Basic GPS Data Capture Using TerraSync

A Quick Start Guide

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Purpose

This Quick Start Guide is designed to introduce new users to the fundamentals of GPS data capture using Trimble's TerraSync field software. Due to its brevity, no advice is offered on installation, advanced techniques, or troubleshooting.

Refer to the ***TerraSync Software Getting Started Guide*** (160 pages), or to the ***TerraSync Software Reference Manual*** (290 pages) for comprehensive guidance. Both are excellent references, and are available for free download in `.pdf` format from:
http://www.trimble.com/terrasync_ts.asp?Nav=Collection-30232

All materials in this Quick Start Guide were prepared using a Juniper Archer Field PC, a Trimble GPS Pathfinder XC compact flash card receiver, and TerraSync 3.05.

Start TerraSync

Tap **Start – TerraSync** on a WindowsMobile device to start TerraSync (left).

TerraSync's start-up page (below) will display for a moment.

The **Connect** icon indicates that TerraSync is trying to connect to a GPS receiver. The **Status – Skyplot** page (below) will display when the GPS connection has been established.
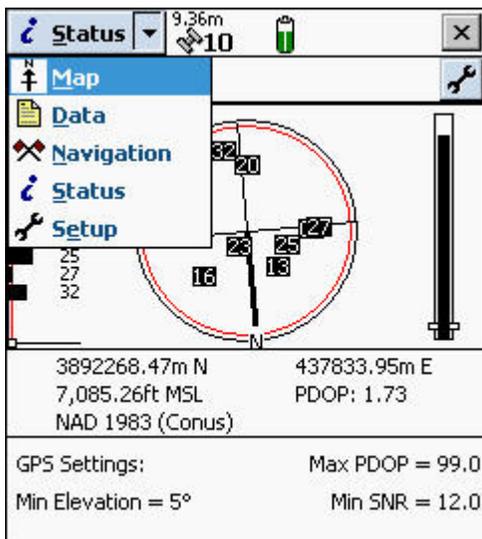
TerraSync's functionality is divided into five sections: **Map**, **Data**, **Navigation**, **Status**, and **Setup** (left).

Each of those sections contain a number of sub-sections, or other options.

For instance, the **Status** section contains nine sub-sections, as shown at right.
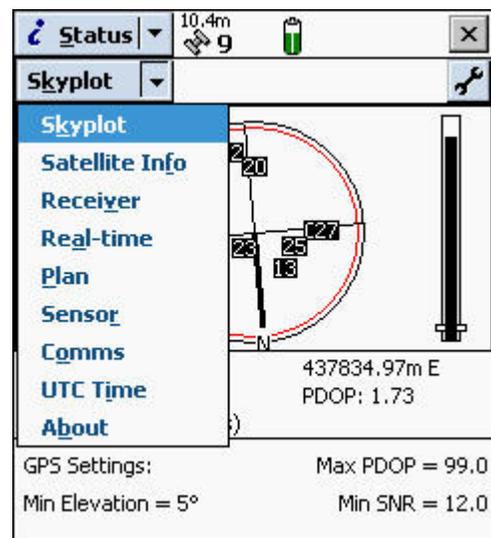
To open the Setup section, tap the section list button and select **Setup**.

Use the **Setup - Options** page (right) to configure TerraSync.

Current Configuration

TerraSync may be reset to its default configuration settings by tapping the Reload button.

If desired, users may create their own customized configurations by clicking **Utilities – Other – Configuration Manager…** in Pathfinder Office.

Customized configurations may then be transferred to TerraSync by clicking **Utilities – Data Transfer…** in Pathfinder Office.

Customized configurations may be activated in TerraSync by tapping the Change button, and selecting the desired configuration from a list of those available.

Logging Settings

Logging settings control what data are stored, and how. Generally, default settings are adequate, but set **Filename Prefix** as needed to avoid potential filename duplication, and set **Between Feature Logging Interval** to **Off**.

GPS Settings

GPS settings affect the quality of captured positions. The settings at right are generally adequate for natural resource mapping. They indicate that GPS capture will be automatically suspended if PDOP exceeds 8.0, or if SNR (Signal-To-Noise Ratio) falls below 37.0.

