

# LandMark CE™



## User's Manual



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# Chapter 1

## Introduction

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**Welcome**  
**Features**  
**Software License Agreement**

# Welcome

We would like to welcome you as a user of LandMark CE, a GPS Receiver Utility™ software program. LandMark CE is designed to serve as the interface between a GPS receiver connected to an Allegro 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 this utility program to manage the GPS receiver connectivity functions. We have focused on providing software capable of performing tasks often used by field personnel in agriculture and natural resources markets.

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 CE runs concurrently with your main data collection and processing programs. By using a “Hot Key”, your GPS data are sent directly into whatever application you are currently working with.

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

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

## Features

- ❑ 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 switch F10 connects / reconnects any Allegro Com Port.
- ❑ Bluetooth Com Port usage auto detection, loads Bluetooth receiver by default if set as a “favorite” when more than one device is available.
- ❑ Bluetooth auto reconnect, LandMark CE automatically tries to reconnect up to three times when a Bluetooth connection is lost.
- ❑ Bluetooth PC card power saver, LandMark CE registers with the Bluetooth stack to the GPS receiver status when it is loaded or unloaded. This reduces time to reload when coming out of suspend and auto connects when the stack is reloaded.

# Software License Agreement

## ▲ 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 CE for use with the Allegro. 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 CE 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 Allegro 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 CE 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 us.
- 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 PCs at the factory, you must delete it.



# Chapter 2

## Installation

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**First Time LandMark CE Installation**  
**Additional LandMark CE Installations**  
**Uninstalling LandMark CE**

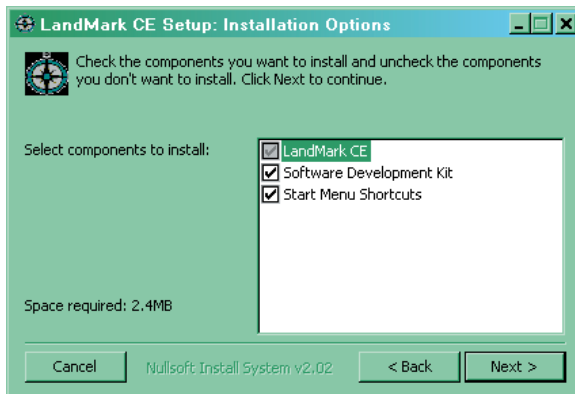
# First Time LandMark CE Installation

To install LandMark CE on your Allegro it must be installed to your desktop PC first. After being installed on your desktop PC, LandMark CE is installed on your Allegro through ActiveSync connection between your handheld and your PC.

## ▲ Step 1: Installing LandMark CE on the desktop PC

To install LandMark CE on your Allegro, complete the following steps:

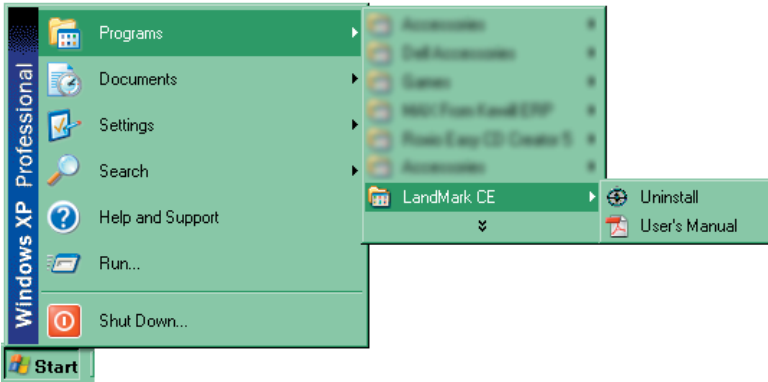
- 1) Establish an ActiveSync connection between your desktop PC and your Allegro.
- 2) Place the LandMark CE CD-ROM into the CD drive of your desktop PC. The installation wizard automatically starts up with the *LandMark CE Setup: License Agreement* screen.
- 3) Click on the *I Agree* button to continue with the installation process. Note: You must agree with the License Agreement to use LandMark CE.
- 4) Select the Installation Options you want from the *LandMark CE Setup: Installation Options* screen. The installation options are described below.



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

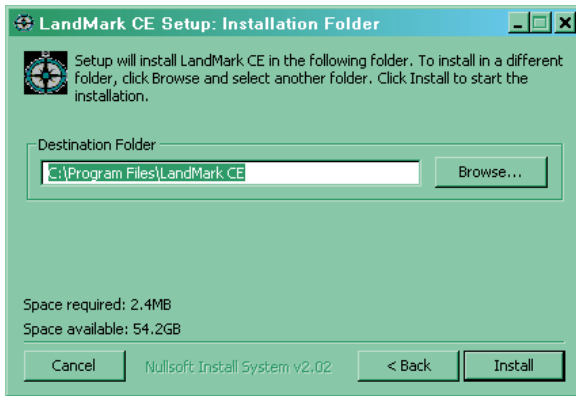
The *Software Development Kit* (SDK) option is selectable. This option installs the SDK in the SDK folder where LandMark CE is installed on your desktop PC. The SDK is used by program developers.

The *Start Menu Shortcuts* option is a selectable. This option places a LandMark CE folder located in the Programs folder of your Start Menu. Inside the LandMark CE folder is the Land Mark CE Uninstall program and the LandMark CE User's Manual, which is a .pdf file.



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

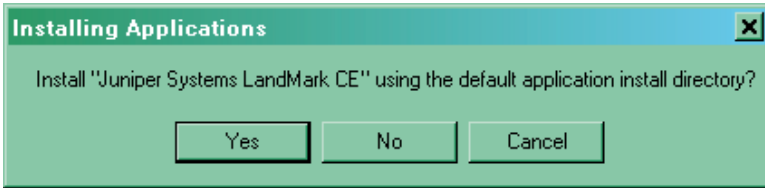
- 5) Select the location on your desktop PC that you want LandMark CE installed. The LandMark CE folder created in the Program Files folder on your desktop PC is the default location. If this location is sufficient, click on the *Install* button.



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

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

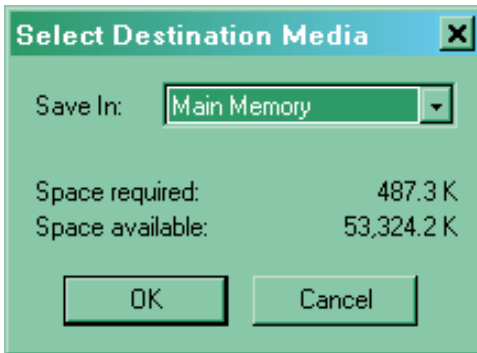
After LandMark CE is installed on your desktop PC, the following message appears if the Allegro is connected to the desktop PC through ActiveSync:



Clicking on the *Yes* button continues the installation of LandMark CE onto your Allegro to the default application install directory. The default folder is C\_Drive\Program Files.

