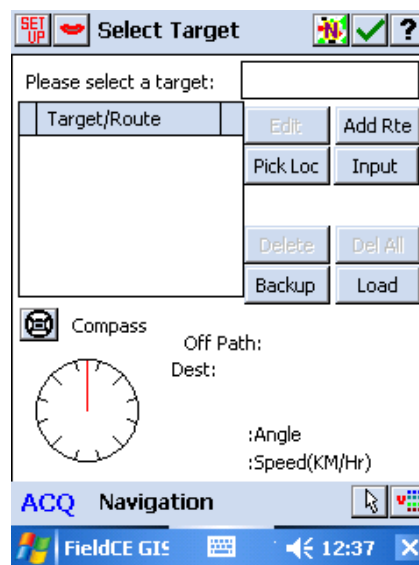
2. Click on the **Input** button.
3. Type in a name for the waypoint if desired. A default name will be chosen for you.
4. In the Edit Point screen, type in the target coordinates using the keyboard function ![icon]. Choose ![icon] to accept the coordinates and return to the Select Target screen. You may edit the target name displayed in the data input box.
5. Click on the ![icon] button to go to the Navigation View and begin navigation to the specified target.

Use the **Set Up** tool to change navigation settings (e.g. target color, marker color, trail color/length, path tolerance, etc.)

Please note: The coordinate system shown will reflect the coordinate system chosen under the **Menu/Setup/Coordinate System** option. For example, to navigate to a set of UTM coordinates in meters using the NAD 83 datum, set the Coordinate

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System to UTM, NAD 83, meters in the Coordinate System setup and then enter the UTM coordinates in the Navigation screen shown above.

## 6.2 Selecting a Target by Clicking on a Location in the Map View

1. From the Map View in Field CE GIS, click on the **Navigation** button found on the Tool Bar .

2. A screen similar to the following **Select Target** screen is displayed:
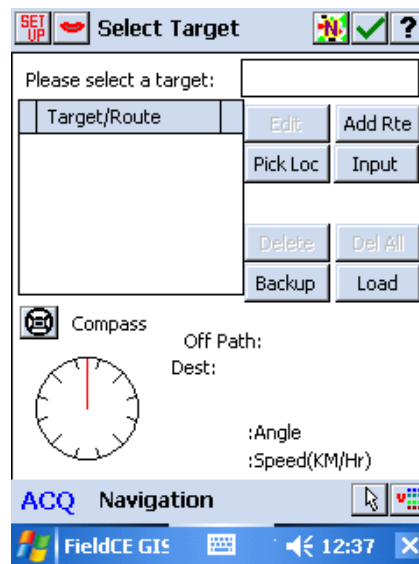
3. Click on the **Pick Loc** button. The Map View will be displayed for you to click on a location with your stylus to select the target coordinates.

4. Upon clicking once in the Map View, your target coordinates will be automatically selected and inserted in the Target/Route menu of the Select Target screen. The navigation target just selected is displayed as: "**PickLoc**". If you are not satisfied with the coordinate shown, the coordinates may be chosen again by repeating step #3 until the desired target coordinates are displayed.

5. Click on the button to accept the coordinates and begin navigation in the Navigation View.

   The next location picked will overwrite the coordinates of **PickLoc**. If you wish to save the location you just picked, highlight the current name in the data input box then enter a new name. You may use the BACKSPACE key to erase part of the displayed target name. However, the program will not allow you to use the BACKSPACE key to erase the entire target name.

## 6.3 Selecting an Existing Feature for Navigation

1. From the Map View in Field CE GIS, click on the **Navigation** button found on the Tool Bar . The following screen is displayed:
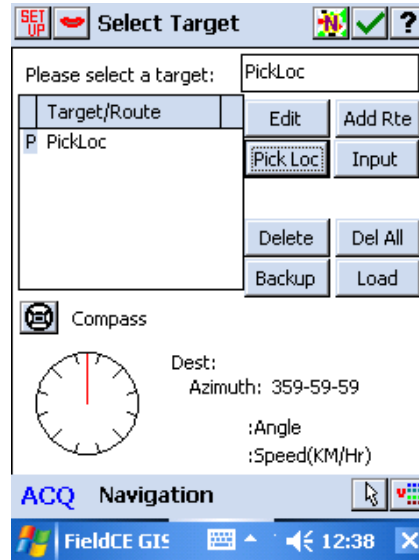
2. Use the Select Feature icon or the select FeatureID icon found in the lower right corner of the screen to select the desired feature for navigation.

    If the Select Feature function is chosen, the Map View will be presented to enable you to click on the desired feature for navigation.

    If the Select FeatureID icon is selected, a text listing of all available features will be shown to enable you to select the specific FeatureID for navigation.

3. To begin navigating to the specified feature, click on the button to go to the Navigation View and begin navigation.

6.4 Creating a Route for Navigation

1. From the Map View in Field CE GIS, click on the **Navigation** button found on the Tool Bar . The Select Target screen is displayed.