Most Trimble users will see the upper **GPS Settings** form. Users with Juno, GPS Pathfinder XC or XB, Nomad, or other SiRF-based receivers, however, will see the lower form, where GPS settings are pre-set to those shown.
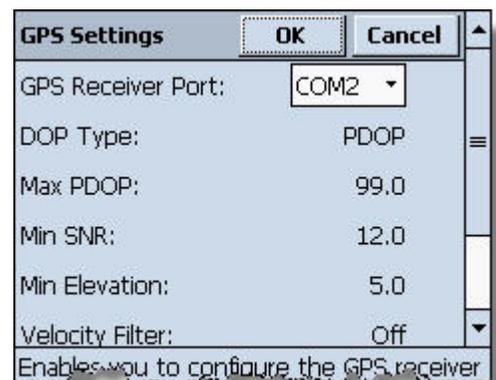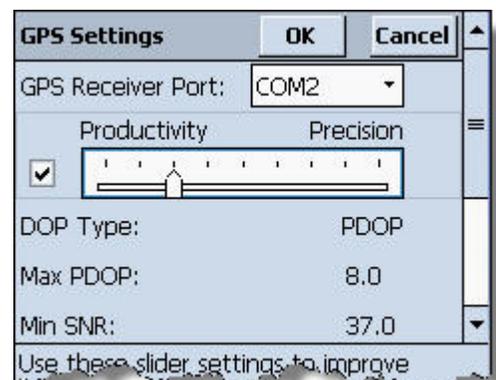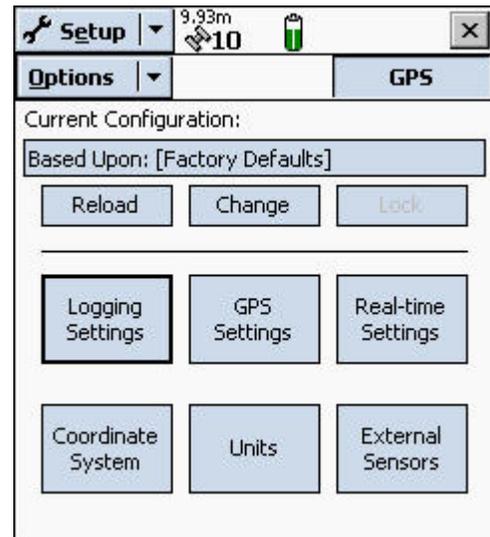
SiRF-based receivers are designed to provide high productivity in difficult GPS environments (steep canyons, dense canopy, etc.) but that productivity comes at the expense of configurable quality control. Post-processing differential correction of SiRF-based data is also of little, or no, benefit. In fact, results may be worse.

Some measure of quality control can be enforced in SiRF-based data by filtering out lower quality positions when features are exported to GIS from Pathfinder Office. However, this procedure could produce gaps in the exported features.

Real-Time Settings

Real-time differential correction offers little benefit in the field, except when accurate navigation to very difficult targets is planned. Nevertheless, users with receivers that support WAAS/SBAS are encouraged to set Choice 1 to **Integrated SBAS**, and Choice 2 to **Use Uncorrected GPS**.

External Sensors

External sensors include items like laser range finders and bar code scanners. If none are in use, uncheck all sensor items.

Units

Units only affect on-screen display of various data items, and have no effect on how GPS positions are actually captured or stored. If bearing-based offsets are planned, however, North Reference and Magnetic Declination settings must match the format of bearings to be entered from a field compass.

Coordinate System

All GPS positions are captured and stored as WGS84 latitude and longitude decimal degrees.

Coordinate system settings only affect the on-screen display of GPS position coordinates and background images, but have no effect on how GPS positions are actually captured or stored.

As an example, the settings illustrated at right are appropriate for the Coconino National Forest.

If background image files are to be displayed on-screen (`.bmp`, `.ecw`, `.jpg`, `.jp2`, `.j2c`, `.sid`, and `.tif` formats are supported), the settings selected here must match the image file's spatial reference.
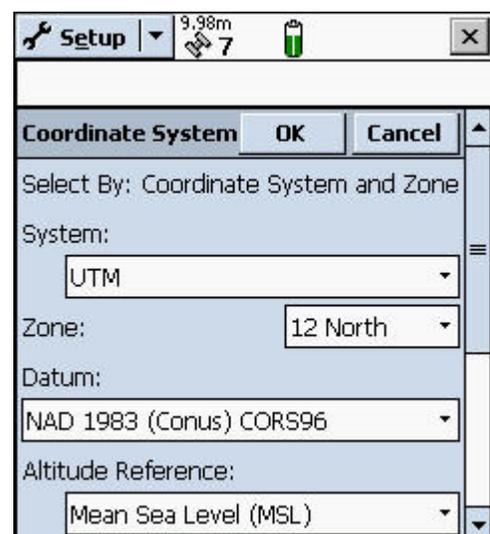
To open the Status section, tap the section list button and select **Status**.

The most useful of the Status section's nine sub-sections is the **Skyplot**. Its elements are described below.

Ten satellites are available to calculate GPS positions with a current estimated accuracy of 9.41 meters.

The red circle represents the current elevation mask (5°). See GPS Settings.

Battery charge is at about 75%.

The black circle represents the horizon (0°).

Satellites represented by filled boxes are used to compute GPS positions. Other satellites are tracked, but not used.

All satellites except 08 and 19 satisfy the SNR mask.

The red line represents the current SNR mask. See GPS Settings.

This is the current PDOP. It satisfies the PDOP mask.

This is the current PDOP mask. See GPS Settings.

These are the current GPS Settings.

These are the current GPS position coordinates, altitude, PDOP, and datum.

Data Section

To open the Data section, tap the section list button and select **Data**. All basic data capture functions are found in this section.

Data sub-sections are illustrated at left, and their availability is described below.

Sub-section	Available When
New File	No files are open.
Existing File	No files are open.
Update Features	A data file is open.
Collect Features	A data file is open.
File Manager	Always.

Create A New GPS Data File

Select **New** from the **Data** section's sub-section list.

A default file name in standard Trimble pmmddhha format is provided. If desired, use the keyboard to modify the file name.

Select the desired data dictionary from the **Dictionary Name** dropdown list.

