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Release Notice

This is the August 2014 release (Revision A) of the Trimble TerraSync™ Software and GPS Pathfinder® Office Software Student Guide. It applies to version 5.6 of the Trimble TerraSync and GPS Pathfinder Office software.

The following limited warranties give you specific legal rights. You may have others, which vary from state/jurisdiction to state/jurisdiction.

Product Limited Warranty Information

For applicable product Limited Warranty information, please refer to Legal Notices in the TerraSync Software End User License Agreement or consult your local Trimble authorized dealer.

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Learning Objectives

Through the direction and support of your Trimble Certified Trainer, supporting field data collection scenarios, office processing, assessments and this student guide, this Trimble Certified class will enable you to:

- Associate GNSS fundamentals and best practices with the criteria of a TerraSync software mapping project
- Create a data dictionary in the GPS Pathfinder Office software
- Create a TerraSync Studio file to configure the TerraSync interface
- Identify TerraSync system components
- Configure your data collector with data collection parameters
- Record GNSS data with the TerraSync software
- Perform differential correction in the classroom with the GPS Pathfinder Office software
- Export TerraSync software data to a GIS or CAD system into multiple formats
- Perform data updates with the TerraSync software
- Navigate
- Use waypoints
Preparing for the Training

Welcome

Welcome to the Trimble Certified Training Guide: TerraSync™ Software and GPS Pathfinder® Office Software. This student guide was developed by Trimble Navigation’s Global Services Training staff to support instruction delivered by a Trimble Certified Trainer. The Trimble Certified Trainer may use this guide to lead you through the typical workflow(s) for a Trimble® TerraSync and GPS Pathfinder Office data collection project. Use it during the training as well as on the job.

Your trainer will instruct you based upon project scenarios that support a general data collection topic and scenario for students of mixed backgrounds or perhaps a more specific scenarios and topics – custom developed for your organization and its workflows.

Overview: Trimble TerraSync software

Trimble TerraSync software is designed for fast and efficient field GIS data collection and maintenance. Integrating all the ways you collect data—with a GNSS handheld computer, laser rangefinder, or centimeter-grade equipment—it is a powerful system for the collection of high quality feature and position data for GIS update and maintenance.

Simple, efficient, and productive in the field—Trimble TerraSync software is the clear choice for collecting and maintaining high quality GIS data.

Regardless of the field application and the complexity of the GIS data to be collected, Trimble TerraSync software provides simple and efficient workflows to capture high quality data quickly and easily.

You can choose the edition that suits your needs:

- **Standard edition**: For data collection projects that do not require the update or maintenance of data.
- **Professional edition**: Provides all the functionality required for data collection and maintenance.
- **Centimeter edition**: Professional edition functions and ability to connect to centimeter-grade receivers.

**Software designed for efficient field GIS data collection and maintenance**

Trimble TerraSync software makes the field data collection workflow seamless by including intelligent features such as map-centric operation, graphical status display, and the ability to record a position offset at the field worker’s fingertips.

**QuickPoint data collection mode for easy productive one-click data capture**
Working in Trimble QuickPoint™ mode, GIS point features can be collected with a single press of a button, a tap of the screen, or point-and-shoot operation of a Trimble laser rangefinder. Simple to learn and use, QuickPoint mode saves field workers time collecting position and attribute information for features of the same type.

**Optimized for Trimble handhelds with integrated digital cameras**
Trimble TerraSync software also makes it easy to incorporate photo capture into the data collection workflow using either a Trimble handheld with integrated camera or the Trimble TrimPix™ Pro system with any supported camera. Field workers can take and preview photos, automatically attaching them to the current feature, and stamping each photo with the time, date, and location at which it was taken.

**Support for centimeter-grade RTK receivers**
Trimble TerraSync software supports a wide range of centimeter-grade receivers-by leveraging RTK receivers, GIS field workers can achieve centimeter-accuracy using existing GIS workflows.

**Conditional attributes for dynamically adapting data capture forms**
Trimble TerraSync software also includes the ability to use data dictionaries created in Trimble GPS Pathfinder Office software, based on the enterprise GIS. A data dictionary allows field workers to create features and assign attribute values that not only comply with the GIS data structure, but also preserve data integrity. Data capture forms can also dynamically adapt to previously entered attribute values for maximum data collection efficiency with a minimum of training.

**Customizable user interface simplifies field operation**
To improve the field worker experience, the TerraSync user interface can be customized and simplified, removing functionality to ensure maximum field productivity and eliminate potential configuration errors, while minimizing the need for specialist training. The TerraSync Studio utility within GPS Pathfinder Office software provides a rich environment to develop and test customized TerraSync user interfaces. The result is that field workers see the overview of a data form more clearly, avoiding confusion and guiding them through only required form sections, speeding up form completion without sacrificing accuracy.

**Smart data maintenance**
Trimble TerraSync software provides additional benefits for field workers involved in data maintenance activities. Assets imported from a GIS can be sorted and filtered based on the order they are to be visited for efficient route planning. Assets can be viewed as a simple list, or on a color-coded map with an aerial photo or satellite image in the background for reference. Fast raster map background redraw makes it possible to work with much larger images in TerraSync, resulting in increased productivity and creating a more dynamic field worker experience.

**Seamless GNSS control in the field for high quality position data**
With Trimble TerraSync software, field workers can collect data and achieve the required level of accuracy, either in real time or after postprocessing. Accuracy-based logging settings specify the GNSS data quality that the enterprise GIS demands and the TerraSync software does the rest. TerraSync software integrates seamlessly with a range of Trimble GNSS receivers to deliver the required accuracy level to meet company or regulatory requirements. The software supports postprocessing the data back in the office or using real-time differential GNSS corrections to improve data quality and accuracy. TerraSync software can also be used with supported Trimble GNSS receivers to collect Trimble H-Star™ data for extra precision. Alternatively, optimal GNSS code processing accuracy can be achieved with a Trimble DeltaPhase™ technology-capable receiver.
Overview: Trimble GPS Pathfinder Office software

Trimble® GPS Pathfinder® Office software is a powerful and easy-to-use software package of GNSS postprocessing tools. Incorporating Trimble DeltaPhase differential correction technology the software is designed to develop GIS information that is consistent, reliable, and accurate from GNSS data collected in the field.

**Differential corrections to improve the quality of GNSS data collected in the field**
Postprocessing with Trimble GPS Pathfinder Office software significantly improves the autonomous accuracy of data collected in the field all the way down to centimeter (1 cm / 0.4 inch) level, depending on the environment and the GNSS receiver.

GPS Pathfinder Office software also includes the unique Integrity Index grading system, which ensures that GNSS field data is differentially corrected using the best quality base station data available.

**H-Star data processing for high accuracy and support for GLONASS postprocessing**
Trimble GPS Pathfinder Office software supports the complete Trimble Mapping and GIS GNSS portfolio, as well as associated positioning technologies, such as the Trimble H-Star technology.

**Data import and export in a variety of GIS and CAD formats**
Data can be imported to and exported from Trimble GPS Pathfinder Office software using a number of GIS, CAD and database formats, allowing previously collected GIS data to be taken back to the field for verification and update.

**Sophisticated data dictionary editor to ensure consistency between the field and the office**
By creating a data dictionary or importing one from a GIS based on its exact data schema, GIS administrators can be confident that data collected in the field will integrate seamlessly with the GIS repository and that data returned will be accurate and consistent. In the field, the data capture form prompts field workers to enter specific information, ensuring data integrity and compatibility with the GIS.

The software's Data Dictionary Editor creates custom lists of features and attributes for field data collection and supports the development of conditional attribute data capture forms in Trimble TerraSync™ software that dynamically adapt to previously entered attribute values for maximum data collection efficiency.

**Customizable User Interface**
Trimble TerraSync Studio utility within GPS Pathfinder Office software is used to develop and test customized TerraSync user interfaces. To improve the field worker experience, the TerraSync user interface can be simplified with this utility, removing functionality to ensure maximum field productivity and eliminate potential configuration errors.

Waypoint files can also be created in the software to assist with navigation and efficient asset relocation.

**Quality control of GNSS data before exporting to GIS**
Trimble GPS Pathfinder Office software includes quality control features critical for enterprise GIS data development. For example, collected features can be compared against any number of background datasets such as vector GIS data, aerial photographs or satellite imagery in order to verify accuracy and detect conflicts.

Background data can be imported to GPS Pathfinder Office software from GIS systems, directly from imagery files, or referenced directly from a web map server.

In addition, before transferring collected features to a GIS, CAD, or database system, they can be analyzed to confirm they are complete and free of errors. Positions and attributes can be changed and unnecessary or unwanted GNSS positions can be deleted with GPS Pathfinder Office software to ensure that only the highest quality data is exported to the GIS.
**Resources and Support**

Please refer to the following resource topics and links for software downloads, user guides, release notes and product compatibility, and other details:

**Trimble Home:** www.trimble.com

**Mapping and GIS Home:** http://www.trimble.com/mappingGIS/index.aspx

**Product Comparison:** http://www.trimble.com/mappingGIS/Product-Comparison.aspx


**TerraSync Software:** http://www.trimble.com/mappingGIS/TerraSync.aspx

**GPS Pathfinder Office Software:** http://www.trimble.com/mappingGIS/PathfinderOffice.aspx

**GNSS Planning Online:** http://www.trimble.com/gnssplanningonline/#/Settings

**Global Training:** http://www.trimble.com/Support/Index_Training.aspx

**Product Videos:** http://www.trimble.com/mappingGIS/videos.aspx

**Mapping and GIS News:** http://www.trimble.com/mappingGIS/email_newsletter.aspx

**Get the Point – Practical Solutions for GIS Users:** http://www.trimble.com/mappingGIS/expert_advice.aspx

**Event Calendar:** http://www.trimble.com/Events/Trimble-Events.aspx

**Contact Us Please:** learn@trimble.com
Planning Your Project

Use this chapter to effectively plan the GNSS data for the GIS project. It is important to understand the final destination of the GNSS field data. This will allow you to collect the GNSS data in a structure that suits the existing GIS database. When planning how to collect the data through building a data dictionary, also investigate when the best satellite geometry will occur to efficiently log the field data in difficult GNSS environments.

Chapter objectives

The chapter objectives are:

- Understand the five steps of a project
- Create a project in the GPS Pathfinder Office software
- Design and create a data dictionary
- Transfer files to the TerraSync software

Step 1 – Field reconnaissance

A field reconnaissance is performed for various reasons. This step allows you to identify the features that will be collected in the field. These features can be entered into a data dictionary, which guides your data collection session. Furthermore, a field reconnaissance helps you identify the attributes that you need to include for accurate analysis and an up-to-date database.

Field reconnaissance helps identify the most efficient order in which the features can be collected. If you have more than one person collecting data, you can decide who collects which features, and whether the field...
Step 2 – Mission planning

Perform these tasks in the office during mission planning. Use the GPS Pathfinder Office software, installed on an office computer, to:

- Create a project
- Prepare or update a data dictionary and transfer that data to the Trimble TerraSync software
- Visit the Trimble online GNSS planning tool for planning in difficult GNSS environments: http://www.trimble.com/gnssplanningonline/

Step 3 – Equipment setup

Before setting up the equipment, confirm that:

- Data collector batteries are charged
- Data dictionary is transferred to the TerraSync software
- Satellite availability is optimal
- GNSS settings have been configured and tested

Equipment needed:

- Data collector running the TerraSync software
- GNSS receiver capable of achieving the accuracy required
- Auxiliary battery (optional)
- External antenna kit (optional)

Step 4 – Data collection

After setting up the TerraSync software in the field, begin data collection. Point, line, and area features are recorded using the data dictionary developed during the mission planning phase. This data is stored in the data collector or memory card until it is transferred to an office computer for processing.

Step 5 – Data processing

Perform the following tasks when you return to the office:

- Connect the data collector to your office computer
- Transfer the data from the data collector or memory card to the office computer
- Postprocess data files using the GPS Pathfinder Office software, if required
- Perform any required edits on the data
- Export the data to a GIS or CAD system
Define a project

To identify the requirements of a project, consider the following questions, and the obstacles and issues that field workers may face:

- **What information do you need to collect?**
  This will help define the features and attributes that you will collect in the field.

- **Will you be collecting new data, or will you be updating existing data?**
  This will define the data preparation prior to fieldwork, and the office and field workflow throughout the project.

- **Who will collect the data?**

- **What level of control should the data collector have?**
  This will define the parameters of the data dictionary, for example, minimum positions, or maximum and minimum attribute values. You could also choose to use TerraSync Configuration files that standardize and configure settings for the data collector, or even lock a user out of changing configurations.

- **Carry out a field reconnaissance.**
  This allows you to identify and/or confirm the features and attributes that you need to collect and will help you design an efficient data dictionary. You will then be able to determine the most efficient order for collecting features and attributes, and whether field personnel will be able to always enter all the attributes this will help define the data dictionary parameters.

  While undertaking field reconnaissance, also note any obstructions and canopy that may affect the accuracy of your data collection. If you find obstructions and canopy, alternative data collection methods (such as offsets using a laser rangefinder) and proper mission planning may become crucial for success.

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**Note:** It is very important to understand the typical coordinate system and units of measurement for the region where your data will be collected and used. Establishing this early in your project planning is critical. The default-based coordinate system and units for your project may be altered in GPS Pathfinder Office under Options / Units and Options / Coordinate System. They may be also overridden through alterations during export processing. Please inquire with your Trimble Dealer or Trimble Certified Trainer to learn more about typical coordinate systems used in your region.

Create a project in the GPS Pathfinder Office software

Create a project in the GPS Pathfinder Office software to organize your data files. The project will contain subfolders to hold base, backup, and export files. Think of a project as a file cabinet. The project is the cabinet, and the subfolders are the drawers in which the data files are stored.

Build a project called *Class 1*. Your data files will be stored in this project.

1. Open the GPS Pathfinder Office software. From the Windows Start menu, select Programs / GPS Pathfinder Office / GPS Pathfinder Office.

   The GPS Pathfinder Office identification screen appears while the program is loading. Then the Select Project dialog appears.
2. If the Select Project dialog is not open, select File / Projects to open it. Click New. In the Project Name field enter Class 1, or as directed, to create the project and then click OK. The C:\Pfdata\Class 1 folder is automatically created. Click OK.

Notes: GPS Pathfinder Office software version 5.6x projects are located by default at the following locations:

- Windows® 7/8 or Windows Vista® operating system:
  C:\Users\<username>\My Documents\GNSS Projects
- New installations of the Windows XP operating system:
  C:\Documents and Settings\<username>\My Documents\GNSS Projects
- Existing installations:
  C:\Pfdata

The subfolders are created as shown in the Select Project dialog:

View subfolders in the Select Project dialog. The following project files are stored in these folders:

- Backup – backup files
- Export – export files
- Base – base files

3. Edit options. From the Select Project dialog, do the following:

- New – create a new project.
- Remove – delete the project highlighted in the Project Name field.
- Modify – modify an existing project.

Note: Display this dialog at start-up: If you select the checkbox the Select Project dialog appears when you run the GPS Pathfinder Office software.
**Develop a data dictionary**

A data dictionary is an outline of the features and attributes to be collected for a particular project or job. The data dictionary is usually a subset of the data schema used in the GIS. Using a data dictionary enables point, line, and area features to be created from X,Y,Z positions collected in the field. It is recommended that all files in a project use the same data dictionary. This helps ensure smooth processing between the GPS Pathfinder Office software and the GIS.

Develop a data dictionary as directed by your trainer. Your data dictionary values will vary from the examples shown in this guide. The data dictionary will be used for your first field session and should therefore represent the features at the field site. Conduct a field reconnaissance if necessary. It is important to carefully plan and test the structure of the data dictionary file, as it should not be changed throughout the course of the project.

