



TerraSync Software

TRIMBLE'S PRODUCTIVE DATA COLLECTION AND MAINTENANCE TOOL FOR QUALITY GIS DATA

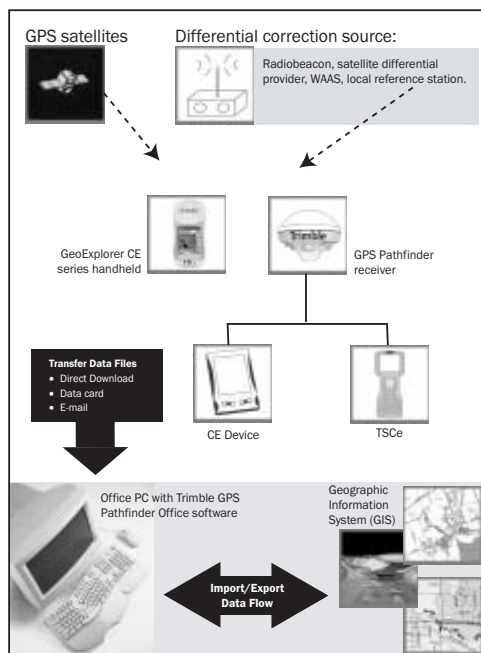
With today's demand for accurate and up-to-date data for decision-making, it's important to quickly collect and verify the data in your geographic information system (GIS). The convenient and flexible TerraSync™ software lets you use your preferred device running Microsoft Windows or Windows CE to quickly and easily collect and maintain GIS data in the field. TerraSync enables a seamless flow of data between the field and the GIS, so you always have accurate data when you need it. With better data, you make better decisions.

TRIMBLE'S TERRASYNC SOFTWARE gives you the convenience and economy of using your preferred field computer to collect and maintain GIS data in the field, as well as the power of advanced Trimble GPS technology that makes the job faster, easier, and more accurate. Running on a GeoExplorer CE series handheld, a rugged GIS TSCe field device, or another Windows field computer of your choice, the TerraSync software is ideal for collecting and maintaining urban, utility, and natural resources data for your GIS.

The TerraSync software lets you collect data about features (things that you want to identify and describe) for a GIS database. For each feature, you can record descriptive information (attributes) and location information (positions). TerraSync records GPS position data from a Trimble GPS receiver.

You can use TerraSync to:

- collect position, feature, and attribute data
- maintain existing GIS data (TerraSync Professional edition only)
- display a map of your current location and any features you have collected
- navigate to existing features
- set GPS parameters in the receiver to maximize productivity or precision
- configure real-time differential correction sources
- view status information about GPS satellites, the GPS receiver, and real-time sources



Note: Different receivers support different correction methods.

Trimble's GPS Pathfinder® Office software works seamlessly with the TerraSync software, providing mission planning, data transfer, data dictionary creation, data import and export, and postprocessing.

FEATURES AND BENEFITS

Displays maps and raster images—Overlay your features on a background map, in raster or vector format for easy location, navigation, and verification. You can display geo-referenced aerial photographs and scanned images in MrSID, JPEG, or bitmap format, and even connect to a Web map server to display background data directly from the Internet.

Graphical interface—Operation is intuitive, with easy-to-understand screens and status displays. Touch-screen interaction brings a new level of simplicity to recording and updating your data.

Runs on Windows or Windows CE—TerraSync can be installed on a variety of field computers running Microsoft Windows or Windows CE. Choose a Windows notebook or laptop computer, or a CE device such as a GeoExplorer CE handheld or a GIS TSCe field device. With a range of solutions available, you can match your data collection requirements for size, power, ruggedness, and price.

Time-saving tools and capabilities—Numerous built-in features, developed by Trimble through its many years of experience in building data collection systems, help you do your work more quickly, easily, and accurately.

Note: TerraSync software is available in Professional or Standard edition. See page 8 for a list of differences between the two editions.