Tap [**Create**] when file name and dictionary name are satisfactory.
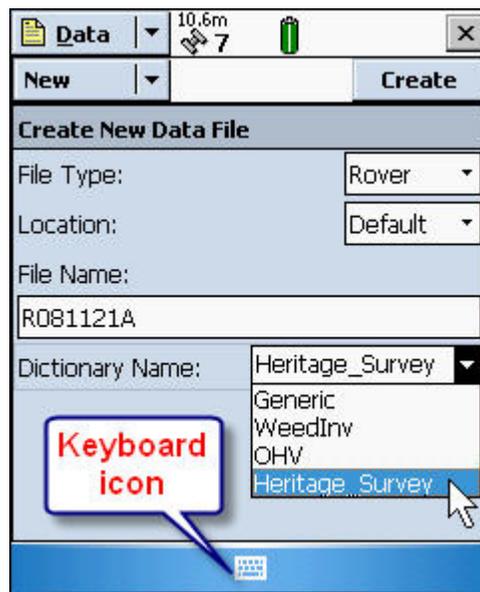
Create, Attribute, Capture, And Close A GPS Feature

The data dictionary's features are displayed when a new GPS data file is created.

Select the feature that is to be captured. For example, the feature **Heritage_Survey_Ln** (heritage survey line) was selected in the illustration at right.

Tap ● **Create** when the feature selection is as desired.
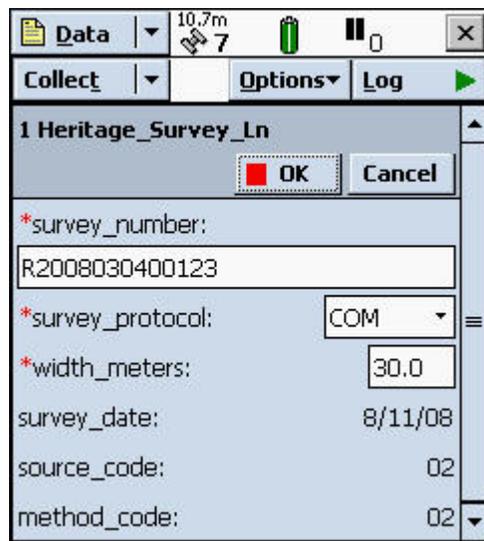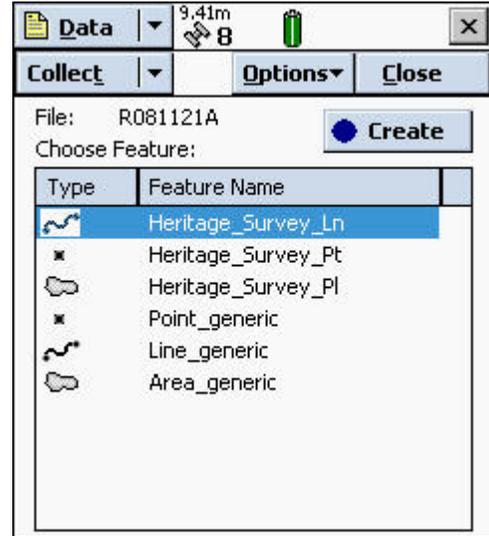
Complete the feature's attribution. In the example at left, the feature's **survey_number** and **width_meters** were input from the keyboard, and **survey_protocol** was selected from a dropdown menu list. Values for read-only fields **survey_date**, **source_code**, and **method_code** were default values from the data dictionary.
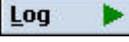
Tap **Log** ▶ when feature attribution is satisfactory.

Position capture for the current feature will begin if all GPS settings are satisfied (PDOP mask, SNR mask, etc.).

In the example at right, 149 positions have been captured to the **Heritage_Survey_Ln** feature.

When the feature's position, alignment, or perimeter has been captured, tap ■ **OK** to close the feature.
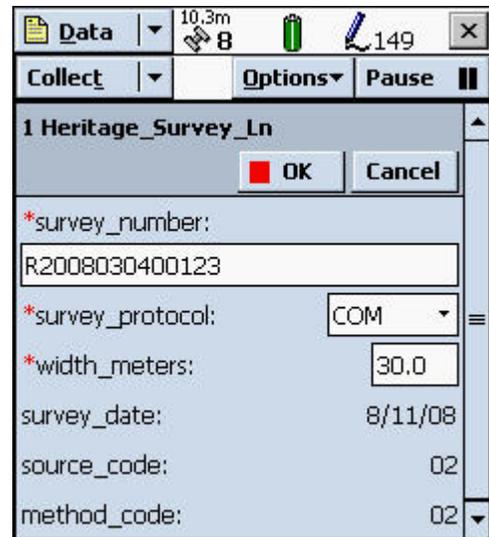
Tap **OK** to confirm that feature closure is desired.

Repeat the process of creating, attributing, capturing, and closing features as needed. Many point, line, and polygon features may be contained in a single GPS data file.

The basic procedure for capturing point, line, and polygon features is the same, except as described below.

- **Point features** - Remain on station while positions are captured and averaged.

- **Line features** – Move directly along the feature's complete alignment as positions are captured.

- **Polygon features** – Move directly along the feature's complete perimeter as positions are captured.