1. Build a list of features that you will collect in the field. Classify each feature as a point, line, or area feature.
2. Build a list of attributes. For each feature, list two or more attributes (or questions) about the feature. Consider using conditional requirements that will improve workflows. Classify each attribute as one of the following types:
   - Menu
   - Numeric
   - Text
   - Date
   - Time
   - File Name

Additionally, the Separator type exists to help organize the structure of the data form.

*Note: You can define a feature without attributes*
Create a data dictionary using the Data Dictionary Editor

After defining your data dictionary with your instructor and class, you can now create it in the GPS Pathfinder Office software using the Data Dictionary Editor utility. After the data dictionary is created, you will transfer it to the TerraSync software to be used in the field as a guide to data collection and rover file structure.

The examples shown in the following sections are for demonstration only. Your data dictionaries will vary based upon your unique training scenario as directed by your instructor.

Start a Data Dictionary file

1. To start the Data Dictionary Editor utility in the GPS Pathfinder Office software select Utilities > Data Dictionary Editor.

2. In the **Name** field, enter **Class 1**, or as directed. This is the title of the data dictionary that will appear in the TerraSync software.

3. In the **Comment** field, enter **your name**.

4. From the **Version** drop-down list, select **TerraSync v5.00 and later**.
Create a point feature

The first type of feature you are going to create is a point feature. To do this:

1. Click **New Feature**. Alternatively, press [F3]. Select the **Properties tab**.

2. In the **Features Name** field, enter *<the appropriate name>* (for example *Light*). The feature name is equivalent to a theme or layer in a GIS or CAD system and can be up to 40 characters long. For Dictionaries for version 4.1x and earlier, this is the name that appears in the data collector.

3. For data dictionaries for the TerraSync software version 5.00 and later, enter *<an alias>* in the **Alias** field (for example *Street Light*). If you leave this field empty, it is automatically populated with the feature name. The alias is the name that appears on the data collector.

4. In the **Feature Classification** group, select the **Point** option:

   ![New Feature dialog box](image)

   This feature is at a single location on the earth’s surface, so a point is typically the most appropriate classification for this feature. Leave this setting as it is.

5. Review the **Default Settings**. Of these options, consider adjusting the **Minimum Positions** for each feature.

6. Review the **Symbol**. Change the symbology of the feature to best suit your project or as directed.

7. Click **OK** to return to the main **Data Dictionary** screen. The feature now appears in the **Features list** with its symbol. When you have created a point feature, you can add the attributes.
Create Attributes - Menu

Menu attributes are useful when the information you need to store is a defined set of options. This standardizes the entry of information and makes it quicker to enter values in the field.

In the field, a menu with these three values appears when you are entering the attribute.

1. Click **New Attribute** or press \[F7\]. The *New Attribute Type* dialog appears:

2. Select the **Menu** option. The *New Menu Attribute* dialog appears.

3. In the **Attribute Name** field, enter *<your first attribute name (question)>*, for example, **Condition**.

4. For data dictionaries for the TerraSync software version 5.00 and later, enter *<an alias>* in the **Alias** field. If you leave this field empty, it is automatically populated with the feature name. The alias is the name that appears in the data collector.
5. Click **New** to enter values. The *New Attribute Value – Menu Item* dialog appears.

6. In the *Attribute Value* field, enter your first menu choice (answer), for example **Good**.

   **Note:** If you select the Default check box, this makes this value the default. Setting a default saves field crews from entering repetitive data and also makes collecting data simpler and faster.

7. Click **Add**. The value is added to the *Menu Attribute Values* group in the *New Menu Attribute* dialog.

   **Note:** The *New Attribute Value – Menu Item* dialog remains open so you can add more values.

8. In the *Attribute Value* field, enter <**additional required values**> (for example **Repair**) and then click **Add**.

9. Click **Close** to return to the *New Menu Attribute* dialog.

10. Set the *Field Entry* to **Required** making the attribute selection compulsory.

11. Click **OK** to return to the *New Attribute Type* dialog.
Create Attributes - Numeric

Use a numeric attribute type to enter numeric attribute values while in the field.

The *Minimum* and *Maximum* field values help prevent incorrect entries, and a sensible default value can save time.

**Note:** If you want to create numeric attributes without default values, you need to disable the Numeric Default Values Required option. To do this, select Options > Numeric Default Values Required. For more information, refer to the GPS Pathfinder Office Help.

1. Click **New Attribute** or press F7. The *New Attribute Type* dialog appears.

2. Select the **Numeric** option. The *New Numeric Attribute* dialog appears.

3. In the *Attribute Name* field, enter `<the numeric attribute name>`.

4. In the *Decimal Places* field, change the *default (0)* if the attribute values contain decimal places.

5. The *Minimum* field and the *Maximum* field limit the range of values that you can enter.
   - Minimum – lowest value a user can enter
   - Maximum – highest value a user can enter

6. In the *Default* field, enter `<a default value>`.

7. Click **OK** to create this attribute.

8. Click **Close** to close the *New Attribute Type* dialog. The attributes that you created now appear in the *Attributes* field.

**Note:** In the field, if you enter a value outside the range defined by the minimum and maximum values, an error message appears in the TerraSync software.
Create Attributes – Text

Text attributes are useful when the information to be stored varies for different occurrences of a feature, and when a defined menu list is impractical. This field lets you enter letters, numbers, and punctuation for each attribute.

**Note:** To add an attribute to a feature which already has an existing attribute, select the required feature from the features list, and then complete the following procedure.

1. Click **New Attribute** or press **[F7]**. The **New Attribute Type** dialog appears:

2. Select the **Text** option. The **New Text Attribute** dialog appears:

3. In the **Attribute Name** field, enter `<the required name>` (for example, **Comments**).

4. In the **Length** field enter `<the value required>`. By default, the length of a text attribute is 30 characters. You can change this if required.
5. Click the **Change** button in the **Condition** area to open the **Set Condition For Attribute** form.

6. Select **Enable Condition**.

7. From the *If this condition is true* options, select "**Condition**", "is", and "**Good**".

8. Select **Not Visible** from the **Field Entry On Creation** and **On Update** settings. This will only show the **Comments** text field when Good is not the selected attribute value.

9. Click **OK** to create this attribute and return to the **New Text Attribute** dialog.

10. Click **OK** to save the Text Attribute settings and return to the **New Attribute Type** dialog.
Create Attributes – Date

You can create this attribute so that it is automatically generated for each feature. When a feature is collected, the current date is automatically entered as the date attribute.

**Note:** You may also select the time attribute to achieve a similar affect with the current time entered instead of the date.

1. Click **New Attribute** or press [F7]. The **New Attribute Type** dialog appears:

2. Select the **Date** option. The **New Date Attribute** dialog appears:

3. To have the data collection software automatically supply the current date when a new feature with this attribute is collected, activate the **Auto Generate on Creation** option.

4. To have the data collection software automatically supply the current date when an existing feature with this attribute is updated, activate the **Auto Generate on Update** option.

When you create a new feature or update an existing one, the TerraSync software automatically generates the date. These fields can be exported as attributes to your GIS or CAD system.

5. In the **Format** field, select *<the Day – Month – Year>* option.

6. Click **OK** to create this attribute and return to the **New Attribute Type** dialog.

7. Click **Close** to return to the main **Data Dictionary Editor** screen
Using the Checkbox option

1. Create a new Menu attribute.
2. In the Name field, enter Pole Inspection.
3. Select an attribute value of New.
4. Create an Inspected and a Not Inspected menu item. Select Inspected as the default value.
5. Select Checkbox from the Display In Field As list. A checkbox can be used only if the menu has exactly two items, for example No / Yes.
6. Click the Change button in the Condition area.

7. Select Enable Condition.
8. In the If this condition is true area, select "Condition", "is or after", and "Good".
9. Select Not Permitted from the Field Entry list. This means that the field cannot be edited outside of the office.
10. Select both the Assign on Creation and Assign on Update checkboxes.
11. In the Value to assign field select Inspected. This creates a menu value of Inspected whenever a light feature is created or edited that cannot be edited.
12. Click OK to return to the New Menu Attribute dialog.
13. Click **OK** to return to the *Data Dictionary* dialog:
Additional options

Your trainer may have you develop additional fields including a *File Name* attribute used to store file names of files such as digital photos taken during your field exercise. A *Separator* does not store values; however, it may be used to provide a break in a long list of attributes. Incorporate both of these additional options as directed.

Save the Data Dictionary

Once you have added all features and their attributes from your tables, it is important to save the new data dictionary.

1. To save the data dictionary, select **File > Save As**. The following dialog appears:

2. In the *File name* field, enter a name for your data dictionary (for example **Class 1.ddf**).
3. Click **Save**.
4. Review the data dictionary.

   - If you make a mistake when creating features, highlight `<the feature>` in the *Features* dialog, and click **Edit Feature. Complete the correction(s)**, and click **OK**.
   - If you make a mistake when adding attributes, highlight `<the attribute>` in the *Attributes* dialog, and click **Edit Attribute. Complete the correction(s)**, and click **OK**.
   - To change the order of features or attributes, **highlight an item**, and then click the **up or down** arrows on the toolbar.
Preview in TerraSync software

A preview of the new data dictionary settings is available when using the TerraSync (Desktop) software.

**Note:** TerraSync (Desktop) software must be installed prior to launching this helpful feature. However, an activated license is not required to use Preview in TerraSync. Please consult the TerraSync Getting Started Guide for specifications and system requirements.

1. Click **Preview in TerraSync** (Desktop) to launch a TerraSync Desktop session and test that the dictionary behaves as intended. The TerraSync software opens in the Data section, with the features from your data dictionary listed.

2. Create a number of features and ensure that any conditions behave as expected.

3. If you need to make any changes to the data dictionary, close the TerraSync software, edit the attributes, save the data dictionary and then preview the dictionary again.

4. From the menu bar, select **File / Exit** to close the Data Dictionary Editor utility.

**Note:** For more information about data dictionaries, refer to the GPS Pathfinder Office Data Dictionary Help.
TerraSync Studio

TerraSync Studio allows you to configure the TerraSync software user interface. You can remove functions from the TerraSync sections, and in some cases you can also remove entire sections of the software to simplify the user interface.

**Note:** Review the Tip for each function to learn how it may be incorporated.

1. From the GPS Pathfinder Office main window, select **Utilities / TerraSync Studio**. Terra Sync Studio opens:

![TerraSync Studio Window](image.png)
2. Select the **Start Image** tab.

If you select the *Display custom image when TerraSync starts* checkbox you can import a 240 x 80 jpeg image into the startup screen.

3. Select the **Map** tab.

You can show or hide the map *Layers* and the *Digitize* tool. Select *Layers*, to control access to the controls for background and data layer visibility and formatting.
4. Select the **Data** tab.
   Review the options from the **Select the Data** section features that you want to field workers to use.

5. Select the **Navigation** tab.
   Select whether or not to allow field workers to access the Navigation section and its functions.
6. Select the **Status** tab.

Review the options from the subsection screens you want field workers to see and use.

7. Select the **Setup** tab.
8. If you want to clear the Allow Setup functions, you must import a configuration file so that setup settings are defined for the TerraSync software. To do this, you must create configuration files in the Configuration Manager. From the GPS Pathfinder Office main window, select Utilities / Other / Configuration Manager.

9. To save the Studio file, select File / Save (or press $\text{CTRL} + \text{S}$).
   To edit an existing Studio file, open TerraSync Studio, then select File / Open (or press $\text{CTRL} + \text{O}$).

10. Once you have configured a Studio file you can preview it by clicking Preview in TerraSync (Desktop).

**Transfer the Data Dictionary and Studio File to the TerraSync software**

Now that you have created a data dictionary file and a Studio file in the GPS Pathfinder Office software, you must transfer them to the TerraSync software before you start to collect data in the field. Use the Data Transfer utility in the GPS Pathfinder Office software to efficiently transfer data between the TerraSync software and the office computer.

To transfer the Class 1 data dictionary and Studio file from the office computer to the TerraSync software, do one of the following:

- If you are running any Windows operating systems other than the Windows 7/8 or Windows Vista operating system, use the Microsoft ActiveSync® technology.
- If you are running the Windows 7/8 or Windows Vista operating system, use Windows Mobile® Device Center.

1. **Switch on your data collector and your office computer. Connect the two.**
   The ActiveSync technology or the Windows Mobile Device Center should automatically establish a connection with the data collector.

2. If ActiveSync technology or the Windows Mobile Device Center does not connect automatically, connect to the data collector manually. For information on connecting with ActiveSync technology, refer to the ActiveSync Help. For information on connecting with the Windows Mobile Device Center, refer to the Windows Mobile Device Center Help.
3. In the GPS Pathfinder Office software, select **Utilities / Data Transfer**.

   The opening dialog of the Data Transfer utility appears:

   ![Data Transfer Utility Dialog](image1)

4. From the **Device** list, select **GIS Datalogger on Windows Mobile**. Alternatively, if you have set up a device definition for your data collector, select `<the device>` from the list.

   The Data Transfer utility automatically connects to the data collector.

5. Select the **Send** tab.

6. Click **Add** and select **Data Dictionary** from the drop-down list. The Open dialog appears.

7. Highlight `<the required *.ddf file>`, and then click **Open**. The Open dialog disappears and the selected file appears in the **Files to Send** list:

   ![Data Transfer File List](image2)
8. Click **Add** again and then select **Configuration**.
9. Select <the **Studio file**> created earlier.
10. Click **Transfer All**. The data dictionary and Studio file are transferred to the data collector.
11. A message box showing summary information about the transfer appears. Click **Close** to close it.

12. Click **Close** to exit the Data Transfer utility.
13. Review and ensure that the data dictionary and Studio file were successfully transferred to the TerraSync software.

**Note:** For more information, refer to the GPS Pathfinder Office Help.
Configuring the TerraSync Software

Before collecting your field data, it is important to set up the equipment correctly. This includes configuring the TerraSync software settings and assembling the hardware.

There are three types of settings, indicating their relative importance to data collection:

- **Critical** – settings that affect the quality and usability of GNSS positions.
- **Non-critical** – settings that affect the behavior of the TerraSync software, but do not impact GNSS position quality.
- **Display** – settings that have no impact on data. These are settings that enhance user-friendliness.

For detailed specifications, including supported operating systems, processors, and memory requirements, refer to the TerraSync Software Datasheet download page and the Mapping and GIS Product Compatibility List.

