

# LandMark Mobile™

*a GPS Utility*



*User's Manual*

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# 1 Introduction

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## Welcome

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We would like to welcome you as a user of LandMark Mobile, a GPS Receiver Utility™ software program. LandMark Mobile is designed to serve as the interface between a GPS receiver connected to a Juniper Systems Field PC, and an application program.

Recognizing the need of custom and third party application software for real-time GPS data streams, Juniper Systems has developed LandMark Mobile to manage the GPS receiver connectivity functions.

GPS services used by field personnel include:

- Navigation
- Offset capabilities on marked waypoints
- Tracking prescribed routes
- Marking (recording) location and elevation of specific points

LandMark Mobile runs concurrently with your main data collection and processing programs. By using a “Hot Key”, your GPS data are forwarded to your primary application.

If you have any questions or comments about LandMark Mobile after reviewing this manual, please feel free to contact Juniper Systems at (435) 753-1881, or visit our website at:

[www.junipersys.com](http://www.junipersys.com).

## Features

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- Connects with a wide variety of GPS receivers using the NMEA data streams.
- Multiple data interfaces to other programs running concurrently. Shared memory, data exchange file, and wedging your GPS data into other programs using a *Hot Key* are options for data interface.
- Sky plot and satellite signal strength bars keep you informed of GPS status and quality.
- Navigation screen allows you to select *To* and *From* waypoints. Features include: a compass ring depicting direction of travel; an arrow designating direction to destination; and data fields showing distance to go, speed, track, and bearing along with cross-track error.
- Multiple user selectable waypoint files, 256 waypoints per file. The number of waypoint files are only limited by the available data storage on the field computer.
- Marking waypoint feature provides the option to average a user specified number of *fix* readings.
- Hot key, user specified, for triggering a *Mark* at any point in time; this key remains *hot* regardless of which application is active.
- Settable serial interface parameters, supporting GPS receiver input through any of the hardware COM ports, including Bluetooth.
- User selectable datums and display units (statute, metric, standard (U.S. feet), nautical).
- Diagnostics dialogue screen that displays received NMEA data strings, which are helpful when connecting a GPS receiver.
- Toggle Icon connects / disconnects any Field PC Com Port.
- Bluetooth Com Port usage auto detection, loads Bluetooth receiver by default if set as a “favorite.”
- Bluetooth auto reconnect, LandMark Mobile automatically tries to reconnect up to three times when a Bluetooth connection is lost.

# Software License Agreement

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## **Manufacturer Agreement**

This Software License Agreement is between the end-user and the manufacturer (Juniper Systems, Inc.) Please read the following terms and conditions before using LandMark Mobile. This agreement supersedes any prior agreement, written or oral.

## **Granting of License**

The manufacturer grants, under the following terms and conditions, a non-exclusive license to use the LandMark Mobile software.

## **Ownership**

Juniper Systems, Inc. retains the title to and ownership of the software plus any copies made of the software.

## **Software Use**

The software is authorized for use on the Juniper Systems Field PC. You can use the software on one Field PC at a time per licensed copy. You may make one copy of the software to be stored as a backup.

## **Copyright**

The LandMark Mobile software is copyrighted by Juniper Systems, Inc. You may not rent, lease, lend, sub-license, modify, or disassemble these programs. The associated documentation may not be copied without written permission.

## **Term**

This License is in effect until terminated. It will be terminated under the following conditions:

- You destroy all copies of the software and documentation.
- You return all copies of the software and documentation to Juniper Systems, Inc.
- You fail to comply with any provisions of the License Agreement.

## **Acceptance or Disagreement**

Use of the software in any manner indicates your acceptance and acknowledgment of the terms and conditions of this agreement. If you do not agree with any of the terms and conditions, do not use the software. Return the disk and documentation to the manufacturer. If the software was installed on the Field PC device at the factory, you must delete it.



# 2

## Installation

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# First Time LandMark Mobile Installation

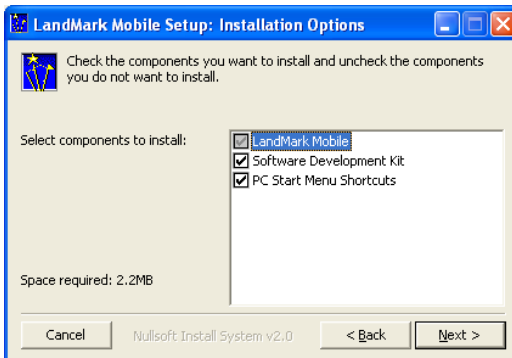
To install LandMark Mobile on your Field PC, it must be installed to your desktop PC first. Once installed on your desktop PC, LandMark Mobile is installed on your Field PC through an ActiveSync connection between your handheld and your PC.

*Note: In this manual, when ActiveSync connection is discussed it is synonymous with Windows Mobile Device Center (WMDC) on a Windows Vista™ Desktop.*

## Step 1: Installing LandMark Mobile on the desktop PC

To install LandMark Mobile on your Field PC, complete the following steps:

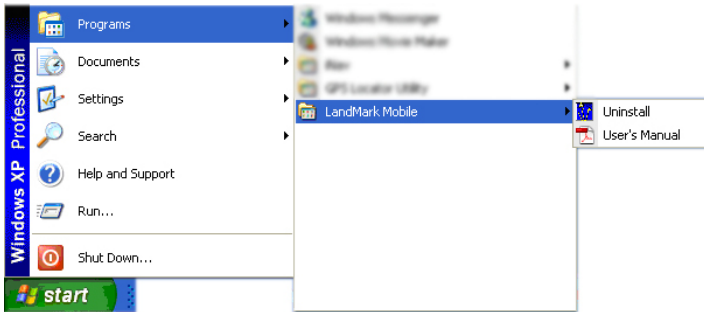
1. Establish an ActiveSync or WMDC connection between your desktop PC and your Field PC.
2. Place the LandMark Mobile CD-ROM into the CD drive of your desktop PC. If it does not auto start, navigate to your CD drive and tap on LandMark Mobile\_install.exe to begin installation. The installation wizard automatically starts up with the *LandMark Mobile Setup: License Agreement* screen.
3. Click on the *I Agree* button to continue with the installation process. Note: You must agree with the License Agreement to use LandMark Mobile.
4. Select the Installation Options you want from the *LandMark Mobile Setup: Installation Options* screen. The installation options are described below.



The *LandMark Mobile* option is selected by default and cannot be unselected. This installs the LandMark Mobile application and the User's Manual on your desktop PC.

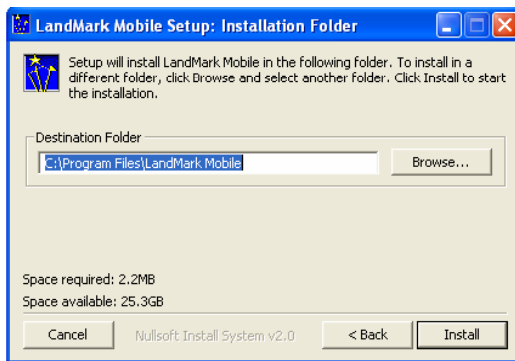
The *Software Development Kit (SDK)* option is selectable. This option installs the SDK in the SDK folder where LandMark Mobile is installed on your desktop PC. The SDK is used by program developers.

The *Start Menu Shortcuts* option is selectable. This option places a LandMark Mobile folder in the Programs folder of your Start Menu. Inside the LandMark Mobile folder is the LandMark Mobile Uninstall program and the LandMark Mobile User's Manual.



*Note: Acrobat Reader is required to open the User's Manual .pdf.*

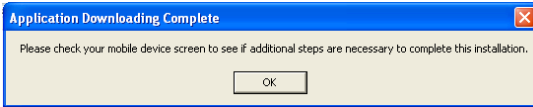
5. Select the location on your desktop PC that you want LandMark Mobile installed. The LandMark Mobile folder created in the Program Files folder on your desktop PC is the default location. Click on the *Install* button to install to the default location.



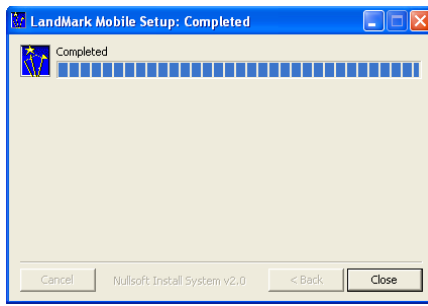
If you want the LandMark Mobile folder placed in a different location, click on the *Browse* button and select the location where you want LandMark Mobile installed. Then click on the *Install* button.

6. Wait until LandMark Mobile installs on your desktop PC. The *LandMark Mobile Setup: Installing* screen appears showing a progression bar as the application installs.

After an install destination is confirmed, the following message box pops up on the desktop PC. Select OK:

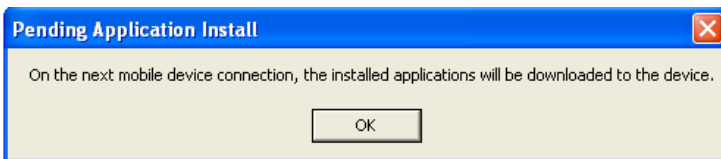


The following screen appears on your desktop PC to confirm that the installation of LandMark Mobile is complete.



Installation of LandMark Mobile on the Desktop PC is complete.

If the Field PC is not connected to the desktop PC through ActiveSync or WMDC, the following message box appears:



This screen indicates that the next time your Field PC connects to the desktop PC that the installation of LandMark Mobile to the Field PC will be completed. Click on the OK button.

On your Field PC you will see one of the following two screens.

### Screen 1



This Screen 1 directs you to finish the installation on the device. Proceed to *Step 2: Installing LandMark Mobile on the Field PC* to complete the step.

*Note: This screen only appears if you have additional memory (SD card or other card) installed on your Field PC.*

### Screen 2



This Screen 2 is the LandMark mobile Registration screen. Proceed to *Step 2: Installing LandMark Mobile\LandMark Mobile Registration Screen.* to complete the installation.

## Step 2: Installing LandMark Mobile on the Field PC

Once LandMark Mobile is installed on your desktop PC, the installation process continues on the Field PC. LandMark Mobile is installed on to the Field PC from the desktop PC through an ActiveSync or WMDC connection. **The following steps are done on your Field PC.**

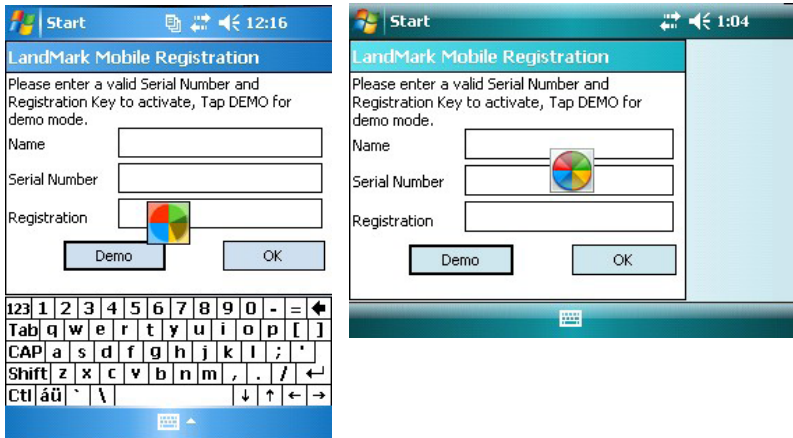
With this screen on your Field PC, verify that “Device” is Selected and then select install.