Close A GPS File

When all desired features have been captured, tap Close to close the GPS data file.
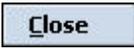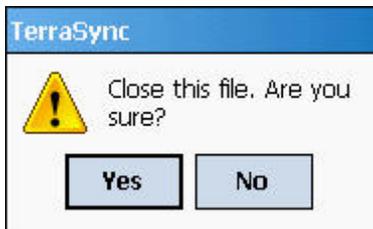
Tap **Yes** to confirm file closure.

Log Now Or Log Later

Two data capture options are available prior to creating a new GPS feature.

Log Now will begin capturing GPS positions immediately upon tapping a selected feature's ● Create button. Generally, this is undesirable, because an annoying cluster of GPS positions will be captured during the feature attribution period.

Log Later will open a feature in a paused state, allowing users to complete feature attribution prior to commencement of GPS position capture.

In **Log Later** mode, users tap Log ▶ when ready to proceed with data capture.
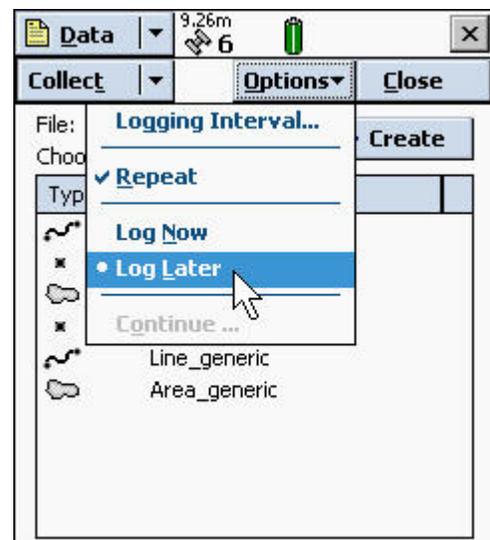
Segment A Line Feature

Rather than opening and closing a series of separate line features along an alignment, it is possible to segment a line feature at any point where its attributes change.

For instance, instead of creating two separate, disconnected heritage survey features, a single connected survey feature could be segmented at the point where it transitions from a width of 20 meters to a width of 30 meters.

To segment an active line feature, tap **Options – Segment Line**.
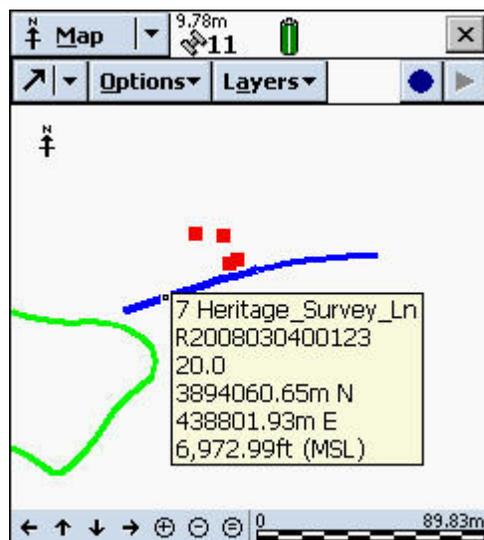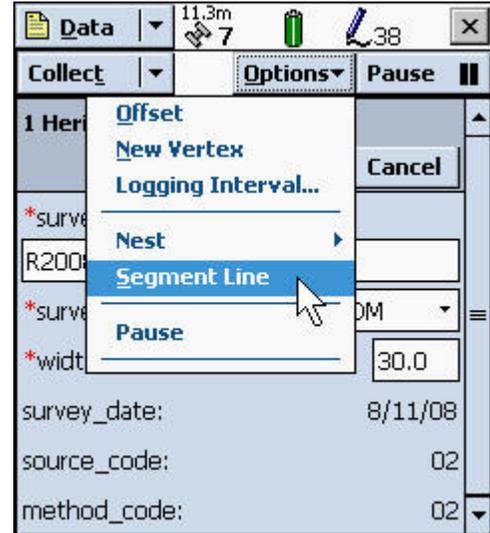
The survey feature at left has been segmented. The first segment (the highlighted portion) had a survey width of 20 meters.

The second segment (the highlighted portion) at right had a survey width of 30 meters.

Note that no gap occurs between the two segments, as would likely have occurred had two separate survey features been created.

A gap will develop, however, if the vertex separating two segments is deleted during edit in Pathfinder Office.
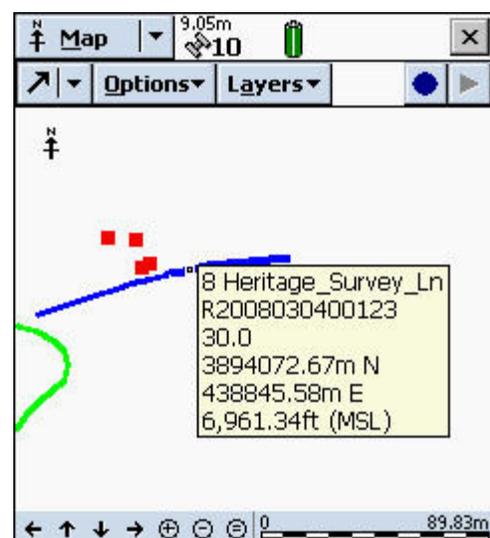
Continue A Line Or Polygon Feature

Line or polygon features may be continued after having been closed.

