

Transplant  
CF LP  
GPS Receiver  
User's Guide



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The synthetic screen displays on the PDA in this manual and on the package description are for demonstration purposes only. All trade names and all GPS software belong to their respective owners.

# Warnings

## Care and Caution

The Global Positioning System (GPS) is operated by the United States Government which is solely responsible for the accuracy and continued operation of the system. Accuracy of position fixes (longitude, latitude and altitude) can be affected by alterations made to the GPS satellites by the U.S. Government. Accuracy is subject to change in accordance with the U.S. Department of Defense civil GPS user policy and Federal Radionavigation Plan. Positional accuracy and time to fix time can also be affected by poor view of caused by obstructions such as

- tall buildings,
- heavy foliage,
- large cliffs and other obstructions

where GPS satellite signals are blocked and poor satellites geometry conditions result.

## Judgment

The CF LP GPS receiver is an excellent navigation and location awareness assist tool, but does not substitute the needs of careful steering and good judgment. Never only rely on one single tool or apparatus for positioning and navigation.

## Accessories

There may have accessory supplied with the **CF LP GPS** receiver which are specifically designed for the **CF LP GPS**. Use of other accessories will severely degrade performance or even damage the receiver, and will void the warranty. Do not try to open or break the receiver. There are no user serviceable parts inside the receiver. Opening the receiver will void the warranty.

## Software

Follow the operation guidance as stated and described in the user guide of the GPS application software.

The software supplied with the CF LP GPS receiver is solely for personal usage. Making copies only for personal use, but may not copy, modify, reverse engineer or transfer the software unless expressly provided by written agreement. The software is the property of Transplant / EMTAC and/or its supplier and is protected by international treaty provisions.

## **Notice**

In order to help you fulfilling any warranty obligations, read comprehensively the "Warnings", "Disclaimer and Limitation of Liability", "Basic Guidelines", "Care and Maintenance", and the whole User Guide.

### Remarks:

1. The External Active Antenna is an optional accessory which is not included in the package.

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# Basic Guidelines

## **SAFETY**

Read the User Guide and these basic guidelines comprehensively. Breaching the regulations and rules may be dangerous or illegal. Road safety is the first priority; do not use or operate the CF LP GPS receiver while driving. Keep the CRUX II / CF LP GPS receiver away from high temperatures and fire. Additional detailed information is given in this user guide. (Consult more details in “Warnings” section)

## **PROPER HANDLING**

Operating the GPS receiver requires a clear and unobstructed view of sky with the antenna facade pointing upward to the sky. Do not bend the CF LP GPS receiver while connected to in the compactflash slot bending will damage the receiver.

## **FIRST TIME OPERATION**

A longer than normal time-to-first-fix of position may result the first time you use the CF LP GPS. Follow this user guide and consult the instructions of the Pocket PC and the GPS application software. The CF LP GPS is designed for use in TYPE II compactflash slots, DO NOT TRY TO FIT OR TO CONNECT THE CF LP GPS WITH OTHER TYPES OF EXPANSION SLOTS or OTHER HOST DEVICE. The CF LP GPS may be used in a PC CARD slot using a type II compactflash to PC CARD adapter (optional).

## **INTERFERENCE**

GPS receivers may receive interference near cellular base-stations and when in close proximity to mobile phone antennae. This interference may affect positioning and time-to-fix performance.

## **CONNECTORS**

There is one external antenna port connector(MCX-female type),. Caution and care must be exercised when handling this parts. Bending or breaking these parts will severely degrade positioning performance as well as damage the receiver and this will void your warranty.

## **ACCESSORIES**

There may have been accessories supplied with the CF LP GPS receiver which are specifically designed for the CF LP GPS. Use of other accessories will severely degrade performance or even damage the receiver, and will void the warranty. There are no end-user servicable parts inside the CF LP GPS receiver.

DO NOT TRY TO OPEN THE CF LP GPS, OPENING THE CF LP GPS WILL VOID YOUR



WARRANTY.

**SERVICE**

Only qualified engineering service personnel must install or repair equipment.