DATA COLLECTION AND DATA MAINTENANCE

Trimble pioneered the introduction and use of handheld GPS/GIS data collection systems in 1987. Since then, GPS has become the premier tool for providing position information. The methods and productivity of the data collection process have advanced enormously, with Trimble leading the way.

Trimble introduced the new concept of GPS/GIS data maintenance in 1999. Advanced GPS technology enables you to relocate features graphically, verify and update their positions and attributes, add new features, and integrate the changes back into your GIS database. With better data in your GIS, you know you're making more informed decisions.

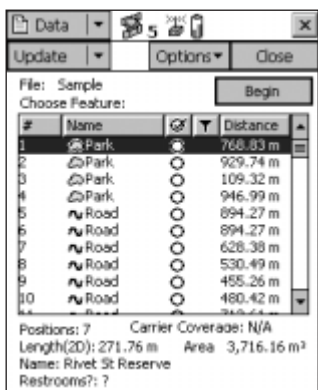
Collecting new data

To begin a GIS data collection project, create a data dictionary—a list of features and attributes that you plan to collect in the field. GPS positions and features are collected using the data dictionary and stored in the field computer. A data dictionary can be created in the GPS Pathfinder Office software, or directly in the TerraSync software. Back in the office, the collected data is transferred to the GPS Pathfinder Office software for postprocessing, validation, and output to a wide range of GIS packages.

Maintaining GIS data

To begin a GIS data maintenance project, import data from your GIS and transfer the resulting files to your field computer. In the field, use the TerraSync software to relocate each feature so that you can verify and update attribute information. You can also add a new GPS-derived position to any feature previously collected with less accurate position information. This is ideal if you collected your data by digitizing and now need more accurate position information.

Any feature you alter in the field is automatically marked, making it easy to determine which data needs to go back into your GIS at the end of the day.



Why GPS?

Using GPS technology has proven to be the fastest, most accurate and most cost-effective method of providing position data for the features in a GIS database. You can collect data virtually any time and anywhere in the world with a common standard of accuracy and dependability using a variety of sources for differential correction.

Differential correction

A GPS position is subject to a number of errors that interfere with accuracy. Differences in the timing devices in the satellites and the receivers, orbit errors, the earth's atmosphere and receiver noise are just a few of the things that reduce accuracy. However, these errors can be removed by a process called differential correction. Differential correction can be done after the data is collected or as it is being collected in the field.

In the field, the TerraSync software allows you to choose from different real-time sources, depending upon the GPS receiver you are using.

Differential correction source	GPS Pathfinder				GeoExplorer CE	
	Pro XR	Pro XRS	Pocket	Power	GeoXT	GeoXM
Satellite differential		✓		✓		
Radiobeacon broadcast	✓	✓				
Second (reference) GPS receiver with radio link	✓	✓	✓	✓	✓	✓
WAAS	✓	✓		✓	✓	✓

If you are in an area not yet covered by any of these correction sources, you can make use of the existing network of reference stations to postprocess your data. Look for one of the following reference stations in your area:

- Trimble Reference Stations (TRS)
- GPS Pathfinder Community Base Stations (CBS)
- Continuously Operating Reference Stations (CORS)
- University NAVSTAR Consortium (UNAVCO) Reference Stations
- International GPS Service (IGS) Reference Stations

The GPS Pathfinder Office software provides a list of many of the available sites. It can automatically search for correct base data and download directly from these sites.

With the TerraSync software, you also have the option of collecting carrier phase data (with supported receivers) and SuperCorrect™ data. Carrier phase data can be postprocessed in the GPS Pathfinder Office software to provide decimeter-level accuracy¹. Files that contain SuperCorrect data can be postprocessed in the GPS Pathfinder Office software applying different filters and settings to those used in the field. This gives you more control over the accuracy and yield of your position data.

USING THE TERRASYNC SOFTWARE

The TerraSync software is arranged in easy to use sections:



Map. This section graphically displays features, raster and vector background files, and the GPS trail. Several selectable layers ensure you see just the information you need.