For example, a polygon feature may have been closed in order to capture a line feature near its perimeter. After capturing the line feature, the polygon feature may be continued (appended), starting from the position at which it was closed.

To continue a line or polygon feature, close any open feature, and tap **Options – Continue…**.
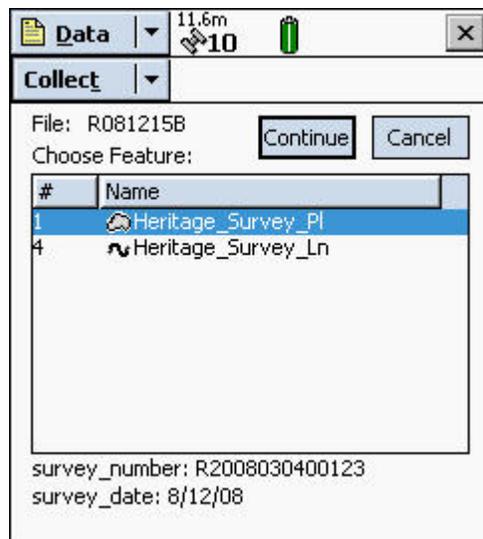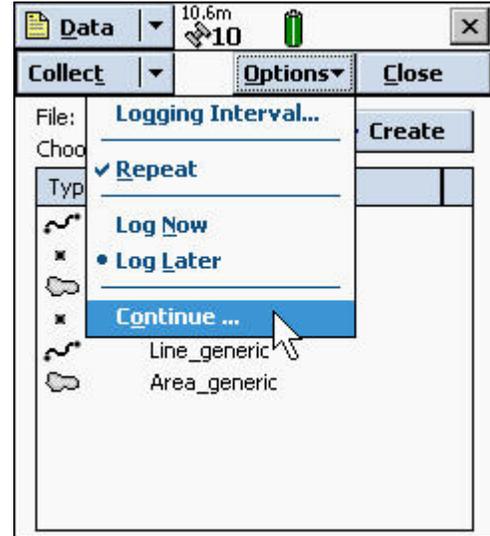
Next, select the desired line or polygon feature from the list of those available for continuance (left), and tap the Continue button.

GPS positions will be captured to the continued feature, just as if it had never been closed.

Any features collected "within", or prior to, a continued feature cannot be continued.

Once a GPS data file has been closed, its line or polygon features cannot be continued.

Nest A Point Feature While Collecting A Line Or Polygon Feature

Users can capture a point feature midway through a line or polygon feature by tapping **Options – Nest**. This suspends line or polygon capture, permits capture of a point feature, and then resumes line or polygon capture.

Repeat Attributes From One Like Feature To Another

Attribute values from the last recorded feature of the same type are copied to new features if the **Repeat** option (above right) is checked. This permits attribute values to be automatically carried forward from one like feature to the next, while still permitting attributes to be edited as needed.

Create Line Or Polygon Features With Averaged Vertices

Line or polygon features can be captured as a series of averaged-position vertices, one vertex for each station along a feature's alignment or perimeter. Although it is slightly more time-consuming to acquire, a vertex resulting from averaged GPS positions is more accurate than a vertex resulting from a single GPS position.

To capture a feature using averaged vertices, open and attribute a line or polygon feature while in **Log Later** mode. Then, tap **Options – New Vertex**.
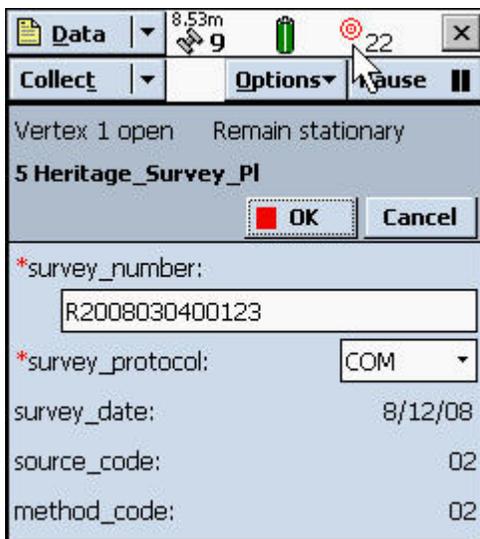
GPS positions will immediately begin contributing to the averaged position that will become the vertex. In the illustration at left, note that 22 positions have been captured so far, the vertex is still open, and the user is reminded to remain stationary.

When sufficient positions have been captured, tap ■ OK to close the vertex.

Repeat the process of opening, capturing, and closing a vertex at each station along a feature's alignment or perimeter.

Tap ■ OK when all vertices have been captured, and the feature is to be closed.

Averaged vertices and streamed vertices can be used in combination. The polygon feature at right is composed of three averaged-position vertices at the southeast, southwest, and northwest corners, and a series of streamed vertices that define the remainder of the polygon's perimeter.