*Note: We recommend that you click on the Yes button and install LandMark CE to the default application install directory.*

Clicking on the *No* button opens the following window:

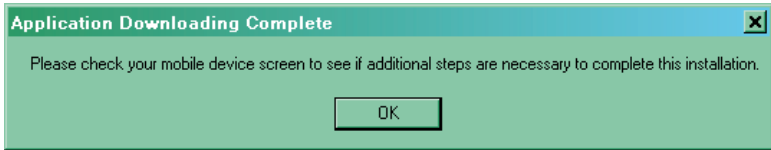


This screen allows you to save LandMark CE in one of the locations that is displayed in the drop-down *Save In:* box. These locations are Main Memory, C\_Drive, and Network.

*Note: It is highly recommended to install LandMark CE on the Allegro's C\_Drive.*

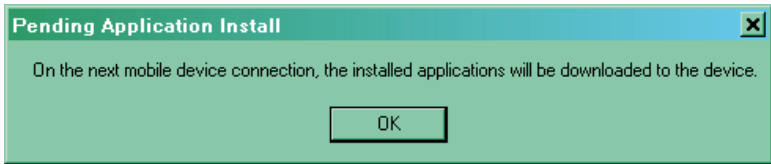
Tap on the location you want LandMark CE saved to and click on *OK* to save your selection. Click on the *Cancel* button to exit out of this screen with out saving your selection.

After a install destination is confirmed, the following message box pops up:

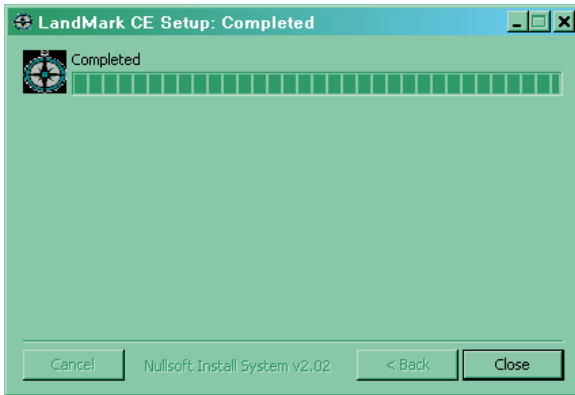


This screen directs you to finish the installation on the Allegro. Click on *OK* and proceed to *Step 2: Installing LandMark CE on the Allegro* to complete the installation.

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



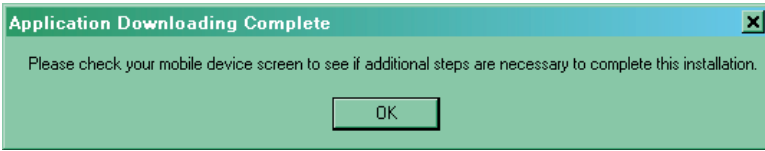
This screen indicates that the next time your Allegro connects to the desktop PC that the installation of LandMark CE to the Allegro will be completed. Click on the *OK* button. The following screen appears to confirm that the installation of LandMark CE onto your desktop PC is complete.



## ▲ Step 2: Installing LandMark CE on the Allegro

Once LandMark CE is installed on your desktop PC, the installation process is continued on the Allegro. LandMark CE is installed on to the Allegro from the desktop PC through an ActiveSync connection. The following steps are done on your Allegro.

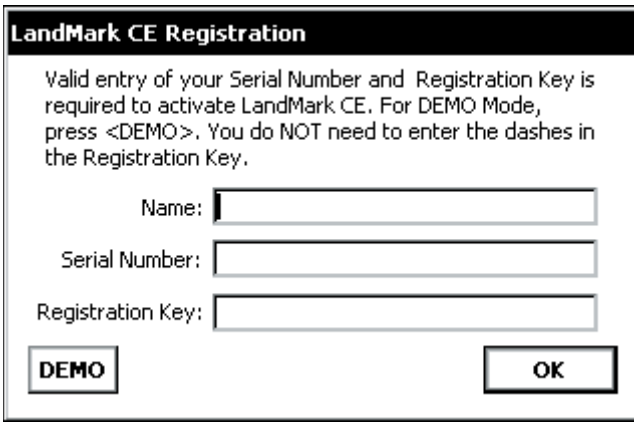
When the following screen appears on your desktop PC, an install progression bar appears in a window on the screen of your Allegro.



After the installation of LandMark CE is completed on your Allegro, the Registration screen appears.

## LandMark CE Registration Screen

LandMark CE is a licensed application and requires a Serial Number and Registration Key to completely activate the program.



### 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 label located on the LandMark CE CD-ROM case. This unique number is specific to the label on LandMark CE.

### Registration Key

The *Registration Key* is located on the label located on the LandMark CE CD-ROM case.

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

## Save System

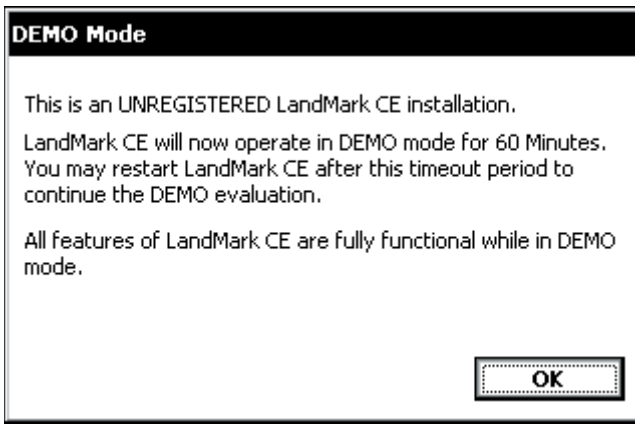
After you have installed LandMark CE on your Allegro, we recommend that you perform a Save System utility on your Allegro. To save the system on your Allegro, complete the following steps:

- 1) Tap on *Start | Programs | Utilities | Save System*.
- 2) Wait for the registry on your Allegro to save and for *Save System* screen to close.

## LandMark CE DEMO Mode

LandMark CE offers a Demo Mode allowing you the opportunity to use LandMark CE for a trial period to evaluate if the program is compatible with your needs.

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



Demo mode allows the user full use of LandMark CE for a 60 minute period. Once the 60 minutes expires, a pop-up window appears indicating the 60 minute evaluation session is over.