**SWITCH OFF**

Obey all laws, regulations, rules and restrictions. Switch off the host platform and discontinue operation of the CF LP GPS receiver in hospital ICUs, aircraft, gasoline station, near fuel or chemicals, near blasting areas, or other restricted areas.

**NOTICE**

Read the "Warnings" section comprehensively before operation.

Remarks:

1. The External Active Antenna is an optional accessory which is not included in the package.

# 1. Getting Started

## Introduction

Congratulations on purchasing the CF LP GPS GPS receiver("CF LP GPS"). The CF LP GPS offers various location awareness applications for both consumer and corporate usages including

- Navigation and Positioning
- Find Street and Route
- Travel Route Planning
- Recreation
- Safety and Security
- Fleet Management
- Logistic
- Field-Force Management
- Location-Based Service (LBS)



**Figure 1**



## Prepare to use your CF LP GPS Receiver

To help you begin to use your CF LP GPS, read this User Guide in the first step. The User Guide explains the detail how the CF LP GPS operates, functions, and common features of the CF LP GPS. A short glossary of GPS related terms and abbreviations at the back of the User Guide.

Before you begin using your CF LP GPS, you must complete the GPS/MAP application software installation to your Pocket PC or Laptop. For information about Pocket PC operation and application software installation, please refer to the documentation that accompanies each product.

For detailed operation information, please consult Chapter 3. In order to get more familiar with your CF LP GPS, please first read Chapter 2 before operating the CF LP GPS.

## GPS signal reception

The Global Positioning System (GPS) is a space-based radio-navigation system. This system consists of 24 satellites, which orbit the Earth at an altitude of approximately 17,500 kilometers, and ground control stations. Each of the 24 satellites, deployed in 6 orbital planes, circles the earth twice a day. The system satellites continuously transmit signals contain the information of time and distance in a precise formation, 24 hours a day in any weather condition, everywhere around the world. By processing the signals received, *CF LP GPS* provides users with helpful information of position, velocity, and time for navigation and location awareness purposes anywhere anytime on the Earth.

The *CF LP GPS* offers high position accuracy and fast Time-To-First-Fix (TTFF), which rely on environment circumstances where receiver located as well as initial states of the receiver. During attempting to a position fix, the receiver needs to lock on to at least 3 satellites and, uses the signal can be received as well as the data of latest position stored in the receiver's digital memory in order to compute the location of the device.

Environmental factors that influence the position accuracy and TTFF including such as

- tall buildings,
- narrow streets and passageways,

protection film on glass,  
heavy foliage,  
large cliffs,

and other obstructions where the satellite signals may be blocked, and, poor satellite geometry situation. Initial state of the receiver, means latest status in memory of the receiver, may mainly determine the time of TTFF. Position can be quickly fixed within only 10 seconds from a hot-start state and needs 80 seconds typically from a cold-start state. The receiver may need at least 3 to 5 minutes from a complete restart-state, for example, flying a distance over 500 miles the time it last had a position fix.

The CF LP GPS uses the satellite signals to calculate an exact geodetic location through triangulation method, contained in 10 meters CEP accuracy without Selective Availability (SA), which is good enough for general location awareness purposes. The position data is then converted within the receiver to latitude and longitude coordinates, which is usually provided in the geodetic datum on which GPS is based (WGS 84). Position offsets of hundreds of meters or much more can result from using the wrong datum.

In addition to datum used, there are number of positioning errors can occur, limiting accuracy. The major errors including satellites orbiting error, poor satellite geometry, multi-path signals, atmospheric delay, receiver clock timing, and poor satellite signal reception.

## Using optional external active antenna<sup>\*</sup>

An optional external active antenna is available for usage when operating under certain environmental situations, such as inside vehicles where satellite signals are blocked. Detailed operation is described in the Operation chapter. Make sure to use only the optional external antenna supplied by Transplant. Use of any other antennas will severely degrade positioning performance or even damage the receiver. Read basic guidelines before using optional external active antenna.

<sup>\*</sup>External active antenna is an optional accessory which is not included in this package.

## 2. General Information

This chapter describes your CF LP GPS in details.