**Chapter objectives**

The chapter objectives are:

- Identify TerraSync system components
- Understand the five sections of the TerraSync software
- Configure the TerraSync software settings

**TerraSync system components – data collector**

The TerraSync software is designed for collecting and updating GNSS and geographical data on a data collector. A data collector is one of the following:

- A device running a Windows Mobile operating system, such as a Trimble Juno or GeoExplorer series handheld device.
- A PC (a desktop computer, laptop computer, or tablet PC running a supported Microsoft Windows desktop operating system).
GNSS receivers

In addition to the integrated GNSS receivers that are available with many of the Trimble handhelds, you can also connect a Trimble handheld running the TerraSync software to the following Trimble GNSS receivers:

- Pro Series
  - Pro 6H/6T
  - Pro XH™/ProXT™
- ProXRT Model 1/Model 2
- R8 Model 3/GNSS
- R6 Model 1/Model 2
- R4 with Data Controller option
- 5800 II

Transferring TerraSync software files

To transfer the TerraSync software version 5.00 or later files between a data collector and an office computer, you need one of the following installed on the office computer:

- Version 5.00 or later of the GPS Pathfinder Office software
- The Trimble Data Transfer utility, which is standard with GPS Pathfinder Office and available for free download from the Trimble website at http://www.trimble.com/datatransfer/

You also need one of the following installed on the office computer:

- ActiveSync technology, version 4.5 or later, for Microsoft Windows operating systems predating the Windows Vista operating system.
- Windows Mobile Device Center, for the Windows 7/8 and Windows Vista operating systems.
Using the TerraSync software

The TerraSync software consists of five sections:

<table>
<thead>
<tr>
<th>Section</th>
<th>Function</th>
</tr>
</thead>
</table>
| Map     | View features, background files, and the GNSS trail graphically.  
  *Note* – Some options in the Map section may be hidden. This customization is done using the TerraSync Studio utility in the GPS Pathfinder Office software. |
| Data    | Work with data files:  
  - create a new data file or open an existing data file  
  - collect new features or maintain existing features  
  - move, copy, delete, or rename data and background files  
  *Note* – Some options in the Data section may be hidden. This customization is done using the TerraSync Studio utility in the GPS Pathfinder Office software. |
| Navigation | Navigate to features using the Direction Dial and Close-up screen.  
  Create and edit waypoints.  
  *Note* – The Navigation section, and all navigation options, may be hidden. This customization is done using the TerraSync Studio utility in the GPS Pathfinder Office software. |
| Status  | View information about:  
  - the satellites the TerraSync software is tracking, their relative positions in the sky, and your current position  
  - the GNSS receiver and real-time correction source  
  - the TerraSync software version and trademark information  
  *Note* – Some options in the Status section may be hidden. This customization is done using the TerraSync Studio utility in the GPS Pathfinder Office software. |
| Setup   | Configure the TerraSync software.  
  *Note* – The Setup section may be hidden. This customization is done using the TerraSync Studio utility in the GPS Pathfinder Office software. |

One of these sections is always active and visible. The **Section list button** shows the section that is currently active. You can move between sections at any time without closing any open forms or screens. To switch to a different section, tap the **Section list button** and then select *the section you want* from the drop-down list. For example, to switch from the *Map* section to the *Data* section, tap the **Section list button** and then select *Data*. The button now shows *Data* and the *Data* section becomes the active section. When you return to the *Map* section, the screen or form that was open when you left appears again.

**Configuring critical settings in the TerraSync software**

There are some critical settings in the TerraSync software that you should configure before collecting data (for example, the GNSS settings). In this section you will learn the recommended settings to make your data collection session easier and your data more accurate. Configure these before leaving the office, or in the field. You can also set other (non-critical) settings to suit your application or preferences.
Configuring GNSS Settings

Using Smart Settings available with the GeoExplorer® 7X/6000 controller for instance, the GNSS receiver generates the best possible position for any given environment, without the need for you to adjust receiver settings to match the conditions. Regardless of whether you are working under canopy, in wide open spaces, or somewhere in between, Smart Settings automatically generates the best solution possible.

Using traditional mask techniques in open conditions, weak signals can accidentally degrade the accuracy of the position if masks are too relaxed, whereas in obstructed conditions, more satellites are needed to help maintain optimum accuracy if masks are set too strictly. Using Smart Settings, the receiver uses all available GNSS information to determine which combination of satellites to use to deliver the best position. Once you set the receiver to use Smart Settings, the receiver does the rest.

By default, the receiver is configured to use Smart Settings as show in the top example to the right. In this mode, the receiver will track all visible satellites, and determine which to use in the position solution to automatically generate the most accurate position possible.

To open the GNSS Settings form, do one of the following:

- Tap **GNSS Settings** in the Setup section.
- Tap the **GNSS Settings button** from the **Skyplot**, or **Satellite Info** section.

To enable Smart Settings, select the **Use Smart Settings** check box.

To define custom GNSS settings, clear the **Use Smart Settings** check box as shown in the middle example to the right. Enter `<values>` in the editable fields to specify the required GNSS quality settings.

Example above from GeoExplorer Series
Other receivers, such as the Juno® 3 Series do not permit any alteration of the GNSS settings on the receiver itself, as shown in the lower example to the right, in order to simplify and maximize high yield GNSS collection capabilities.

**Configuring the Logging Settings**

To open the *Logging Settings* form, tap *Logging Settings* in the *Setup* screen. Use this form to configure settings that control what data is stored, and how.

Use the *Logging Settings* form to configure how additional data is collected:

- **Accuracy Settings** – To specify the accuracy settings, tap the Setup button beside this field. The Accuracy Settings form appears.

- **Point/Vertex Auto-pause Count** – This field specifies the number of positions that the software will log for a point feature or an averaged vertex in a line or area feature, before automatically pausing logging. When the number of positions specified in this field is reached, the Minimum Positions Stored event sounds and logging is paused. You can resume the feature to continue logging positions, or close the feature.
• **Antenna Height** – The height of the GNSS antenna. This field is read-only. To specify antenna details, such as the height and correct type of external antenna if using one, tap the **Setup** button beside this field. The **Antenna Settings** form appears.

*Note: Configuring an incorrect antenna type may degrade the accuracy of your postprocessed GNSS data (particularly H-Star or Carrier data). Ensure that you select the correct antenna type.*

- **Allow Position Update** – The conditions where updating of feature position information is allowed. The options are:
  - **Yes** – Position information for existing features can always be updated.
  - **No** – Positions cannot be updated.
  - **Confirm** – Confirmation is required before you are allowed to update the position.

- **Confirm End Feature** – The options are:
  - **Yes** – Select this option to display a confirmation message when you close an updated feature. The message asks you to confirm that you want to end the current feature and save any changes to the attributes or position information of the feature.
  - **No** – Select this option to disable the confirmation message.

- **File Prefix** – The prefix to be included at the beginning of the default name of each new data file. The prefix may be any alphanumeric string between 1 and 30 characters long.

*Note: The prefix that you define in this field is for rover files only. The default filename prefix for base files is Base. You cannot change this default prefix. However, when you create a new base file, you can edit the default filename.*

- **Waypoint Filename Prefix** – The prefix to be included at the beginning of the default name of each new waypoint file. The prefix may be any alphanumeric string between 1 and 30 characters long.

- **Style** – The method of measurement for between feature positions. The options are:
  - **Time** – A position is logged after a specified time has elapsed since the last position logged.
  - **Distance** – A position is logged once you have traveled a specified distance from the last position logged.

- **Interval** – The logging interval for the between feature positions:
  - If you selected **Distance** from the **Style** list, enter the distance between logging positions, or select an existing value from the list.
  - If you selected **Time** from the **Style** list, enter the number of seconds between logging positions, or select an existing value from the list.
  - Select **Off** to turn off between feature logging.

- **Style** – The method of measurement for the specified feature type. The options are as for Style above. This field only appears if a data file is open. It is repeated for each feature type in the file.

*Note: If the feature is a point feature, this field is set to Time and cannot be changed.*

- **Interval** – The logging interval for the specified feature type. The options are as for Interval above. This field only appears if a data file is open. It is repeated for each feature type in the file.
Configuring Accuracy Settings

To open the Accuracy Settings dialog, tap the Setup button beside the Accuracy field in the Logging Settings dialog:

In the Accuracy Value for Display / Logging field, select <the parameters> that the TerraSync software will use to determine the estimated accuracy of the current GNSS position. The value is displayed by the Estimated Accuracy icon on the status bar. Select <two out of four available parameters>.

The options are:

- Horizontal - Use the horizontal estimated accuracy of the current GNSS position.
- Vertical - Use the vertical estimated accuracy of the current GNSS position.
- In the field - Use the current estimated accuracy of the current GNSS position. The value calculated depends on several factors, including satellite geometry and the type of GNSS receiver that is connected.
- Postprocessed - Use the predicted estimated accuracy of the current GNSS position, which is the estimated accuracy that is likely to be achieved after the field data has been postprocessed.

In the Postprocessing Base Distance field, select <the estimated distance> to the base station that will be used during postprocessing.

In the Use Accuracy-based Logging field, select whether the calculated estimated accuracy determines whether the GNSS position is logged. The options are:

- No - GNSS positions are always logged if they can be calculated.
- Yes - GNSS positions are only logged if they can be calculated and they meet the estimated accuracy specified in the Required Accuracy field. The Required Accuracy field appears at the bottom of this form once you select Yes in this field.

The following two fields only appears if you select Yes in the Use Accuracy-based Logging field above. Select the feature types that the accuracy requirements will apply to in the Apply Accuracy-based Logging To field. Features of the selected type will only contain GNSS positions that meet the estimated accuracy specified in the Required Accuracy field above. The options are all features, point features and averaged vertices, or line and area features.
In the Required Accuracy field, select or enter `<the estimated accuracy value>` that is required before the current GNSS position is logged. If the current GNSS position has a poorer estimated accuracy than the value specified in this field, the GNSS position is not logged.

**Note:** The estimated accuracy of a GNSS position depends on several factors, including the satellite geometry, the type of GNSS receiver that is connected, and whether you are using real-time differential corrections.

**Configuring Real-time Settings**

To open the Real-Time Settings form, in the Setup screen tap Real-time Settings. Use this form to configure settings that control the sources of real-time differential GPS that you use, if any, and how your system communicates with each source:

The TerraSync software always uses the highest priority real-time source available, according to your list of preferences. If the source it is currently using becomes unavailable, the TerraSync software switches to the next choice. Whenever the TerraSync software acquires a higher priority real-time source, it switches back to this source. For example, the TerraSync software will not use your second choice if your first choice is available.

Real-time Datum selection. The real-time correction source must be in the same coordinate system, datum, and reference frame as the GIS database you are using. For example, if a base station has coordinates in terms of ITRF2000 but your GIS is in terms of NAD83, this can introduce up to a meter of error.

**Note:** To record uncorrected GNSS positions only, without using any real-time corrections, select Use Uncorrected GNSS from the Choice 1 field. You can correct these positions back in the office using the GPS Pathfinder Office software.

For more information on real-time settings, refer to the TerraSync Software Getting Started Guide.
Configuring Coordinate System settings

To open the Coordinate System form, in the Setup screen tap Coordinate System. Use this form to specify the coordinate system that you want the TerraSync software to use to display foreground and background files:

A coordinate system is a three-dimensional frame of reference that can be used to describe the location of objects. Many different coordinate systems can be chosen. Each is appropriate depending upon the map projection and region in which you are collecting data.

Setting your coordinate system in the TerraSync software for postprocessed data collection is a display setting only. All GNSS data is collected in the World Geodetic Datum of 1984, the latitude/longitude coordinate system, and the Height Above Ellipsoid altitude reference. Configuring the TerraSync software to a different coordinate system only affects the display of your coordinates. It does not convert the data. However, this setting is critical when navigating. If you are navigating or looking for a location on a paper map, the coordinates will not match unless the TerraSync software is configured to the same coordinate system as the paper map.

Datums are fundamental to GNSS. To compare GNSS data with locations from an existing map, both must be referenced to the same datum. Different datums provide different coordinates for any location. GIS users choose to convert their data to a datum matching their existing GIS database during the export process. Each datum has a unique point of origin, which is why one point displayed in two different datums yields two different sets of coordinates.

Examples of datums:

- WGS-84 – worldwide
- NAD-83 – region-wide
- EUROPEAN 1950

Examples of coordinate systems:

- Latitude, Longitude, Altitude – 3D-based
- UTM – Grid Squares – 2D-based
- State Plane - each US state has created its own grid system
Height values can be expressed as a height above the ellipsoid (HAE) or as a height above mean sea level (MSL). GNSS works in HAE, but many Geographical Information Systems are set up using MSL. You can convert between the two for display in the TerraSync software, and for map display and map export in the GPS Pathfinder Office software:

- Ellipsoid – a mathematical model of the Earth’s size and shape. HAE equals the distance from the ellipsoid to the geoid (MSL) surface.
- Geoid – considers the gravitational pull to model the Earth’s “true” size and shape. The Earth is not uniformly dense. Gravity is a function of mass; therefore, gravitational pull varies from place to place.

Note: The geoid height equals the separation between the geoid and the ellipsoid. This distance approximates mean sea level (MSL).

Configuring Units settings

To open the Units form, in the Setup screen tap Units. Use this form to specify the units used for measurements and display.

The following fields are available:

- Distance Units
- Area Units
- Velocity Units
- Angle Units
- Lat/Long Format
- Offset Format
- North Reference
- Magnetic Declination

Change the units as appropriate. Changing unit settings does not affect data quality. However, unit settings are critical when specifying an accurate antenna height, or when navigating.
Using TerraSync in the Field

After the Trimble TerraSync software is configured and the hardware is assembled, you are ready for the field. Upon your arrival at the field site, first check the status of your receiver to see which satellites it is tracking. This section will show you how to view this information in the field. Then it will teach basic and advanced data collection techniques.

Chapter objectives

The chapter objectives are:

- Become familiar with data collection methods and procedures
- Practice efficient data collection methods

Data collection orientation

After the TerraSync software has been configured, you are ready for the field. This section covers two functions of the TerraSync software:

- GNSS status
- Data capture

You should become familiar with these functions, as they assist you throughout field data collection.

GNSS status

Upon arriving at the field site, start the TerraSync software to allow it to begin satellite tracking. Before data collection, it is useful to check the status of your receiver. Make sure that the receiver is tracking at least four satellites for data collection. Check that all precision standards are met.
Starting the TerraSync software

When you get outside, **switch on your data collector** and **start the TerraSync software**: The GNSS receiver should activate automatically.

TerraSync may be launched a variety of ways depending upon your specific receiver, its operating system and the configurations you may applied to your applications, hot keys and shortcuts.

While the software is loading, a Trimble identification screen appears. The software always opens at the *Skyplot* subsection of the *Status* section.

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Getting a clear view of the sky

**Move to a location where you have a clear view of the sky.**

Signals can be received from any direction. Satellite signals can be blocked by people, buildings, heavy tree cover, large vehicles, or powerful transmitters. Anything that blocks light also blocks signals. GNSS signals can go through leaves, plastic, and glass, but these all weaken the signal.

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Checking the GNSS status

When you start the TerraSync software, it automatically connects to the GNSS receiver, and begins to track visible satellites and to calculate its current position. Use the satellite icon on the status bar to check whether the receiver is computing GNSS positions. It provides information about the geometry of the satellites that are being used to compute GNSS positions.

Use the *Status* section to view the satellites currently tracked and those that are being used to calculate the current position.
To view the GNSS status:

1. The *Skyplot* screen appears when you start up the TerraSync software. If this screen is not visible, tap the **Section list button** and select **Status**, then tap the **Subsection list button** and select **Skyplot**. The following figures show the elements of the *Skyplot* screen:

   ![Figure A](image)

   Figure A

   ![Figure B](image)

   Figure B

2. Use Skyplot to check the satellites that are being tracked and to see your current position.

   Filled boxes represent satellites that the receiver is using to compute its current GNSS position. White boxes represent satellites that the receiver is getting signals from but is not using because the signals are too weak, or because real-time corrections are required and none are being received for that particular
satellite. In Figure A, eight GNSS satellites and six GLONASS satellite are being tracked, and all of these satellites are being used to compute GNSS positions.

If a SBAS satellite is being tracked, its location is indicated by this icon: 📨

Satellites shown in red are GLONASS satellites. These satellites appear only if the receiver you are using can track multiple constellations (for example, the GeoExplorer 7X/6000 receivers). Additional constellations may appear in varied colors depending upon your receiver and availability.

**Note:** *Numbers without a box indicate that the almanac tells TerraSync software that there are satellites available, but that the TerraSync software is not receiving signals from them.*

Your current GNSS position is displayed at the bottom of the screen.