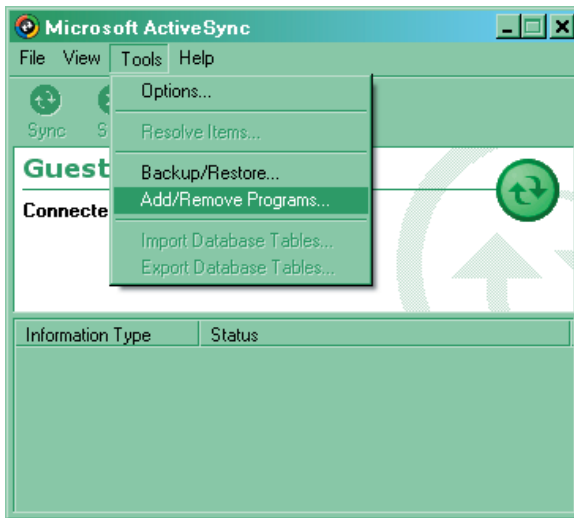
Tapping on the OK button or the X in the top right corner of this window saves the LandMark CE files you are working on and closes down the LandMark CE application.

## Additional LandMark CE Installations

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

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

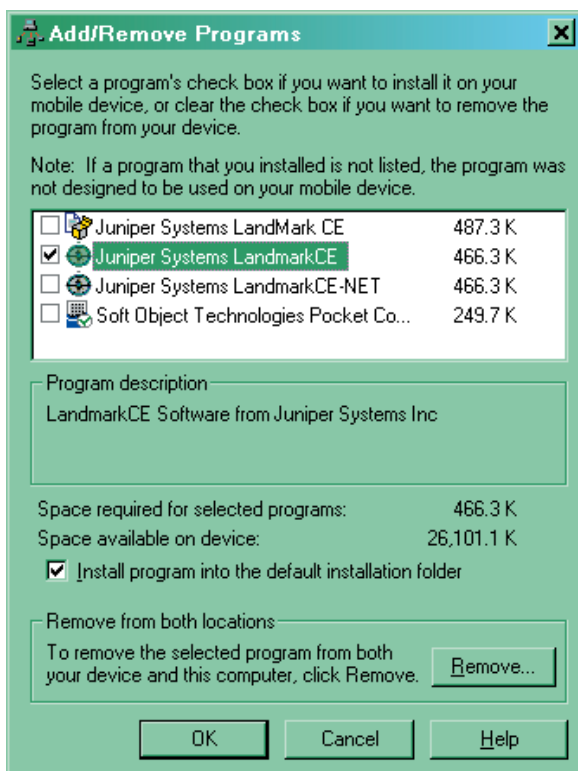
- 1) Establish an ActiveSync connection between the Allegro and desktop PC.
- 2) Click on the *Tools* option in ActiveSync and tap on *Add/Remove Programs*.



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

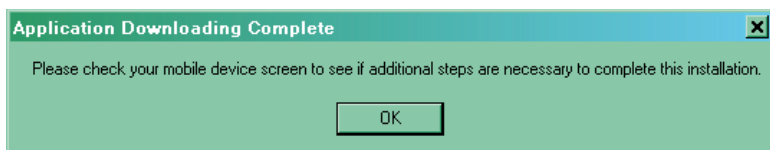


- 3) Select the Juniper System LandMarkCE option so a checkmark appears next to option.



- 4) Click on the *OK* button to proceed with the installation.

After a install destination is confirmed, the following message box pops up:



This screen directs you to finish the installation on the Allegro.

- 5) Click on *OK* and proceed to *Step 2: Installing LandMark CE* on the Allegro to complete the installation.

## Uninstalling LandMark CE

Since LandMark CE is installed on the desktop PC and the Allegro, the process for uninstalling the application varies depending on which device you are uninstalling LandMark from. The following sets of instructions are device specific, use the one that address your your uninstal request.

### ▲ Uninstalling LandMark CE from the Desktop PC

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

- ❑ Click on the *Start* button and go to *Settings | Control Panels*. Double-click on the *Add/Remove Programs* icon. Select *LandMark CE* and click on the *Remove* button.
- ❑ Click on the *Start* button and go to *Programs | LandMark CE | Uninstall*. Follow the directions in the uninstall wizard.

### ▲ Uninstalling LandMark CE from the Allegro

To uninstall LandMark CE from your Allegro, perform the following procedure:

- ❑ Tap on the *Start* button and go to *Settings | Control Panels*. Double- tap on the *Remove Programs* icon. Select *Juniper Systems LandMark CE* and tap on the *Remove* button.

# Chapter 3

## Using LandMark CE

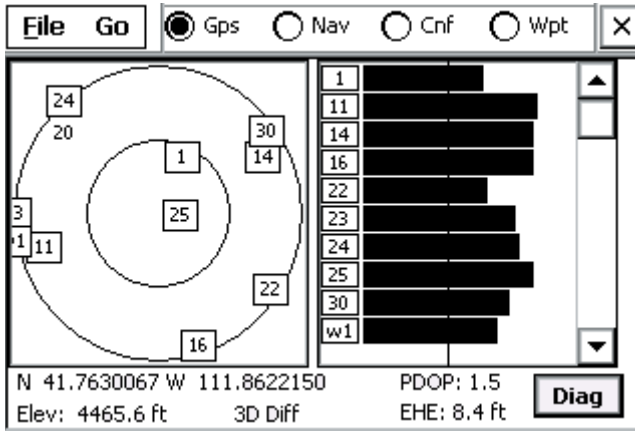
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**Introduction and Operation**  
**GPS Status Screen**  
**Navigation Screen**  
**Configuration Screen**  
**Waypoint Screen**

# Introduction and Operation

After LandMark CE 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 CE, double-tap on the LandMark CE desktop icon. A splash screen displaying *LandMark CE A GPS Receiver Utility* and the version number are displayed for two seconds. The program opens to the following screen:



## ▲ Screen Selection

The top of initial program screen allows you to select between the different operation screens that LandMark CE offers.

- Gps = GPS Screen
- Nav = Navigation Screen
- Cnf = Configuration Screen
- Wpt = Waypoint Screen

## ▲ Keyboard Options

To navigate through LandMark CE, use a stylus and tap on the screen, or press the following keys on the Allegro:

Key	Open Screen
F1	GPS Screen
F2	Navigation Screen
F3	Configuration Screen
F4	Waypoint Screen
F10	COM Port Connect/Disconnect

Navigate within each screen by using the circular arrow key located in the center of the keyboard.