### General features

Your CF LP GPS is an excellent navigation and positioning aid tool when using with Pocket PCs and Laptop computers. The general features are

- Rugged Type II Compactflash design. Slim housing.
- Fully compatibility with Pocket PC 2000,2002, and 2003; Windows 98,ME,200 and XP.
- No software driver required for Pocket PC, works with all GPS programs which accept industry standard NMEA GPS input.
- Ultra-low power consumption.
- Embedded high sensitivity GPS active antenna.
- Optimal antenna orientation design enhances reception both in the car and on foot.
- Optional external active antenna for in-vehicle and indoor usage.
  - Outstanding performance even along tree-lined streets, urban canyons and in vehicles with coated windshields.
  - Allows mounting the iPAQ Pocket PC anywhere you like in the vehicle.

### Embedded active antenna

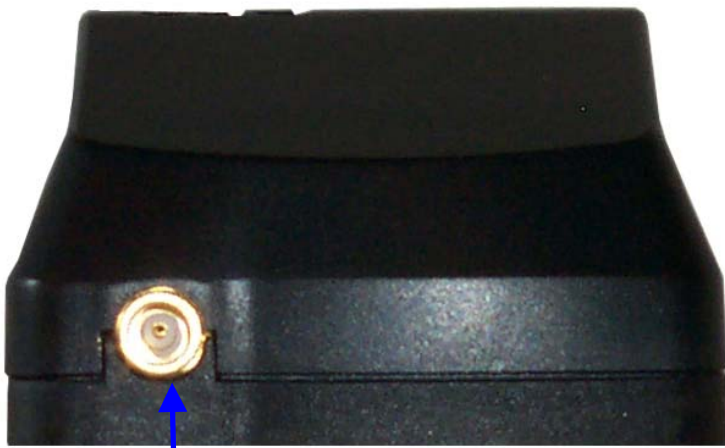
Your CFLP GPS is embedded with a high sensitivity 1575.42MHz GPS active antenna internally, which can offer good satellite signal reception for position fixes. The embedded active antenna is illustrated as "A" in Figure 2 and 3, and the antenna facade area is indicated in Figure 3. Keep this facade area surface clean and clear view to the sky while operating the CF LP GPS. Do not let this surface area become covered fully or partially by any object especially one which contains metal and/or electromagnetic wave absorption materials such as screwdriver, pen, watch, floppy diskette, CD and metal wires, thin metal foil like aluminum foil and metal-coated plastic bag, water or liquid, and carbon paper.



**Figure 3**

## External antenna port

Your CF LP GPS is equipped with a RF connector port (MCX type) for connecting with external active antenna(optional accessory) when operating under certain environment situation, such as inside a vehicle and where satellite signals are blocked or obstructed. The external antenna port is indicated as in Figure 4. Make sure using the optional external antenna supplied by Transplant. Use of other active antennas will severely degrade positioning performance or even damage the receiver. Please read basic guidelines before using the external active antenna accessory.



**External Antenna Port  
(MCX female-type)**

***Figure 4 Top of CF LP GPS***

## External active antenna (optional accessory)

The external active antenna is an optional\* accessory. Connecting the optional external active antenna to the external antenna port described in previous section "External Antenna Port" as indicated in Figure 4. This optional active antenna is embedded magnet in the bottom for easy mounting on metal surface, be caution not put near to materials are sensitive to magnetic field, such as magnetic storage media like floppy diskette. Figure 5 is the reference photo of the optional external active antenna. Make sure to use only the optional external antenna supplied by Transplant. Use of other any other active antenna will severely degrade positioning performance or even damage the receiver.





***Figure 5\****

\*The external active antenna is an optional accessory which is not included in the package.

## 3. Operation Guide

Before using the CF LP GPS, first make sure to prepare following steps are ready for operation.

- The GPS software is correctly installed on the Pocket PC or Laptop Computer.
- The Pocket PC is fully power charged.
- The CF LP GPS is securely connected in a Type II Compactflash slot correctly.
- Identify the operation environment and determine whether an external antenna\* is needed or not.

For information about the operation of the Pocket PC and the GPS application software installation procedures, please refer to the documentation that accompanies each product, respectively.

In this Chapter, a step-by-step operation procedure is described.