Change Logging Interval Within A Feature

Tap **Logging Interval…** (above right) to change the rate at which GPS positions are logged into a feature, even midway through a feature.
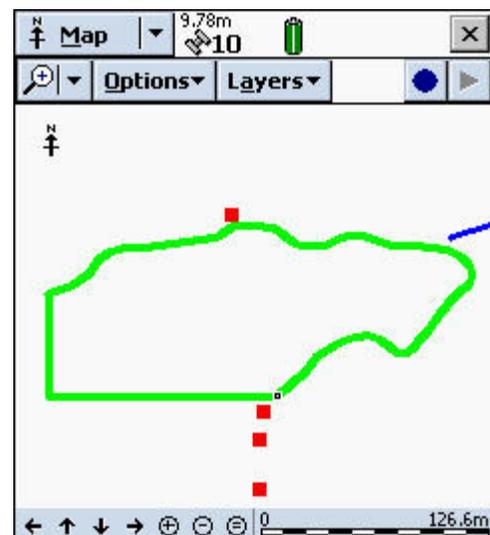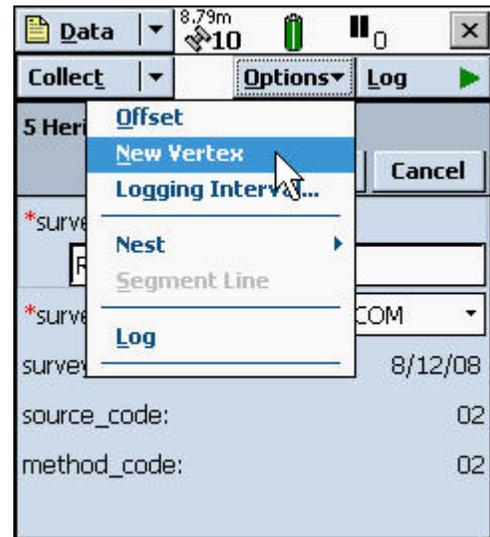
Offset A Feature

Offsets can be used to capture point features that are unapproachable (a hazardous vertical mine shaft), or that have poor GPS conditions (a rock art panel in an overhanging alcove).

Point features may be offset using five different methods, as shown at right. An example of a **Bearing – Bearing** offset is illustrated below.
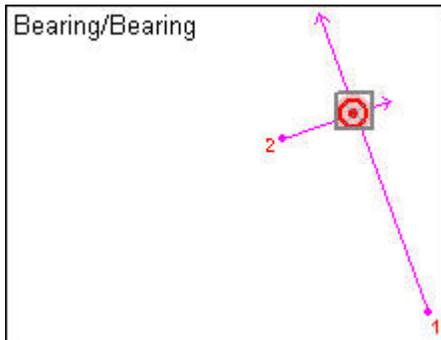
Here, the point feature's position is established by the intersection of bearings from 2 different reference points. Bearings that intersect at a more nearly perpendicular angle create a more accurate position than bearings intersecting at a more oblique angle.
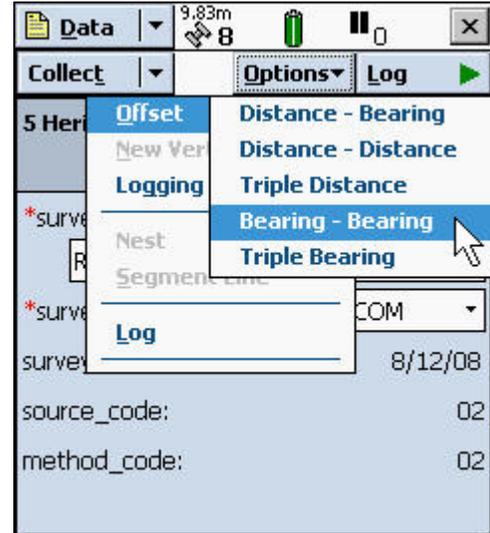
Line or polygon features may be offset to the left or right of a traveled alignment or perimeter by the distance specified.

In the example at right, a heritage survey for a buried utility trench reliably known to lie 30 meters right of a road's travel lane could be captured while driving the road with the illustrated offset in effect.

To apply an offset, open and attribute a feature as per normal procedure.
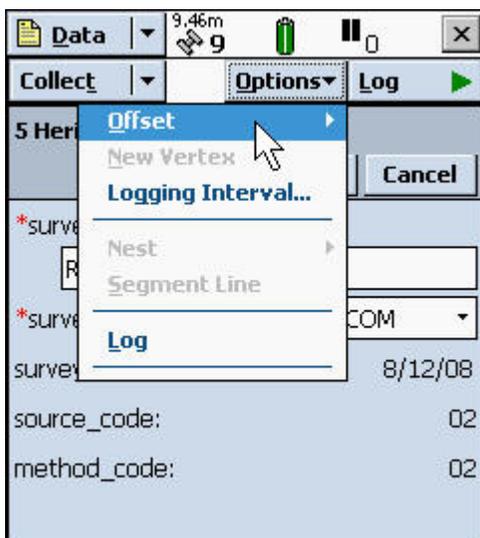
Then tap **Options – Offset…**, and proceed as per on-screen instructions for that type of offset.
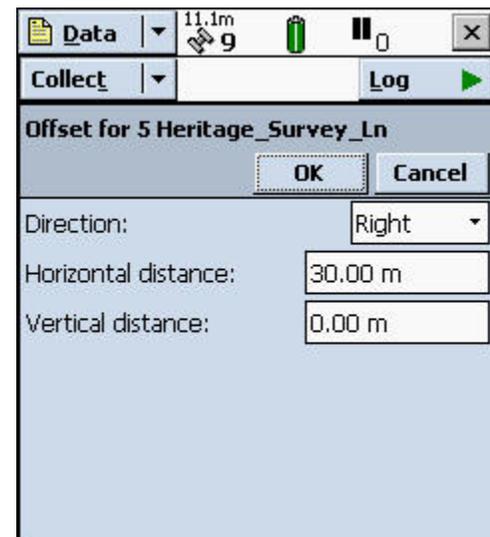
If bearing-based offsets are planned, tap **Setup – Options – Units** to ensure that North Reference and Magnetic Declination settings match the format of bearings to be entered from a field compass.