Use the *Tab* key for cursor movement between fields. When you are in the desired field, press *Enter* to select whatever you have highlighted.

*Alt* activates the *File* drop-down menu, and *Spacebar* checks or unchecks a box when a dotted line surrounds it.

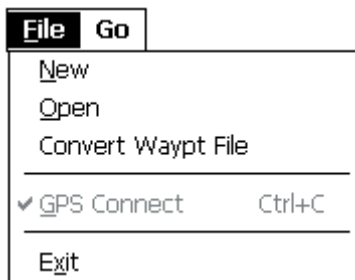
Press *Esc* to exit any screen.

### F10 (Com Port Functionality)

LandMark uses F10 as a toggle switch to connect and reconnect the Com Port. The F10 toggle function works on all the COM Ports that LandMark CE can connect to. This functionality allows COM Ports to be manually disconnected and reconnected without having to close and re-start LandMark CE.

## ▲ File

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



### New

The *New* option allows you to create a new waypoint file.

## Open

The *Open* option allows you to open an existing waypoint file.

## Convert Waypt File

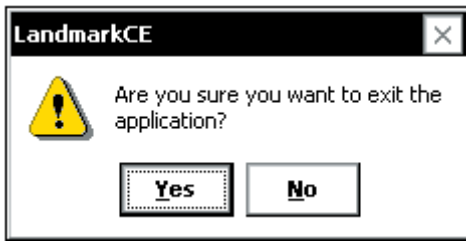
The *Convert Waypt File* allows you to convert a waypoint file into a data file. It may be necessary to convert a waypoint file for viewing in a different application. We recommend that if you need to convert a waypoint file that you do so only after the waypoint file is completed and all necessary data is collected.

## GPS Connect

The GPS Connect option is only available when using Bluetooth with your GPS receiver. This option connects the GPS receiver through a Bluetooth connection.

## Exit

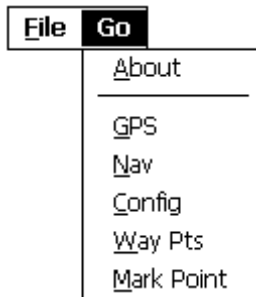
The *Exit* option exits you out of the LandMark CE program. After selecting Exit you receive the following confirmation screen:



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

## ▲ Go

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



## About

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



## 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.

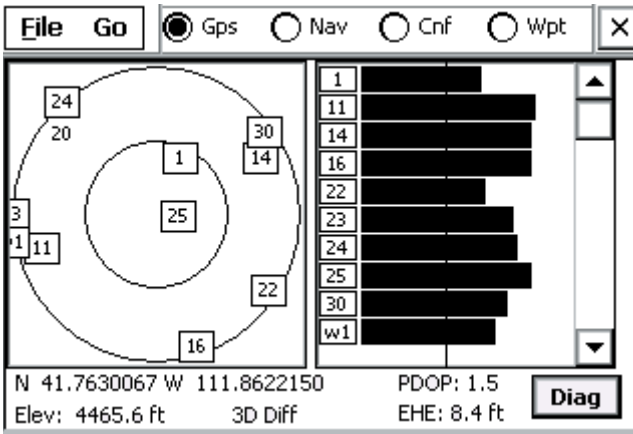
## Mark Point

Tapping on the *Mark Point* option opens the Mark Point screen.

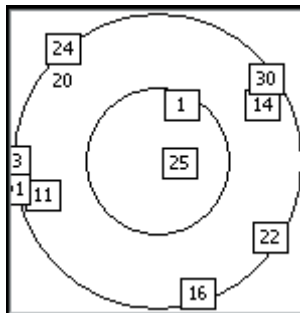
# GPS Status Screen

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* option at the top of the menu bar.
- Tap on *Go* to access a drop-down menu and select *GPS*.
- Press *F1* on the Allegro keyboard.



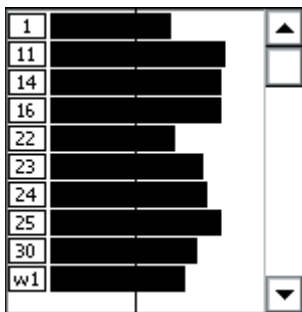
The Skyplot is on the left side of the screen and displays the approximate locations of the visible GPS satellites. Your position is located at the center of the inner circle. The outer circle represents the flat or horizon of where you are standing. The inner circle represents the area above you, this 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 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 satellite quality values are shown below the skyplot section of the GPS screen. The *PDOP* (Percent Dilution of Position) and *EHE* (Estimated Horizontal position Error) values are shown under the bar graphs.


N 41.7625982 W 111.8189946	PDOP: 2.4	
Elev: 4571.0 ft 3D Diff	EHE: 13.6 ft	

### ▲ PDOP

*PDOP* (Percent Dilution of Position) 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 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.
2D	GPS fix from 3 satellites; no elevation.
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.
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/height above WGS-84 datum to within a few centimeters.

 *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 only 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 most receivers.

### 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 wire has been disconnected from the COM port. Check to be sure that the GPS is connected to the specified COM port and that it is attached 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 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 do a soft reset.

#### **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.

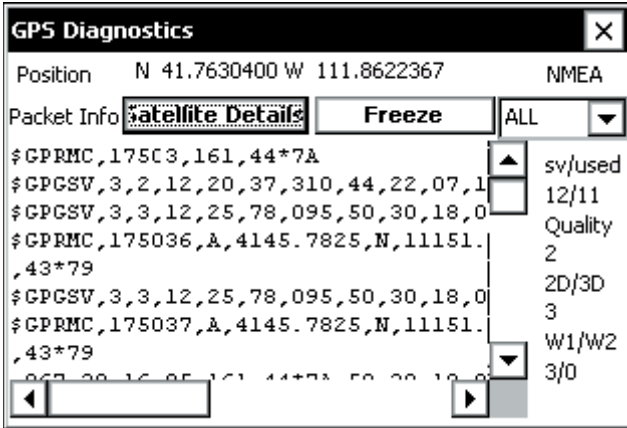
#### **No Fix**

*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 recieved.

### **Sv/used**

The sv/used heading means Satellites in view/ number being used in fix. The numbers 12/5 are displayed in the example above.

12 = number of satellites in view

5 = number of satelited 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)

5 = 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.