**Note:** *For detailed information on satellite positions and signal strengths, use the Satellite Info subsection of the Status section.*

You need a minimum of four satellites, with good geometry, to compute a 3D GNSS position. When you turn on the GNSS receiver, it automatically starts to track visible satellites and to calculate its current position. Use the satellite icon in the status bar to check whether the receiver is computing satellite positions. If the satellite icon and the number below it are solid (not flashing), the receiver is computing GNSS positions.

- **Required Accuracy.** You can choose to use the *Accuracy Settings* dialog in the TerraSync software (select **Setup / Logging Settings / Accuracy Settings**) to prevent the logging of GNSS positions that do not meet your accuracy requirements.

  If the estimated accuracy of any GNSS position is greater than the configured value, the software will not log the position. If the satellite geometry is poor or there are too few satellites available to compute GNSS positions, adjust the GNSS slider or wait until conditions are more favorable.

**Status bar**

The status bar appears in the top row of the TerraSync screen. The status bar provides basic information about the status of the TerraSync software. The following figure shows the icons in the status bar:

![Status bar icons](image)

The status bar is always visible, but the icons displayed depend on the current status of the system. Refer to the *TerraSync Getting Started Guide* for a current list of status bar icons.
Data collection and best practices

Observing a few simple practices in the field can save you time and effort. To get good results first time, Trimble recommends that you do the following when using the TerraSync software in the field:

- If you are using a handheld GNSS receiver, make sure it is clear of your body. As with any GNSS receiver, the antenna requires a clear view of the sky.
- Use the Log Now / Log Later functions to pause and resume logging when appropriate. It is useful to control GNSS logging to prevent unwanted positions being logged to the feature. For example, you can pause to go around an obstacle when logging a line, then resume once you are back on track. Pausing when stationary - at traffic lights for example - will prevent a small drift from being recorded as part of the feature.
- When postprocessing data, collect good quality GNSS data between features and/or before and after collecting GNSS measurements for features that are not in open environments. This enables the processing engine to use good measurements to improve the final feature positions.
- Minimize constellation changes. Each constellation of satellites gives a slightly different position solution. Provided the PDOP values fall within the default values, then no solution is significantly more accurate than any other. However, there is often a relative shift between one constellation and another. Therefore, within a feature, try to avoid objects that block the view of the sky intermittently and cause constellation changes.

Basic data collection

The primary objective of this field exercise is to become familiar with basic data collection techniques. You will very likely revisit the field and perform these techniques more than once for practice and perfection. During the initial exercise, concentrate on logging point, line, and area features, using the data dictionary you created.
Creating a new data file

Before starting the data collection session, you need to create a new data file to store the new features and attributes you collect. Use the Data section to do this.

1. To create a new file tap the Section list button and then select Data.
2. Tap the Subsection list button and select New. The Create New Data File screen appears.
3. The TerraSync software automatically enters a default name in the File Name field. Replace the default name with an appropriate name.
4. In the Dictionary Name field, select the appropriate data dictionary.
5. Tap Create.
6. The Confirm Antenna Height form appears. If necessary, enter the correct antenna height, antenna type and measurement point, and then tap OK.

7. The Collect Features screen appears. This screen shows a list of all the features in the data dictionary.

You have now created a new data file and can start collecting features.
Log Now, Log Later, and QuickPoint

The TerraSync software provides two closely-related options for logging GNSS data. These options differ in their timing of GNSS data collection relative to the start of a feature. The options are:

Log Now – start a feature and simultaneously start collecting GNSS positions.

If you select the Log Now option, the TerraSync software begins logging positions for a new feature as soon as you select the feature type and tap Create. You can enter attribute values while positions are being recorded.

Log Now is the default logging option. When Log Now is selected, a bullet (•) appears beside it in the option list.

To select Log Now, tap Options in the Collect Features screen and then select Log Now from the option list.

Note: Log Now applies only to new features. When you open an existing feature for update, logging is paused and the pause icon flashes in the Status bar. New positions are logged for an existing feature only after you tap Log in the attribute entry form and select the Update position option.

Log Later – start a feature, and start collecting GNSS positions later.

If you select the Log Later option, the TerraSync software begins logging positions for a new feature only after you tap Log in the attribute entry form. Until you begin logging, the pause icon flashes in the Status bar.

When Log Later is selected, a bullet (•) appears beside it in the option list.

To select Log Later, tap Options in the Collect Features screen and then select Log Later from the drop-down list.

TerraSync also allows you to use the QuickPoint button and the QuickPoint Feature Capture button to capture QuickPoints from the Map screen. The TerraSync software must be in QuickPoint data collection mode. When you tap the QuickPoint button, a drop-down list appears, showing each point feature type that is defined in the data dictionary of the open file. Select a point feature type from this list to enable you to quickly log features of this type. To log each feature, tap the QuickPoint Feature Capture button.

Each of the feature collection options detailed above may be accessed through the Options found in the Collect Features screen:
Collecting a point feature with Log Now

To record a point feature, remain stationary while the TerraSync software logs GNSS positions. These GNSS positions are averaged to compute the final feature position of the point feature.

When the TerraSync software is logging GNSS positions, the logging icon appears in the status bar. The number beside the icon indicates how many positions have been logged for the selected feature.

To record a point feature:

1. If the *Collect Features* screen is not already open:
   a. Tap the **Section list button** and then select **Data**.
   b. Tap the **Subsection list button** and then select **Collect Features**.

2. To make sure that the default logging option is selected, tap **Options** and then select **Log Now**.

3. **Move close to the feature**.

4. From the *Choose Feature* list, select <**the appropriate point feature**>. The attribute entry form for the Light feature type appears.

   **Note:** *Try to keep the antenna still during these next steps.*

As the software logs GNSS positions, the counter beside the logging icon increments, as shown:

5. **Enter all the required attribute information**.

6. Once you finish entering the attributes, tap **Done** to save the feature and return to the *Collect Features* screen.

7. Later you can navigate back to a sign that needs to be replaced, and update its attributes. You need to collect this light feature now. **Repeat Step 1 through Step 5 to log another light feature.** When you reach Step 4, change the **Condition** field to **Needs replacing**.
Collecting a line feature with Log Later

The next feature you need to record is a line feature – for example, an irrigation main trench. To record a line feature, you must travel along the line. As you travel, the TerraSync software records a GNSS position at the configured logging interval, which defaults to the value that was set when the feature was created in the data dictionary. These positions are joined together to form a line.

By default the TerraSync software begins logging GNSS positions as soon as you open a new feature. For this feature you will use the Log Later option to delay logging of positions until you have entered the attributes for the feature and you have reached the start of the feature.

To record a line feature with the Log Later option:

1. If the Collect Features screen is not already open:
   a. Tap the Section list button and then select Data.
   b. Tap the Subsection list button and then select Collect Features.

2. Tap Options and then select Log Later.

3. From the Choose Feature list, select <the appropriate line feature>.
   The attribute entry form appears.

   Note: When you use the Log Later option, the pause icon flashes in the status bar to let you know that the TerraSync software is not logging GNSS positions.

4. Fill out the required attributes.

5. Move to the start of the feature and then tap Log to begin logging GNSS positions for the feature.

The pause icon disappears from the status bar and the number on the logging icon increments as each position is recorded.

Continue down the irrigation line trench. When you reach the end of the line you are logging, tap OK to save the feature and return to the Collect Features screen.
Collecting a point with QuickPoint

If the TerraSync software is in QuickPoint data collection mode, the Collect Features screen shows only point features. To log a QuickPoint, select <the required point feature>, and then tap QuickPoint.

Note: The Map screen also has a QuickPoint button.

Collecting an area feature

Similar to the examples above, to record an area feature, you must travel around the perimeter of the area. As you travel, the TerraSync software logs GNSS positions at the logging interval set in the data dictionary. The first and last GNSS positions are joined together to form the perimeter of the area, so there is no need to return to the exact start point.

To collect an area feature:

1. If the Collect Features screen is not already open:
   a. Tap the Section list button and then select Data.
   b. Tap the Subsection list button and then select Collect Features.

2. Tap Options and then select Log Now.

3. Move to where you want to record the first perimeter position.

4. From the Choose Feature list, select <an appropriate area feature>.

   The attribute entry form opens, and the TerraSync software starts to log positions.

   You can pause logging at any time. For example, if you are driving around the perimeter of the park and you want to stop to examine a sign some distance from the park, you can stop logging positions for the park boundary. You can also pause logging if you want some time to enter attribute values.

5. To pause logging, tap Pause. The TerraSync software stops logging positions and a pause icon flashes in the
The primary objective of this field exercise is to become familiar with advanced data collection techniques. You will very likely revisit the field and perform these techniques more than once for practice and perfection. During this exercise use advanced data collection techniques to maximize your efficiency in the field.

status bar. To continue collecting the feature, tap Resume to resume logging. The pause icon disappears.

6. To view the map while collecting features, tap the Section list button and then select Map. The features that you have collected are displayed on the map, along with the feature that you are currently collecting.

7. If you cannot see your current position or a selected feature on the map, tap Options and then select Auto Pan to GNSS Position or Auto Pan to Selection.

To view the map at different scales, tap the Zoom In or Zoom Out button on the Command bar.

Alternately, tap the Map Tools list button, select Zoom In or Zoom Out and then select the point on the map that you want to zoom in to or out from.

8. Tap the Section list button and then select Data to go back to the Data section. The attribute entry form is still active and the TerraSync software is still logging positions.

9. Enter the attributes of the feature.

10. When you have travelled around the perimeter of the area, tap Done to save the feature and return to the Collect Features screen.

11. Tap Close in the Collect Features screen.

Advanced data collection

The primary objective of this field exercise is to become familiar with advanced data collection techniques. You will very likely revisit the field and perform these techniques more than once for practice and perfection. During this exercise use advanced data collection techniques to maximize your efficiency in the field.

Nesting a point feature

When recording a line or area feature, you may come across a point that you need to record. This feature may be along the line or area feature, or it may be some distance away. When collecting a path (line feature), for example, you might encounter a gate (point feature). You do not have to record the entire path and then return to record the gate. Simply end the path feature, collect the gate feature, and then use the Continue option to continue the path feature that you were collecting.

To nest a point feature (this example uses a light pole):

1. Tap Options. Select Log Later.
2. In the Collect Features screen, select the line feature.
3. Tap Log.
4. Walk along the feature until you reach the first point feature that you want to “nest”. Tap Pause.
5. Tap Options, select Nest and then select the feature from the drop-down list.
6. Walk up to the feature and then tap Log.
7. In the attribute entry form, enter the attributes for the feature.
8. Once you collect sufficient positions for the feature, tap Done to return to the attribute entry form for your feature.
9. Return to the line you were walking when collecting the street and then tap Resume.
10. Continue along the line until you reach another point feature and then tap Pause.
11. Repeat Step 6 through Step 10 to log the remaining point features.
12. At the end of the line, tap Done to save the feature and return to the Collect Features screen.

Segmenting a line feature
When collecting line features, it is often convenient to divide a line into a number of segments. Segmenting line features allows you to specify different attribute values for parts of the same physical line. You can also end one line feature and immediately start another of the same type, while still moving. This is useful when mapping roads or highways where it is difficult (or illegal) to stop at the point where one feature ends and the next starts.

To segment a line feature:
1. While recording a line feature, in the attribute entry form, tap Options and then select Segment Line.
2. The TerraSync software ends the current line feature and immediately starts another line feature of the same type. The last GNSS position of the first feature is identical to the first GNSS position of the second
Collecting line and area offsets

When you select the Offset option in the attribute entry form for a line or area feature, the Offset form appears. Recording an offset lets you log accurate position information for a feature without traveling over it. You can use offsets for line and area features. For example, when collecting a line feature such as a fence, it may be easier to drive along the road beside the fence and record the positions of the fence as an offset. When collecting an area feature such as a lake, you could walk some distance from the lake edge and record its perimeter using an offset.

**Note:** Any feature (point, line, or area) can have only one offset associated with it. To collect a line or area feature using offsets, the same offset value must apply to the whole feature. This may require a test run around or along an object to make sure that you can remain a consistent distance from it.

Collecting point offsets

When you record a point offset, you do not record any position information for the feature. Instead, you record GNSS positions for one, two or three reference positions and measure the distance and/or direction from each reference position to the feature. Then the TerraSync software uses coordinate geometry (COGO) to calculate the location of the feature, in much the same way as a GNSS receiver uses the distances to GNSS satellites at known locations to calculate GNSS positions.

In the TerraSync software, you can record a point offset using either one, two or three reference positions, and you can specify either the distance to the feature or the bearing (direction). To increase accuracy, you can record each reference position as if it were an averaged vertex. If you log a number of positions at each reference point, the TerraSync software averages these positions to give a more accurate reference position. The principle of *Dilution of Precision (DOP)* applies to complex offsets, so you should choose reference positions that are widely spaced.
If the selected feature is a point feature, and you select **Offset** from the *Options* list, you can select a type of offset to record:

Select an option to open the corresponding form. The options are:

- Distance-Bearing
- Distance-Distance
- Triple Distance
- Bearing-Bearing
- Triple Bearing

If you have a Geo 7X with an integrated laser rangefinder module (Flightwave) or a laser accessory with a compass, you may opt for Distance-Bearing offsets to expedite data collection. If you have a tape measure or a Laser without a compass you will probably use Distance-Distance or Triple Distance offsets. If you only have a compass, you will use probably use Bearing-Bearing or Triple Bearing offsets.

**Note:** Refer to *Trimble Geo 7X Handheld User Guide* and the *Geo 7X Rangefinder Utility User Guide* for details of the rangefinder module workflows.


**Note:** Distance based offsets may provide better, more accurate results than those derived with bearing values.
Distance-Bearing offset

When you select the **Distance-Bearing option** in the **Point offset type** form, the **Distance-Bearing Offset** form appears:

When you set a distance-bearing offset, you specify a distance and a bearing from north. The feature lies at the point where the bearing line intersects the circle with the specified distance as its radius:

To specify a distance-bearing offset, fill in the fields on this form and then tap **Done**.
Distance-Distance offset

When you select the **Distance-Bearing option** in the *Point offset type* form, the *Distance-Distance offset* form appears:

When you set a distance-distance offset, you record two reference positions, and the distance from each of these positions to the feature.

A distance-distance offset uses the distance between the feature and two reference positions (A and B) to specify the feature’s position. The feature lies at the point where the circles centered on A and B intersect (see Triple Distance offset). Because there are two points where the circles intersect, you need to specify which direction the feature is in, relative to the path from A to B:
When you select the **Triple Distance option** in the Point offset type form, the **Triple Distance Offset** form appears:

When you set a triple distance offset, you record three reference positions (A, B, and C), and the distance from each of these positions to the feature. A triple distance offset uses the distance between the feature and three reference positions (A, B, and C) to specify the feature’s position. The feature lies at the point where the circles centered on A, B, and C intersect. There can be only one point where the three circles intersect, so you usually do not need to specify a direction.

A triple distance offset is similar to a distance-distance offset, but a third measurement provides some mathematical redundancy that can improve accuracy:
Bearing-Bearing offset

When you select the **Bearing-Bearing option** in the Point offset type form, the **Bearing-Bearing Offset** form appears:

When you set a bearing-bearing offset, you record two reference positions (A and B), and the bearing from north from each of these positions to the feature.

A Bearing-Bearing offset uses the bearing from north from each of two reference points (A and B) to the feature to specify the feature’s position. The feature lies at the point where the two bearing lines intersect.
Triple Bearing offset

When you select the **Triple Bearing option** from the Point offset type form, the *Triple Bearing Offset* form appears:

When you set a triple bearing offset, you record three reference positions (A, B, and C), and the bearing from north from each of these positions to the feature. A triple bearing offset uses the bearing from north from each of three reference points (A, B, and C) to the feature to specify the feature’s position. The feature lies at the point where the three bearing lines intersect.