**Step-1** To install the GPS application software

**Step-2** To connect with the Pocket PC

**Step-3** To operate the GPS application software

Connect with the external active antenna\*

\*The external active antenna is an optional accessory which is not included in the package.

## Step 1 To install the GPS/MAP application software

Before operation the CF LP GPS, make sure the GPS application software is properly and completely installed in the iPAQ Pocket PC.

To install the GPS/MAP application software, please consult and follow those operating procedures described in the user's guide of the GPS application software and the iPAQ Pocket PC, respectively. Make sure the GPS application installed completely and correctly.

In the included CD-ROM, there is the "Crux\_View Test Program"(Evaluation version) for testing purposes. Please follow the step-by-step procedure indicated and described in the CRUX\_VIEW(Evaluation) Manual file(in .pdf format). Figure 6 is a screen shot example of Crux\_View Test Program (indicating the Satellites in view and Signal-Level View).

### Note:

- (a) The Crux\_View Test Program is an evaluation version program and only for testing purpose.
- (b) The Crux\_View program is only for the CF LP GPS to be used with the Pocket PC 2002 or 2003.
- (c) Crux\_View supports ARM(StrongARM/X Scale) based Pocket PCs.

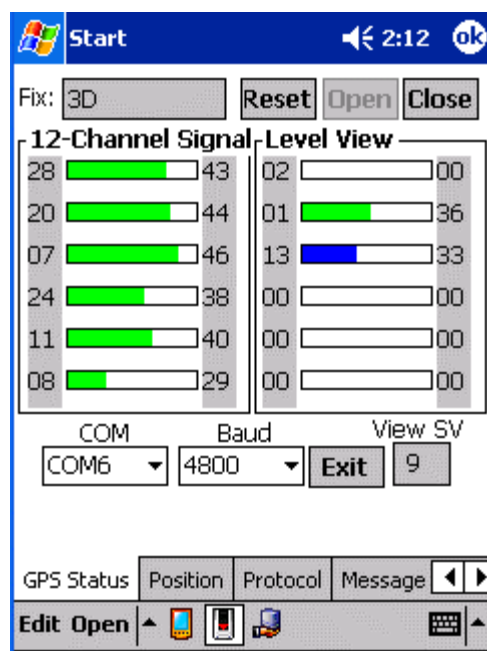


Figure 6

## Step 2 To connect with the iPAQ Pocket PC

To connect your **CF LP GPS** with a Pocket PC, simply slide the CF LP GPS into the **type II compactflash slot**. Figure 7 illustrates the CF LP GPS being inserted into an iPaq Pocket PC with CF expansion sleeve. (Please also consult the operation procedures described in the user's manual of your Pocket PC.)



*Figure 7*

### Step-3 To operate the GPS application software

To open and use the GPS/MAP application in your iPAQ Pocket PC, first make sure the GPS/MAP software is correctly installed in the iPAQ Pocket PC which is fully charged.

- Your CF LP GPS is fitted with and connected with the Pocket PC.
- Open the GPS application in the iPAQ Pocket PC.
- Enter into the GPS application operation.

General Com Port settings are (your settings may vary depending on hardware and software configuration):

IPaq 3600 – Com 4

Ipaq 3700/3800 – Com 5

IPaq 3900/ series – Com 6

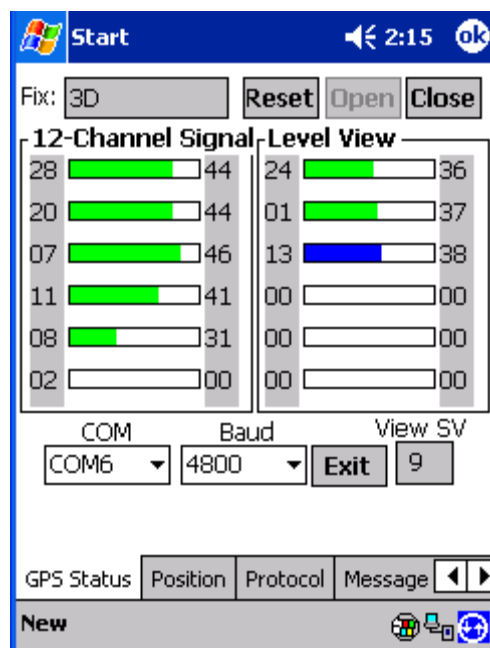
IPaq 5400/5500 series – Com 4

Dell Axim – Com 5

HP iPaq 2200 series – Com 7

Baud rate should always be 4800.