After the installation of LandMark Mobile is completed on your Field PC, the Registration screen appears.

## LandMark Mobile Registration Screen

LandMark Mobile is a licensed application and requires a Serial Number and Registration Key to completely activate the program. You can run LandMark Mobile in Demo mode by tapping the Demo button. The registration screen is shown below in portrait or landscape format dependent on the orientation of your Field PC screen.



*Note: Tapping on the Registration screen causes busy symbol to disappear.*

### Name

The Name box is used to identify who purchased the program. This can be either an individual or a company name.

### Serial Number

The *Serial Number* is located on the Serial Number label located on the LandMark Mobile CD-ROM case. The serial number is a unique number for this licensed copy of LandMark Mobile..

### Registration Key

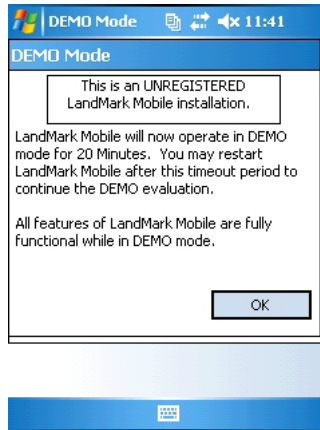
The *Registration Key* is located on the Serial Number label located on the LandMark Mobile CD-ROM case.

After you have entered the required information, tap on the OK key. LandMark is now fully installed and registered on your Field PC and is ready to use.

## LandMark Mobile DEMO Mode

LandMark Mobile offers a Demo Mode allowing you the opportunity to evaluate LandMark Mobile prior to purchase.

Click on the *DEMO* button to activate Demo mode.



Demo mode allows the user full use of LandMark Mobile for multiple 20 minute periods. Once the 20 minutes expires, a pop-up window appears indicating the 20 minute evaluation session is over.

Tapping on the *OK* button or the *X* in the top right corner of this window saves the LandMark Mobile files you are working on and closes down the LandMark Mobile application.

## Additional LandMark Mobile Installations

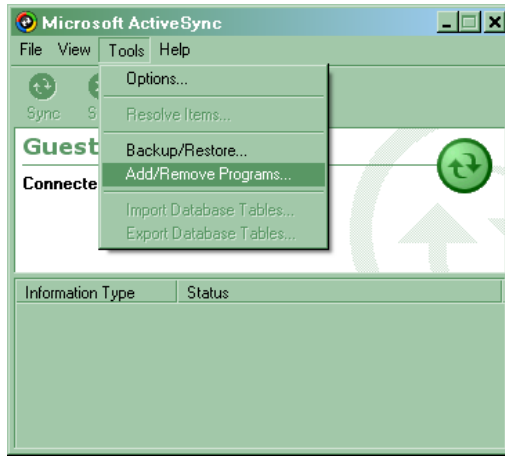
Once LandMark Mobile has been installed on your desktop PC it does not need to be reinstalled each time you want to install LandMark Mobile on additional Field PC's. You will need a separate Serial Number and Registration Key for each additional Field PC installation.

To install LandMark Mobile onto a Field PC from a desktop PC that already has LandMark Mobile installed on it, complete the following steps:

1. Establish an ActiveSync connection between the Field PC and desktop PC.

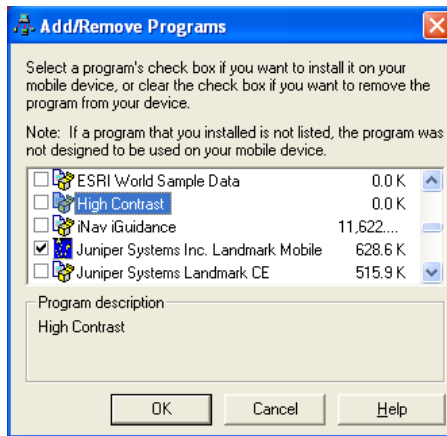


2. Click on the *Tools* option in ActiveSync and tap on *Add/Remove Programs*.

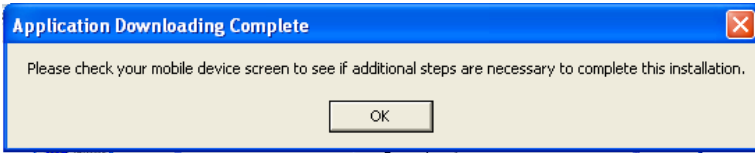


The *Add/Remove Programs* screen appears with a list of items on your desktop PC that are available to install on the Field PC.

3. Select the Juniper System LandMark Mobile option so a checkmark appears next to option.



4. Click on the *OK* button to proceed with the installation. After an install destination is confirmed, the following message box pops up:



This screen directs you to finish the installation on the Field PC.

5. Click on *OK* and proceed to *Step 2: Installing LandMark Mobile* on the Field PC to complete the installation.

## Uninstalling LandMark Mobile

The following instructions are device specific and describe the steps to uninstall LandMark Mobile from your desktop PC and Field PC.

### Uninstalling LandMark Mobile from the Desktop PC

To uninstall LandMark Mobile from your desktop PC, perform one of the following procedures:

- Click on the *Start* button and go to *Settings* | *Control Panel*. Double-click on the *Add/Remove Programs* icon. Select *LandMark Mobile* and click on the *Remove* button. This path can vary depending on desktop OS and actual view (Classic or other) being used.
- Click on the *Start* button and go to *Programs* | *LandMark Mobile* | *Uninstall*. Follow the directions in the uninstall wizard.

### Uninstalling LandMark Mobile from the Field PC

To uninstall LandMark Mobile from your Field PC, perform the following procedure:

- Tap on the *Start* button and go to *Settings* | *System*. Tap on the *Remove Programs* icon. Select *Juniper Systems Inc. LandMark Mobile* and tap on the *Remove* button.

# 3

## Using LandMark Mobile

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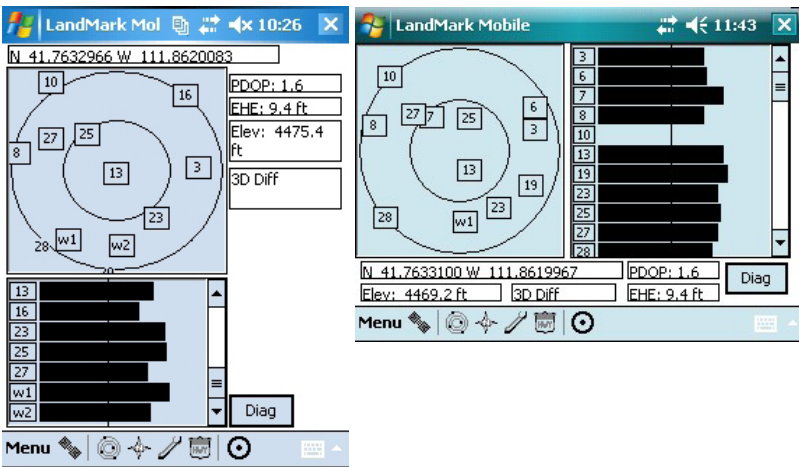


# Introduction and Operation

After LandMark Mobile is installed, you can operate it in the field or office. This chapter describes the operation, screens, and specific features of the program.







To begin using LandMark Mobile, from the Today screen select *Start | Programs | LandMark Mobile* icon. A splash screen displaying *LandMark Mobile A GPS Receiver Utility* and the version number are displayed for two seconds. The program opens to one the following two screens.

The left screen is typical of a portrait display on the Archer Field PC while the screen on the right is typical of a landscape display on the Allegro MX.



## Screen Selection

The initial program screen allows you to select between the different operations that LandMark Mobile offers.

- Menu = Drop Down Menu
-  = GPS Screen
-  = Navigation Screen
-  = Configuration Screen
-  = Waypoint Screen
-  = Connect
-  = Mark

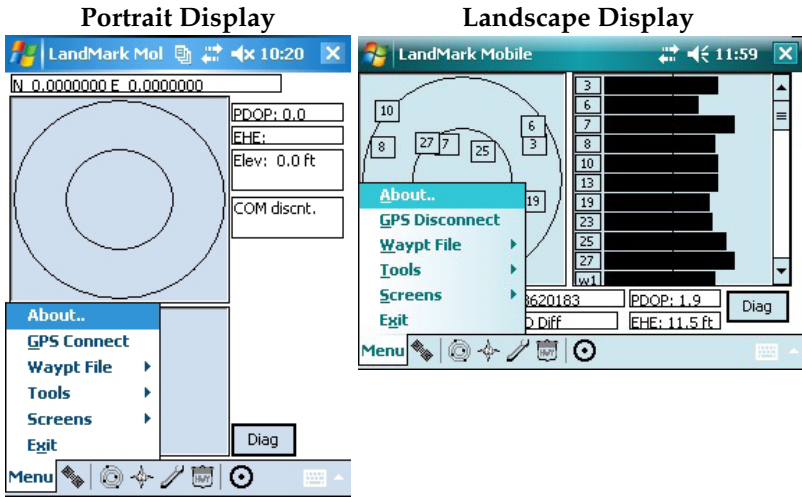
*Note: The program can be used in landscape or portrait mode. The information will be the same but the screen layout varies.*

## Keyboard Options

To navigate through LandMark Mobile, use a stylus with the touch screen. You may also use the circular directional key located in the center of the keyboard for limited navigation within each action screen.

## Menu

The *Menu* option is available on the GPS, Navigation, and Waypoint screen. Tap on *Menu* to activate the following drop-down menu.



## About

The *About* option opens a pop-up screen that displays the LandMark Mobile version number and date the version was released.



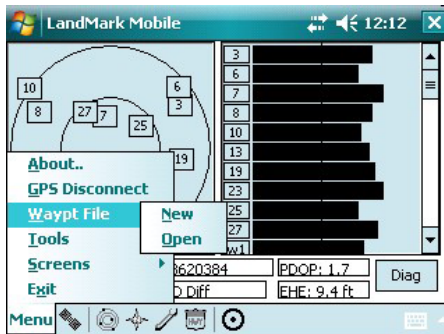
*Note: Landscape display screen shots are used through the rest of this document. Portrait displays will contain the same basic content in a slightly different layout.*

## GPS Connect/ GPS Disconnect

This option connects or disconnects the GPS receiver through a Bluetooth connection.

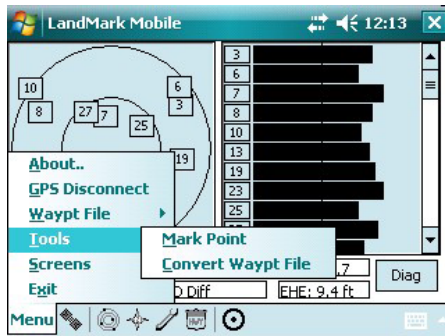
## Waypoint Files

Selecting waypoint file opens the following menu where you can open an existing waypoint file or create a new one.



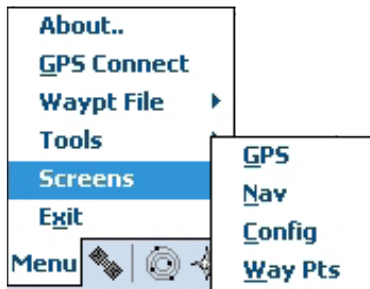
## Tools

Selecting tools opens the following menu which allows the user to convert a waypoint file or jump to the mark point screen. We recommend that if you need to convert a waypoint file, that you do so only after the waypoint file is completed and all necessary data is collected.