0 = no WAAS

1 = WAAS satellites visible but not used


2 = WAAS satellites used

3 = Visible and used

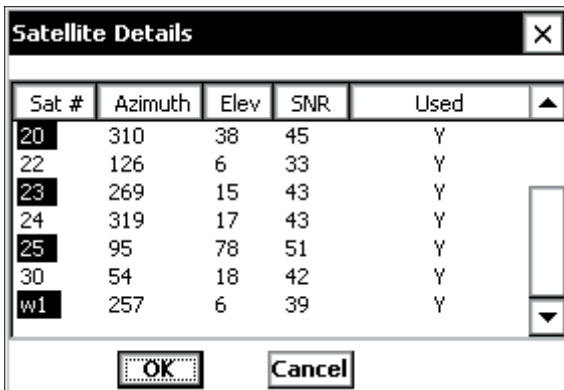
 *Note: WAAS enabled receivers receive WAAS corrections, but not additional satellite information.*

## 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. Not all receivers pass WAAS satellite information in the NMEA strings.*

## Satellite Details Screen



Sat #	Azimuth	Elev	SNR	Used
20	310	38	45	Y
22	126	6	33	Y
23	269	15	43	Y
24	319	17	43	Y
25	95	78	51	Y
30	54	18	42	Y
w1	257	6	39	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.

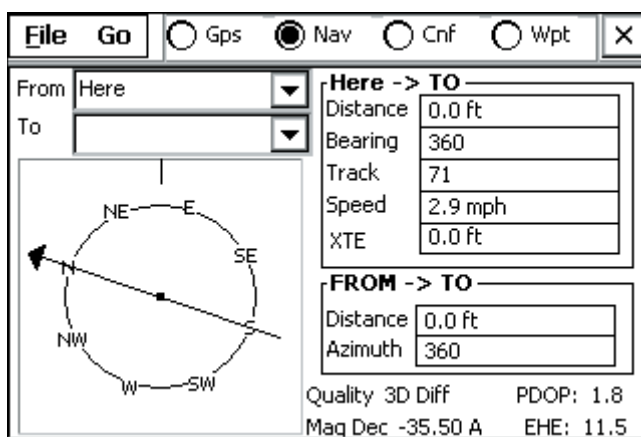


## Nav Screen

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* option at the top of the menu bar.
- Tap on *Go* to access a drop-down menu and select *Nav*.
- Press *F2* on the Allegro keyboard.

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 where you intend to stop at once you arrive there.

## 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 CE allows having multiple files and does not limit how many waypoint files are used. 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, meaning 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).

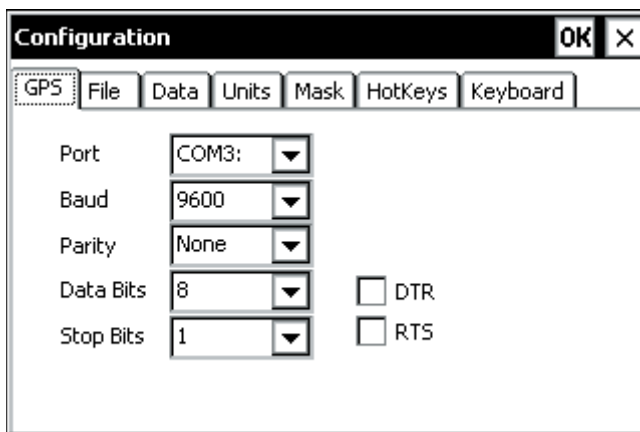
For more information about the heading settings and the options available to you, go to the *Heading* title in the *Configuration Screen* section of this chapter.

## Configuration Screen

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

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

- ❑ Tap on the *Cnf* option at the top of the menu bar.
- ❑ Tap on *Go* to access a drop-down menu and select *Config*.
- ❑ Press F3 on the Allegro keyboard.



❑ *Note:* You must first exit the *Configuration* screen to be able to use the F1-F4 keys again.

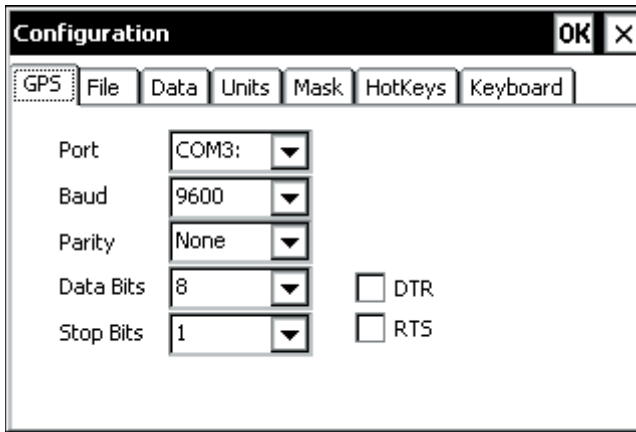
The *Configuration* screen contains seven tabs, GPS, File, Data, Units, Mask, HotKeys, and Keybd. This section covers the options available in each one of these tabs.

To use the *Configuration* screen via the keyboard, use the tab keys (forward or back tab), space bar, and the arrows key. To exit the *Configuration* screen, you can either press *Enter* on the keyboard, or you can tap *OK* in the top right hand corner of the screen, to automatically save all your configuration changes.

❑ *Note:* Pressing the *ESC* key or tapping on the *X* in the top right hand corner does not save any of the 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 CE currently supports communication ports COM1 through COM9.

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

To set the correct port for GPS communication, complete the following steps:

- 1) Using a stylus: Tap the down arrow next to the *Port* box to access the drop-down menu and tap on the desired *COM Port*.  
Using the keyboard: Push the *Tab* key to highlight the *Port* box. When the box is highlighted, use the arrows key to move through the available *COM Port* options.
- 2) Close the *Configuration* screen by tapping on *OK* in the top right corner of the screen, or by pressing the *Enter* key.

## Bluetooth COM Ports

LandMark CE 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 CE 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 CE automatically tries to reconnect up to three times.