Consult and follow the details operation guidance described in the user guide of the GPS/MAP application software which you installed. Figure 8 illustrates the Crux\_View Test Program is well in operation (the screen display is example of the Satellites in view and Signal-Level View) which indicating that the Crux\_View software is completely installed.



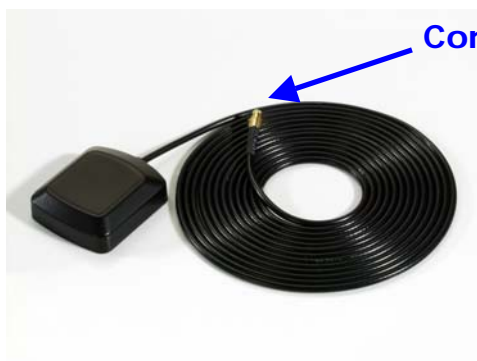
***Figure 8***

## Connect with external active antenna\*

When operating under the condition that satellite signals are obstructed or blocked such as inside vehicle. First, locate the external antenna port (MCX female) and then plug the connector (MCX male) of external active antenna(optional accessory) into external antenna port, as indicated in Figure 10. Put the external active antenna on the roof metal surface of the car, or on the front top-surface of the dash board where are not affect driving safety and appropriated. Use only the active antenna(optional accessory) supplied with the BTGPS. Use of other antenna will severely degrade positioning performance or even damage the receiver. Read “Basic Guidelines” before using external active antenna accessory.



**External Antenna Port  
(MCX-type/female)**



**Connector of optional External Active Antenna  
(MCX-type/male)**

**Figure 10**

\*The external active antenna is an optional accessory which is not included in the package.

Connect and install the external active antenna in position before driving. Do not operate the external antenna while steering on the road. The active antenna is embedded magnet in its bottom for easy mounting on metal surface, be caution not put near to materials are sensitive to magnetic field, such as magnetic storage media like floppy diskette and mechanical wrist watch.

## 4. Troubleshooting

### **1. Why does it take so long to find the satellites and have position fix?**

A longer than normal time-to-first-fix of position may result the first time you use the CF LP GPS. When the CF LP GPS is first initialized it can take several minutes the receiver to locate the satellites in the orbit. Be sure that the CF LP GPS has a clear and unobstructed view of sky. Buildings, heavy foliage, and other obstacles are capable of blocking the satellite signals.

### **2. Why there is no satellite signal reading on my Pocket PC?**

Make sure the CF LP GPS is well fitted and firmly connected with the iPAQ Pocket PC. Second, ensure your Pocket PC is fully charged. Charge the Pocket PC before operating the CF LP GPS and the GPS/MAP software. Consult the operation steps described in Chapter 3 "Operation Guide".

### **3. Why do I get a position fix faster some times than others?**

GPS satellites are not always over the same point on the Earth. The constellation of the GPS satellites is not geostationary. Based on satellite variation from to time, you could experience a position fix faster some times. Buildings obstruct any GPS signal, so setting up in a vertical window immediately blocks at least half of the sky view.

### **4. Why I can't open the MAP/GPS application in the iPAQ Pocket PC?**

Check the MAP/GPS application software is completely and correctly installed on your iPAQ Pocket PC. If necessary, re-install the GPS/MAP application. Consult and follow the installation and operation guidance come with the user guide of the GPS/MAP application software which you purchased.

### **5. I can not find the driver for the CF LP GPS inside the package, do I need it?**

There is no software driver need for the CF LP GPS itself when used with Pocket PC. Consult and follow the installation and operation guidance come with the user guide



of the GPS/MAP application software which you purchased. When using the CF LP GPS with a Laptop (and optional PC CARD adapter), the appropriate drivers are located on your CD.

## 5. Care and Maintenance

Your CF LP GPS is a sophisticated product of superior design and craftsmanship, it should be treated with care and proper maintenance. The suggestions below will help you to fulfill any warranty obligations.