## Screens

Tap on *Screens* to activate the following drop-down menu.



*Note: These screens and the mark point may also be accessed by tapping on the icons located in the task bar.*

### GPS

Tapping on the *GPS* option opens the GPS screen.

### Nav

Tapping on the *Nav* option opens the Navigation screen.

### Config

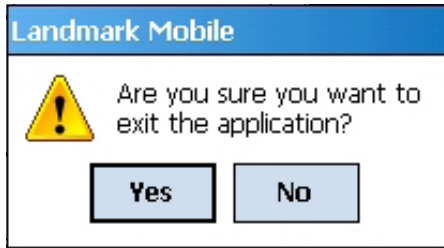
Tapping on the *Config* option opens the Configuration screen.

### Way Pts

Tapping on the *Way Pts* option opens the Waypoint screen.

## Exit

The *Exit* option exits out of the LandMark Mobile program. After selecting Exit you receive the following confirmation screen:

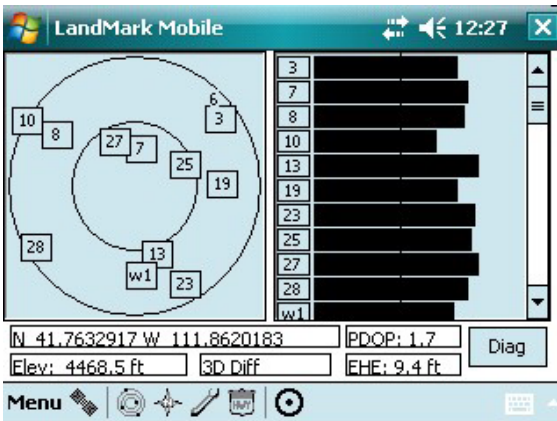


Tap on *Yes* to continue to Exit out of LandMark Mobile or tap on *No* to cancel the Exit process.

## GPS Status Screen

The GPS status screen displays a skyplot that shows the position of each satellite transmitting GPS data. This screen also helps you determine how accurate the GPS readings are. To display the *GPS* Screen, complete one of the following steps:

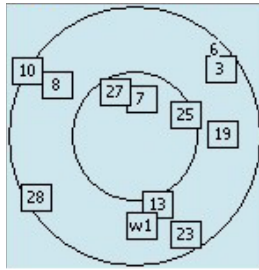
- Tap on the *GPS* icon located in the task bar.
- Select *Menu* | *Screens* | *GPS*



The Skyplot is on the upper left side of the screen and displays the approximate locations of the visible GPS satellites. Your position is located at the center of the inner circle. The outer circle represents the flat or horizon of where you are standing. The

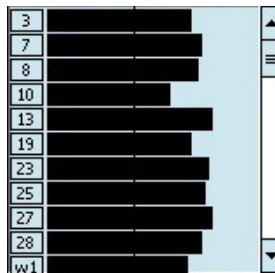


inner circle represents the area above you, this circle has a 60 degree incline from the outer circle.



When a satellite rises above the horizon, the GPS receiver can then receive a positioning signal from the satellite. The satellite then appears in the skyplot section of the GPS screen. GPS readings are more accurate when the satellites are more scattered across the sky.

The right side of the GPS status screen displays a bar graph showing the relative satellite signal strengths. Each satellite is assigned an SV number (space vehicle or satellite vehicle number). These numbers appear to the left of their corresponding signal strength bars. A boxed number indicates which particular satellite is being used to determine the GPS position.



*Note: Only active satellites are displayed on the bar graph, but all viewable satellites are displayed in the Skyplot. The scroll bar on the right of the graph box allows you to view all displayed satellites.*

Latitude, longitude, elevation, and position quality values are shown below the skyplot section of the GPS screen. The *PDOP* (Position Dilution of Precision) and *EHE* (Estimated Horizontal position Error) values are shown under the bar graphs.

N 41.7632917 W 111.8620183	PDOP: 1.7	
Elev: 4468.5 ft	3D Diff	EHE: 9.4 ft

## PDOP

*PDOP* (Position Dilution of Precision) is based on the geometric arrangement of satellites, and indicates the quality of GPS readings. Optimal PDOP occurs when one satellite is directly overhead and three or more others are evenly spaced out over the horizon. A PDOP less than 4 gives the best accuracy, between 4 and 8 is acceptable, and greater than 8 is poor.

## EHE

*EHE* (Estimated Horizontal Error) indicates the amount of receiver horizontal position uncertainty. This reading is an estimate based on PDOP, HDOP, and other parameters from the GPS receiver. The smaller the number the closer the estimate.

*Note: The EHE reading appears in either feet or meters depending on the measurement preferences that are set in the Configuration screen.*

## Elev

*Elev* (elevation) is the altitude where you are geographically positioned. For display options, go to the Altitude Reference section later in this chapter.

## GPS Status Quality — Receiving Data

GPS status quality is shown to the right of *Elev* reading and consists of the following mode indicators when **receiving** any data:

Mode	Meaning
3D Diff	Fix from 4 or more satellites; receiving real-time corrections from WAAS, beacon, etc.
2D Diff	Fix from 3 satellites; receiving real-time corrections from WAAS, beacon, etc.
3D	GPS fix from 4 or more satellites; including elevation; no real time connection.
2D	GPS fix from 3 satellites; no elevation; no WAAS.
3D PPS	Precise Positioning Service; need capability to read PPS code; Excellent signal.
2D PPS	Precise Positioning Service; need capability to read PPS code; Excellent signal.

## **Mode      Meaning**

3D RTK	Real-Time Kinematic; measure lat/long/height above WGS-84 datum to within a few centimeters.
2D RTK	Real-Time Kinematic; measure lat/long WGS-84 datum.

*Note: Depending on the quality of receiver and the receiver capabilities, different messages are displayed.*

### **Using 3D Diff or 2D Diff Mode**

The 3D Diff or 2D Diff mode is displayed when the receiver is receiving real-time differential corrections from WAAS, beacon, base station, Omnistar, etc.

### **Using 3D or 2D Mode**

The 3D or 2D mode is the standard for receivers that do not offer real time differential correction.

### **Using 3D PPS or 2D PPS Mode**

The 3D PPS or 2D PPS mode is only displayed when the receiver being used is capable of reading PPS code from three or more satellites.

### **Using 3D RTK or 2D RTK Mode**

The 3D RTK or 2D RTK mode is only displayed when the receiver being used is capable of reading RTK code from three or more satellites.

## **GPS Status Quality — Not Receiving Data**

GPS status quality is shown to the right of *Elev* reading and consists of the following indicators when **not receiving** any data:

- No Com Actv.
- No New Data
- COM Discnt
- COM Errors
- No Fix

### **No Com Actv.**

*No Com Actv.* (activity) indicates that the GPS receiver is not sending data, or the communication to the Field PC is disconnected from the COM port. Check to be sure that the GPS is connected to the specified COM port and that it is configured properly.

## No New Data

*No New Data* indicates that the COM has been set up right, and the GPS is sending data properly, but the data string is not in a readable format (i.e. data not in NMEA format).

## COM Discnt

*COM Discnt* (disconnect) indicates that the program tried to open the specified COM in Configurations, but it could not open it. Check the configurations for the right COM port, or that the receiver has been disconnected by operator.

## COM Errors

*COM Errors* indicates that the baud rate is not set correctly, or the COM port could be set wrong. Check the configurations and select the correct baud rate specified by your GPS receiver, and make sure you are connected to the correct COM port.

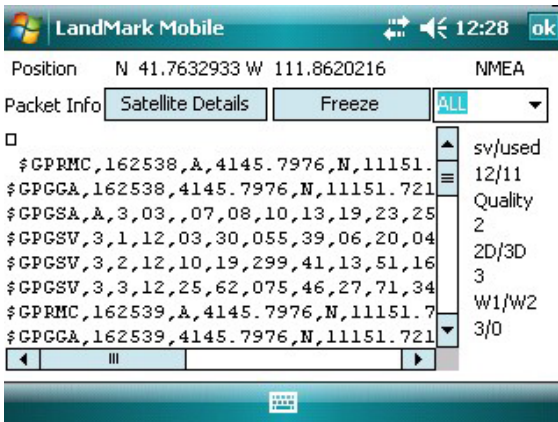
## No Fix

*No Fix* indicates that the GPS is not sending quality data. Empty strings of NMEA are being received, so a GPS fix cannot be calculated. Wait for data to be received, or move to a new location.

## Diagnostics

Tap on the *Diag* (Diagnostics) button within the *GPS Status* screen.

The *GPS Diagnostics* screen displays a dialog box showing your position and packet information, or NMEA data strings, supplied from GPS receiver. These NMEA data strings are displayed in their entirety and can be viewed by using the scroll bar at the bottom of the screen.



Displayed on the right side of the dialog box are the following diagnostics and information headings:

- sv/used
- Quality
- 2D/3D
- W1/W2

Below each heading is a number(s) displaying specific data received.

### **Sv/used**

The sv/used heading means Satellites in view/ number being used in fix. The numbers 12/11 are displayed in the example above.

12 = number of satellites in view

11 = number of satellites being used to establish GPS fix

### **Quality**

The Quality heading shows the quality of your GPS fix.

0 = no fix

1 = GPS

2 = Differential

3 = PPS (Precise Positioning Service)

4 = RTK (Real-Time Kinematic)

### **2D/3D**

The 2D/3D heading shows the current number of satellite fixes.

1 = no fix

2 = 2D fix (minimum of 3 satellites)

3 = 3D fix (minimum of 4 satellites)

### **W1/W2**

The W1/W2 heading shows WAAS satellites. (Up to two WAAS satellites may be tracked, indicated by W1/W2)

0 = no WAAS

1 = WAAS satellites visible but not used

2 = WAAS satellites used

3 = Visible and used

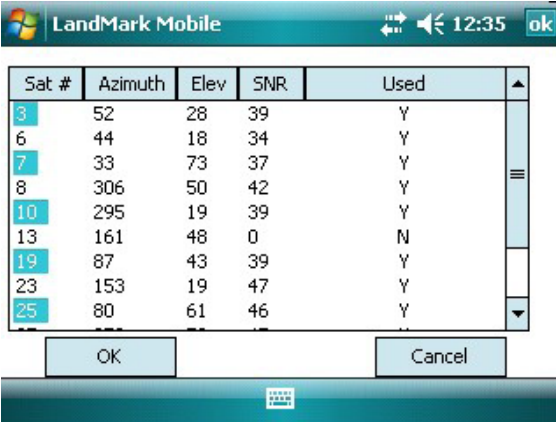
### **Satellite Details**

The *Satellite Details* button within the *GPS Diagnostics* screen opens the satellite details screen. Tapping on this screen button

displays a dialog box showing the SV number, azimuth, elevation, signal to noise ratio, and use status of all GPS satellites in view. When WAAS satellites are visible, they are shown on Satellite Details screen.

*Note: The WAAS satellite information may or may not be shown due to manufacturer's specifications. If the receiver is not WAAS enabled then no WAAS info is received. Some receivers will only track one satellite while others may track two.*

### Satellite Details Screen



Sat #	Azimuth	Elev	SNR	Used
3	52	28	39	Y
6	44	18	34	Y
7	33	73	37	Y
8	306	50	42	Y
10	295	19	39	Y
13	161	48	0	N
19	87	43	39	Y
23	153	19	47	Y
25	80	61	46	Y

#### Sat #

*Sat #*, or SV number, indicates the satellite vehicle, or space vehicle number.