Manage Files

Users may gain access to the File Manager by selecting **File Manager** from the **Data** section's sub-section list.
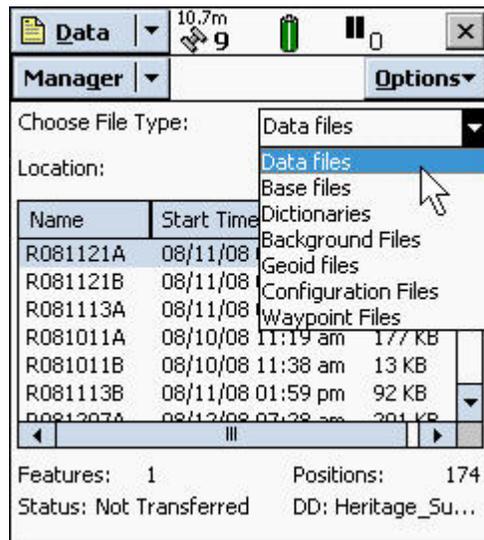
Select a file category from the **Choose File Type** list, and then select a file of interest.
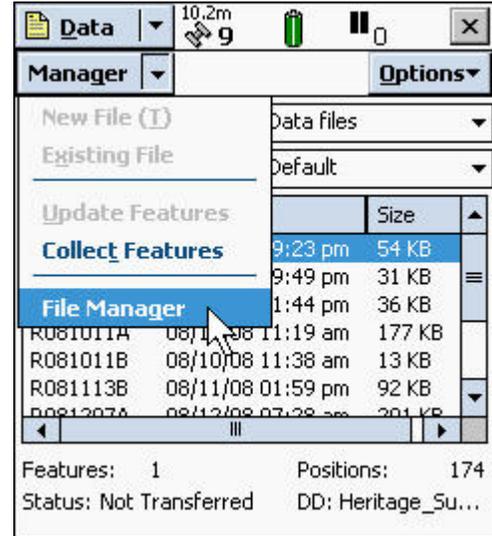
Once a file is selected, tap **Options▾** to reveal file-related actions that may be taken.
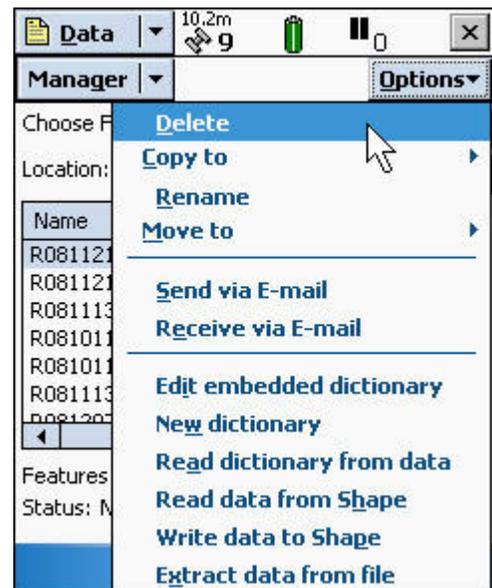
To open the Map section, tap the section list button and select **Map**. This section permits users to view all features in the current GPS data file, as well as the receiver's current position (the little red x).

The *TerraSync Software Reference Manual* describes these, and other, Map section features.