2. Click on the **Add Rte** button to display to the Create Route screen.

3. Use the **Add by GPS**, **Add by Search, or Add by Stylus** buttons to add waypoints to the list under the **Waypoints** box. . Whenever you click the **Add by GPS** button, a GPS waypoint is automatically added. With the **Add by Stylus** method, you may tap on multiple waypoints before closing the graphic view window.
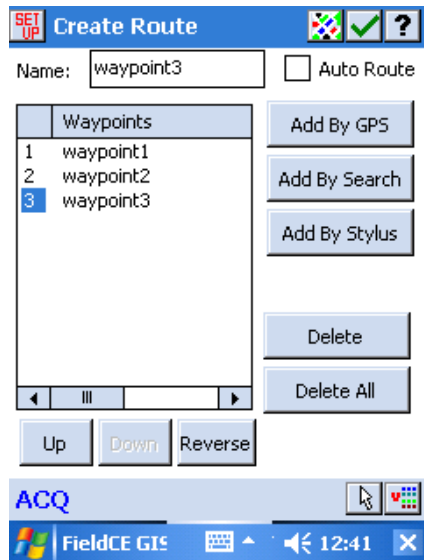
You may use the Select Feature icon or the select FeatureID icon to select and add an existing point feature to the waypoint list.

Please note that duplicate waypoint names are permitted. It is advisable not to rename a waypoint with the same name as another waypoint.

When using the **Add by Stylus** option, you will be taken to a view of your map with the following tools displayed at the top of the window:

Use the provided Zoom tools to zoom in or zoom out, pan and zoom fit as needed to view and select the desired waypoint locations.

Also use the **Snap to Node** function to select locations that are part of existing features. This function can be toggled ON/OFF to allow the selected waypoint location to be "snapped" to the nearest node (of an existing feature). When toggled off, the button looks like this: , and you are free to click on any location in the map to select that location as a waypoint.

When this option is toggled on to **Snap to Node**, the button will stay depressed and will look like this: . This indicates that snapping to a node will occur when you click within a few feet from an existing node.

Click on the button when done selecting waypoints to return to the Create Route screen.

4. It is important to select the waypoints in the correct navigation order. The first waypoint in the list will be the first target of the route; the second waypoint in the list will be the second target, and so forth. Use the **Up** and **Down** buttons to change the order of the waypoints in the list. Click on the **Reverse** button to completely reverse the order of the listed Waypoints.

Click the **Auto Route** checkbox if the route is to follow the roads on the basemap, rather than connecting one waypoint directly to the next. If you add, delete or change the order of the

waypoints on an Auto Route, you will need to first unmark the Auto Route checkbox then mark it again to update the Auto Route (see Section 6.5).

5. You may view the newly created route by clicking on the ⊠ button.

Click on the ⤴ button to return to the Create Route screen. You may change the Waypoint symbol and the Route pattern by clicking on the ⊞ button in the Create Route screen. Click on the ✔ button to return to the Select Target screen.

6. To begin navigating along the route, select the desired route in the Select Target window. The default name for the first created route is: "Nav_Rout001". Once the desired route is highlighted, click on the ⊞ button to begin navigation along the route in the Navigation View.

## 6.5 Creating an Auto Route for Navigation

Field CE GIS uses the Basemap roadways to route you to your destination. In order to use the Auto Route function, you need to load a CMT BaseMap for the desired route. When using the **CMT PC software** to convert the BaseMap the PBM format, be sure to check the option for "**Support Auto Routing**". The BaseMap will automatically be sent to the Mobile Device and will be available for use with the Auto Routing function in Field CE GIS.

Following are the general steps for using Field CE GIS to help you navigate along an Auto Route:

1. From the Map View in Field CE GIS, click on the **Navigation** button found on the Tool Bar ⊠.
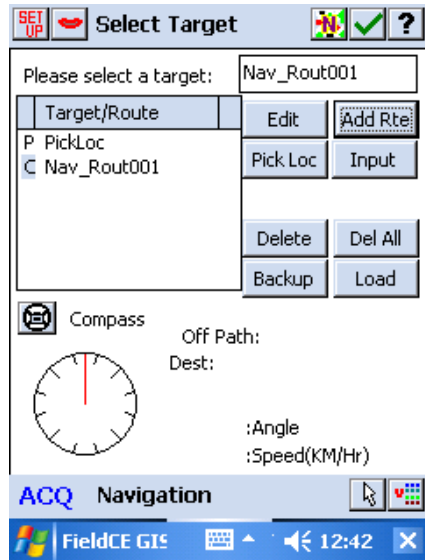
2. Click on the **Add Rte** button to go to the Create Route screen. The following screen is displayed:
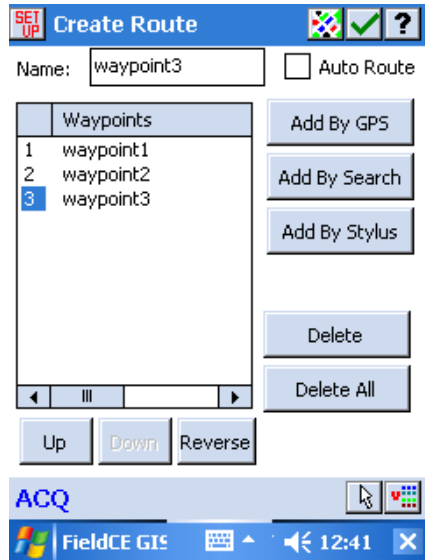
3. Place a checkmark in the **Auto Route** box to specify that the route being created will be an Auto Route. When Auto Route is selected, Field CE GIS uses the Basemap roadways to route you to your destination. Therefore, as you add waypoints to be included in your Auto Route, they will automatically "snap" to the nearest road. Use the **Add by GPS**, **Add by Search, or Add by Stylus** buttons to add waypoints to the list under the **Waypoints** box.