#### Azimuth

*Azimuth* is the bearing measurement in degrees from North that represents the horizontal direction of the satellite from the current position.

#### Elevation

*Elevation* is shown in degrees and is the angular measurement above the Azimuth line, which gives the satellite's height above the horizon. A satellite located lower on the horizon has a lower elevation in degrees.

#### SNR

*SNR* is the Signal to Noise Ratio, or the ratio of signal received to noise received. More signal, or higher number, indicates a stronger signal strength. More noise indicates less signal strength.

## Used

*Used* is the status of the satellite's signal in calculating the current location. If the satellite signal is picked up by the receiver, but the signal is not strong enough, or if the satellite is not beneficial to use due to poor geometric arrangement, it is not used for position calculation. *Yes* indicates that the satellite's data is being used to calculate your position. *No* indicates that the satellite's data is not being used to calculate your position.

## Freeze/Unfreeze

The button title automatically toggles between *Freeze* and *Unfreeze* depending on your selection. The button title displays the action that occurs when the button is tapped. The *Freeze* button captures the *Packet Info* (data stream) instantaneously from the GPS receiver. Tap *Unfreeze* to return to the continuous data stream mode.



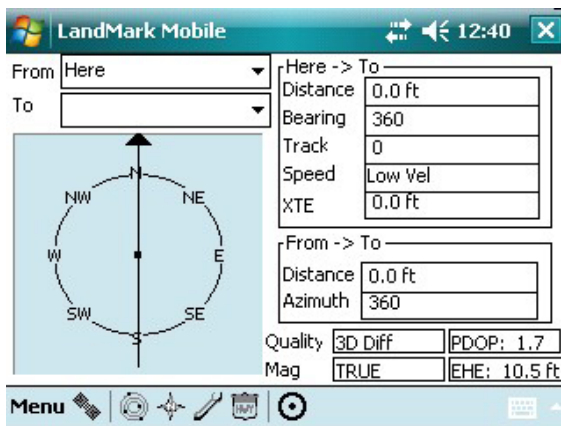
## Navigation Screen (NAV)

The *Nav* screen allows users to collect point information, calculate point differences, check survey lines, and specify a path of travel. To display the *Nav* Screen, complete one of the following steps:

Tap on the *Nav* icon located in the task bar.

- *Select | Menu | Screens | NAV.*

The Navigation screen is shown below:



The Navigation screen displays the following features, discussed later in this section:

- From
- To
- Compass
- Here -> TO
- FROM -> TO
- Quality
- Mag Dec

### **From**

The *From* box displays the waypoint that is the starting point you intend to begin traveling from. The option *Here* is the current position.

### **To**

The *To* box displays the waypoint that is the ending point. This point is your destination point.

### **Waypoint File**

Waypoint files are files consisting of points that have been saved and labeled. Before the navigation function can be used, a waypoint file must be identified and opened.

When waypoints within the file are selected in the *From* and *To* boxes, the *Nav* screen fields update the following:

- Compass
- Here -> To
- From -> To
- Quality - Always updated - Current GPS status
- Mag Dec - Set value based on Configuration Settings

*Note: If the GPS receiver is not active, only the From -> To box is updated.*

LandMark Mobile allows an unlimited number of waypoint files. You can log 256 waypoints in each waypoint file.

To open a waypoint file, complete one of the following steps:

1. Tap on *File/New* to create a new waypoint file.
2. Tap on *File/Open* to open an existing file.

A waypoint file is now activated.



## **Compass**

The compass is shown on the left side of the screen. The compass rotates to show the direction of travel when you start moving. It is updated when your speed is greater than 0.5 km/hr (0.31 mph).

The arrow is fixed and always points toward the *To* location and assumes the direction of travel is the top of the screen. The compass body rotates to show the current direction of travel, as long as you are moving. When you stop, the top of the compass points to the north.

## **Here -> To**

The *Here -> To* section of the *Navigation* screen, shown on the upper right, displays calculated values based on the current GPS location (*Here*) and the destination (*To*) location.

### ***Distance***

The *Distance* box displays the distance in the selected current units (meters or feet) from the *Here* to the *To* location.

### ***Bearing***

The *Bearing* box displays the compass heading in degrees from *Here* to the *To* location.

### ***Track***

The *Track* box displays the direction you are traveling in degrees.

### ***Speed***

The *Speed* box displays the speed you are moving in current display units (km/h or mph).

### ***XTE***

The *XTE* box gives the shortest distance between the current location of the GPS receiver and the line that connects the *From* and *To* locations. A positive (+) *XTE* is to the right of the path and a negative (-) *XTE* is to the left, assuming you are traveling toward the *To* location.

## **From -> To**

The *From -> To* section of the *Navigation* screen displays calculated values based on the *From* location to the *To* location. When changing *From* or *To* waypoints, displayed information in the *Here -> To* section may not be updated until you start moving; this can depend on the GPS receiver being used.

The *From* -> *To* section is updated even without receiving GPS signal. Once the *From* and *To* waypoints are selected, the values in the *From* -> *To* section do not change.

### **Distance**

The *Distance* box displays the distance in current units (metric or standard) from the *From* location to the *To* location. The distance converts to miles or km when the distance reads high enough that it applies.

### **Azimuth**

The *Azimuth* box displays the compass heading in degrees from the *From* location to the *To* location.

### **Quality**

See GPS quality status explanations located earlier in this section.

### **Heading Setting**

The heading setting is located below the Quality status line. It displays which heading the compass is set to. Options include True North, Auto Magnetic, Manual Magnetic, or the World Magnetic Model Epoch 2000 (WMM-2000 or WMM 2K).

For more information about the heading settings and the options available to you, go to the *Heading* title in the *Configuration Screen* section of this chapter.

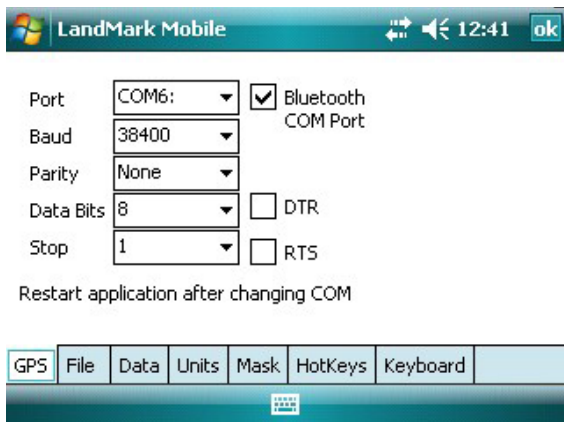
## **Configuration Screen (Config)**

---

The *Configuration* screen allows you to customize LandMark Mobile according to operational preferences.

To display the *Configuration* screen, complete one of the following steps:

- Tap on the *Configuration* icon located in the task bar.
- *Select | Menu | Screens | Config*



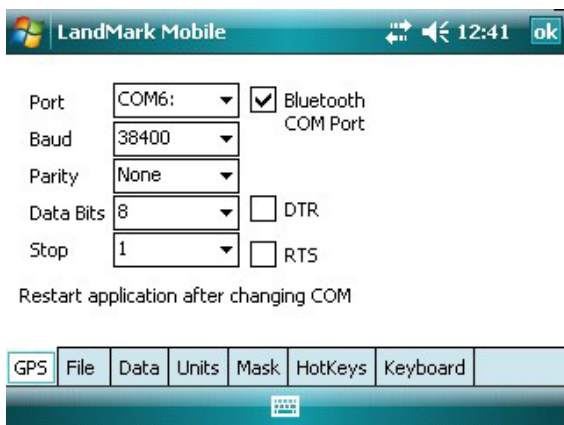
The *Configuration* screen contains seven tabs, GPS, File, Data, Units, Mask, HotKeys, and Keyboard. This section covers the options available in each one of these tabs.

To use the *Configuration* screen via the keyboard, use the tab keys (forward or back tab), or the circular navigation key. To exit the *Configuration* screen, tap *OK* in the top right hand corner of the screen, which will also automatically save all your configuration changes.

*Note: Tapping on the OK in the upper right hand corner saves any configuration changes you have made.*

## GPS Tab

The *GPS* tab is used to configure the COM port you are using to attach the GPS receiver. Any changes to the communication port become effective immediately, a program restart is not needed.



## **Port**

The *Port* field allows you to select the communication port you are using. LandMark Mobile currently supports communication ports COM1 through COM10.

*Note: If you are using a serial Holux receiver, you need to use COM1 and check the DTR option.*

1. To set the correct port for GPS communication use the stylus to tap the down arrow next to the *Port* box to access the drop-down menu and tap on the desired *COM Port*.
2. Close the *Configuration* screen by tapping on *OK* in the top right corner of the screen.

### *Bluetooth COM Ports*

LandMark Mobile has multiple automated functions specifically for Bluetooth receivers.

### *Bluetooth COM Port Usage Auto Detection*

When a user selects a Bluetooth COM port or when the application loads, LandMark Mobile automatically detects when a Bluetooth COM Port is being used. If a Bluetooth receiver is set as a *favorite* when more than one device is available, loading the COM port defaults to the desired receiver and bypasses the Bluetooth device selection screen.

### *Auto Reconnect*

When a Bluetooth connection is lost, LandMark Mobile automatically tries to reconnect up to three times.

### *Auto Bluetooth Card Power Shut-off*

When using Bluetooth PC cards, the power to the card is shut off when the Field PC is suspended. LandMark Mobile registers with the Bluetooth stack to the GPS receiver status, when the stack is loaded or unloaded. This feature reduces the reload time when coming out of suspend and auto connects the receiver when the stack is reloaded.

*Note: If Bluetooth is not active when the Field PC is suspended, LandMark Mobile does not auto connect.*

## **Baud**

*Baud* determines the signaling speed. The rate at which the COM port accepts data must match the rate that the GPS receiver sends data. If the Baud is not set correctly, you will get a framing error, and the Field PC will not be able to communicate with the GPS.

## **Parity, Data Bits, Stop Bits**

As with Baud rate, the communication parameters for *Parity, Data Bits, and Stop Bits* must be those used by the receiver. *Parity, Data Bits, and Stop Bits* are specified by the GPS receiver's manual. Please see the user's manual for these values and set them appropriately.

## **DTR**

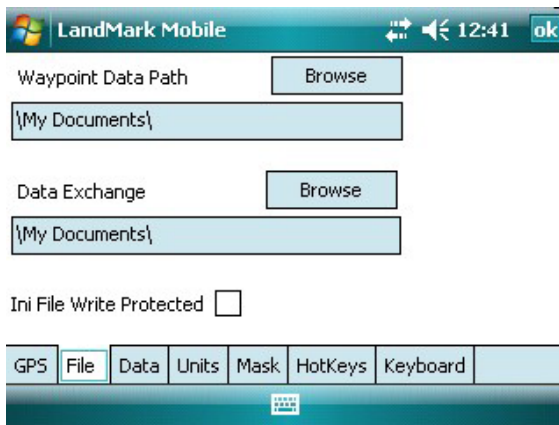
The *DTR* (Data Terminal Ready) option provides a 5V power supply on COM1 (only). It is used when an external GPS receiver requires power from the Field PC.

## **RTS**

The *RTS* (Request to Send) option is a standard when using serial port communication. You should only select this option when requested by the GPS receiver.

## **File Tab**

The *File* tab defines where you want to store your LandMark Mobile waypoint files on the Field Computer.