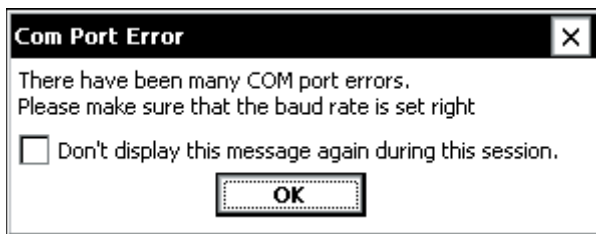
### *Auto Bluetooth Card Power Shut-off*

When using Bluetooth PC cards, the power to the card is shut off when the Allegro is suspended. LandMark CE registers with the Bluetooth stack to the GPS receiver status, when the stack is loaded or unloaded. This 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 Allegro is suspended, LandMark CE does not auto connect.*

## Baud

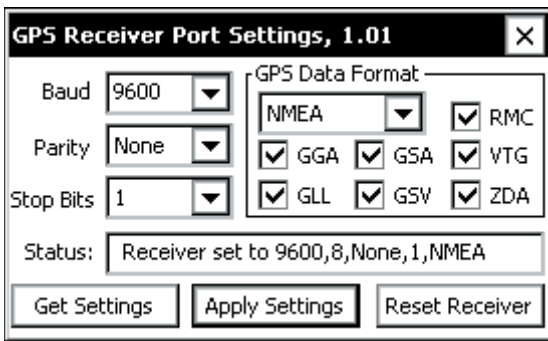
*Baud* determines the signaling speed. The rate at which the COM port accepts data must match the rate that the GPS receiver sends data. If the Baud is not set correctly you will get the following message:



If using a GPSPOD with a Trimble Lassen LP receiver, complete the following steps, otherwise skip to step 6 and proceed:

☐ Note: Steps 1 - 5 only apply when using the built in GPS pod for the Allegro through COM 3. The Holux 211 receiver is completely external, or any Bluetooth, and only the settings in the Config screen need to be properly set.

- 1) Exit out of LandMark CE.
- 2) Tap on the *Start* button and navigate through *Programs | Utilities | GPS Pod Setup*.
- 3) Tap on the *Get Settings* button when the *GPS Receiver Port Settings* screen appears and wait for the readings to appear.



☐ Note: Make sure you select GGA, GSA, VTG, and GSV as the minimum number of NMEA packets to use with LandMark CE.

- 4) Confirm you are using the NMEA setting in the *GPS Data Format* section and write down the baud rate.
- 5) Tap on the *Apply Settings* button if you made any changes and tap on the X in the top right corner to exit the *GPS Receiver Port Settings* screen.

☐ Note: If new settings are not shown after they are applied, repeat the process until changes are shown as updated.

- 6) Go to the *GPS* tab of the *Configuration* screen and enter the correct *Baud*.

☐ Note: If the *Com Port Error* message appears, tap in the box next to the *Don't display this message again during this session* message so a check mark appears and tap on the *OK* button before checking your Allegro for the set baud rate.

## Parity, Data Bits, Stop Bits

As with Baud rate, the communication parameters for *Parity*, *Data Bits*, and *Stop Bits* must have those of 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 accurately.

## DTR

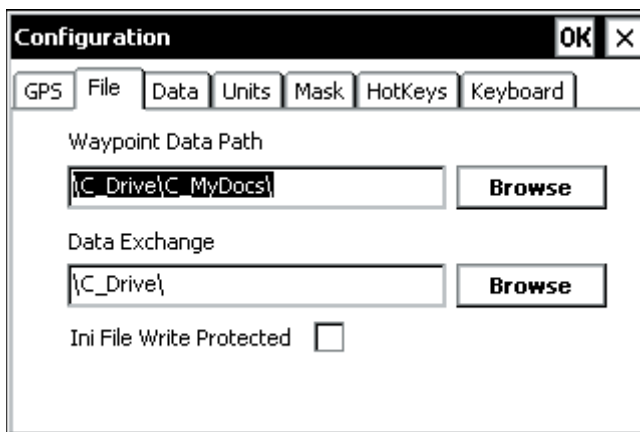
The *DTR* (Data Terminal Ready) option uses a 5V power supply that is only used with COM1 and when an external GPS receiver is being used which needs a power supply.

## RTS

The *RTS* (Ready 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 CE waypoint files on the Field Computer.



## Waypoint Data Path

LandMark CE automatically defaults to `\C_Drive\C_MyDocs\` 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 maneuvering 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.

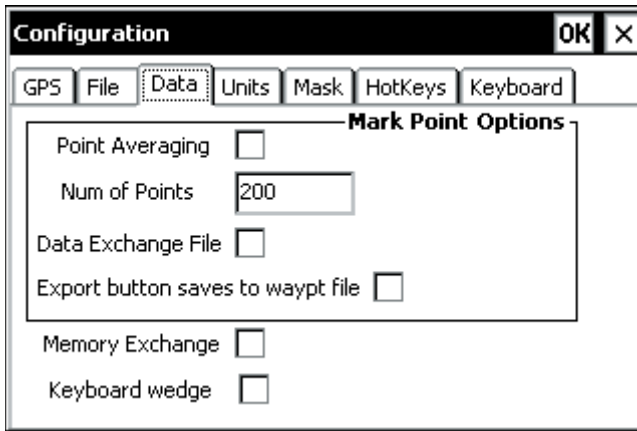
When the *Export* button is tapped in the *Mark Point* screen, your last active application opens automatically. Press *Enter* or type a command to read the modified *dtex.txt* file and obtain the GPS data. (See the *Mark Key* section later in this chapter for further details on *Mark Point* screen.)

## 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 CE. To check the box and lock the configured settings, see the Programmer's 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. Typically new GPS points are received once per second from the GPS receiver. The GPS receiver calculates a new average about once per second.



Each new position is included in the running average until the specified number of positions to calculate the overall average have been 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 waypoints.

### **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**

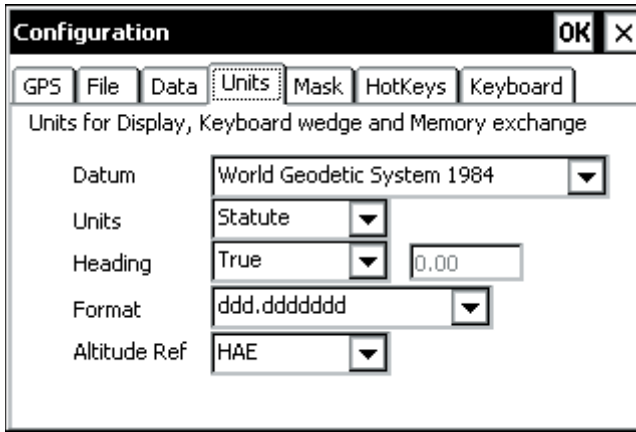
Check the *Memory Exchange* option to share location data with another application. See the *Programmer's* chapter for more information.

### **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 is useful when you want a simple GPS point logged in another application.

## ▲ 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. Datum points are used by the GPS to reference a point or line in measuring elevation. LandMark CE 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
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 2000)

Declination is the angle formed between magnetic north and true north from the GPS receivers 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 on 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 2005 - 2010 model will be available from NGDC on the following website on 12/2004:

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

Follow the direction on the above website to download the necessary file. Once the file is downloaded, place the file in the LandMark CE folder on your Allegro.