A triple bearing offset is similar to a bearing-bearing offset, but a third measurement provides some mathematical redundancy that can improve accuracy:
Repeating features

Use *Repeat* to efficiently record a sequence of similar features. You do not have to re-enter values for all attributes. Just check that each attribute value is correct for the new feature, and change only those that are different. When you use the Repeat option, default attribute values are copied from the last recorded feature of that type.

To repeat attributes for similar features:

1. In the *Collect Features* screen, tap *Options* and then select *Repeat*. When Repeat is selected a check mark appears beside it in the option list.

2. Select *a feature* from the *Choose Feature* list and then tap *Create*. The attribute entry form appears. The attribute values that appear are those of the last recorded feature of that type. *Edit if necessary*. Tap *OK* to save the attribute values and store the feature.

3. Select *another feature*. Continue until you want to turn off Repeat mode.

To turn off Repeat mode:

- From the *Collect Features* screen, tap *Options* and then select *Repeat*. The check mark disappears.

*Note: When the Repeat option is not selected, default attribute values are determined by the data dictionary. Where appropriate, the data dictionary specifies a default value for each attribute belonging to a feature.*

Recording a position only

The GNSS data that you collect with the TerraSync software is recorded in files. You can collect positions in a file without collecting feature and attribute data. These positions are called *between feature positions*. They appear in their own layer on the *Map* graphical screen.

Recording GNSS positions only is a useful technique when you do not need to record feature and attribute data. For example, you may want to record a trail of the day’s activities to track where you have been. In this case, you would not want to collect feature or attribute information, only the positions. You can also use between feature logging to record the route traveled from one feature to the next.

By default, the TerraSync software does not record between feature positions. Use the *Logging Settings* form in the *Setup* section to enable between feature logging. If the *Interval* field contains a time or distance value, then between feature logging is enabled. If it is set to Off, then between feature logging is disabled.

If between feature logging is enabled, the TerraSync software logs positions (at the rate you have specified) whenever you are not logging positions to a feature.
Recording averaged vertices

A line or area feature consists of a number of positions, joined in sequence from the first position logged to the last. Each position represents a vertex of the feature. For more accurate recording of line and area features, you can record several positions at each vertex, then average these positions together to calculate the vertex position.

Logging a line or area feature with averaged vertices is similar to logging a number of point features, each being the average of a number of positions, then joining these point features together in sequence.

To record a line or area using vertices:
1. Tap the Subsection list button and then select Collect Features.
2. Tap Options and then select Log Later if not already selected.
3. Tap <the line or area feature> you wish to collect.
4. Tap Options and then select New Vertex:

5. The Vertex form that appears contains the same fields as the attribute entry form.
6. The software starts logging GNSS positions for the averaged vertex, and the logging icon in the status bar changes to . The number beside it shows the number of positions logged for this vertex.
7. Once you collect enough GNSS positions for the vertex, tap Done.
8. Repeat Step 4 and Step 7 for each vertex.
9. Enter <appropriate attributes>.
10. Tap Done to save the feature and return to the Collect Features screen.

An averaged vertex is similar to a point feature, and the same limitations that apply to a point feature apply when the Vertex form is open. You cannot segment a line feature while recording an averaged vertex. You can edit the feature’s offset while collecting a vertex.
Note: Each feature can have only one offset, so you cannot offset individual vertices.

While the Vertex form is open, you must remain stationary, as though you were recording a point feature. The messages Vertex # open and Remain stationary appear to remind you to stay still. The number of positions recorded for this vertex also appears in the status bar.

A line or area feature can include both averaged vertices and positions logged normally as you travel. If you want to record only averaged vertices, you must use the Log Later function to pause logging before you open the feature. Whenever you open the Vertex form, logging starts, and when you close the Vertex form, logging returns to its former state. This technique ensures that no positions are logged except those you log for averaged vertices.

Logging H-Star data

By connecting the TerraSync software to a receiver with H-Star technology, you can collect high-accuracy GNSS data. You can achieve horizontal accuracies (RMS) of up to 10cm (4 inches) + 1ppm.

A receiver capable of real-time H-Star technology uses base station data from a VRS or a nearby single base station (within 80 km) to generate H-Star positions in the field.

For real-time H-Star operation, a wireless data link is required between the roving GNSS receiver and either a nearby base station or a VRS network.

For postprocessed data, three or more good quality dual-frequency (L1/L2) base stations within 200 km are required. Alternatively, one good quality dual-frequency base station within 80 km is required.

The coordinate of each base station must be in the same coordinate system, datum, and reference frame, as one another, and as the GIS database you are using. For example, if a base station has coordinates in terms of ITRF2000 but your GIS is in terms of NAD83, this can introduce up to a meter of error. Also, if one base station has coordinates in terms of ITRF2000 but another is in terms of NAD83, this can also introduce significant error.

Best practices for high accuracy data collection

Trimble recommends the following to help ensure successful high accuracy data collection:

- Collect good quality GNSS measurements between features. For example:
  - Collect good measurements in the open, while walking towards the ‘tough’ feature under a tree.
  - Collect the feature.
  - Collect more good measurements while walking away towards the open.

Collecting good measurements requires orienting the GNSS antenna to have a good view of the sky; do not drop it to your side, or point along or down, as you walk.

There are several reasons for this practice. The good measurements can help to smooth out poor quality measurements at the feature. In postprocessing, this effect applies both forwards and backwards in time, so good measurements after the feature are important. Ideally you should aim for 30 to 60 seconds of good measurements between more difficult locations.

- Log a point feature for 5 seconds in good conditions. This is enough data when the accuracy estimate is sufficient, as indicated by the CEA (Current Estimated Accuracy) or PPA (Predicted Postprocessed Accuracy) values. This assumes you have collected good data before the feature. It is also an efficient workflow - there is no point taking longer to log a feature when the accuracy does not improve.
• In difficult conditions, or if the accuracy is less than desirable, log for 15 or 30 seconds, or even longer if necessary, until the estimated accuracy is good enough. Or you could cancel the existing feature, and try walking into the open and carefully back to recollect the GNSS measurements for the feature.

• Position the antenna appropriately over the target:
  – Set the correct antenna height if there is an offset.
  – Hold the antenna directly over the target feature.
  – Use a range pole for accurate vertical measurements.

• Avoid blocking satellites (five or more satellites are recommended):
  – Avoid harsh GNSS environments when collecting H-Star data.
  – Use a range pole and an external antenna to get the antenna above your body.

Status information
When collecting data, the TerraSync software provides additional status information - an estimated in-the-field or postprocessed accuracy value for the feature appears on the status bar.

*Note: The estimated accuracy value is only an indicator of accuracy that can be achieved with H-Star postprocessing. The accuracy indicated is not guaranteed.*

Configuring the TerraSync software to collect H-Star data for real-time H-Star technology
1. Tap the Section list button and then select Setup.
2. Tap Real-time Settings. The Real-time Settings form appears.
3. From the Choice 1 field, select External Source.
4. Tap the Setup button beside the Choice 1 field to configure the correction source and then select the appropriate settings depending on the correction source and the communication method used. When you have finished configuring the external source, tap Done.
5. From the Choice 2 field, select **Wait for Real-time**.

6. Tap **Done** to confirm the real-time settings and return to the main **Setup** screen.

7. Tap **Logging Settings**. The **Logging Settings** form appears.

8. To use accuracy-based logging:
   
   a. Tap the **Setup button** in the Accuracy Settings field. The **Accuracy Settings** form appears:
      
      a. From the **Accuracy Value for Display/Logging** fields, select **In the Field** and whether the TerraSync software should calculate the estimated horizontal or vertical accuracy.
      
      b. From the **Use Accuracy-based Logging** field, select **Yes**.
      
      c. From the **Apply Accuracy-based Logging To** field, review the feature types that will use accuracy-based
logging. Select All Features.

d. In the Required Accuracy field, enter <the accuracy you require>.

*Note: Check that your receiver is capable of this accuracy in the field. Consult your trainer if required.*

e. Tap Done to save the accuracy-based logging settings and return to the Logging Settings form.

9. Tap Done to close the Logging Settings form and confirm the changes you have made.

**Configuring the TerraSync software to collect H-Star data for postprocessed H-Star technology**

1. Tap the Section list button and then select Setup.

2. Tap Logging Settings. The Logging Settings form appears.

3. To use accuracy-based logging:
   a. Tap the Setup button in the Accuracy Settings field. The Accuracy Settings form appears:

   b. From the Accuracy Value for Display/Logging fields, select Postprocessed and whether the TerraSync software should calculate the estimated horizontal or vertical accuracy.

   c. If you selected In the office, select <the distance to the base station> from the Postprocessing Base Distance field.

   d. From the Use Accuracy-based Logging field, select Yes.

   e. From the Apply Accuracy-based Logging To field, select the feature types that will use accuracy-based logging — select All Features.

   f. In the Required Accuracy field, enter <the accuracy you require>.

   *Note: Check that your receiver is capable of this accuracy in the field. Consult your trainer if required.*

   g. Tap Done to save the accuracy-based logging settings and return to the Logging Settings form.

4. Tap Done to close the Logging Settings form and confirm the changes you have made.

**Collecting features**

As you log a feature, the estimated accuracy value appears in the status bar. The value of the estimated accuracy correlates directly with the length of time that you have continuously collected data. To collect H-Star data you must:

- be connected to a receiver that has H-Star technology
- maintain carrier lock on the required number of satellites

When using a real-time correction source, configure the Estimated Accuracy icon to show an estimate of the accuracy being achieved for that position in the field. When the value shown in the Estimated Accuracy icon
reaches the accuracy you require for the feature, you can stop logging. Collect 30 to 60 seconds of good GNSS measurements before and after a feature. When estimated accuracies are good, collect 5 to 10 positions at the feature, and then pause GNSS logging and move away if there are obstructions.

When you are logging data for subsequent processing, configure the Estimated Accuracy icon to show a prediction of the accuracy that will be achieved after postprocessing. For carrier-capable GNSS receivers, the longer the duration of carrier lock, the better the accuracy, which is indicated by a decreasing estimate. The predicted accuracy applies to all positions logged since you acquired carrier lock on the required number of satellites. The accuracy estimate has a 68% confidence level, which means that 68% of the time the position will be within the estimated value shown when the position was collected, providing that the data is processed against base stations that meet H-Star technology requirements.

Note: If you lose carrier lock while collecting a feature, the accuracy estimate increases, and you must reacquire satellites and remain at the feature until the estimated accuracy value decreases to the required accuracy, or cancel the feature and move away from obstructions and then move back in once you have recorded 30 to 60 seconds of good GNSS measurements.

When collecting data for postprocessing, you do not have to remain at the same feature until the required predicted accuracy value is reached. If you are collecting a series of features, attempt to maintain a clear view of the sky between features.

Advanced techniques and problem locations

Sometimes it is impossible to avoid locations that create multipath conditions. However, there are a few techniques that can be used to deal with harsh GNSS environments:

- Offsets – when being close to a feature means your view of the sky is blocked, use an offset.
- Multipath – this error is caused by the signal for one or more satellites arriving at the antenna after being reflected off another surface, such as a building or tree canopy. Because the signal has not come directly from the satellite to the receiver, the pseudorange measurement is incorrect and creates an error in the position. Errors caused by multipath cannot be removed with differential correction as they only affect the rover.
Data Processing with the GPS Pathfinder Office Software

In this section you will transfer your data from your data collector to the GPS Pathfinder Office software for differential correction, apply any necessary editing, and export the data to a GIS format or to the Google Earth mapping service.

Postprocessed differential correction in the GPS Pathfinder Office software is the most accurate way to process GNSS data. In the field, you collected autonomous and/or real-time corrected data, while base data was stored at base stations nearby. The data sets are loaded into the GPS Pathfinder Office software where corrections are applied. After you display your corrected data file, you can edit any unwanted positions. Verify that the feature information is correct, and edit any attributes. Then you export your data to a GIS, to the Google Earth mapping service, or in CAD format.

Chapter objectives

The chapter objectives are:

- Transfer field data
- Configure the GPS Pathfinder Office software
- Perform differential correction
- Display and edit your data
- Export your data to a GIS or to the Google Earth mapping service format

Transfer field data

Use this exercise to practice transferring field data to the GPS Pathfinder Office software. You can transfer:

- Data files
- Base data
- Waypoint files
- Data dictionaries

This exercise shows you how to transfer a field data file to the GPS Pathfinder Office software.
Connect the data collector to the office computer

To connect the data collector to the office computer:

1. Switch on your data collector and your office computer. Connect the two.

   The Microsoft ActiveSync technology (for all Windows operating systems except the Windows 7/8 and Windows Vista operating system) or the Windows Mobile Device Center (for the Windows 7/8 and Windows Vista operating systems) should automatically establish a connection with the data collector. When ActiveSync or the Windows Mobile Device Center is connected to a data collector, the message Connected appears in the relevant window, and its taskbar icon is green.

2. If ActiveSync or the Windows Mobile Device Center does not connect automatically, remove and then re-insert the USB connection. For information on connecting with the different technologies, refer to the relevant Help

Transfer rover file

To transfer the rover file from your data collector to the office computer:

1. In the GPS Pathfinder Office software, select **Utilities /Data Transfer**.

   The Data Transfer dialog appears.

2. From the **Device** list, select **GIS Datalogger on Windows Mobile**. Alternatively, if you have set up a device definition for your data collector, select that device name from the list.

   The Data Transfer utility automatically connects to the data collector.

3. Select the **Receive tab**.

4. Click **Add** and select **Data File** from the drop-down list. The **Open** dialog appears:

   ![Open dialog](image)

   **Note**: The files that appear are the files in the TerraSync software data folder on the data collector. Files that are highlighted have not been previously transferred from the datalogger.

5. Highlight `<the rover file>`, and then click **Open**. The **Open** dialog disappears and the selected file appears in the **Files to Receive** list.
6. Highlight **the rover file**, and then click **Open**. The *Open* dialog disappears and the selected file appears in the *Files to Receive* list:

![Data Transfer dialog](image)

7. **Click Transfer All.**

   The data file is transferred to the office computer.

8. A message box showing summary information about the transfer appears. **Click Close** to close it:

![Transfer completed message box](image)

9. **Click Close** to exit the Data Transfer utility.

   **Note:** For additional information refer to the GPS Pathfinder Office Help utilities.
Configure the GPS Pathfinder Office software

The GPS Pathfinder Office software is set up primarily for display. Most configuration settings do not actually convert the data. However, the tasks listed below are critical:

- Displaying a raster background file
- Querying the map display
- Exporting data
- Entering manual positions
- Creating and querying waypoints
- Printing or plotting a map display

Set the units

To set the units:

1. Select **Options > Units**. The *Units* dialog appears:

   ![Units Dialog](image)

   2. Select **units** for:
      - **Distance** – to measure.
      - **Area** – to query area features.
      - **Velocity** – to view velocity records.
      - **Offsets** – to view distance from features.

      *Offset Distance Format* – similar to the setting in the TerraSync software.

      Offsets can be displayed/created using horizontal and vertical distances, or by slope distance and
inclination.

*Precisions* – the units to view precision values in the position and feature dialogs.

*Confidence* – to view the statistical confidence level displayed with the precision values.

*North Reference* – the bearing from North. For magnetic, select either Automatic Declination or Manual Declination. For manual declination, enter the magnetic declination.