When using the **Add by Stylus** option, you will be taken to a view of your map with the following tools displayed at the top of the window:

Use the provided Zoom tools to zoom in or zoom out, pan and zoom fit as needed to view and select the desired waypoint locations.

Also use the **Snap to Node** function to select locations that are part of existing features. This function can be toggled ON/OFF to allow the selected waypoint location to be "snapped" to the

nearest node (of an existing feature). When toggled off, the button looks like the following: and is set to **No Snap** meaning that no "snapping" to existing nodes will occur. Therefore, you are free to click on any location in the map to select that location as a waypoint.

When this option is toggled on to **Snap to Node**, the button will stay depressed and will look like the following: . This indicates that the nearest node contained in a feature will be selected when you click on a location in the map with your stylus. Snapping to a node will only occur when you are within a few feet from an existing node.

Multiple waypoints may be selected from this screen by continuing to click on the map with your stylus. Click on the button when done selecting waypoints to return to the Create Route screen.

4. Once you are back to the Create Route screen, the waypoints selected in the previous step will be automatically joined together to form a route. Therefore, it is important to select the waypoints in the correct navigation order. The first waypoint in the list will be the first target of the route; the second waypoint in the list will be the second target, and so forth. Use the **Up** and **Down** buttons to change the order of the waypoints in the list. Click on the **Reverse** button to completely reverse the order of the listed Waypoints.

5. You may view the newly created Auto Route by clicking on the button. Click on the button to return to the Route Setup screen. You may change the Waypoint symbol and the Route pattern by clicking on the button in the Create Route screen to go to the **Route Setup** screen. The Route Setup screen is also used to specify the **Auto-route mode**. Available options for calculating the Auto Route include: **Shortest** (based on distance) and **Quickest** (based on time). Click on the **Road Speed** button to specify default road speeds for different road types (e.g. Interstate = 70 mph, US Highway = 65 mph, etc.). Click on the button to create the route and return to the Select Target screen.

6. To begin navigating along the route, select the desired route in the Select Target window. The default name for the first created route is: "Nav_Rout001". Once the desired route is highlighted, click on the button to begin navigation along the route in the Navigation View (see Section 6.7.3).

6.6 Navigation Waypoint/Route Management

In the **Select Target** screen, use the **Delete** or **Delete All** buttons to remove unwanted waypoints/routes listed under the Target/Route section.

For easier identification of the Targets, the following notation appears next to the target name in the Select Target screen:

"P" = **Point** target.

"L" = **Line** target. Both line and area features will be shown as this type.

"C" = **Connected route** – a route formed by direct connection of the waypoints.

"R" = **Road route** formed by using the **Auto Route** method.

Waypoints and routes are stored independently of the current job and are available for access from any job selected.

Use the **Backup** button to create a backup file of your existing list of waypoints/routes. The backup file will be stored with the extension *.NAV. Therefore, you will have an opportunity to name the backup file

when the **Backup** function is accessed. Name the file in the "Save File As" screen and then click on ✅ to save it.

Use the **Load** button to access and load the backup file created by using the Backup button.

Use the **Edit** button to view and edit the currently selected Target/Route. Also, the currently selected Target/Route name appears in the upper right corner of the Select Target window. The Target/Route name may be edited in this box using the keyboard function. Any change will automatically be reflected and shown under the Target/Route section. Changes are automatically saved.

6.7 The Navigation View

Once the target and method of navigation has been selected, you are ready to call up the Navigation View so that you can see your target for navigation.

6.7.1 Navigating to Point Targets

For point targets, you will see a screen that looks similar to the following:
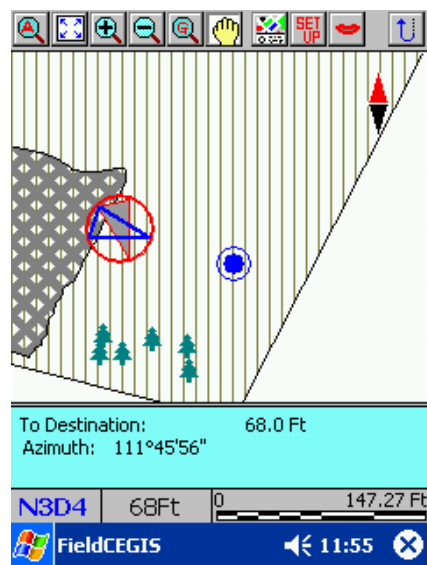
Your current position will be marked by the following symbol: ⬤. The large arrow indicating your current position will be a gray color when your speed is very slow (e.g. less than 1 m/s). The arrow will change to a red color when your speed is above 1 m/s. The direction of the arrow indicates your current direction ⬤. Your target will be marked by the following symbol: ⬤. An indicator showing the direction to reach the target is overlaid on top of your current position and is shown as a blue triangle ◺. To reach the target, start moving in the direction of the target so the arrow indicating your current position aligns with the blue triangle points toward the target.