Data. This section allows you to create a new data file or open an existing data file for editing. In addition, you can manage data dictionaries, background files, and configuration files. You can even use e-mail to send and receive files, for maximum productivity in the field.

Navigation. This section helps you navigate to features using the Direction Dial and Close-up screens. The combination of the navigation and map capabilities gets you where you're going easily and reliably, and is especially useful for locating hidden or underground features.

One of these sections, or the software's **Status** or **Setup** sections, is always active and visible. You can easily move between sections at any time without closing any open forms or screens.

OFFICE PREPARATION

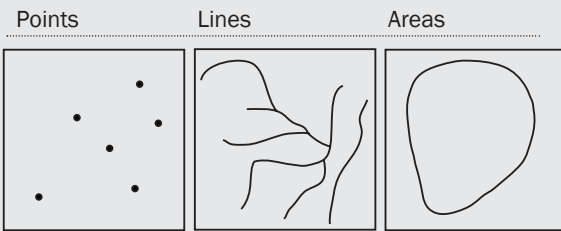
By performing several quick tasks in the office, you can work more effectively in the field. These include:

- Creating a data dictionary or importing data from your GIS.
- Mission planning with the QuickPlan™ module to establish the best time to collect data.
- Transferring user-defined coordinate systems or local sites to the TerraSync software.

- Configuring important settings either directly in the TerraSync software, or in the office using the GPS Pathfinder Office software's Configuration Manager.

Features and attributes

In general, features are things that you want to identify, describe, or locate. You describe them with attributes: for example, the name of a park, or the condition of a sign, are attributes of those features. The TerraSync software lets you collect and maintain data for three types of features.



- | | | |
|-----------------|----------------|----------------|
| • Road signs | • Roads/Trails | • Parks |
| • Power poles | • Pipelines | • Land parcels |
| • Nesting sites | • Rivers | • Wetlands |

The way GPS data is collected differs for each type of feature:

For point features, GPS positions are collected and averaged as you remain stationary at the feature.

For line features, GPS positions are recorded periodically as you move along the feature. You can configure the system to record positions at regular intervals, or to average a number of positions to get a more accurate vertex position. These positions are joined to form a line.

For area features, GPS positions are recorded periodically as you move around the perimeter of the site (in the same manner as a line feature).

These positions are connected to form the boundary of an area, with the last position automatically connecting back to the first.

Creating a data dictionary

Use the GPS Pathfinder Office software to create data dictionaries. Using the **Data Dictionary Editor**, you can define the feature and attribute data to be collected in the field, create menu options, and set default values. A data dictionary makes data entry faster and more accurate. It also ensures that the data you collect meets the requirements of your GIS.

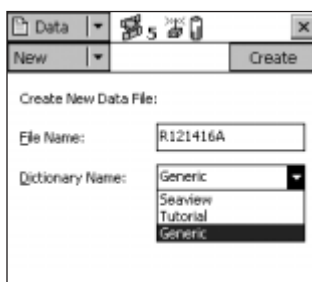
Alternatively, you can use the **Import** utility to convert an existing GIS file directly to a data dictionary.

When you have finished defining the data dictionary, transfer it to your Trimble field data collection system.

IN THE FIELD

Collecting new data

Once you have configured your settings and downloaded a data dictionary to the TerraSync software, you are ready to collect data. When you create a data file, you assign a data dictionary to it. GPS positions, along with feature and attribute data that you collect, are automatically recorded to that file. Each time you create or reopen a data file, a menu of the features named in the data dictionary is displayed. When you select a feature, you are prompted to enter the relevant attributes, and GPS positions are automatically logged at the specified rate. Numerous time-saving features help you collect and store all the data you need and transfer it to your GIS faster and more easily than you thought possible.



Maintaining GIS data

After transferring your GIS data to the TerraSync software, you are ready to verify and update your features. The software displays the features in your data file. The list can be sorted chronologically, by feature type, or by distance from your current position. You can also filter the list to display only features with a certain attribute value; for example, all park benches that need repair. Or you can find a feature with a specific attribute value, such as a unique ID.