3. Click **OK** to accept the unit settings.

Configure the coordinate system settings

To configure the coordinate system:

1. Select **Options / Coordinate System**. The *Coordinate System* dialog appears:

   ![Coordinate System Dialog](image)

   The coordinate system determines how the GPS Pathfinder Office software displays coordinates. However, it does not modify the coordinates in a file.

2. Configure the Coordinate System settings. In the Select By group, **choose one of the following**:
   - System – the GPS Pathfinder Office software provides over 80 predefined coordinate systems covering most regions of the world.
   - Datum – the GPS Pathfinder Office software provides over 250 datums. Select an appropriate one to associate with your selected coordinate system.

   **Note**: User-defined coordinate systems can also be created in the Coordinate System Manager utility.

3. In the Altitude Measured From group, **select one of the following**:
   - Height Above Ellipsoid (HAE) – altitude is referenced from a mathematical ellipsoid.
   - Mean Sea Level (MSL) – altitude is referenced from the selected geoid model.

4. From the *Coordinate Units* field, select **<the units>** for computing and interpreting coordinates.
5. From the Altitude Units field, select <the units> for computing and interpreting altitudes.
6. Click OK to accept the coordinate system settings.

Set the style of display
To set the display style:

1. Select Options / Style of Display from the main menu of the GPS Pathfinder Office software. The following dialog appears:

   ![Style of Display dialog]

2. Set <the appropriate display settings>:
   - Null String – entered when a field has no value.
   - Initial Letter for WPT Files – first letter of the waypoint file name.
   - Scale Format – choose 1:X.
     - 1:X – the scale is displayed as a ratio, independent of the units used (for example, 1:2400).
     - 1in:Xft – the scale is displayed as a ratio dependent upon the units used (for example, 1 cm:1 km).
   - Coordinate Order – allows you to display coordinates as either Easting/Northing or Northing/Easting.
   - Lat / Long Format – provides options for display and entry of latitude and longitude.
   - Display USNG – allows you to select a precision level for the United States National Grid (USNG) spatial address, or to hide the USNG spatial address.

3. Click OK.
Select the time zone

Data files store GNSS times approximating UTC. This enables the GPS Pathfinder Office software to display local time zones:

1. Select **Options / Time Zone** from the main menu. The **Time Zone Settings** dialog appears:

2. Set <the time zone>, or create <a new time zone> if your zone does not exist.

3. Click **OK**.

**Differential correction**

Differential correction reduces atmospheric errors; therefore, it is necessary for achieving submeter accuracy for a C/A code position and decimeter accuracy for an H-Star processed position. Differential correction can be performed in real time, or back in the office with the GPS Pathfinder Office software. For optimal results, you can use both.

For a differential correction to be performed, a dual-frequency base station must be running at the same time as a rover in the same vicinity. Both base and rover must track the same satellites at the same time and therefore record the same errors from regional atmospheric conditions. The base station is set up over a known reference position and can compare positions computed with errors to “truth”. Differential correction then adjusts for errors in the rover file, based on a time tag for each position.

You can use real-time differential corrections from the following sources:

- Integrated SBAS receiver
- Integrated beacon receiver
- Integrated OmniSTAR® receiver
- External source connected to the GNSS receiver (for example, a GeoBeacon receiver or a DGPS radio, or a VRS™ correction)

For **postprocessing**, corrections are logged in a base file that is transferred when you return from the field.

**Note:** With high accuracy data collection, it is very important to understand how error can be introduced through incorrect datum transformations. Please inquire with your Trimble Dealer or Trimble Certified Trainer to learn more about typical correction workflows in your region – or visit Pathfinder Office Technical Support [http://www.trimble.com/mappingGIS/PathfinderOffice.aspx?dtlID=technical_support](http://www.trimble.com/mappingGIS/PathfinderOffice.aspx?dtlID=technical_support) for more information about reference frames and their current status.

To start the Differential Correction Wizard from the main GPS Pathfinder Office menu bar, select **Utilities / Differential Correction**.
The Differential Correction Wizard:

The *Select SSF files to correct* list will be empty, or it will show the SSF files that were created the last time you downloaded rover files. To remove any SSF files that are listed, select them and then click ⌧. To select the SSF files you want to differentially correct click ⬤.

1. Click ⬤. The *Select SSF Files* dialog appears:

   Select <a rover file>, or **hold down the Shift key** to select <multiple files> to be corrected. By default the uncorrected files (*.ssf) are shown highlighted for efficient selection.

2. Click **Open**.

   The fields below the selection list display information about the selected file. The *Collected with H-Star receiver* field indicates whether the rover file contains data collected using a receiver with H-Star.
technology. The *Centimeter output enabled field* indicates whether the rover file was collected using a centimeter optioned GNSS receiver and TerraSync Centimeter Edition. The options displayed in the rest of the Differential Correction Wizard are dynamic: H-Star processing options are only displayed if the value for this field is Yes. The image on the left displays data that was collected without an H-Star receiver. The image on the right displays data that was collected with an H-Star receiver.

2. Click **Next**. The *Processing Type* page of the wizard appears:

![Processing Type page](image1)

This screen displays the processing options available for processing the GNSS data in the selected rover files. If the data was not collected with an H-Star receiver, the *H-Star Processing* options will not be available as shown in the example on the left.
Select type of processing

Use the Processing Type step of the Differential Correction Wizard to specify the type of processing you want to use for the selected SSF files. There are three standard processing options. If the receiver that is used to collect the data uses H-Star technology, an additional two H-Star processing options are available.

**Standard processing types**

Standard processing corrects the GNSS data in the selected SSF files using data from a single base station. The standard processing options are always available whether the selected files were collected using an H-Star receiver or not. The options are:

- **Automatic Carrier and Code Processing** - The GNSS data is both carrier-processed and code-processed using data from a single base station. The position with the best precision estimate is used as the corrected position.

- **Code Processing Only** - The GNSS data is code-processed using data from a single base station.

- **Carrier Processing Only** - The GNSS data in the session is carrier-processed using data from a single base station to produce a carrier float solution.

**H-Star processing types**

H-Star processing enables GNSS data in the selected SSF files to be corrected using data from a group of base stations. The files are corrected using data from each base station in the group, and then the results are averaged to produce a single corrected position for each original position. The averaging calculation gives more weight to base stations that are closer to where the original GNSS positions were collected, and can result in a better solution than a correction from a single base station. The options are:

- Use multiple base providers, if a network of base stations are available and are within 200 km.

- Use a single base provider if a base station is within 80 km, and there is not a suitable network of base stations within 200 km.
To select the type of processing:

1. Select **one of the processing types** for differential correction. The options are explained above.
2. Click **Next**. The *Correction Settings* page of the wizard appears:

![Correction Settings Dialog](image)

**Select appropriate settings**

Use the options in the *Correction Settings* dialog to customize differential corrections.

1. Click **Change** to open the *Correction Settings* dialog:
2. Select <an option> from the Output Positions group, which determines the data to be stored in the corrected file:
   - Corrected only – stores only corrected positions
   - Corrected and uncorrected – stores corrected and uncorrected positions

3. Select <GPS filters> to apply to the data as it is differentially corrected. You can let the postprocessing smart filtering work out the best results for your GNSS measurements (recommended), or you can apply your own elevation, SNR, and DOP settings.
   - Select the Use smart automatic filtering option and process files with the processing engine having access to all the GNSS measurements (this is the recommended option).
   - Select the Use new filter settings option to process files using the settings specified in this tab.

The system uses files containing carrier or pseudorange data to increase the accuracy of positional calculations. Data collected using real-time correction sources such as SBAS can be postprocessed, as can data from rover positions using satellites not seen by the base station. Rover data is recomputed using the satellites common to both rover and base station.

4. Activate the Re-correct realtime code positions to improve the accuracy of real-time corrected positions. Clear this check box to leave real-time corrected positions unprocessed. Click OK to save differential correction settings.

5. Click Next. The Select Base Data page of the wizard appears.

Select base files
The interface that appears will depend on whether your rover files contain H-star data and whether or not the Use multiple base providers option has been selected.

Rover files without H-star data and H-Start Data using a single base provider
If your rover files do not contain H-star data or you selected Single Base Provider for your H-Star data, the following page appears:
Select base files:

- If you are going to download files from the Internet select the **Base Provider Search option**, and click **Select**.
- If the base files are in the base folder for the current project select the **Folder Search option**. If the wrong folder is displayed, click **Select** and choose `<the folder>`.
- If you want to manually select the base file(s), select the **Browse option** and then click **Browse**. In the **Open** dialog, <navigate to the folder> where the base files are stored, select `<the base file(s)>` and click **OK** to return to the Differential Correction Wizard.

**Rover files with H-star data and Base Provider Group Option Selected**

If your rover files contain H-star data and the **Use multiple base providers** option was selected, the following page appears:

With H-star processing you can select more than one base station to correct your data with.

*Note*: It is important to make sure that all the base stations in a H-Star group use the same coordinate system and datum to represent their coordinates in.
To do this, select a number of base stations and save them as a group:

1. Click the Select button next to the **Base Provider Group** field. The **Base Provider Group** dialog appears:

   ![Base Provider Group dialog](image)

The **Base Provider Group** dialog displays information about the selected base provider group. Each member of the group is displayed in the group provider list, which displays the presence of L2 and GLONASS data, distance, and integrity index records for the base provider. These details are the same as those in the parent **Base Provider** list displayed in the **Select Base Provider** dialog. The type of integrity index shown in the group member list depends on the type of data contained in the GNSS sessions currently selected for differential correction. To display integrity index values of a different type, select a different type from the drop-down list.

**Note:** The Integrity Index value is an indicator of the quality of the data provided by the base station. A poor Integrity Index value can indicate that the base provider is unreliable or often off line. Good stations may be displayed with “?” as the Index value. For example, password protected stations and private stations may not be able to have a value calculated, so treat the value as an indication.
2. Click **New** to open the *New Base Provider Group* dialog and create a new base provider group.

3. Click ![image](image) to open the Select Base Provider dialog and select `<a base provider>` to add to the group. **Repeat this process until you have added all the required base stations to your group.**

   Next to the list of base provider group members, a map displays the approximate positions of the base providers, in relation to the rover.

4. Click **OK** to return to the Differential Correction Wizard.

**Reference Position settings**

1. Select what you want to use as the source of the base station reference position.
   
   From the Reference Position option select one of the following:
   
   - Use reference position from base files - If you know the reference position for the base provider is incorrect select this option to use the reference position specified in the selected base files. By default, these coordinates are taken from the first selected base file.
   
   - Use reference position from base provider - Select this option to use the recorded reference position of a selected base provider. This option is recommended, as the reference position recorded for a base provider is generally more accurate than the reference position provided in base files.

   **Note:** If there is no H-star data in the selected rover files, or a single base provider was selected for H-Star processing, the name of the base provider selected to provide the reference position is displayed in the text box below this option. Click **Select** to select a different base provider.

2. Confirm base data and position before postprocessing. Select the check box to confirm the co-ordinates of the reference position and the availability of the base files to be used. This information appears in the *Differential Correction Processing* window on the last page of the wizard before you start the correction process. If the check box is not selected, clicking Start on the last page of the Differential Correction Wizard will automatically start the correction process without first checking that base data is available.

3. Click **Next**. The *Output* page of the wizard appears:
**Select output options**

1. Select *the folder* that you want to store the output files in from the following options:
   - Use the same folder as the input file - Output files will be stored in the same folder as the input folder. This allows you to select rover files from different folders, process them, and to store the corrected files with their corresponding input files.
   - Use this folder - All output files will be stored in the same folder. By default, this is the current project folder.

2. Select *how you want the output files named* from the following options:
   - Create a unique filename based on the input filename - Automatically creates a unique filename, based on the input filename. The format for automatically created names is: `<input rover file>_<n>.cor`, where n denotes the number of subsequent processing of the same rover file.
   - Use original filename, overwriting any existing .cor file - The output file has the same name as the input rover file, with a .cor extension. Subsequent processing of the same input file results in previous output files being overwritten.

**Differentially correct your data**

1. Select **Start**. The differential correction process starts.

   If you have chosen to Confirm base data and position before processing a dialog similar to the following will appear:
2. If the base data coverage and reference positions are correct, click **Confirm**. The data is processed.

As the GPS Pathfinder Office software begins differentially correcting the selected SSF files, the *Correct processing* page of the wizard appears:

![Correct Processing Page](image)

It displays details about the status of the differential correction process. The SSF files are processed sequentially. The Correct Processing page displays the number of corrected positions for each SSF file.

When the last SSF has been processed, the message Differential correction complete and a summary of the estimated accuracy values gained for the corrected GNSS positions appears at the bottom of the Correct Processing page.

This summary provides immediate feedback as to the quality of the corrected GNSS positions. For example, if too few base providers have been selected for multi-base processing, the results will indicate this by showing large estimated accuracy values.

3. Click **Close**.

*Note: The most common reason for differential correction failure is choosing the wrong base files.*
View differential correction reports

The Summary - Correct_DATE_TIME.txt reports are created upon conclusion of processing. These reports detail processing settings, files used, files created, and include a processing summary.

You can view generated reports in a text editor, such as Microsoft Notepad:

![Image of Notepad window]

Viewing data files

After your data is corrected, proof your data before exporting it to a GIS. The GPS Pathfinder Office software lets you view and edit both feature and attribute data. Additionally, you can view precision values, DOPs, and area, perimeter, or line length information. The GPS Pathfinder Office software provides symbols, line styles, and colors to emphasize features on the display and in printing. Symbols can be set for background files, notes, waypoints, and precisions. Given a feature name and attribute value, the Find Feature will locate and highlight a feature. This exercise introduces these and other data display tools.

There are two ways to view a data file:

- With the map display
- With the time line

You can move and resize the map or time line views using standard Windows commands.
View Map or Time Line

1. From the main menu, open a map view by selecting View / Map:

2. Open a time line by selecting View / Time Line:

3. To open a corrected file, select File / Open.
4. Select your corrected file, and click Open.

You can view more than one file at a time, but only a single file display can be edited.
Display a background file

Using the background display allows you to view multiple files while editing one. Display the uncorrected file with the background option. Note the differences between uncorrected and corrected data files.

To display a background file:

1. Select **File / Background**.

2. In the **Load Background Files** dialog, click **Add** to include a file. You can add data files, AutoCAD .dxf files, ESRI Shapefiles, and raster .ecw, .bmp, .jpg, .jpeg, .jp2, .j2c, .sid, or .tif files.

   **Note**: If you are adding a raster file as a background, make sure that you select the correct coordinate system. For more information, see **Configure the coordinate system settings**.

3. Select <the file(s)>, and click **Open**.

   The file appears, with a check mark to the left:

   ![Load Background Files dialog](image)

4. Click **OK**.

   Open a data file on top of the background. This file can be edited.
Customize the view

You can modify map and timeline views to better identify the data:

1. Select View / Layers / Features. The Features Layers dialog appears:

   ![Features Layers dialog](image1)

2. Highlight <a point feature> and then click Symbol:

   ![Point generic dialog](image2)
3. Click **Change**:

4. Select *<a symbol>* for the point feature and then click **OK**.

5. You can now select *<a size>* and *<a color>* for the point feature. Click **OK** to return to the Features Layers dialog.

6. Highlight *<a line>* or *<a area feature>* and click **Line Style**.
   A display of line colors appears.

7. Select *<a color>* and *<a thickness>* and click **OK**.

8. Continue to add symbols by repeating steps 2 to 7. When completed, click **OK**.
Customize the background

When you select symbols for the open data file, the same symbols are used in the time line, but not in the background. You can customize background data by choosing symbols as you did for the active data file. However, if you use the same symbols in the background as you did for the active data file, you will not distinguish features in the data file from those in the background file.