The Map View is always North-oriented unless you have chosen the option for "Moving Map" in the Navigation Settings. A north arrow is provided on the Map View for your reference. The red portion of the north arrow points to the north. When in "Moving Map" mode, the north arrow will rotate along with your map to always show which way is north.

In the **Target Tolerance** field, enter the radius of the target territory. When you enter that region, you will be considered to have arrived at the target. When you are traveling along a path, your position will be projected on the path unless you are within the range of the target tolerance.

The **Snap to Road/Path** option is useful when you are navigating along a road or path. Your position may not be right-on due to GPS receiver accuracy or because you are not walking straight. Check the "Snap to Road/Path" box if you wish to have your position displayed on the path as long as you are within a given distance from the path.
When the "Snap to Path" option is active, you will be able to enter the permitted deviation into the **Snap Distance** field.

If you have the **Target Voice** toggled on , then you will hear an audible voice notify you when your current position is within the specified tolerance of the target marker as well as the remaining distance to reach the target.

Distance information from your current position to the target marker is dynamically displayed and updated each second. This information is found in the Status Bar at the bottom of the screen:
.

Use the button to toggle ON/OFF the written description information at the bottom of the screen. Toggle this information OFF to maximize your viewing area of the Navigation View.

Use the various zoom tools to **Zoom In/Out**, **Pan** or use the **Zoom Fit** button to fit all items in the current file into the Map View. Use the **Zoom to GPS** button to zoom to the current GPS position.

Please note: The units of measurement displayed and used for the dynamic distance display reflect those settings chosen under the **Menu/Setup/Coordinate System** menu. (See Section 3.8 in this Reference Guide.)

6.7.2 Navigating Along a Route
When navigating along a route, you will see a screen similar to the following:
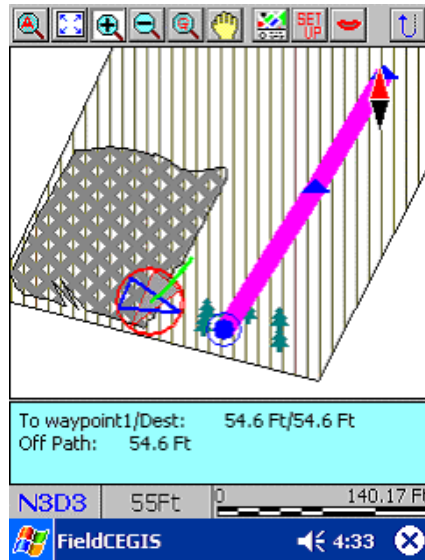
The red arrow marks your current position and direction . Your position will be marked as a gray arrow while you are not moving or while you are moving at a speed less than 1 m/s. Information is displayed at the bottom of the screen for: direction and distance to the current waypoint/destination as well as your current distance from the route (path).

Your current projection on the route will be marked by the following symbol . Waypoints on the route will be shown as blue triangles connected by a solid pink line (symbology for waypoints and routes may be adjusted in the Route Setup screen, see item 5 of Section 6.4). The current waypoint target is displayed in the written description at the bottom of the screen. Proceed in navigating toward the waypoint target until you are within the "Target Range" specified in the Navigation Setup screen. You will receive an audible notification when you are at the target if you have the audible voice activated .

To proceed to the next waypoint, continue along the highlighted route and Field CE GIS will automatically change the current target to the next waypoint on the route when you have moved out of the tolerance range of the current target.

Use the button to toggle ON/OFF the written description information at the bottom of the screen. Toggle this information OFF to maximize your viewing area of the Navigation View.

Use the various zoom tools to **Zoom In/Out**, **Pan** or use the **Zoom Fit** button to fit all items in the current file into the Map View. Use the **Zoom to GPS** button to zoom to the current GPS position.

6.7.3 Navigating Along an Auto Route

Once you have created the Auto Route and selected it under the Select Target screen, click on the **Navigation View** button to begin navigation along the Auto Route.

In the Navigation View, the Auto Route will be highlighted and displayed on the screen.

The bottom of the screen displays distance information to the current waypoint as well as the distance to the next road. The "NOW" indicator tells you what road you are currently traveling on. The "NEXT" indicator tells you the next road containing a waypoint and the distance from your current position to that waypoint.