- Keep CF LP GPS and all accessories out of small children's reach.
- Keep CF LP GPS dry. Humidity, liquids and precipitation contain minerals that will corrode its connector, jack, switch and electronic circuit boards.
- Use only the supplied and approved optional accessories. Unauthorized accessories, antenna, modifications or attachments could damage the CF LP GPS and may violate regulations governing radio devices.
- Only use the charger supplied with for charging purpose. Use other charger may damage the CF LP GPS and even dangerous at the risk of explosion.
- Use dry and clean soft cloth to clean the CF LP GPS. Do not use harsh cleaning solvents, chemicals or strong detergents.
- Do not drop, shake or knock the CF LP GPS. Rough handling can break the connector, jack, switch and internal electronic circuit boards. Dropping the CF LP GPS may break the connector, jack and switch which will cause non-recoverable and malfunction damages.
- Do not expose to rain or high humidity environment, or even pour water on it, which will cause malfunction or non-recoverable damage.
- Do not store CF LP GPS in dusty, dirty areas. Its parts, like connector pin and jack, can be damaged.
- Do not store CF LP GPS in hot areas. High temperatures can shorten the life of electronic devices, and melt or drape certain plastics.
- Do not expose to high temperatures higher than 60°C (140°F) such in car under direct sunshine.
- Do not store CF LP GPS in cold areas. When the CF LP GPS warms up to its normal operation temperature, moisture can aggregate inside it, which may severely damage electronic circuit boards inside.
- Do not attempt to open the CF LP GPS. Unauthorized handling may damage the CF LP GPS.
- Do not paint on the CF LP GPS. Paint can clog the connector, jack, switch, and prevent proper normal operation of the CF LP GPS.

# Glossary

## **Almanac data**

A set of information that transmitted by each satellite on the orbits and state of every satellite in the GPS constellation. Each GPS satellite contains and transmits the almanac data set for the entire GPS satellite system network. Almanac data allows the GPS receiver to rapidly acquire satellites shortly after it is turned on.

## **ACTIVE ANTENNA**

An antenna that amplifies the GPS signal before it sends it to the receiver.

## **Altitude**

The distance between the current position and the nearest point on WGS 84 reference ellipsoid, usually it is expressed in meters or feet and is positive outside the ellipsoid.

## **Baud**

Bits per second. Also referred to as a baud rate.

## **Channel**

Channel refers to a set of hardware in the receiver that detects locks on and continuously tracks the signal from a single GPS satellite. The more channels available, the greater number of GPS satellite's signals a receiver can simultaneously lock and track. A receiver of 12 channels is the optimized design, considering the current consumption, chip-package size and cost.

## **CEP - Circular Error Probable**

CEP is the radius of a circle, centered at a true location, within which fifty percent of positioning solutions fall. CEP is used to achieve horizontal accuracy.

## **C/N<sub>0</sub>**

Carrier-to-Noise density ratio. An indication of satellite signal strength received by the GPS receiver.

## **COLD START**

A condition in which the GPS receiver can arrive at a navigation solution without initial position, time, current Ephemeris, and almanac data.

**Constellation**

Constellation refers to the specific set of orbiting GPS satellites system, used in calculating positions or all the satellites visible to a GPS receiver at one time. The pattern created by the relative positioning of a GPS satellite network is designed to achieve a very high probability of global satellite coverage even in the event of satellite outages.

**dB**

Decibel. A notation of relative unit such as the satellite signal strength received.

**DATUM**

A math model which depicts a part of the surface of the earth. Latitude and longitude lines on a paper map are referenced to a specific map datum. The map datum selected on a GPS receiver needs to match the datum listed on the corresponding paper map in order for the position readings to match.

**Elevation mask**

Elevation mask is an adjustable feature of GPS receivers that specifies a satellite must be a certain number of degrees above the horizon before its signals are used for positioning. Satellites at low elevation angles (five degrees or less) have lower signal strengths and are more prone to loss of lock thus causing noisy solutions.

**Ellipsoid**

A geometric surface which all of whose plane sections are either ellipses or circles.