The graphical navigation and map displays allow you to rapidly re-locate features to verify that the current attribute values are still valid. The map display also shows other useful data, such as a background street map or aerial photograph, to aid in navigation and provide assurance that you are updating the correct feature.

With Web map server support, background maps can be updated automatically, via the Internet, as you zoom and pan around the map screen.

To edit the attributes of an existing feature, simply key in the new information or select the correct value from a pre-defined list. The feature is automatically marked as updated. You can also store a new GPS position for a feature that currently does not have a position or has an inaccurate position. Once you have checked and updated any changed information, you are ready to move on to the next feature. It's that simple!

Coordinate systems

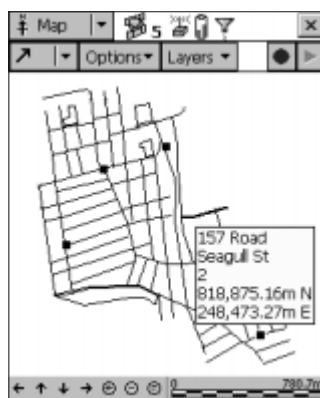
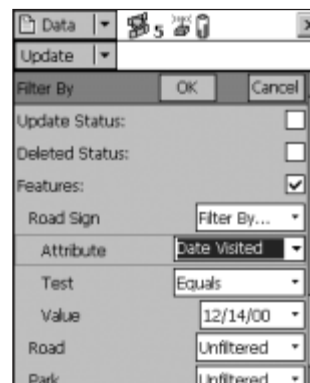
The TerraSync software is supplied with a comprehensive selection of coordinate systems and datums. The software allows you to specify a datum transformation and map projection so that you can see your GPS position (and the position of features you may have recorded) in your local coordinate system. This makes it easy for you to check your position or to navigate using a map produced by your GIS. For compatibility with emergency services, support for the USNG coordinate system is included

Maps

The Map section is a graphical display of the features in the open data file. It can also display raster (in JPEG, MrSID, or bitmap format) and vector background maps, along with GPS and navigation information. For clarity you can choose which layers of information will be displayed on the Map.

The map layers are:

- Filtered features
- Unfiltered features
- Between-feature GPS positions
- Background
- GPS trail



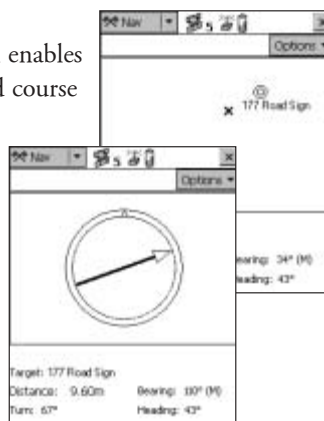
For example, on a data maintenance job, you may want to display only those features that you have filtered—for example, all the park benches that need painting. Displaying only these items on the map greatly simplifies the task of finding and updating each one. For any feature you select on the map, its coordinates, feature number, and feature name are displayed, as well as the values of two attributes of your choice.

You can easily move around on the map by panning and zooming in or out to see more or less detail. These tools let you tailor the map to your exact needs for any project or part of a project.

Navigating

The Navigation section enables you to follow a planned course to a target location, or visit features you have previously mapped.

The Direction Dial screen shows you all the information you need to navigate to the target from a distance. It is very useful for navigation in open country, or where you can follow a direct route to the target.



When you're within a few feet or meters, the Close-Up screen automatically replaces the Direction Dial screen and helps you find the exact location of the target. Both screens provide a graphical display, as well as the name of the target, its distance and bearing, and your heading.

Navigation information is also displayed on the TerraSync Map screen, so you can use your features and background information as a visual reference.

TIME-SAVING TOOLS

The TerraSync software provides numerous tools and capabilities that enable you to collect high quality data in the most efficient and productive way.

Mission planning. The Plan section lets you check the GPS satellite constellation and identify times of poor GPS conditions in your location. With in-the-field mission planning you can avoid unexpected downtime and choose the best times to collect data.