The on-screen graphical display provides a visual reminder for the remaining distance to your next turn as well as the direction of the next turn. The street name is also provided. For a complete navigation experience, toggle ON the audible voice directions to help you reach your destination.

Use the button to toggle ON/OFF the written description information at the bottom of the screen. Toggle this information OFF to maximize your viewing area of the Navigation View.

Use the various zoom tools to **Zoom In/Out**, **Pan** or use the **Zoom Fit** button to fit all items in the current file into the Map View. Use the **Zoom to GPS** button to zoom to the current GPS position.

By default, the zoom tool **AutoRoute Zoom** is selected and will automatically keep you zoomed in to the nearest road/intersection to facilitate navigation along the Auto Route.

The current waypoint target along the Auto Route will be marked by the red target symbol . Your corresponding position on the Auto Route will be marked by the blue target symbol and will slide along the Auto Route path as your position moves. Your actual current position will be marked with the standard arrow marker . Other waypoints will be shown on the route as blue triangles connected by a solid pink line (symbology for waypoints and routes may be adjusted in the Route Setup screen, see item 5 of Section 6.4).

Verbal reminders are available to help remind you to turn as you travel along the route. By default, the verbal messages are toggled ON. The following icon is used to control the verbal directions: . Click on this icon again to toggle the verbal instructions to OFF. The icon will change as follows to indicate the verbal directions are now OFF: .

Please note: With the verbal directions toggled OFF, you can still click on a waypoint or on the route once to get a single voice prompt telling you how far you are away from your current target.

An example of a calculated Auto Route and Navigation along the Route is shown in the following window:
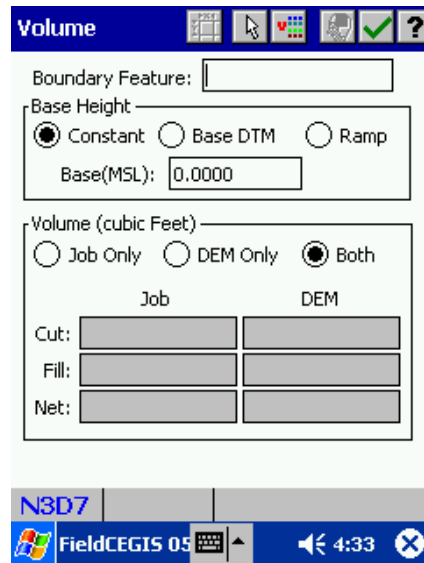
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Proceed in navigating toward the waypoint target until you are within the "Target Range" specified in the Navigation Setup screen. You will receive an audible notification when you are at the target if you have the audible voice activated .

To proceed to the next waypoint, continue along the highlighted route and Field CE GIS will automatically change the current target to the next waypoint on the route when you have moved out of the tolerance range of the current target.

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Section 7 - DEM Contour/Volume
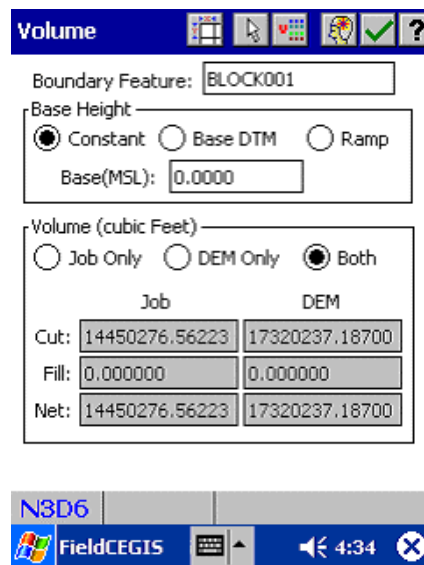
7.1 Measuring Volume

Use the **Measure Volume** function to get volume measurements for a line or area feature in the Map View.

Steps for obtaining a volume measurement:

1. Select the line or area feature by using the button to click on a feature in the Map View or by using the button to select the feature from a list.

The name of the selected feature will appear in the **Boundary Feature** box as shown.

2. Select the appropriate method for defining the Base Height:

a) Choose **Constant** if the volume is to be calculated from a flat plane of a specified elevation.
b) Choose **Base DTM** to use as base elevations, a Digital Terrain Model computed from the boundary nodes.
c) Choose **Ramp** to define the X, Y and Z coordinates of three known positions to define an inclined plane that will be used for the base height.

3. Select the desired volume calculation method:

a) **Job Only** will calculate volume using elevation data taken from any point, line or area feature that fall inside the selected boundary feature.
b) **DEM Only** will calculate volume using the Digital Elevation Model data (CDM data) that fall inside the selected boundary feature and has been converted and sent to your Mobile Device. Use the PC-GPS 07 software and the **Utilities/Mobile Device Interface/Conversion/CE DEM** function to define the area and send the CDM data to your Mobile Device.
c) **Both** will provide volume calculations for both Job data and DEM data.

4. Once you have completed the necessary parameters, click on the button to calculate the volume.

Please note: Volumes are displayed in the current unit of measurement for the map. To get volume measurements in a different unit of measurement, change the units under the **Menu/Setup/Coordinate** System window.