## **Waypoint Data Path**

LandMark Mobile automatically defaults to \My Documents\ for *Waypoint Data Path*. Tap on *Browse* to set a different location for the waypoint file. This feature makes saved waypoint files easy to access.

## **Data Exchange**

*Data Exchange* gives you the option of easily sharing GPS data between two applications. Every time a new point is created

using the *Mark Point* screen (explained in detail later in this chapter), a file named *dtex.txt* is overwritten or created in the location you have specified in the *File* tab.

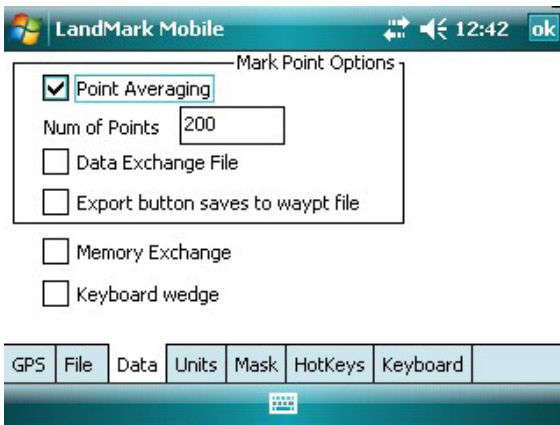
When the *Export* button is tapped in the *Mark Point* screen, your last active application opens automatically. Press *Enter* or type a command to read the modified *dtex.txt* file and obtain the GPS data. See the *Mark Key* section later in this chapter for further details on *Mark Point* screen.

### **Ini File Write Protected**

The *Ini File Write Protected* box indicates whether a general field user can change configuration settings when checked. This option ensures that all data being collected are always the same format, regardless of which user is operating LandMark Mobile. To check the box and lock the configured settings, see the Programming chapter.

### **Data Tab**

Once the data are calculated in the specified format, *Data* tab options determine how they are sent to their final locations, through *Data Exchange*, *Memory Exchange*, or *Keyboard Wedge*.



### **Mark Point Options**

*Point Averaging*, *Number of Points*, and *Data Exchange File* all apply to the *Mark Point* screen. The *Mark Point* screen pops up when the *Mark Hot Key* is pressed. (See *HotKeys* tab to set up the *Mark Hot Key*.)

#### **Point Averaging**

Checking *Point Averaging* activates the point averaging function; if this option is left unchecked, no averaging occurs when marking

a waypoint. Point averaging averages the positions collected from the specified number of averaging points to calculate the point average value.

Each new position is included in the running average until the specified number of positions to calculate the overall average are accumulated. *Point Averaging* is used when the *Mark Point* screen is open.

*Note: Masked position information is not included in the average. See the Mask Tab section in this chapter for more information.*

### **Number of Points**

Enter in a *Number of Points* after you have checked the *Point Averaging* box. This user-specified number of GPS positions is used when calculating averaged points.

### **Data Exchange File**

Check the *Data Exchange File* option to use the data exchange path when exporting an averaged point. See the *Data Exchange* section in this chapter.

### **Export button saves to waypt file**

Check *Export button saves to waypt file* to both save data as a waypoint, and to export data concurrently when the *Export* button is tapped.

### **Memory Exchange**

Check the *Memory Exchange* option to share location data with another application. See the *Programming* chapter for more information.

### **Keyboard Wedge**

Check the *Keyboard Wedge* option to activate the wedge *Hot Key*. *Keyboard Wedge* allows the latitude, longitude, and elevation to be sent directly into another application when the *Hot Key* is pressed. This option is useful when you want a simple GPS point logged in another application.

When *Keyboard Wedge* and *Date Exchange* boxes are both checked, use the *Mark* hot key to send data to a data exchange file and also wedge data into other applications.

## Units Tab

The *Units* tab is used to format data. For example, say that your data needs to be calculated in feet, with magnetic declination set, in UTM scale, and mean sea level altitude reference set. Set up all of these configurations in the *Units* tab. Selected settings are also used in displayed data for *Keyboard Wedge* and *Memory Exchange*.



### Datum

The *Datum* option is a set of constants used for calculating coordinates on earth. A datum is used by the GPS to reference a coordinate on the earth's surface. LandMark Mobile automatically defaults to WGS-84, the datum constants established by the World Geodetic System in 1984 (WGS 84).

A selection of over 200 different map datum points from around the world can be used to convert the position to a different datum. When waypoints are stored, they are always recorded in the WGS 84 datum.

### Units

The *Units* option allows you to specify the units of measurement that you want your data to be expressed in. Choices include feet, miles, meters, kilometers, knots, miles per hour, or kilometers per hour.

Display Option	Distance Units	Speed Units
Statute	Feet, Miles	Miles per hour (mph)
Metric	Meters, Kilometers	Kilometers per hour
Nautical	Feet, Nautical Miles	Knots



<b>Display Option</b>	<b>Distance Units</b>	<b>Speed Units</b>
Feet	Feet (changes to miles at 13,000 ft.)	Miles per hour
Meters	Meters (changes to kilometers at 1500 m)	Kilometers per hour

### **Heading**

The *Heading* option allows you to set the display compass readings to the following:

- True
- Auto Mag (automatic magnetic declination)
- Manual Mag (manual magnetic declination)
- WMM 2K (World Magnetic Model 2005)

Declination is the angle formed between magnetic north and true north from the GPS receiver's location.

#### *True*

The *True* selection uses true north as the compass heading.

#### *Auto Mag*

The *Auto Mag* selection displays all compass headings as magnetic north using the magnetic declination value from the NMEA RMC packet sent by the GPS satellite. The declination is applied to the Auto Mag reading and appears on the GPS screen modified, adjusting for the altered declination degrees.

*Note: If the receiver you are using is not able to use RMC or VTG NMEA packets and the declination does not appear in the Diagnostic screen, do not use Auto Mag with that receiver.*

#### *Manual Mag*

The *Manual Mag* value uses a negative (-) number for East declination and a positive (+) number for West declination. When manually entering the declination, use the box to the right of the *Heading* drop-down menu and specify either East (using a negative value) or West (using a positive value).

#### *WMM 2K*

Earth's magnetic field, as measured by a magnetic sensor on or above the Earth's surface, is a composite of several magnetic fields generated by a variety of sources.

The World Magnetic Model Epoch 2000 (WMM-2000 or WMM 2K) is a generated model used to configure and display magnetic north in GPS units. The World Magnetic Model coefficients are produced and distributed by the National Geospatial Intelligence Agency (formerly National Imagery Mapping Agency), Washington, D.C.

The model, associated software, and documentation are distributed by NGDC on behalf of NGA. The model is produced at 5-year intervals. The 2010–2015 model will be available from NGDC on the following website in December 2009:

<http://www.ngdc.noaa.gov/geomag/WMM/DoDWMM.shtml>

Follow the directions on the above website to download the necessary file. Once the file is downloaded, place the file in the LandMark Mobile folder on your Field PC.

*Note: Some GPS receivers may not supply the magnetic declination. If your GPS receiver uses the Sirf chipset, it probably does not provide the magnetic declination value.*

### **Format**

The *Format* option allows you to select the format for displaying your location. Latitude and longitude can be set to degrees, degrees and minutes, or degrees, minutes, and seconds; UTM can be set to a northing/easting format.

<b>Format</b>	<b>What is Displayed</b>
ddd.ddddddd	latitude/longitude in decimal degrees
ddd mm.mmmm	latitude/longitude in degrees and decimal minutes
ddd mm mss.ss	latitude/longitude in degrees, minutes and seconds
UTM	northings/eastings

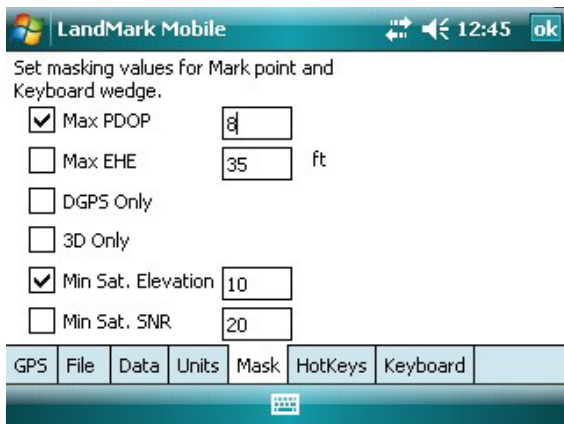
### **Altitude Reference**

The *Altitude Reference* option displays the altitude as *MSL* (mean sea level) or *HAE* (height above ellipsoid). When *MSL* is selected, its value is calculated when the GPS receiver provides the geoidal separation value in the NMEA GGA packets from the satellite.

## Mask Tab

The *Mask* tab is used to set the GPS signal masking parameters while marking waypoints. Only those GPS fixes that meet the specified criteria are used in averaging a waypoint. In essence, inaccurate GPS positions are screened with this feature.

The check boxes are used to enable or disable specific masking features. The edit boxes on the right of the check boxes are used to specify the mask value.



### **Max PDOP**

Select the *Max PDOP* (Maximum Position Dilution of Precision) option and then enter a value in the box to the right. This selection masks GPS *PDOP* readings greater than the value entered. Only computed waypoints with a *PDOP* equal to or less than the value you entered are used.

### **Max EHE**

Select the *Max EHE* (Maximum Estimated Horizontal Error) option and then enter a value in the box to the right. This masks GPS *EHE* readings greater than what you enter. Only computed waypoints with an *EHE* equal to or less than the value entered are used.

### **DGPS Only**

Select the *DGPS Only* option to collect GPS fixes with differential corrections. When selected, all other points that are not *DGPS* are masked.

### **3D Only**

Select *3D Only* to collect waypoints that are received when using at least four satellites.

### **Min Sat Elevation**

Select *Min Sat Elevation* (Minimum Satellite Elevation) and specify the minimum elevation in the box to the left. Satellites that are equal to or greater than the elevation value entered are included in the waypoint averaging.

### **Min Sat SNR**

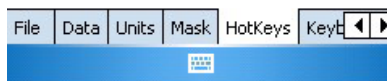
Select *Min Sat SNR* (Minimum Satellite Signal to Noise Ratio). A higher SNR is a better reading. A SNR value less than 4 is considered unusable. SNR values above the specified value are valid.

### **HotKeys Tab**

Use the *HotKeys* tab to set up user specified keys that automatically save a waypoint or send GPS data to a different application when pressed.

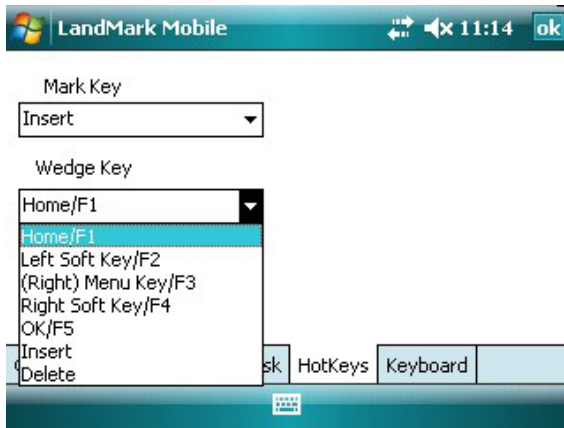
The following are keys that can be used for the *Wedge Key* or *Mark key* on the Archer:

- Windows Key
- Left Menu Key
- Home Key
- Right menu Key



The following are the keys that can be used for the Wedge or Mark Key on the Allegro MX.