Data dictionary. Use a data dictionary to define the features and attributes that you plan to collect prior to going to the field. You save significant time in the field, and ensure that the collected data contains the exact information you need. When you are out in the field and you find something unexpected, it's easy to add new features and attributes to the data dictionary, ensuring you collect all the quality data you need.

Filtering. A powerful filtering capability lets you quickly identify all of the features in the data file that meet certain criteria; for example, all of the park benches that need repainting. Filtering also allows you to set up a checklist of features for inspection. As you visit and update each one, it is automatically checked off the list.

Status bar. The status bar, which is always visible, provides basic information about the status of the TerraSync software, the GPS satellites, the GPS receiver (including its battery level), and the differential correction source. Just a glance at the status bar tells you the condition of your system and provides assurance that the data you are collecting is of the highest possible quality.



Continue. The Continue option makes data collection quicker, as you do not need to retrace your steps to collect point, line, or area features that you encounter when collecting another feature. For example, when collecting a path (line feature), you might encounter a pond (area feature). You do not have to record the entire path and then return to record the pond. Simply end the path feature, collect the pond feature, and then use the Continue option to resume collecting the path feature.

Repeating features. This function speeds up entry of attribute data when there is a sequence of similar features, such as a line of power poles. You do not have to re-enter values for all attributes. Just flip through, checking that each attribute value is correct for the selected feature. Change only those attributes that need to be changed.

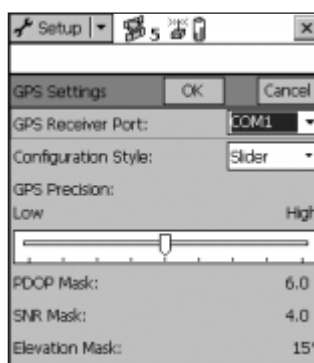
Offsets. When it is impractical to position the GPS receiver directly over a feature, you can stand or drive at a distance and specify an offset to the feature. Using offsets can provide significant improvements in productivity, especially in situations where you do not have good GPS satellite coverage. The TerraSync software also accepts offset information from a variety of laser rangefinders.



Pause/resume. You can pause logging at any time. For example, if you are driving around the perimeter of a park and want to stop and examine a sign some distance from the park, you can pause logging positions for the park boundary. You can also pause logging if you want some time to enter attribute values, or just to take a break. Whenever you're ready, just tap Resume to begin logging again.

Send & receive via e-mail. In addition to saving your collected data as a file in your field computer or on a data card, you can send the file via e-mail. If you have access to the Internet, there is no faster or easier way to get essential data back to the office. To send a file, just select the Send via E-mail option, fill in the address and subject line, and tap OK. The e-mail, with the selected file attached to it, is automatically generated and sent to your e-mail outbox. When you connect to the Internet, the e-mail is sent. To receive e-mail, select the Receive via E-mail option and TerraSync will scan your inbox for attached files.

GPS slider bar. The GPS slider bar lets you quickly set the GPS "sensitivity" for best results under different conditions. The slider bar controls several GPS parameters. Sliding the control to the right means you collect fewer positions, but they will be more precise; by sliding it to the left, you can obtain more positions, but with less accuracy. Using the GPS slider bar and logging SuperCorrect records you obtain fast



results in the field and more flexible data processing in the office. By setting the slider bar to the left in less favorable conditions, you can collect as much data as possible while in the field. Then, back in the office, postprocess the data with different GPS parameters to achieve your required accuracy and yield.

Multimedia file attributes. You can attach any type of file to a specific feature; for example, a voice recording or digital photo describing a flooded area. Any file attachments are transferred seamlessly and automatically between your field computer, the GPS Pathfinder Office software, and the GIS.

Auto-incrementing attributes. By setting the incrementation interval in your data dictionary, you can have an attribute value automatically increment every time a new feature is created. This is very helpful when logging features with individual identification numbers, such as power poles or addresses, as it provides a unique identification sequence for each feature.