To compute the volume, Field CE GIS creates a grid to break down elevation data in the selected boundary feature. The number of samples in the grid may be adjusted using the button. When this button is clicked, the following screen is displayed:
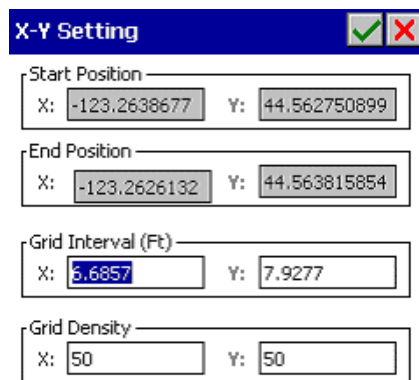
The coordinates for the start and end position of the grid are shown for reference. These positions may not be changed. The settings for **Grid Interval** and **Grid Density** may be changed.

Grid Interval: controls the size of each sample in the grid. Grid Intervals may be changed independently in both the x and y directions. Therefore, grid sample areas do not have to be square. Adjusting the settings for the Grid Interval affects the number of grid samples that can fit in the selected boundary feature. Therefore, the Grid Density will be affected and is automatically adjusted.

Grid Density: controls the number of samples in the grid. An increase in the Grid Density parameter results in a smaller Grid Interval. The Grid Interval is automatically adjusted based on your input for Grid Density.

7.2 Creating Contour Lines for your BaseMap

Contour lines may be generated and displayed along with your BaseMap and your job data in Field CE GIS. DEM data converted from PC-GPS to the Mobile Device format is used to calculate volumes for a specified area (see Section 2.1) and they are also used to display contour lines with your BaseMap.

When converting the DEM data from PC-GPS to the Mobile Device, it is important to correctly define the extents of the DEM data to be converted. Plan ahead for DEM coverage that not only covers any volume calculations you will need for line or area features, but also for generation and display of contour lines with your BaseMap.

Conversion of the DEM data for use in Field CE GIS must be done using PC-GPS. Please refer to the PC-GPS Reference Guide on information and the procedure to convert DEM data or SDTS data obtained from the Internet to the CMT CDM format. Once all desired DEM data has been converted to CDM format, you are now ready to send it to the Mobile Device. Load the BaseMap and DEM (CDM) data for the area of interest. Choose the Utilities/Mobile Device Interface/Conversion/CE DEM option. The following dialog is displayed:
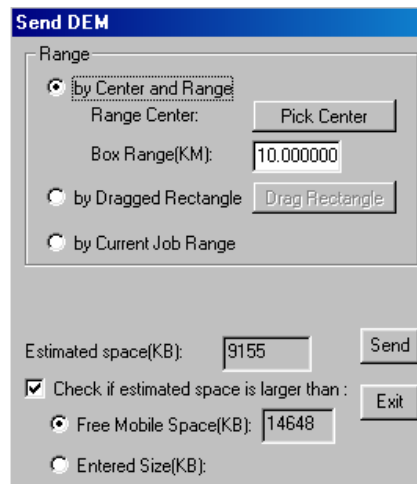
7.2.1 Sending DEM data to your Mobile Device from PC-GPS

1.   Specify the method for defining the range and the range for the conversion. Choose from one of three options:
     a) **By Center and Range** – Pick the center with your mouse and then define a rectangular range from the center to the extents of the DEM.
     b) **By Dragged Rectangle** – Select this option to draw a box using your mouse to define the data extents.
     c) **By Current Job Range** – If you have a Job open, select this option if to let PC-GPS define the extents of the DEM data by the extents of the Job.
2.   Confirm that the available storage space on the Mobile Device is large enough to handle the estimated size of the DEM.
3.   Convert the data and send it to the Mobile Device using the **Send** button.

4. Choose **Exit** to close the dialog.

After successfully converting and loading the desired DEM data from PC-GPS to your Mobile Device, you are now ready to use the DEM data to display contour lines in your map.

Steps:

1. Load the BaseMap for the area of interest.
2. Choose **Menu/DEM/Show Contour**. The contour lines will be loaded and integrated with your BaseMap. The contour lines may be turned on and off for display by choosing the **Menu/DEM/Show Contour option**.

A check mark next to the **Show Contour** option indicates that this feature has been activated. Following is a sample of contour lines using the SWCVO.PMP file found in Benton County, OR:
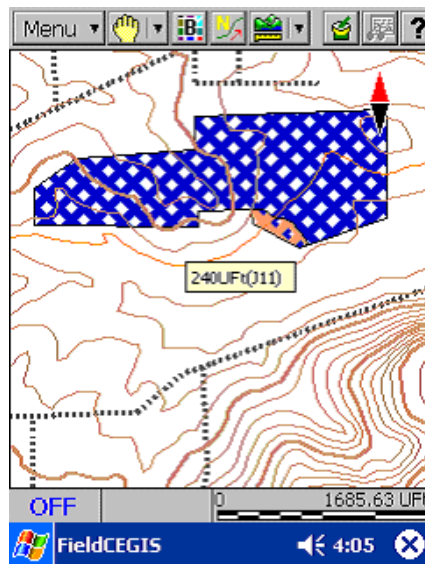

Click on a contour line to get the elevation reading for the associated contour line. The selected contour line will also be highlighted for easier identification.