- Home (F1)
- Left Soft Key (F2)
- Menu Key (F3)
- Right Soft Key (F4)
- OK (F5)
- Insert (Ins)
- Delete (Del)



### **Mark Key**

Select a *Mark Key* from the drop-down menu. Whenever that key is pressed it brings up the *Mark Point* screen.

### **Wedge Key**

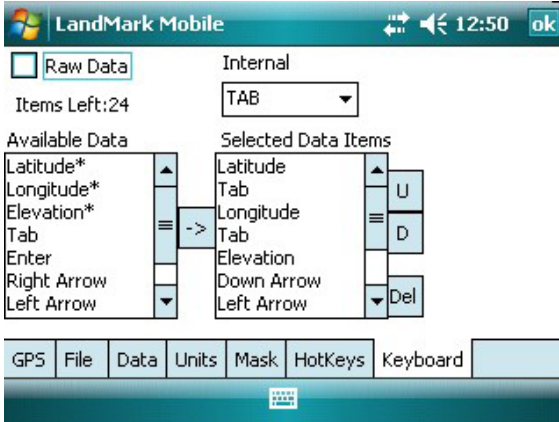
Select a *Wedge Key* from the drop-down menu. Whenever that key is pressed, it sends the GPS position into another active application. See *Keyboard* to specify the order you would like the data to appear.

### **Keyboard Tab**

The *Keyboard (Keybd)* tab is used to specify how you want data entered into another application when the *Wedge Key* is pressed. You can specify the order that latitude, longitude and elevation

are recorded. You can also set up carriage returns and tabs for the data sent. The Keyboard specifications work for any other applications being used.

*Note: As an example, Excel Mobile is the application used to explain the Keyboard functions.*



## Available Data Items

*Available Data Items* are listed options for how and what data are transferred. Select data items by highlighting and then tapping the arrow button between the *Available Data Items* box and the *Selected Data Items* box. *Available Data Items* are then copied into the *Selected Data Items* box. Asterisks denote data that can be transferred, while items without asterisks specify data formatting options.

## Selected Data Items

*Selected Data Items* are items that have been selected from the *Available Data Items* list. The order of the items is significant to how the data are displayed in the concurrent program when the *Wedge Key* is pressed.

## Items Left

The *Items Left* starts out with the number 35, indicating how many total *Selected Data Items* options are available. As you select items, this number is reduced by one for each selection.

For example, if you select latitude, tab, longitude, tab, elevation, down arrow, and then left arrow 3 times, you have used 9 of the 35 options, and the *Items Left* number reads 26 after this example.

## **U**

The *U* (up) button moves a *Selected Data Item* entry up, switching places with the item above it.

## **D**

The *D* (down) button moves a *Selected Data Item* down, switching places with the item below it.

## **Del**

The *Del* (delete) button deletes the item highlighted in the *Selected Data Item* box.

## **Internal**

Select one of the *Internal* options to split your whole data string into smaller segments. One data string includes what you have specified in the *Selected Data Items* box display. When your data string is being sent to the concurrent program, it is entered and separated into different cells or fields according to the option you have selected.

For example, when *Tab* is selected in *Internal* and *ddd mm ss.ss* is selected in *Units/Format*, a latitude data string in Excel Mobile is entered as follows: *N* has its own cell, *ddd* has its own cell, *mm* has its own cell, and *ss.ss* would have its own cell. This feature is nice for applications that require data calculations.

*Note: If you have an Internal option selected, be sure that your Selected Data Items box is filled in correctly.*

The *Internal* options are accessed from a drop-down list with the follow settings and data format after each data segment:

### **Internal**

#### **Setting      Data format after each data segment**

Tab	The cursor automatically tabs over to the next field.
Right	The cursor automatically moves to the right one space.
Left	The cursor automatically moves to the left one space.
Up	The cursor automatically moves up one line.
Down	The cursor automatically moves down one line.
Return	The cursor automatically returns.

## **Raw Data**

Click the *Raw Data* box for non-configured data entered into a concurrently running program when the wedge *HotKey* is pressed.

## Waypoint Screen (Way Pts)

Use the *Waypoint* screen to display and manage the contents of the currently selected waypoint file. The available functions allow for marking points, editing points, and deleting points from a waypoint file.

To display the *Waypoint* screen, complete one of the following steps:

- Tap on the *Waypoint* icon on the task bar.
- Tap on *Menu* | *Select Screens* | *Way Pts*.

Before working in the waypoint screen, you need to create or open a waypoint file. Do this by using the File menu.

The waypoints in the open waypoint file are displayed in a list on the left side of the display. Selecting a waypoint displays its waypoint number, ID or name, latitude, longitude, elevation, PDOP, and EHE on the right side of the screen.



### New

Tap *New* to create a new waypoint and manually enter its coordinates. This feature allows you to enter points without actually going into the field.



When *New* is tapped, a pop-up screen appears.

The screenshot shows a mobile application interface for creating a new waypoint. The title bar is teal and contains the Windows logo, the text 'LandMark Mobile', signal strength, volume, and the time '12:54', along with an 'ok' button. The main area has several input fields: 'Waypoint #' with the value '2' and an 'Offset' button; 'Waypoint ID' with the value 'WP2' and a 'Show Offset' checkbox; 'Latitude' with the value '0.000000000000' and a dropdown menu set to 'N'; 'Longitude' with the value '0.000000000000' and a dropdown menu set to 'W'; and 'Elevation' with the value '0.000000000000' and the unit 'ft'. At the bottom, there are 'OK' and 'Cancel' buttons. A teal bar at the very bottom contains a small icon.

Change the Waypoint ID and fill in latitude, longitude, and elevation. The units format depends on what is selected in the configurations screen. (See *Configuration* instruction to change *Units* format.)

### **Waypoint #**

Waypoint # is the number assigned by LandMark Mobile. All points in a waypoint file are numbered consecutively.

### **Waypoint ID**

Waypoint ID is the point name that you give to a point.

### **Latitude**

Latitude shows the waypoint latitude.

### **Longitude**

Longitude shows the waypoint longitude.

### **Elevation**

Elevation shows the waypoint elevation.

When you are finished entering all fields, tap on the *OK* button to go back to the *Waypoint* screen. All of your point information is saved into the waypoint file when you tap on *OK*.

## Edit

Tap *Edit* to edit the selected waypoint. When *Edit* is selected, the *Waypoint* pop-up screen is displayed. The exact format of the waypoint screen depends on the *Units* format selected. (See *Configurations* instructions to change *Units* format.)

*Note: A recommended practice is not to edit a waypoint very many times when using a datum other than WGS-84. The conversion between datums that occurs internally can potentially introduce errors into the original GPS data.*

## Del (Delete)

Tap *Del* to delete the selected waypoint. When the pop-up box appears, select *yes* to delete, or select *no* to return to the *Waypoint* screen.

## Mark

Tap on the *Mark* icon to capture a current location waypoint using the *Mark Point* pop-up screen. This screen also can be accessed by selecting *Menu* | *Tools* | *Mark Point*.

The *Mark Point* screen automatically assigns a waypoint number and a MarkID number. The MarkID number can be changed to any text value by selecting that field and entering the desired name using the keyboard. The MarkID number is what shows up on the left-hand side of the *Waypoint* screen.



*Note: The Average button only appears if the Point Averaging option is selected on the Data tab of the Configuration screen.*

## Current GPS

The top of the screen shows *Current GPS* readings. Each new GPS fix from the GPS receiver updates the location, elevation, quality, PDOP, and EHE values while the *Mark Point* screen is active.

## Waypoint #

The Waypoint 1 (the number varies depending on the waypoint file being used) box displays the Waypoint file you are currently using.

## Offset

Tapping on the *Offset* button opens the *Offset Input* screen. This screen enables the user to specify the distance, direction, and slope from the initial (current) location to an offset location.

LandMark Mobile 12:56 ok

Distance  ft

Direction  Ref: True North

Slope

OK Cancel

### Distance

The *Distance* box sets the direct distance in displayed units to the offset point.

### Direction

The *Direction* box sets the angle, in degrees, measured from north to the offset point. The Ref (reference) label is next to the Direction box. This displays the heading you set up in the configuration of LandMark Mobile and the declination angle. The reference used for each point is stored with the waypoint.

### Slope

The *Slope* box sets the angle, in degrees, of altitude inclination. A negative number represents a declination in altitude.

This ability to offset points is valuable in many situations. For example: The offset function can be used when a point you want

to mark is inaccessible (i.e. like a power pole behind a fence or an island in a lake), when the GPS signal at a desired point is unavailable (it may be blocked), or when gathering points from a vehicle without having to get out of the vehicle.

To use the Mark Point Offset function, complete the following steps:

1. Fill in the *Distance* from where your current location is to the point you are wanting to save.
2. Fill in the *Direction* in degrees that the new point is located.
3. Fill in the *Slope* from where you are located to the new point. Use a clinometer to measure the slope.
4. Check the *Offset On* check box, after these fields are filled in, if you want the offset calculations activated before closing the waypoint.

Now, whenever you select the saved offset point, if the *Offset On* check box is checked, an indicator appears in the *Waypoint* screen while viewing the point information.

If you want to view the unaltered point information, tap on the *Edit* button in the *Waypoint* screen.

Offset values are activated automatically when saving/closing the waypoint by tapping on the *OK* button. The *Cancel* button does not save any of settings or impose the new offsets.

### **Average**

The *Average* button is used to average GPS fixes that pass the mask settings. When you press the *Average* button, the bar graph above starts to fill, showing a ratio of points that have been included in the average so far.

The status/quality of GPS averaging is displayed in the box to the left. If a reading is masked, the reason for being excluded from the average is displayed in the box to the left.

The running and final averaged information is located to the left of the *Average* button. While a waypoint is being averaged, the average button displays *Averaging*.

If the *Store Wpt* button is pressed during the averaging process, the final average is not stored until all the points specified to compute the average have been included. You will notice that the *Store Wpt* button shows *waiting* while it is averaging. Similarly, final data cannot be exported until averaging is complete.

**Store WPT**

The *Store WPT* (Store Waypoint) button is used to store an average waypoint in the current waypoint file. If the *Store WPT* button is pressed before the *Average* button (if the button is available), the averaging process begins automatically and continues until all points for the average have been obtained. After the point is averaged, it is stored in the waypoint file.

In both cases, after the averaged waypoint is stored, the *Mark Point* screen closes. The new waypoint is included in the list of waypoints on the left side of the *Waypoint* screen.

**Export**

The *Export* button starts the average function, and then exports the averaged point to your *Waypoint Data Path* (See *Configuration/File* to set up *Waypoint Data Path*).

*Note: When the waypoints file reaches the 256 point limit, the Export button can still be used to export data to another application, but a new waypoint file must be created if additional points are stored.*

**Cancel**

Tapping the *Cancel* button closes the *Mark Point* screen.



# 4

## Troubleshooting

56 *Error Messages*

65 *Warning Messages*



## Error and Warning Messages

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LandMark Mobile displays pop-up messages when an error occurs.

The following section lists the possible error messages and suggests how to fix the problems related to an error message.

### LandMark Mobile Startup Error Messages

The following are the error messages and suggested fix for those messages that may occur during LandMark Mobile startup.