*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/ 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

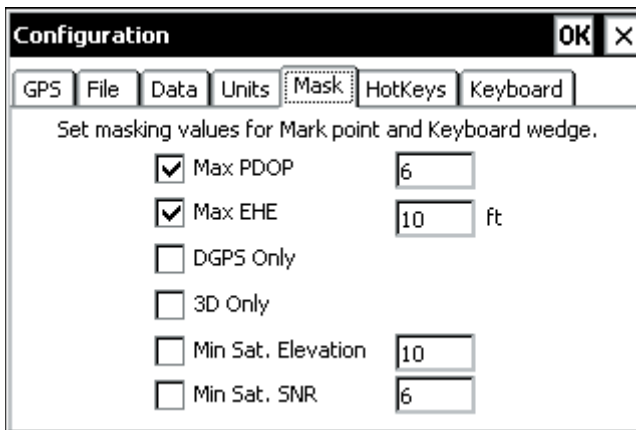
## Altitude Reference

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 Percent 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

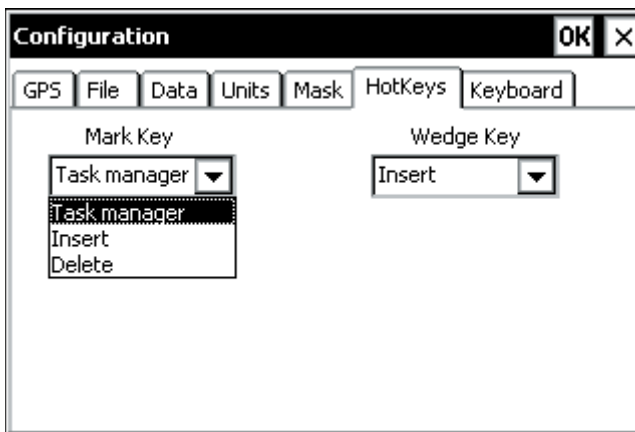
Select *Min Sat Elevation* (Minimum Satellite Elevation) and specify the minimum elevation in the box to the left. Satellites that are equal to or greater than the elevation value entered are included in the waypoint averaging.

## 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 the three keys that can be used for the *Wedge Key* or *Mark Key*:



Task manager



Insert



Delete

## Mark Key

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

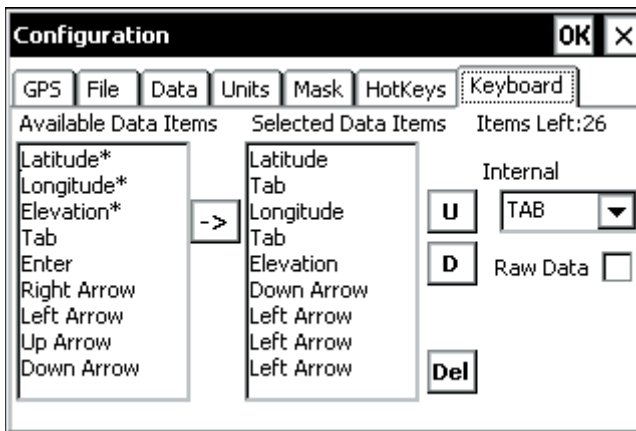
## Wedge Key

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

### ▲ Keybd 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 *Keybd* specifications work for any other applications being used.

 Note: As an example, *PTab* is the application used to explain the *Keybd* 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 PTab 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.
Space	The cursor automatically inserts a space.
Display	Data are entered exactly as displayed on the GPS screen in LandMark CE.
N/A	N/A automatically comes up when the Raw Data box is checked. No formatting of data segments occur and only number values are transmitted.

### **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

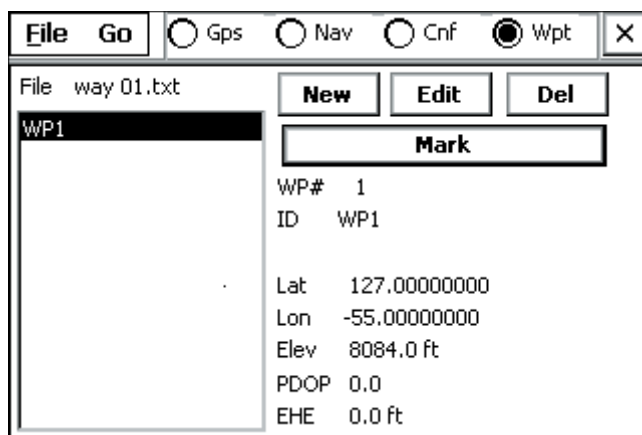
Use the *Waypoint* screen to display and manage the contents of the currently selected waypoint file. The available functions allow for marking points, editing points, and deleting points from a waypoint file.

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

- Tap on the *Wpt* option at the top of the menu bar.
- Tap on *Go* to access a drop-down menu and select *Way Pts*.
- Press F4 on the Allegro keyboard.

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 dialog box titled "Way Point (DD)". It contains the following fields and controls:

- Waypoint #: 2
- Waypoint ID: Wp2
- Latitude: 41.7623762, with a dropdown menu set to N
- Longitude: 111.8204400, with a dropdown menu set to W
- Elevation: 4571.05, with units set to ft
- An "Offset" button
- A "Show Offset" checkbox (unchecked)
- "OK" and "Cancel" buttons at the bottom

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 CE. 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 a waypoint latitude.

### Longitude

Longitude shows a waypoint longitude.


### Elevation

Elevation shows a 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.*

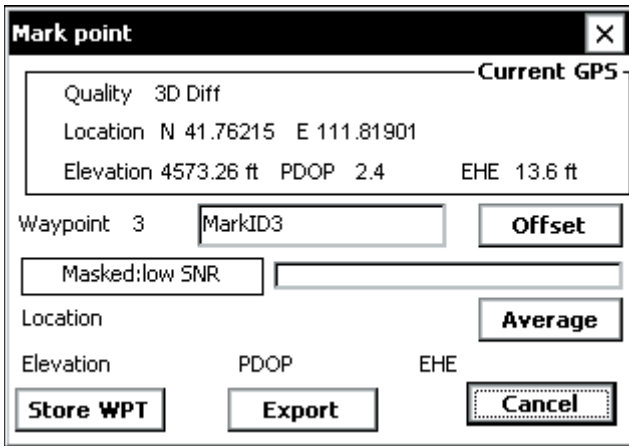
### ▲ Del (Delete)


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* button to capture a current location waypoint using the *Mark Point* pop-up screen. (The *Mark Hotkey* also activates this feature. For more information see the *Hotkey* section of this chapter.)