Digitizing. When GPS data is unavailable, the TerraSync software allows you to manually enter position data by clicking on the map display to indicate the feature's location, or entering the coordinates if they are known.

External sensors. It's easy to attach various external sensors to the field computer so that attribute or uninterpreted sensor data can be sent to the TerraSync software. This way you can use temperature sensors, depth sounders, tree calipers, and many other sensors when you are collecting field data. For example if you need to measure the height of a tree, you can use a laser rangefinder to calculate the height value, and have it output the data directly to the TerraSync software—automatically populating the "Height" attribute field.

BACK IN THE OFFICE

When you have completed your field work and returned to the office, process your data using the GPS Pathfinder Office software or the online GPS Pathfinder Express service. Both allow you to automate all the repetitive tasks of downloading, differentially correcting, and exporting the data to your GIS or spatial database.

CONCLUSION

The TerraSync software, running on a GeoExplorer CE handheld, GIS TSCe field device, or a field computer of your choice, is a convenient and powerful part of your GIS data collection and maintenance solution. TerraSync software is Trimble-tailored to provide easy, flexible operation and fast, accurate data collection—whether you’re collecting GIS data for the first time, or updating and improving your existing GIS database. With TerraSync software, you are sure of always having accurate and up-to-date GIS data for your important decisions.

TerraSync Professional and Standard

TerraSync Professional Edition is a fully-featured software product, designed for high-quality GIS data collection and ongoing data maintenance. TerraSync Standard Edition is an ideal solution for populating a new GIS database.

TerraSync Standard does not support the following functions:

- Upload of data from an existing GIS database
- Use of background data in the map display
- Connection to a Web map server
- Data input from a laser rangefinder
- Data input from an external sensor

¹ The GPS Pathfinder Office Centimeter Processing option provides centimeter-level accuracy for data collected with a GPS Pathfinder Pro XR, Pro XRS, or Power receiver.

² For an up-to-date list of tested devices and supported platforms, visit the www.trimble.com.

³ The serial cable and serial port are required for connection to a GPS Pathfinder receiver. They are not required for GeoExplorer CE handhelds which have an integrated GPS receiver.

⁴ WAAS support requires version 1.50 or later firmware and the WAAS option enabled.

MINIMUM SYSTEM REQUIREMENTS

Field computer

To run the TerraSync software on a Windows CE device, you require the following:

- Windows CE device running Windows CE version 3.00 or later²
- 16 MB RAM (with at least 8 MB free memory)
- Serial cable and RS232 serial port (or appropriate adapter)³
- Color or grayscale touch screen (240 × 320 pixels or larger)
- Reflective screen (or other screen suitable for outdoor viewing)

To run the TerraSync software on a laptop or PC, you require the following:

- Windows 95, 98, Me, NT 4.0, 2000, or XP
- 16 MB RAM (with at least 8 MB free memory)
- Serial cable and RS232 serial port (or appropriate adapter)
- 8 MB free hard disk space

GPS receiver

The TerraSync software accepts GPS data from any of the following Trimble GPS receivers:

- GPS Pathfinder family:
 - Pocket
 - Power⁴
 - Pro XR⁴
 - Pro XRS⁴
 - Pro XL
- GeoExplorer CE series:
 - GeoXT
 - GeoXM

Software requirements

This document describes functionality supported in TerraSync version 2.20 and later. Use GPS Pathfinder Office software version 2.90 or later with this version of the TerraSync software.

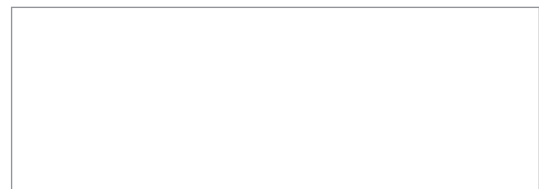
To transfer files between your desktop computer and a Windows CE device, you must have Microsoft ActiveSync version 3.1 or later installed on your desktop computer.



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