**Ephemeris**

Ephemeris is a set of parameters used by a global navigation satellite receiver to predict the location of a satellite and its clock behavior. Each satellite contains and transmits ephemeris data about its own orbit and clock. Ephemeris data is more accurate than the almanac data but is applicable over a short time frame from four to six hours. Ephemeris data is transmitted by the satellite every 30 seconds. The predictions of current satellite position are transmitted to the user in the data message.

**Geodetic coordinate**

A coordinate system whose elements are latitude, longitude and geodetic height. The latitude is an angle based on the perpendicular to the ellipsoid. Longitude is the angle measured in the XY plane.

## **GIS (Geographic Information System)**

a computer based system that is capable of collecting, managing and analyzing geographic spatial data. This capability includes storing and utilizing maps, displaying the results of data queries and conducting spatial analysis.

## **Hot Start**

Start mode of the GPS receiver when current position, clock offset, approximate GPS time and current ephemeris data are all available.

## **L1 frequency**

1575.42 MHz GPS carrier frequency which contains only encrypted P code, used primarily to calculate signal delays caused by the ionosphere.

## **Latitude**

A north/south measurement of position perpendicular to the earth's polar axis.

## **Longitude**

An east/west measurement of position in relation to the Prime Meridian, an imaginary circle that passes through the north and south poles.

## **Multipath**

Multipath is the reception of a signal both along a direct path and along one or more reflected paths. Multipath signals result in an incorrect pseudorange measurement.

## **NMEA (NATIONAL MARINE ELECTRONICS ASSOCIATION)**

A U.S. standards committee that defines data message structure, contents, and protocols to allow the GPS receiver to communicate with other pieces of electronic equipment aboard ships.

## **Selective Availability (SA)**

Selective Availability is a process whereby the U.S. Department of Defense dithers the satellite clock and/or broadcasts erroneous orbital ephemeris data to create a pseudorange error to prevent adversaries from using the extremely accurate GPS positioning data.

## **SPREAD SPECTRUM**

The received GPS signal is wide bandwidth and low power. The L-band signal is modulated with a pseudo random noise code to spread the signal energy over a much wider bandwidth than the signal information bandwidth. This provides the ability to receive all satellites unambiguously and to give some resistance to noise

and multipath.

### **TIME TO FIRST FIX (TTFF)**

The time it takes to find the satellites is called the Time to First Fix (TTFF). If you have not used your GPS unit for several months, the almanac data for the satellites may be out of date. The unit is capable of recollecting this information on its own, but the process can take several minutes. The time it takes after the user first turns on the GPS receiver, when a GPS receiver has lost memory, or has been moved over 300 miles from its last location.

### **TRIANGULATION**

A method of determining the location of an unknown point, as in GPS navigation, by using the laws of plane trigonometry.

### **Universal Time Coordinated (UTC)**

UTC is the time as maintained by the U.S. Naval Observatory. Because of variations in the Earth's rotation, UTC is sometimes adjusted by an integer second. The accumulation of these adjustments compared to GPS time, which runs continuously, has resulted in an offset between GPS time and UTC. After accounting for leap seconds and using adjustments contained in the navigation message, GPS time can be related to UTC within 20 nanoseconds or better. Greenwich Mean Time (GMT) is still the standard time zone for the prime meridian (zero longitude).

### **Warm Start**

Start mode of the GPS receiver when current position, clock offset and approximate GPA time are input by user or by the application software. Almanac is retained, but ephemeris data is clear.

### **Wide Area Augmentation System (WAAS)**

Developed by the United States government, WAAS is a Satellite-Based Augmentation System (SBAS) that calculates the errors in the GPS signal at several monitoring stations around the country, then transmits error correction messages from geostationary satellites to GPS receivers.

### **World Geodetic System 1984 (WGS 84)**

The primary map datum used by GPS. Secondary datums are computed as differences from the WGS 84 standard. WGS 84 is a set of U.S. Defense Mapping Agency (DMA) parameters for determining global geometric and physical geodetic relationships. Parameters include a geocentric reference ellipsoid; a coordinate system; and a gravity field model. GPS satellite orbital information in the navigation message is referenced to WGS 84.