To separate the background from data features:

1. Select **View / Layers / Background**. The *Background Layers* dialog appears:

2. In the *Display* group, select the **Single Color** option. All background data will be displayed as light grey in color.

3. Click **OK**.

Notes, waypoints, and precisions can also have custom symbols and colors.

**Editing data**

The GPS Pathfinder Office software provides data editing tools that you can use to “clean” data before GIS export. Cleaning the data may involve deleting positions that cause intersecting vertices in an area or line feature affected by multipath.

Using editing tools, you can delete individual positions or blocks of positions. You can also delete and undelete entire features and modify attribute values. When querying a feature, you can add or edit an offset value.

You can also create a point, line, or area feature and add it to an active data file by specifying coordinates and attributes. This technique can be used if a GNSS feature was not collected. Background data files serve as a guide.

This exercise shows you how to use the GPS Pathfinder Office editing tools.

*Note: The zoom and measure tools use standard Windows conventions to assist in editing data.*
Use the Zoom tools

You can zoom in to look at a cluster of data or zoom out to look at a larger view. To get the original selection back, click the Select arrow, otherwise the last tool remains active.

To practice using the zoom tools:

1. Select View / Zoom / In, or select the Zoom In tool \(\text{🔍}\) from the main toolbar.
2. Select View / Zoom / Out, or select the Zoom Out tool \(\text{🔍}\) from the main toolbar.
3. Select View / Zoom / In, and use the mouse to draw a selection box around a portion of the map you want to view.
4. Click <a point on the map> to be the center.
5. Select View / Zoom / Extents, or choose the Zoom Extents tool \(\text{🔍}\) from the main toolbar, and click in the map display. This tool displays the full map.
6. Select View / Pan or choose the Pan tool \(\text{🔍}\) from the main toolbar to move around the map.
7. Click and drag around the map.
8. To set the scale of the map manually, select View / Scale / Map:

![Scale Map dialog box]

9. Set <the scale> from a predefined list, or enter <a value manually>, and click OK.
10. Select View / Scale / Time Line, and complete the following fields:
    - Duration – set the duration of the time line.
    - Start From – set the date and time for the time line.

Use the Measure tool

To use the Measure tool:

1. Select Data / Measure, or the Measure tool \(\text{🔍}\) from the main toolbar.
2. Click on the first position on the map view.
3. Click on the second position to measure to.
4. Repeat step 3 if angles to the measurement are required.
5. Double-click on the last position. Distance, bearing between the last two positions, and area are displayed in the status bar.
Edit single positions

To edit single positions:

1. **Zoom in on a portion of the data file.**
2. **Select Data / Position Properties.** The Position Properties dialog appears:

![Position Properties dialog](image)

3. In the Map display, click *on a GNSS position that you want to delete*.
4. In the Position Properties dialog, click **Delete**.

**Note:** *If you delete a position by mistake, click Undelete to undo it.*

5. In the Position Properties dialog, click *one of the arrow buttons in the toolbar* to select either the **previous** or **next position** to delete. Alternatively, click *a new position in the map view*.
6. If you make a mistake, select **Edit / Undelete All Positions**. This returns all positions deleted after the last save.

The GNSS positions of deleted features remain on the map display. The positions marked for deletion are not written to your GIS export file.

Edit multiple positions

A group of clustered positions can be deleted quickly with *block delete*. This is convenient, for example, if the antenna remained stationary while a feature was open, creating overlapping lines at the beginning of a feature.

To edit multiple positions:

1. **Zoom in to a cluster of positions that need to be edited.**
2. Select **Edit / Delete Block of Positions**, or choose the corresponding icon from the icon bar.
3. Hold down the left mouse button, and *draw a selection box around positions to edit*.
4. Answer **Yes** in the dialog that asks you to confirm if you want to delete the selected positions.
5. **Zoom to extents, and repeat steps 2 to 4** until all edits have been made.
6. If you make a mistake, select **Edit / Undelete All Positions**. This returns positions deleted after the last save.
Edit entire features

To edit features:
1. **Select Data / Feature Properties**.
2. On the map display, select <a feature>.
3. In the Feature Properties dialog, click **Delete**.
4. Answer **Yes** to delete the feature.
5. If you make a mistake, click **Undelete**.
6. In the Feature Properties dialog, click on <an arrow to select the previous or next feature to delete>. Alternatively, choose a new feature in the map window.

Edit attribute values

To edit attribute values:
1. Double-click to <select a feature>.
2. In the **Feature Properties** dialog, select the **Attributes tab**:

   ![](image)

3. Select <an attribute to edit>.
4. Edit <the attribute value>.
5. When all attributes have been edited, select **File / Save**.

**Note:** To facilitate edits to an SSF file that may have been generated with condition-based data dictionary attributes, you must first alter the default settings in Pathfinder Office under the Data function for Make All Attributes Editable. This must be selected/activated to view all attribute edit options.
Edit offsets

1. In the Feature Properties dialog, click Offset. The following figures show examples of the Offset dialog that appears for each offset type:

Distance/bearing

Distance/distance

Triple distance
Bearing/bearing

Precision values for line or area features that have an offset applied may be exported as 0.0.

**Note:** Offsetting irregularly shaped line or area features by large distances, relative to the length of the feature, may cause unexpected results.

Each position used to calculate the offset is displayed in the list on the left side of the dialog. These positions are called *offset reference positions* and are labeled using the numerical system Point 1, Point 2, Point 3, and so on. Select a position from the list to display the details for that reference position in the **Measurements to feature** group.

To correctly determine the position of the feature when using distance/distance or triple distance offsets, choose the direction of the feature relative to you when you look towards the next reference point. It will be on your left or right.

When the feature selection changes, the Offset dialog also changes to show the information for the new feature. If a feature has no offset, the information for the distance/bearing offset shows with zero values. If you have made a change to the offset information, and then selected another feature without closing the Offset dialog, a message *Do you want to save the current feature appears*. If you click **Cancel**, the feature selection does not change and the current feature remains selected.

The following fields can appear in an Offset dialog:

- **Bearing** – the angle between North and a line from the observer to the feature. The field name contains (T) or (M), depending on whether North is true or magnetic.
- **Slope Distance** – the length of a straight line, from the observer to the feature.
- **Inclination** – the angle between a horizontal line and a line from the observer to the feature. When the
feature is higher than the observer, the inclination is positive.

- **Horizontal Distance** – the length of a horizontal line from the observer to a vertical line through the feature.
- **Vertical Distance** – the distance from the feature to a horizontal line from the observer. When the feature is higher than the observer, the vertical distance is positive.
- **Max Residual** – the error estimate (or residual) associated with the calculation of the offset. It only appears for the bearing/bearing, distance/distance, triple bearing, and triple distance complex offsets. This field displays the longest distance from the point feature to the bearing line as a distance measurement:

![Diagram showing horizontal and vertical distances](image)

The maximum residual for bearing/bearing and triple bearing offsets is converted from a bearing to a distance measurement.

- **Direction** – indication of whether the feature is to the left or to the right, looking along the direction of collection.

2. Click **OK**.
3. When all offsets have been edited, select **File / Save**.
Find a feature

To find a feature and attribute:

1. Select **Edit / Find Feature**. The *Find Feature* dialog appears:

![Find Feature dialog]

2. Select the <feature, attribute, test, and value>.
3. Choose <a place to search from>: *From Start, For Previous Feature, For Next Feature, or From End*.
4. Click **Find**. The GPS Pathfinder Office software searches for the requested feature and highlights it in the map window.
5. Click **Close**.

Create a feature

To create a feature:

1. Select **Data / Create Feature**. The Create Feature dialog appears:

![Create Feature dialog]

2. Select <a feature to create from the data dictionary>.
3. In the Attributes From group, classify the source of the attribute value for the new feature as:
• Defaults – use the attribute value specified as the default in the data dictionary.
• Selected – obtain an attribute value from the selected feature.
• Last Entered – obtain the attribute value from the last feature of the same kind that you created.

4. Click **OK** to create the new feature. The Enter Attributes dialog appears:

5. In the Enter Attributes dialog, highlight `<an attribute name>`.
6. From the Attributes tab, select or enter `<an attribute value>`.
7. Click **Next** to continue to the next attribute. Enter or select `<the appropriate attribute value>`.
8. Select the **Manual Positions** tab, and enter `<the coordinates of the new feature>`. Key in `<values>`, or select `<a position from the map>`. The values that you key in must use units of the current coordinate system. If you normally use one coordinate system and want to use positions from another, switch to the other system, enter the positions, and switch back to your original system.
9. On the Manual Positions tab, click **Add** to save the position. Clear the **Add From Map** check box. If you make a mistake, click **Delete Last**.
10. **Repeat Step 7**.
11. Click **End** to close the created feature.
12. Click **Close** to close the Create Feature dialog.
13. To see your new feature on the map, select **View / Layers /Features**, and select `<the check box corresponding to the feature layer>`.
Creating GIS export setups – KML/KMZ

Many types of GNSS data can be exported to a GIS, including features, attributes, not in feature positions, notes, velocity records, and external sensor records. This exercise defines options to convert this information to a format that matches an existing GIS or CAD database.

When you have collected and postprocessed the GNSS data, you may want to share the data with others using KML/KMZ format files. These files can be used to visualize the data using the Google Earth mapping service application.

The GPS Pathfinder Office software supports a native KML/KMZ export utility. KMZ files are simply compressed KML files.

For this exercise, you will export the data files to a KMZ file and then display the dataset using the Google Earth mapping service.

This exercise shows you how to:

• export data files to the KMZ format
• display the KMZ files in the Google Earth mapping service

To export files to the KMZ format:

1. Click , or select Utilities / Export.

The main window of the Export Utility appears:

When the Export utility starts, the most recently used data files are selected by default as input files.

The Output Folder field defaults to the export folder specified in the current project, for example:
The conference file, as shown above. The export folder is where all export files are created by project level default.

The Choose an Export Setup group shows information about the export type, the type of data you are exporting, output options, and the coordinate systems used for the exported data. The drop-down list in this group contains a list of available export setups. An export setup consists of a format plus several parameters that customize that format for a particular purpose. You can create as many export setups as you like and use them over and over.

2. From the drop-down list, select **Sample KML Setup**.
   This export setup creates output files in the KML/KMZ format. The resulting KML/KMZ files contain 3D coordinates. When captured with images, a sub-folder containing the images is also created. These images are referenced from the KML/KMZ file.

   At this point it is recommended to create a New Setup using the Sample KML Setup as a template. Select **New** to open the New Setup dialog:

   ![New Setup dialog](image)

   **Rename the New Setup to match your project name and/or export specifics** – for example Class 1 KML Setup. Select **OK** to exit the New Setup dialog.

3. The Export Setup Properties dialog will open to allow you to finalize your export setup requirements:
4. Select the **Data tab**. This tab allows you to select which feature type to export. For the exercise, we will be exporting features. Select **Features - Positions and Attributes**, with the option **Export all Features**.

5. Select the **Output tab** and then select **Combine all input files and output to the project export folder**. This creates a single KML/KMZ file for the export.

6. Select the **Attribute tab**. Select **Attribute Value**.

7. Select the **Position Filter tab**. This tab enables you to filter on the type of position, including whether uncorrected, digitized (non-GNSS) positions are to be exported.

8. Select the **Coordinate System tab**. Notice that you cannot change the coordinate system as, by default, KML/KMZ files are 3D and use the WGS 1984 datum.

9. Select the **KML tab**. This tab is only available when exporting to KML/KMZ format files.
   a. Select **Time Stamps** if time stamps are to be exported (this is selected by default).
   b. Group features enables you to group feature classes together for easier handling in the KML/KMZ file navigation pane in Google Earth.
   c. Output enables you to select either KML or KMZ file format. We will use the default value of KMZ in the tutorial.
   d. Each feature type (point, line, or area) has an Altitude Mode. The Altitude Mode enables you to display the feature in Google Earth:
      - on the Earth's surface (Clamp to ground) following the terrain model (if enabled)
      - hovering above the Earth's surface (Relative to ground)
      - at an absolute elevation (Absolute), which may project the feature into the Earth if terrain is enabled in Google Earth. The latter two selections also allow the projection of an 'extrusion' vertically down from the feature to the Earth's surface, represented as a 'fence'.
   e. **Lines and areas** enables you to give the feature or feature perimeter an opacity value (0 - 100%), which you can use to see through the feature at underlying features.

For Area features, set `<a fill opacity 0 - 100%>`. 
The icon or color will be derived from the Data Dictionary used when collecting the original dataset:

10. Click **OK** to close the *Export Setup Properties* dialog.
   
The rest of the information in the *Choose an Export Setup* group is updated with information relating to the export setup you have selected.

11. Click **OK** to start the export process.

12. If a message warns that files may be overwritten, click **Yes** to continue.

   When the process is complete, the *Export Completed* dialog appears:

13. Click **Close** to remove the message without displaying the export log.
Using Windows Explorer or another file management utility, look at the contents of the `\GNSS Projects\Tutorial\Export` folder.

The folder contains the following file types:

<table>
<thead>
<tr>
<th>File Type</th>
<th>Extension</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>KMZ file</td>
<td>.kmz</td>
<td>Compressed Keyhole Markup file</td>
</tr>
<tr>
<td>TXT file</td>
<td>.txt</td>
<td>GPS Pathfinder Office Export log file</td>
</tr>
<tr>
<td>Setup Information</td>
<td>.inf</td>
<td>Information on the settings used in the export process. You can use the text editor to open this file. This file is named after the first data input in the Export dialog.</td>
</tr>
<tr>
<td><code>&lt;project&gt;~files</code> Sub-folder</td>
<td>Sub-folder containing the icon graphics of the exported point features and associated images</td>
<td></td>
</tr>
</tbody>
</table>

If you have Google Earth installed, double-click `<the KMZ file>` to launch Google Earth and to load the file into the temporary file folder.

**Creating GIS export setups – Shapefile**

In this exercise, you will create a customized export setup, configure the format setup options, and export your corrected data file. Make sure you clearly understand the options offered to perform a GIS export.

This exercise shows you how to use the Export utility to match GNSS data to your GIS database using the Shapefile data format.

To create an export setup:

1. Select **Utilities / Export**.
2. In the Export dialog, click **New** to open the New Setup dialog as directed in the KML export exercise.
3. Rename the New Setup `<to match your project name and/or export specifics>` – for example Class 1 ESRI Shapefile Setup. Select **OK** to exit the New Setup dialog.
4. In the Create group, select the **New setup** option and then select **ESRI Shapefile** from the list.
5. Click **OK**.

**Configure the format**

To configure the format of an export setup:

1. In the **Type of Data to Export** group in the **Data** tab, select the **Features / Positions and Attributes** option:
   - **Features / Positions and Attributes** – exports features and attribute information.
   - **Include Not in Feature Positions** – exports not in feature positions as either **one point per Not in Feature position** or as **one line per group of Not in Feature positions**.
   - **Positions Only** – exports positions as either one point per GNSS position, one point per file (mean position), one line per input file, or one area per input file.
2. In the **Create Point Features From** group, you can export the following as point features:
• Notes
• Sensor records

A position for each note, velocity record, or sensor record is interpolated from GNSS positions within the input file.

3. The Starting Feature ID group is only available for export formats that require a unique ID. The Value field specifies the starting feature ID for the session:

• Start Each Session with this Value – specifies that the starting feature ID always starts at the value shown.
• Continue Increment from Previous Session – the value field defaults to 1 plus the last feature ID exported in the previous session.