7.3 Geoid 2009

For accurate elevation conversions from HAE to MSL, use the fine resolution Geoid 2009 grids for your specific work area. Use the Utilities/Mobile Device Interface/Conversion/Geoid 2009 option in PC-GIS 09, PC-GPS 09 or PC-MAPPER 09 to select the appropriate Geoid grid to convert and send to the Field CE GIS 09 software for accurate MSL elevations in the field. Please refer to the Online Manual in the PC software for more information on the usage of Geoid files for accurate MSL elevation readings.

Section 8 - Create Grid

You may use your Field CE GIS software to create evenly spaced grid nodes or grid lines on an area in your map. Point Features created from such grid nodes are often used for collection soil samples or timber cruising data. To create a grid, first, click in the Area Feature to highlight it. From the main **Menu**, select the **Utilities** function. Then select **Create Grid**. Enter the coordinates for the starting point for displaying the grid, or click the "By Mouse" button and select a point from the map.
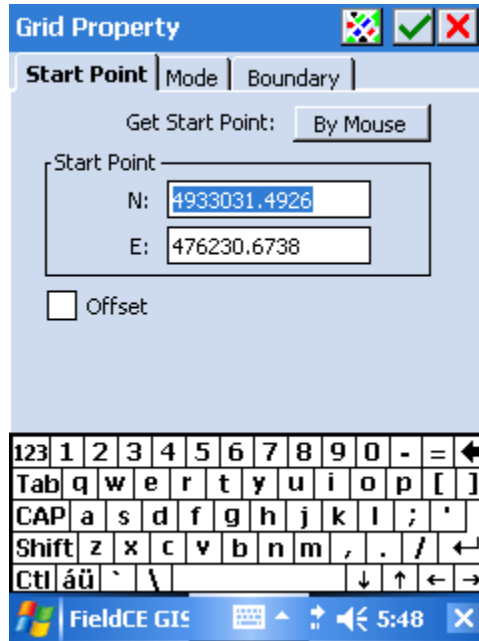
Click the **Mode** button to specify the grid Orientation, grid intervals (Scale), grid marker size and grid color. You may define the grid orientation by using an existing line segment or two existing nodes.
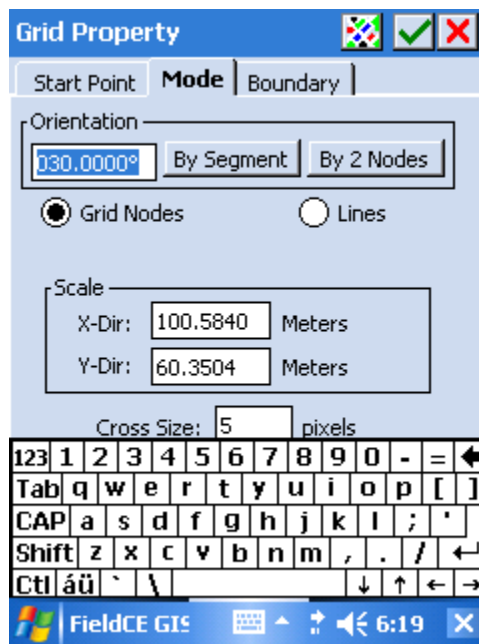
Select the **Grid Nodes** option if you wish to just see the grid nodes. If you wish to see the grid lines then select **Lines**.

For the **Grid Nodes** mode, you have the option to mark the **Create Points from Grid** checkbox if you wish 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.

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

Click the **Boundary** button. 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.
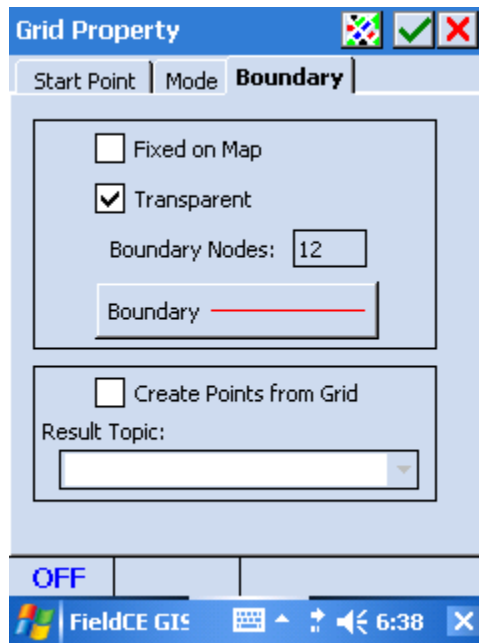
Ignore the "**Fixed on Map**" option as you cannot drag the grid in Field CE GIS. In the PC software, you can click on this option to prevent it from being moved. Mark the "**Transparent**" option if you want the Features beneath the grid to show through.