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

The screenshot shows a dialog box titled "Offset Input" with a close button (X) in the top right corner. The dialog contains three input fields: "Distance" with the value "22" and the unit "ft", "Direction" with the value "15", and "Slope" with the value "9". To the right of the "Direction" and "Slope" fields, there is text: "Ref:Mag North." and "Dec. Angl= 0.00". At the bottom, there are two buttons: "OK" and "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. Next to the *Direction* box is the Ref (reference) label. This displays the heading you set up in the configuration of LandMark CE 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. This is a useful tool to determine the a clinometer.

- 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. (Notice how the *Store Wpt* button shows *waiting* while still 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 will close. 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 must be stored.*

## **Cancel**

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





# Chapter 4

## Troubleshooting

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**Error Messages and Warnings**

## Error and Warning Messages

LandMark CE 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 CE Startup Error Messages

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

#### Error message:

**Application Path Not Found. Please make sure the path 'C\_Drive\C\_Program Files\LandMarkCE' exists. If it does not, please re-install LandMark CE.**

This error message appears for one of the following reasons:

- 1) The path, *C\_Drive\C\_Program Files\LandMarkCE*, (the LandmarkCE default installation path), was changed after installation.
- 2) You tried to copy the Landmark CE folder from another Allegro. You must use the installation CD to set the path where the LandMark CE is installed on the Allegro.
- 3) A factory default reset on the Allegro was performed; LandMark CE is still saved in the C\_Drive, but the registry has been erased.

To fix the error, reinstall LandMark CE.

#### Error message:

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

When LandMark CE 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, or a Set Factory Default was executed.
- 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 CE.

### **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 Set Factory Default 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 can be fixed by doing a soft reset. If the soft reset does not work, reinstall LandMark CE.

### **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 Set Factory Default 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 Allegro precedes the year 2000.

Registry errors can be fixed by doing a soft reset. If the soft reset does not work, reinstall LandMark CE.

### **Error message:**

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

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

- 1) The registry is corrupt, or a Set Factory Default 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 can be fixed by doing a soft reset. If the soft reset does not work, reinstall LandMark CE.

**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 CE. LandMark CE automatically defaults to WGS84 when this happens.

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

**Error message:****Cannot open LandMark CE 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 CE registry.
- 2) LandMark CE did not close the registry properly the last time it was open.
- 3) Another programs wrote a different value to the LandMark CE registry for this key.
- 4) Set Factory Default was executed, erasing the LandMark CE registry.

Registry errors can be fixed by doing a soft reset. If the soft reset does not work, reinstall LandMark CE.

**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 CE registry.
- 2) LandMark CE did not close the registry properly the last time LandMark CE was open.
- 3) Possibility that other programs wrote a different value to the LandMark CE registry.
- 4) Set Factory Default was executed, erasing the LandMark CE registry.

Registry errors can be fixed by doing a soft reset. If the soft reset does not work, reinstall LandMark CE.

### **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 CE cannot read the application path value. This problem could happen because of one of the following reasons:

- 1) A Set Factory Default was executed and erased the key-value.
- 2) The registry has been corrupted.

Registry errors can be fixed by doing a soft reset. If the soft reset does not work, reinstall LandMark CE.

### **▲ LandMark CE General Error Messages**

The following are the error or warning messages and the suggested fix for those messages that may occur during general LandMark CE 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 listed above 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 File/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 “\C\_Drive\C\_MyDocs\.**

When LandMark CE 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 CE. When LandMark CE is reopened it is looking for the original waypoint file, but because it has been renamed, it automatically defaults to `\C_Drive\C_MyDocs\`, 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 CE. You should never change the waypoint file outside LandMark CE.

### **Error message:**

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

When LandMark CE is executed, it automatically tries to open the last read waypoint file. If the directory cannot be detected, LandMark CE 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 CE automatically goes to the default directory and path and opens the default waypoint file (`wptdef.txt`) to fix the problem.

### **Error message:**

#### **File already exists. Using:\n%s%s.**

LandMark CE 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 CE and renaming the file, or resave the points of the file if they were deleted. To avoid this in the future, do not change the last file to the name that was open outside of LandMark CE.

**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 soft 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 new 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.

**Warning message:****Are you sure you want to exit the application?**

This message appears for one of the following reasons:

- 1) Select the X in the upper right-hand corner of the Allegro screen to exit the application.
- 2) Go to File/Exit to exit the application.

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.

**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 soft reset and restart LandMark CE.

**▲ LandMark CE Mark Point Screen Error Messages**

The following are the error messages and suggested fix for those messages that may occur when using the LandMark CE 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 CE 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 must be stored.



## ▲ LandMark CE Waypoint Screen Error Messages

The following are the error messages and suggested fix for those messages that may occur when using the LandMark CE 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 files 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 waypoints from the current file.

## ▲ LandMark CE Configuration Screen Error Messages

The following are the error messages and suggested fix for those messages that may occur when using the LandMark CE 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 Programmer's 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 CE (i.e. a third party application). When Landmark CE 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 soft reset, or reinstalling LandMark CE.

### **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 from the *File* tab, this error message appears for the following reason:

- 1) The *Ini File Write Protected* box must be checked 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 can be deactivated on the *Data* tab of *Configuration* screen.

### **▲ LandMark CE Navigation Screen Error Messages**

The following are the error messages and suggested fix for those messages that may occur when using the LandMark CE 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 Allegro precedes 2000 or is not within the specified time frame that the model can be applied to.

To fix the problem call your LandMark CE reseller to receive your closest LandMark CE technical support center. The new calculation file is available December 12, 2004. At that time the file can be sent to you or can be downloaded from Internet. You need to update the calculation file in 2005.

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



# Chapter 5

## Programmers Guide

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Programming for LandMark CE

# Programming LandMark CE

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

The Memory Exchange file is used to exchange information between LandMark CE 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 CE (real time), or data pulled from LandMark CE 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 CE 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

Argument for Function	Function Affected
(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 CE 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 CE to tell the third party program that the data are ready.

## LMCE\_API BOOL GetInternalGPSRT

Argument for Function	Function Affected
(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 CE (refer to the Configuration section of LandMark CE). 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

Argument for Function	Function Affected
(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 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

Argument for Function	Function Affected
(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 CE. The GPS point is pulled after marking a point in LandMark CE 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

Argument for Function	Functions 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 degrees
double &mark_lon,	Longitude in decimal degrees
char &mark_lathem,	Hemisphere either N or S
char &mark_lonhem,	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_system,	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 CE 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 mart 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 CE 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 CE signals with new data. The DLL is aware of Landmark CE unloading and releases the block so that the third party application is not blocked if LandMark CE 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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