**Error message:**

*Application Path Not Found. Please make sure the path 'my device\Program Files\LandMark Mobile' exists. If it does not, please re-install LandMark Mobile.*

This error message appears for one of the following reasons:

1. The path, *my device\Program Files\LandMarkMobile*, (the LandMark Mobile default installation path), was changed after installation.
2. You tried to copy the LandMark Mobile folder from another Field PC. You must use the installation CD to set the path where the LandMark Mobile is installed on the Field PC.
3. A clean boot (factory default reset) on the Field PC was performed.

To fix the error, reinstall LandMark Mobile onto the Field PC.

**Error message:**

*Error initializing datums. If "3\_param.dat" and "7\_param.dat" files are corrupt, re-install, or check for correct application path (\my device\C\_Program Files\LandMarkMobile).*

When LandMark Mobile is installed, datum files are saved in the registry as *3\_Param.dat*, and *ellipse.dat*. This error message appears for one of the following reasons:

1. The registry is corrupt.
2. The program path was modified, so the registry path is no longer available.
3. The *3\_Param.dat*, and *ellipse.dat* files were deleted.

Fix the error by either checking the registry path, or reinstalling LandMark Mobile.

**Error message:**



*Could not find Ellipse.dat file.*

Ellipse.dat files are datum files saved in the registry. This error message appears for one of the following reasons:

1. The registry is corrupt, or a clean boot was executed.
2. The program path was modified, so the registry path is no longer available.
3. The ellipse.dat files were deleted.

To solve the problem, check the registry path. Registry errors may be fixed by doing a reset. If the reset does not work, reinstall LandMark Mobile.

**Error message:**

*Error Initializing WMM2K - WMM.COF File not found.*

WMM is a formula used to calculate magnetic declination from GPS data. Most receivers do this calculation, but some do not. In the instance that a receiver does not calculate magnetic declination, you need to use either *Manual Mode*, or *WMM 2K* for calculations.

The error message appears if the WMM.COF file cannot be found. The following are reasons for not being able to find the file:

1. The registry is corrupt, or a clean boot was executed.
2. The program path was modified, so the registry path is no longer available.
3. The WMM.COF file was deleted.
4. The date setting on the Field PC precedes the year 2005.

Registry errors may be fixed by doing a reset. If the reset does not work, reinstall LandMark Mobile.

**Error message:**

*lm.ini File not found - Default values used.*

The *lm.ini* file is where LandMark Mobile's specifications are written. This message appears for one of the following reasons:

1. The registry is corrupt, or a clean boot was executed.
2. The program path was modified, so the registry path is no longer available.
3. The *lm.ini* file was deleted.

Registry errors may be fixed by doing a reset. If the reset does not work, reinstall LandMark Mobile.

**Error message:**

*Datum not defined. Using WGS84 (Default Datum).*

This message appears for the following reason:

1. A programmer changed the datum in the *lm.ini* file. The new datum value was not valid and is therefore unusable by LandMark Mobile. LandMark Mobile automatically defaults to WGS84 when this happens.

Fix the error by changing the *lm.ini* file datum. See the Programming chapter for more information.

**Error message:**

*Cannot open LandMark Mobile registry key.*

The registry is a database maintained by the operating system. This error messages appears for one of the following reasons:

1. Another program has opened the LandMark Mobile registry.
2. LandMark Mobile did not close the registry properly the last time it was open.
3. Another program overwrote the registry key.
4. A clean boot was executed, erasing the LandMark Mobile registry.

Registry errors may be fixed by doing a reset. If the reset does not work, reinstall LandMark Mobile.

**Error message:**

*Cannot close registry key.*

The registry is a database maintained by the operating system where applications can operate. This error appears for one of the following reasons:

1. Another program has opened the LandMark Mobile registry.
2. LandMark Mobile did not close the registry properly the last time LandMark Mobile was open.
3. Another program overwrote the registry key..
4. A clean boot was executed, erasing the LandMark Mobile registry.

Registry errors may be fixed by doing a reset. If the reset does not work, reinstall LandMark Mobile.

**Error message:**

*<System Error>. (Error Reading Application Path Value.)*

Every command in the registry comes in a key-value pair. When

the key-value pair is not functioning correctly, LandMark Mobile cannot read the application path value. This problem could happen because of one of the following reasons:

1. A clean boot was executed and erased the key-value.
2. The registry has been corrupted.

Registry errors may be fixed by doing a reset. If the reset does not work, reinstall LandMark Mobile.

## **LandMark Mobile General Error Messages**

The following are the error or warning messages and the suggested fix for those messages that may occur during general LandMark Mobile use.

### **Error message:**

#### *Error Reading Waypoint file.*

A waypoint file is saved as a text file (.txt), so a user can open it in Word or Notepad, etc. and modify it. To do this, the data must be properly formatted. This error message pops up for the following reason:

1. The waypoint file is not formatted properly.

To fix this problem use the *Convert Waypoint File* menu option in Menu/Tools/Convert Waypoint. It formats your data to the proper usable format.

### **Error message:**

#### *Error Creating Waypoint file.*

This error message is used to protect any files you may have saved. It ensures that your files are not overwritten. This message appears for one of the following reasons:

1. You are trying to duplicate a file name.
2. The path specified to save to or to open from is not valid.

To fix this problem, rename a file, or be sure that the path you have specified exists.

### **Error message:**

#### *Directory does not exist. Using "\My Documents\.*

When LandMark Mobile is closed, the current waypoint file is

automatically saved and opened when the program is executed again. This message appears for the following reason:

1. You change the name of the file after closing LandMark Mobile. When LandMark Mobile is reopened it is looking for the original waypoint file, but because it has been renamed, it automatically defaults to `\My Documents\`, where the original waypoint file has been renamed to `wptdef_C#.txt`.

Fix the problem by renaming the file to its original name outside of LandMark Mobile. You should never change the waypoint file contents of this file using a program other than LandMark Mobile.

**Error message:**

*Last Opened Directory does not exist. Using\n%\$%\$.*

When LandMark Mobile is executed, it automatically tries to open the last read waypoint file. If the directory cannot be detected, LandMark Mobile defaults to path *N* and this message informs you of the file being used. The original waypoint file cannot be opened for one of the following reasons:

1. The path is invalid.
2. The file does not exist.
3. The file has been corrupted.

LandMark Mobile automatically goes to the default directory and path and opens the default waypoint file to fix the problem.

**Error message:**

*File already exists. Using\n%\$%\$.*

LandMark Mobile automatically tries to open the last waypoint file used. This message is not an error message, but rather an informative message to let you know the program is using a modified or new file because the last opened file could not be found. Files cannot be found for one of the following reason:

1. The file path last opened no longer exists.
2. The file path last opened has been modified.

Fix the problem by opening LandMark Mobile and renaming the file, or resave the points of the file if they were deleted.

**Error message:**

*Failed to open waypoint file and create the converted file.*

This error message appears for the following reason:

1. A waypoint file conversion fails at the beginning of the process because the waypoint file could not be accessed.

Fix the error by doing either a reset or by deleting old files to free up disk space.

**Error message:**

*Failed to create the converted file.*

This message pops-up when trying to either create a new converted file or write data to a newly converted file. This message appears for one of the following reasons:

1. The disk is full.
2. The file is already open in another application.

To fix the error, delete some files off of the storage disk or close the file being used by the other running application.

**Error message:**

*Could not create shared memory. Method stopped.*

The error message appears for the following reason:

1. An error reserving shared memory has occurred.

To fix the error do a reset and restart LandMark Mobile.

**LandMark Mobile Mark Point Screen Error Messages**

The following are the error messages and suggested fix for those messages that may occur when using the LandMark Mobile Mark Point screen.

**Error message:**

*Waypoint name can be 30 characters or less. Characters after 30 will be truncated.*

When naming a point, this message appears for the following reason:

1. The waypoint name is too long and needs to be shortened.

To fix the problem, shorten the point name to less than 30 characters.

**Error Message:**

*Unable to open data exchange file.*

This message appears for one of the following reasons:

1. LandMark Mobile cannot open or create the data exchange file because the disk is full.
2. A third party program has the data exchange file open.

Fix the problem by either deleting files off of the disk, or wait for the third party program to close the data exchange file.

**Error message:**

*Maximum number of waypoints per file has been reached. EXPORT button still available for data export.*

Waypoint files have a maximum of 256 waypoints per file. This message appears for the following reason:

1. The maximum number of waypoints has been reached.

The *Export* button can still be used to export data to another application, but a new waypoint file must be created if extra points are stored.

**LandMark Mobile Waypoint Screen Error Messages**

The following are the error messages and suggested fix for those messages that may occur when using the LandMark Mobile Waypoint screen.

**Error message:**

*Waypoint name can be 30 characters or less. Characters after 30 will be truncated.*

This message appears for the following reason:

1. The allotted number of characters (30) for a waypoint name has been used.

Fix the problem by making the waypoint name shorter.

**Error message:**

*Maximum number of waypoints per file has been reached. Either create a new waypoint file or delete unused waypoints from the current file.*

Every waypoint file has a maximum number of points (256) that can be entered. This error message appears for the following reason:

1. The maximum number of waypoints per file has been reached.

Fix the problem by creating a new waypoint file or by deleting unused points from the current file.

## LandMark Mobile Configuration Screen Error Messages

The following are the error messages and suggested fix for those messages that may occur when using the LandMark Mobile Configuration screen.

### **Error message:**

*Parameter file is write protected! Parameter cannot be changed.*

Message appears when a you try to change the configuration settings. Changes cannot be made for the following reason:

1. The *Ini File Write Protected* box has been checked by the programmer.

If parameter changes need to be made, the programmer must uncheck the *Ini File Write Protected* box. See Programming chapter for details on how to do this.

### **Error message:**

*Datum not defined. Using WGS84 (Default Datum).*

You can change the Datum in the *lm.ini* file outside of LandMark Mobile (i.e. a third party application). When LandMark Mobile starts up, it checks if the *lm.ini* datum value is valid. The error message appears for one of the following reasons:

1. The current datum used is the default WGS84.
2. When any of the three datum files are corrupt.

Fix the problem by fixing the *lm.ini* file, doing a reset, or reinstalling LandMark Mobile.

### **Error message:**

*Cannot change this option through the application. Please read the manual for details.*

When you try this to check the *Ini File Write Protected* box found in the *File Tab* within the configuration settings, this error message appears for the following reason:

1. The *Ini File Write Protected* box must be enabled by a programmer in the ini file source code.

See the Programming chapter for more information.

**Error message:**

*Please make sure at least one of the following data items is selected for the keyboard wedge to function (latitude, longitude, or elevation).*

The keyboard wedge sends specified data to another application. This message appears for the following reason:

1. Latitude, longitude, or elevation have not been selected in the configuration screen.

You must have at least one of these items selected, otherwise the wedge key is deactivated on the *Data* tab of *Configuration* screen.

**LandMark Mobile Navigation Screen Error Messages**

The following are the error messages and suggested fix for those messages that may occur when using the LandMark Mobile Navigation screen.

**Error message:**

*WMM.COF file outdated for WMM2K calculations. Please update the file.*

Every five years a new calculation is released to compensate for the earth's magnetic field changes. The error message appears for one of the following reason:

1. It is time to update the calculations with a new calculations file.
2. The date setting on the Field PC precedes 2005 or is not within the specified time frame that the model can be applied to.

To fix the problem call your LandMark Mobile reseller to receive your closest LandMark Mobile technical support center. The new calculation file is available December 2009. At that time the file can be sent to you or can be downloaded from Internet. You need to update the calculation file in 2010.

For more information about WMM2K go to the WMM2K heading in Chapter 3 of this manual.