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

When you confirm the **Grid Property** screen, you will see the grid points or the grid lines displayed in the map. The grids are stored in the Non-Spatial Data Topic. You may go to the **Browse Features** screen by using **Menu/Job/Browse Jobs** then delete them.

Field CE GIS also provides a function for you to set up a default grid for all new jobs. To set up a default grid, first select **Menu/Setup/Default Grid**. In the **Default Grid** screen, select **Grid Nodes** if you wish to just see the grid nodes. If you wish to see the grid lines then select **Lines**. Enter the desired parameters then confirm the setting by clicking on the green check mark at the top of the screen.

Appendix A - Glossary

Attributes -   Attributes are the second layer of data in Field CE GIS Job files. Attributes are used to further describe collected features. Attributes can be thought of as questions which are asked about the feature.

Constellation -   A group of GPS satellites visible to a receiver. The size of a usable constellation is a minimum of four satellites. Valid corrections may be computed from a constellation of four or more satellites.

Dilution of Precision (DOP) - A measure of quality of the GPS derived position and time estimates, based on the geometry of the satellite constellation. A smaller DOP indicates better geometry which yields a better solution. Generally, the more spread out the satellites, the lower the DOP. The DOPs used for GPS satellite tracking are as follows:

NDOP - Dilution of precision in the north axis.
EDOP - Dilution of precision in the east axis.
VDOP - Dilution of precision in the vertical axis.
TDOP - Dilution of precision with respect to time.
HDOP - Horizontal dilution of precision.
PDOP - Position dilution of precision.
GDOP - Geometric dilution of precision.

Ellipsoid -   In geodesy, a mathematical figure formed by revolving an ellipse about its minor axis.

Ellipsoidal Height - Height of the ellipsoid relative to sea level. This is an alternate elevation system to Mean Sea Level.

Feature -   Primary organizational layer for data in Field CE GIS Job files. A feature is the object that is being mapped (point, line or area). Features are defined by a name and an X, Y, Z coordinate. Features can be further described by attributes and values.

Feature List -   List of features, attributes and values, which can be used in the field to streamline data collection. Feature Lists can be generated in Field CE GIS.

Geographic Information System (GIS) - System for presenting and analyzing spatial and non-spatial data. Typically PC or Workstation based, GIS systems are used to generate maps which reflect desired characteristics of the spatial data.

Global Positioning System (GPS) - The NAVSTAR GPS, consisting of orbiting satellites, a network of ground control stations, and user positioning and navigation equipment. The system has over 30 satellites in six orbital planes about 20,200 km above the earth. Additional satellites are strategically stationed in orbit as spares in the event of on-line satellite malfunction.

Initialize -   Entering key operating constants into the hand-held data collector, enabling it to start producing accurate positions. The constants are latitude, longitude, time, date and altitude.

PMP File -   Principal Field CE GIS data file (also referred to as "Job" file). The PMP file contains spatial data.

Map View -   Graphical representation of spatial data contained in a Field CE GIS Job file. The Map View provides a "picture" of the Map file.

Pseudo-range - The distance from an orbiting satellite to a GPS receiver. The pseudo-range is calculated by measuring the time it takes for the satellite transmission to reach the GPS receiver, and then multiplying the result by the speed of light.

Signal-to- Noise Ratio - Quantitative relationship between the useful and non-useful part of the received satellite signal. A minimum value of 32 dB is needed for tracking. Average values range from 38-41 for low-elevation satellites and 42-50 for mid-to-high-elevation satellites.

State Plane Coordinate (SPC) - Coordinate system designed by individual States. Many maps provided by State agencies reference SPC coordinates.

Feature Topic - Main organizational layer for data in Job files. Each feature topic contains individual features which have the same attributes.

Feature Topic View -   Listing of all of the feature topics contained in the Map file. The Feature Topic View contains a catalogue of all the feature topics in the current Map file.

Tracking -   Receiver mode (TRK) where the GPS unit is locked onto a satellite and is evaluating its status.

Universal Time Coordinated (UTC) - Greenwich Mean Time corrected for polar motion of the earth and seasonal variation in the earth's rotation.

Universal Transverse Mercator (UTM) - Coordinate system used by most government agencies. Often used in the production of "Quad" maps.

Values -   Final organizational layer of data in Field CE GIS Job files. Values are the answers to the questions asked by the attributes.

WGS-84 Datum - The basic reference frame and geometric figure for the earth provided by the World Geodetic Survey of 1984. The GPS satellites use this datum.

Appendix B - End User License Agreement

Field CE GIS End User License Agreement. This is a legal agreement between you, the End User, and Corvallis Microtechnology, Inc. ("Company"). By installing Field CE GIS on your PC, you are agreeing to be bound by the terms of this agreement.

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This Agreement is governed by the laws of the State of Oregon.

If you have any questions concerning this Agreement, please write to:
Customer Service - Corvallis Microtechnology, Inc.
413 SW Jefferson Avenue, Corvallis, Oregon 97333, USA.

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