- Zoom
- Pan
- Select
- Filter
- Set navigation target
- Add background images
- Format layers
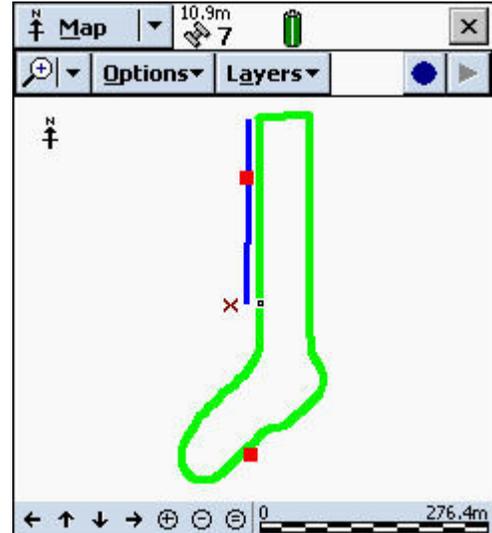
Use the Create Feature button ● or the End Feature button ■ to open a new feature from within the Map page, or to close an active feature. Other Map section opportunities are illustrated below.
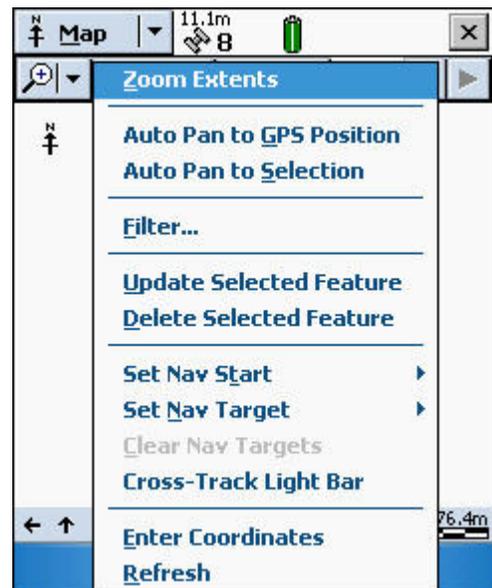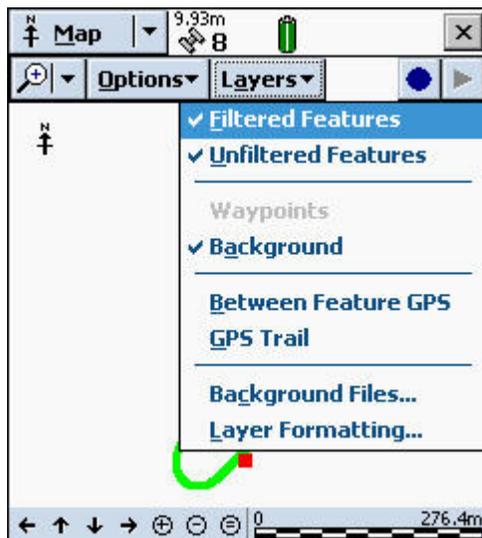
Use Background Images

TerraSync supports `.bmp`, `.ecw`, `.jpg`, `.jp2`, `.j2c`, `.sid`, and `.tif` background image formats. Transfer an image, its world file, and a coordinate system file (created automatically in PFO) to TerraSync using the Pathfinder Office Data Transfer Utility. An image's spatial reference must match TerraSync's. Images reduce performance.

Tap **Layers – Background Files…** on the Map page to add a background image.

Tap the section list button and select **Navigation** to open the Navigation section. The Navigation section permits users to navigate from their current position (little red x) to a selected target or feature.

To navigate to a point, select the desired point feature in Map view. The selected feature will be displayed as the boxed point feature symbol at right.

Next, tap **Options – Set Nav Target** in Map view.
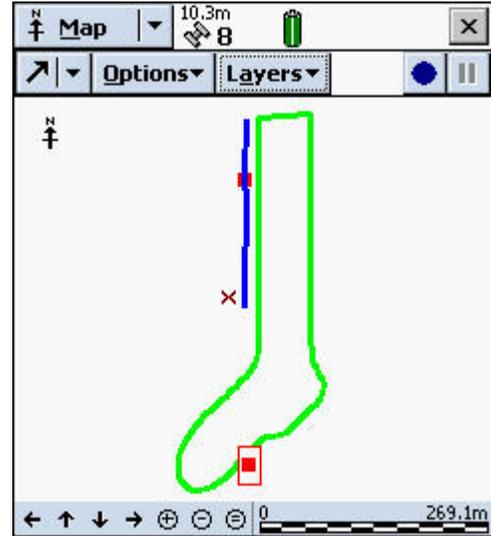
The navigation target will now be displayed as a blue crossed-flags navigation target symbol.
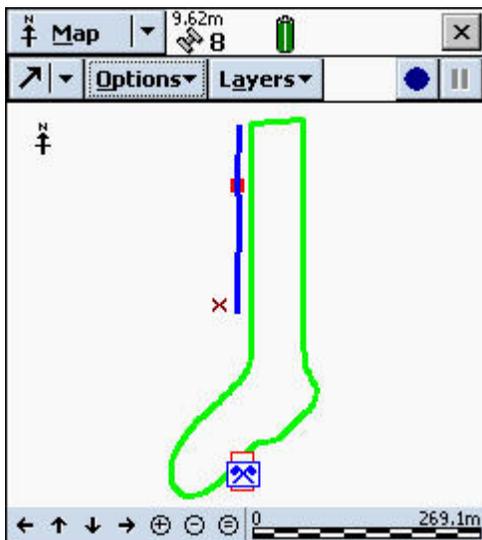
Select **Navigation** from the section list, and note these items (below right).

- Target's ID and type (2 Heritage_Survey_pt).
- Distance to target (189 meters).
- Bearing to target (176°). The arrow pointer indicates the bearing graphically.
- User's current heading (14°). The pointer on top the dial represents the user's heading.

TerraSync's "compass" depends on a series of GPS positions to detect the direction of travel, so users have to keep moving to keep the compass in an active state. If they stop, the compass will wander and drift.

Follow the arrow pointer until the target feature is reached. As the target is approached, an alert tone will sound, and the view changes to a zoomed-in representation of the target feature and the current GPS position.