## Warning Messages

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**Warning message:**

*Are you sure you want to exit the application?*

This message appears for the following reason:

1. *Select | Menu | Exit|.*

If you would like to exit the application, select *Yes*. If you do not want to exit the application, select *No*.

**Warning message:**

*Waypoint will be permanently deleted! Continue?*

This message appears for the following reason:

1. A waypoint is selected in the waypoint screen, and *Delete* button is tapped.

Tap *Yes* to delete or *No* to keep the waypoint.



# 5

## Programming Guide

68 *Programming for LandMark Mobile*



## Programming LandMark Mobile

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LandMark Mobile is designed to be used as a GPS utility for third party applications. This chapter explains details about how LandMark Mobile and third party applications work together. This chapter is intended to give programming tips on interfacing with LandMark Mobile.

The Memory Exchange file is used to exchange information between LandMark Mobile and a third party application program. There are three methods to obtain information from Memory Exchange. These methods are divided into two categories: data pushed by LandMark Mobile (real time), or data pulled from LandMark Mobile by a third party application. The following is a list and description of each category.

### Using the Memory Exchange Mechanism

The memory exchange module can be accessed by third party applications by using the *lmce.dll* provided with the software package. It supports C++ projects only.

Static link the library using the files *lmce.h* and *lmce.lib* in the third party application project. This is the recommended method of using the DLL module.

The alternative method is to dynamically link to the library at run time. If you are planning on using this method, please make sure to use *LoadLibrary* at the beginning of application installation and free it when the application closes. This methodology is needed because the module contains state variables that should only be initialized once.

The DLL can be used by one third party application at a time.

### Internal GPS — Pulled Data

The third party application calls the following function when it needs new GPS data. The function returns with the most current GPS data LandMark Mobile has copied to shared memory, or provides the information after a three second delay.

The internal GPS function provides GPS data in WGS84 datum, decimal degrees, and altitude/elevation in meters. This is the recommended internal format of most GPS receivers as the most accurate GPS data.

### **LMCE\_API BOOL GetInternalGPS**

<b>Argument for Function</b>	<b>Function Affected</b>
(DWORD &tic,	Unique ID
double &r_lat,	Latitude in Decimal Degree
double &r_lon,	Longitude in Decimal Degree
double &r_alt,	Elevation in meters
double &r_pdop,	GPS data
double &r_ehe,	GPS error in meters
int &quality);	2D, 3D, etc.

### **Internal GPS — Pushed Data**

The only difference in this function compared to pulling data, is in the protocol. Once the third part has called for data, the function blocks the calling thread/process until LandMark Mobile signals when new data are processed. There is not a three second delay after this function is called, but the function listens for a *QUIT* from LandMark Mobile to tell the third party program that the data are ready.

### **LMCE\_API BOOL GetInternalGPSRT**

<b>Argument for Function</b>	<b>Function Affected</b>
(DWORD &tic,	Unique ID
double &r_lat,	Latitude in Decimal Degree
double &r_lon,	Longitude in Decimal Degree
double &r_alt,	Elevation in meters
double &r_pdop,	GPS data
double &r_ehe	GPS error in meters
int &quality);	2D, 3D, etc.

### **Masked GPS — Pulled**

The Masked GPS functions give more formatting options to the third party application. The Get Mask GPS filters the GPS data according to the preferences set in LandMark Mobile (refer to the Configuration section of LandMark Mobile). The protocol is the same as the Pulled internal GPS function.

Check the GPS data (“mask\_msg” argument) to see if it is masked before using the data being received. The mask values are described after the function definition.

**LMCE\_API BOOL GetMaskGPS**

<b>Argument for Function</b>	<b>Function Affected</b>
(DWORD) &mask_tic,	Unique Data ID
double &mask_alt,	Elevation in meters
double &mask_alt_ft,	Elevation in feet
double &mask_lat,	Latitude in decimal degree
double &mask_lon,	Longitude in decimal degree
char &mask_lathem,	Hemisphere either N or S
char &mask_lonhem,	Hemisphere either E or W
char &maskdeg_lat	Decimal degree without the signs
double &maskdeg_lon,	Decimal degree without the signs
int &maskilat,	Integer part of the latitude for Degree Minute
int &maskilon,	Integer part of the longitude for Degree Minute
double &maskmin_lat,	The minute part of the Degree Minute
double &maskmin_lon,	The minute part of the Degree Minute
int &maskiminlat,	The minute part of the Degree Minute Second
int &maskiminlon,	The minute part of the Degree Minute Second
double &masksec_lat	The seconds part of the Degree Minute Second
double &masksec_lon	The seconds part of the Degree Minute Second
char mask_UTMZone[]	The UTM Zone
int arr_size,	The length of the UTM Zone array
double &mask_northing	UTM Northing
double &mask_easting	UTM Easting

double &mask_pdop,	PDOP reading
double &mask_ehe,	EHE reading
double &mask_ehe_ft,	EHE reading in feet
int &mask_quality,	Mask quality
short &mask_msg;	If GPS was filtered, this indicates the reason

### **Mask Flags**

0	GPS data not masked.
1	GPS not in 3D mode.
2	PDOP is greater than maximum allowed
3	GPS not in DGPS mode.
4	Satellite SNR is below the minimum allowed
5	Satellite elevation is below the minimum allowed
6	EHE is greater than the maximum allowed
7	No fix

### **Masked GPS — Pushed**

This function is the available when a GPS receiver with Real time capability is being used real-time capable version of the Get Mask GPS function.

### **LMCE\_API BOOL GetMaskRT**

<b>Argument for Function</b>	<b>Function Affected</b>
(DWORD &mask_tic	Unique Data ID
double &mask_alt,	Elevation in meters
double &mask_alt_ft,	Elevation in feet
double &mask_lat,	Latitude in decimal degree
double &mask_lon,	Longitude in decimal degree
char &mask_lathem	Hemisphere in N or S
char &mask_lonhem,	Hemisphere in East or West
double &maskdeg_lat,	Decimal degree without the signs
double &maskdeg_lon,	Decimal degree without the signs
int&maskilat,	Integer part of the latitude for Degree minute

int &maskilon,	Integer part of the longitude for Degree minute
double &maskmin_lat,	The minute part of the Degree Minute
double &maskmin_lon,	The minute part of the Degree Minute
int &maskiminlat,	The minute part of the Degree Minute Second
int &maskiminlon,	The minute part of the Degree Minute Second
double &masksec_lat,	The seconds part of the Degree Minute Second
double &masksec_lon,	The seconds part of the Degree Minute Second
char mask_UTMZone[]	The UTM Zone
int arr_size,	The length of the UTM Zone array
double &mask_northing	UTM northing
double &mask_easting	UTM easting
double &mask_pdop,	PDOP reading
double &mask_ehe,	EHE reading
double &mask_ehe_ft,	EHE reading in feet
int &mask-quality,	Quality reading
short &mask_msg);	If GPS was filtered, this indicates the reason.

### Mark GPS — Pulled

The mark function relies on the mark waypoint data generated by LandMark Mobile. The GPS point is pulled after marking a point in LandMark Mobile and using the *Export* button on the Mark Point screen.

If this function is called before marking a point, it returns with an error. The data obtained from these functions is the same as the data exchange file. The pulled version returns immediately with the requested data.



**LMCE\_API BOOL GetMarkNB**

<b>Argument for Function</b>	<b>Functions Affected</b>
DWORD &mark_tic	Unique Data ID
double &mark_alt,	Elevation in meters
double &mark_alt_ft,	Elevation in feet
double &mark_lat,	Latitude in decimal degrees
double &mark_lon,	Longitude in decimal degrees
char &mark_lathem,	Hemisphere either N or S
char &marklonhem,	Hemisphere either E or W
double &markdeg_lat,	Decimal degree without the signs
double &markdeg_lon,	Decimal degree without the signs
int &markilat,	Integer part of the latitude for Degree minute
int &markilon,	Integer part of the longitude for Degree minute
double &markmin_lat,	The minute part of the Degree Minute
double &markmin_lon,	The minute part of the Degree Minute
int &markiminlat,	The minute part of the Degree Minute Second
int &markiminlon,	The minute part of the Degree Minute Second
double &marksec_lat,	The seconds part of the Degree Minute Second
double &marksec_lon,	The seconds part of the Degree Minute Second
char mark_UTMZone[]	The UTM Zone
double &mark_northing	The UTM northing
double &mark_easting	The UTM easting
double &markpdop,	GPS data
double &markehe	GPS error in meters
double &mark_ehe_ft,	GPS errors in feet
int &mark_pts,	GPS mark points

SYSTEMTIME &mark_sysm,	GPS mark system
double &mark_ofst_dir,	Mark offset point direction
double &mark_ofst_dist,	Mark offset point distance
double &mark_ofst_dist_ft,	Mark offset point distance in feet
double &mark_ofst_slope,	Mark offset point slope
char MapDatumID[]	Map datum

### Mark GPS — Pushed

This function opens the LandMark Mobile mark waypoint screen so that a user can mark a waypoint and then return with the new data. It has the same arguments as the pulled version of Mark GPS.

### **LMCE\_API BOOL GetMarkBLK**

Argument for Function	Function Affected
(DWORD &mark_tic,	Unique Data ID
double &mark_alt,	Elevation in meters
double&mark_alt_ft,	Elevation in feet
double &mark_lat,	Latitude in decimal degree
double &mark_lon,	Longitude in decimal degree
char &mark_lathem,	Hemisphere in N or S
char &mark_lonhem,	Hemisphere in E or W
double &markdeg_lat,	Decimal degree without the signs
double &markdeg_lon,	Decimal degree without the signs
int &markilat,	Integer part of the latitude for Degree minute
int &markilon,	Integer part of the longitude for Degree minute
double &markmin_lat,	The minute part of the Degree Minute
double &markmin_lon,	The minute part of the Degree Minute
int &markiminlat,	The minute part of the Degree Minute Second

int &markiminlon,	The minute part of the Degree Minute Second
double &marksec_lat,	The second part of the Degree Minute Second
double &marksec_lon,	The second part of the Degree Minute Second
char mark_UTMZone[]	The UTM Zone
double &mark_northing,	The UTM northing
double &mark_easting,	The UTM easting
double &mark_pdop,	GPS data
double &mark_ehe,	GPS error in meters
double &mark_ehe_ft,	GPS error in feet
int &mark_pts,	Mark Points
SYSTEMTIME &mark_system,	Mark System
double &mark_ofst_dir,	Mark offset point direction
double &mark_ofst_dist,	Mark offset point distance
double &mark_ofst_dist_ft,	Mark offset point distance in feet
double &mark_ofst_slope,	Mark offset point slope
char MapDatumID[]	Map datum

### Functions of the DLL

The communication between the DLL and LandMark Mobile relies on named event signaling and named shared memory. All pulled data based events have time-outs, but the pushed data event blocks the third party application until LandMark Mobile signals with new data. The DLL is aware of LandMark Mobile unloading and releases the block so that the third party application is not blocked if LandMark Mobile is no longer running.

## **Other exported functions of the DLL**

### **Setup function**

Function: *LMCE\_API BOOL SwitchModes(int whichMethod, BOOL isRealTime)*

Use this function to set the mode for each of the three methods described above. The mode changes to either Pulled or Pushed version in each of the methods.

### **GetError function**

Function: *LMCE\_API BOOL GetError(int whichMethod, short &error)*

All exported functions return a zero value to indicate failure. Use the *GetError* function to get more detailed information about the nature of the failure.

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