Include certain filters

To include position filters:

1. Select the Position Filter tab:
2. Select the Filter by GNSS Position Info option.
   
a. From the Minimum Satellites list, select 3D (4 or more SVs). This option only exports positions collected with a specified number of satellites. It does not filter out positions created manually (without GNSS).
   
b. From the Maximum PDOP list, select 6. This option filters out positions above a particular PDOP.
Only positions with a PDOP less than or equal to this value are exported.

c. From the *Maximum HDOP* list, select **12**. This option filters out positions above a particular HDOP. Only positions with an HDOP less than or equal to this value are exported.

d. In the Include Positions That Are group, select *any of the following*:
   - Uncorrected – the uncorrected positions are exported. **CAUTION** – If you have uncorrected data in your GIS you may be compromising the accuracy standards of your existing GIS database.
   - P(Y) Code – positions collected using P- or Y-code are exported. Only military receivers can log positions using these codes.
   - Real-time SBAS – positions collected using SBAS real-time DGPS are exported.
   - Real-time Code – positions collected using real-time differential GPS and computed using a code phase solution are exported.
   - Postprocessed Code – positions corrected in the Differential Correction utility using the code-processing options are exported.
   - Real-time Carrier Float – (for RTK systems only.) Positions collected using real-time differential GPS and computed using a carrier float solution are exported.
   - Postprocessed Carrier Float – positions that have a carrier float position. These positions were corrected using either the H-Star processing option in the Differential Correction Wizard, or using the Smart Code and Carried Phase Processing option or the Carrier Phase Processing option in the Differential Correction utility.
   - RTK Fixed – (for RTK systems only.) Positions collected using real-time kinematic techniques and computed using a carrier fixed solution are exported.
   - Postprocessed Carrier Fixed – positions corrected in the Differential Correction utility using the Centimeter Processing option, and having a carrier fixed solution, are exported.

e. Select the **Include Non-GNSS Positions option** to export positions that were collected manually, were originally imported from a GIS or CAD system using the *Import* utility, or were created with the *Create Feature* tool in the GPS Pathfinder Office software.

3. Select the **Filter by Precision (68% confidence) option** to filter a data set based on horizontal and vertical precision tolerances.

4. Select the **Export Features That Have No Positions option** to include features that have no positions in the GIS or CAD output. This is useful when attribute information about a feature is gathered but GNSS positions were unavailable.
Reference graphic data

To reference graphic data:

1. Select the Coordinate System tab:

2. Select the Use Export Coordinate System option to export data in the coordinate system and zone configured in this tab.
   The Use Current Display Coordinate System option exports data as specified under Options / Coordinate System in the main GPS Pathfinder Office program.

3. Click Change to set the appropriate datum, coordinate system, and altitude reference.

4. Click OK.

5. The options in the Export Coordinates As group are available for formats that accept either two-dimensional or three-dimensional coordinates.
   - XY – exports two-dimensional coordinates.
   - XYZ – exports three-dimensional coordinates.
6. Browse to <an existing ESRI projection (*.prj) file, if available> to establish the final spatial reference for your project data. This setting is an optional setting and will not prohibit the final export. However, if a file is not selected you will be notified by the following message:

7. Select Yes to proceed or No to return to the Export set up.

Choose the output options

To set output options:

1. Select the **Output tab**:

![Output tab image]

2. From the **Output Files** group, select <**one of the following**>:

   - **Combine all input files and output to the project export folder** – a single output file (or set of output files) is created in the export folder.

   - **Combine all input files and output to an auto-generated subfolder** – a single output file (or set of output files) is created in a subfolder of the export folder.

   - **For each input file create output file(s) of the same name** – for each input file, an output file (or set of output files) with the same filename as the input file is created in the export folder.
• For each input file create output subfolder(s) of the same name – for each input file, an output file (or set of output files) is created in a subfolder of the export folder.

3. From the System File Format group, select <the operating system> of the computer for your GIS or CAD program.

Configure the units

To configure the units:

1. Select the **Units tab**:

2. In the Units group, select **Use Export Units**. Data is exported in the units set in this tab. Click **Change** to reset the export units.

3. Choose the <**Distance, Area, and Velocity Units**> and click **OK**.

4. Decimal Places – these fields control the number of decimal places exported. The decimal places fields apply only to data exported in ASCII formats.

5. Select the **Latitude/Longitude Options**, if they are available:
   - Format – controls the style of exported Latitude and Longitude coordinates.
   - Quadrant – determines how the quadrant or hemisphere component of a Latitude/Longitude coordinate is exported. Select +/- to export Northern hemisphere latitudes and Eastern hemisphere longitudes as positive numbers, and Southern hemisphere latitudes and Western hemisphere longitudes as negative numbers. Select NS/EW to export hemisphere letters.

6. Choose from the following **Date/Time Options**, if available:
   - Time Format
   - Date Format
To include attributes:

1. Select the Attributes tab:

2. In the Export Menu Attributes As group, select the Attribute Value option.
   - Attribute Value – exports the attribute value that was entered while collecting data.
   - Code Value 1 – exports the first predefined code in the data dictionary.
   - Code Value 2 – exports the second predefined code in the data dictionary.
   - Code Values 1 + 2 – exports both predefined codes.

3. The Generated Attributes group includes additional attributes for documentation. Select <any> for your output file.

For all feature types and their exported attribute names, include:

- PDOP – MAX_PDOP
- Correction Status – CORR_TYPE
- Receiver Type – RCVR_TYPE
- Date Recorded – GPS_DATE
- Time Recorded – GPS_TIME
- Feature Name – FEAT_NAME
- Data File Name – DATAFILE
- Total Positions – UNFIL_POS. Total number of positions of the feature in the SSF file.
- Filtered Positions – FILT_POS. Total number of positions of the feature after position editing.
4. For *Point Features*, and their exported attribute name, include:
   - Height – GPS_CALC_HEIGHT. Elevation of the point features.
     Use this attribute if your GIS or CAD system does *not* accept three-dimensional coordinates. Do not select this if your GIS or CAD system stores three-dimensional positions.
   - Standard Deviation – STD_DEV. The spread of positions averaged for the point feature.
     Standard deviation is not a measure of accuracy of a point feature’s position. It indicates the spread of positions from the mean.
   - Horizontal Precision – HORZ_PREC
   - Vertical Precision – VERT_PREC

5. For *Line Features*, include:
   - Length – GPS_LENGTH
     If your GIS or CAD system computes lengths internally, results may vary due to algorithmic processing.
   - Average Horizontal Precision – AVG_HORZ_P
   - Average Vertical Precision – AVG_VERT_P
   - Worst Horizontal Precision – WORST_HORZ
   - Worst Vertical Precision – WORST_VERT

6. For *Area Features*, and their exported attribute names, include:
   - Area – GPS_AREA
   - Perimeter – GPS_PERIMETER
     If your GIS or CAD system computes area and perimeter internally, results may vary due to algorithmic processing.
   - Average Horizontal Precision – AVG_HORZ_P
   - Average Vertical Precision – AVG_VERT_P
   - Worst Horizontal Precision – WORST_HORZ
   - Worst Vertical Precision – WORST_VERT

7. Click **OK** to save settings and return to the main *Export* dialog.

Export data

1. In the *Input Files* group, click **Browse**.
2. Select the corrected file to be exported (if it does not appear in the *Select Data Files* dialog), and click **Open**.
   You can export multiple files that use the same data dictionary.
3. In the *Choose an Export Setup* group, verify that the newly created export setup is selected, and click **OK**.
   Processing begins.
   An *Export Completed* dialog informs you of the number of positions and features exported.
4. Click **More Details** to view the text file created from the export.
5. Click **Close** to exit the Export utility.

When you return to the office, create an export setup to match your company’s GIS. If you are unsure of the settings that your GIS requires, write down the settings here and speak to your GIS specialist.
Data Update

After collecting GNSS data and populating your GIS database, it may be necessary to go back to the field and update your features and/or attribute information. Perhaps the attribute values have changed or the actual position of the feature has moved. This can be done days, months, or years after the GNSS data was collected. This section shows you how to import your data in the GPS Pathfinder Office software, and how to update your data in the field.

Chapter objectives

The chapter objectives are:

- Use the GPS Pathfinder Office Import utility to convert GIS data to SSF format
- Prepare for data update

Data preparation

Before files can be updated, you need to decide which format to use.

Data file format

How you prepare a file for data update depends on whether it is an ESRI Shapefile or an SSF file. Both the TerraSync software and GPS Pathfinder Office software can convert SSF data files to ESRI Shapefiles and vice versa, and you can choose which format to use for data update.

Shapefiles

With ESRI Shapefiles, you do not require any GPS Pathfinder Office utilities to convert, transfer, or process the data. The files need less office processing, but you cannot edit or differentially correct the data before merging it back into the database. You also need to actively manage the transfer of these files to and from the data collector.

SSF files

With SSF files, you can use GPS Pathfinder Office utilities to convert, transfer, or process the data. If your GIS does not use or export to Shapefile format, you can use the Import and Export utilities to convert to and from a variety of GIS and CAD formats.
An SSF file needs more office processing than a Shapefile, but it does offer more control of the data that is to be merged back into the database. Most of the office processing is automated by the Data Transfer or TerraSync software, or can be automated using the Batch Processor utility in the GPS Pathfinder Office software.

**Prepare Shapefiles for data update**

To update the data in Shapefiles you need to:

1. Export the relevant Shapefiles from your GIS.
2. Delete unnecessary files.
3. Import the relevant Shapefiles into the TerraSync software.

**Export Shapefiles from the GIS**

Use your GIS or a third-party conversion utility to select the data that is to be updated, and to export it into Shapefile format.

**Delete files**

Before downloading data files, delete older ones to make space on the device. This will enable you to transfer data and collect new data. The amount of space needed depends on the project.

To delete files:

1. In the TerraSync software, select **Data / File Manager**. The **File Manager** screen appears as shown.
2. In the list of files, highlight **the file to delete**.
3. Click **Options** and from the drop-down list select **Delete**.

The selected file is deleted.

*Note: If a data file has not been transferred to the office computer, the following message appears: <File name>: This file has not been transferred. Are you sure you want to delete it? Select Yes to delete the file. Select No to cancel the deletion.

*Note: Large files take a long time to transfer, and also take up a lot of space on the data collector. Send only small files that focus on the specific area of data that needs to be updated or verified.*
Import Shapefiles into the TerraSync software

Use the TerraSync software to convert the Shapefiles into data files suitable for use in the TerraSync software.

To import Shapefiles into TerraSync:

1. In the File Manager screen, from the Choose File field select Data files.
2. In the Setup section, review and select <the correct coordinate system>. This is the coordinate system that you want the output file to use.
3. Click Options and then select Read data from Shape. The Read from Shape form appears as shown:
4. In the Create data file field, specify <the output file name>.
5. Make sure that the correct coordinate system is selected.
6. Select <the folder on the device with the Shapefiles that are to be converted>. To do this, enter <the full path and name> in the From Shape file(s) field. Alternatively, tap <the drop-down arrow and in the pop-up window that appears, navigate to the folder>.
7. Select <the check box beside each Shapefile that you want to include>. Clear <the check box to exclude a file>.
8. Tap Done to begin the conversion. A progress bar and summary information is displayed.
9. When the message Shape conversion complete appears, tap Close to return to the File Manager screen. The new file appears in the list of files.
Prepare SSF files for data update

To update the data in SSF files you need to:

1. Export the data files from your GIS in an appropriate format.
2. Delete unnecessary files, and import relevant files into the GPS Pathfinder Office software.
3. Download and save the files on the data collector.

Export data from the GIS

Use your GIS or a third-party conversion utility to select the data that you want to update, and to export it into one of the following example formats:

- AutoCAD DXF
- dBASE
- ESRI Shapefile
- MapInfo MIF
- Microsoft® Access® MDB
- Google Earth KML

Import as SSF data

The Import utility in the GPS Pathfinder Office software converts data from one of the above GIS data formats to the SSF file format required by the TerraSync software.

To import GIS data into SSF format:

1. From the GPS Pathfinder Office menu bar select Utilities / Import. The Import dialog appears.
2. In the Choose an Import Setup group, select <an import setup>.
3. Click Browse and select <the input file(s)>
4. To change the output file, click Browse in the Output File group.
   By default, the path specified for the output file is the current project folder.
5. Make sure that all import settings are correct. Click Properties to make changes.
6. In the Import Setup Properties dialog, select the Data tab.
   This tab defines the type of files that will be created. The options are:
   - Features with Data Dictionary – create an SSF file with an embedded data dictionary. The data dictionary will contain only features and attributes that appear in the SSF file.
   - Data Dictionary File Only – create a Data Dictionary file (.ddf) only. The Data Dictionary file will contain only features and attributes that appear in the input file.
   - Features with External Data Dictionary – create an SSF file. You need to specify a Data Dictionary file against which the feature and attribute information in the SSF file will be validated.

Note: If you do not already have a data dictionary for the GIS that you want to import data from, use the second option to import the data dictionary only. Edit the defaults and the acceptable range of values for the various attributes in that data dictionary. Then, in a second import process, import the features, validating them against
the data dictionary you edited.

7. Select the Coordinate System tab and specify <the coordinate system> that the input files use. When you import the files, positions in the input files are converted to positions in the WGS-84 coordinate system, which is used by GNSS. If you do not select the correct coordinate system for the input files, your output file(s) will contain incorrect positions.

8. Select the Output tab and specify <how the imported files will be output>:
   > Select the Combine input files into one output file option to specify that the Import utility should create a single output file containing data from all the input files.
   > Select the Create one output file for each input file option to specify that the Import utility should create an output file for each input file. If you select this option, you cannot change the output file names.

9. Click OK to close the Import Setup Properties dialog.
10. Click OK to import the files.

For more information, refer to the GPS Pathfinder Office Help.

Transfer GIS data to the data collector

Once the data from the GIS is imported into the GPS Pathfinder Office software, use the Data Transfer utility to transfer it to the data collector.

Note: When you transfer files from the GPS Pathfinder Office software to the data collector, the associated data dictionary is automatically transferred with the file.

To transfer files from your office computer to the data collector:

1. Switch on your data collector and your office computer. Connect the two.
   
   Use either Microsoft ActiveSync technology or the Windows Mobile Device Center to manage the connection between the device and the computer. The software you use depends on the operating system the office computer is running.
   
   When the device and the computer are connected, one of the following appears on the office computer:

2. If the computer is running Windows Vista or later, the Windows Mobile Device Center window appears and displays the message Connected.

3. If the computer is running Windows XP or 2000, the message Connected in the main ActiveSync window, and its taskbar icon is green.

4. If ActiveSync or the Windows Mobile Device Center does not connect automatically, remove and then reinsert the USB cable and try again. For information on connecting, refer to the relevant Help.
5. In the GPS Pathfinder Office software, select **Utilities / Data Transfer**.

   The *Data Transfer* dialog appears:

   ![Data Transfer dialog](image)

6. From the *Device* list, select **GIS Datalogger on Windows Mobile**. Alternatively, if you have set up a device definition for your data collector, select *the device name from the list*.

   The Data Transfer utility automatically connects to the data collector.

7. Select the **Send tab**.

8. Click **Add** and select **Data File** from the drop-down list. The *Open* dialog appears.

9. Highlight *the files* that you want to send, and then click **Open**. The *Open* dialog disappears and the selected files appear in the *Files to Send* list:

   ![Files to Send list](image)
10. Click Transfer All.
    The data files are transferred to the data collector.
11. A message box showing summary information about the transfer appears. Click Close to dismiss.
12. Click Close to exit the Data Transfer utility.

*Note: For more information, refer to the GPS Pathfinder Office Help.*

**Preparing the data collector and background**

Now that the GIS data files and configuration files have been transferred to the data collector, you are ready to update data in the field. When you arrive at the field site, remember to check the Status screen for the status of satellite tracking. Next, check your real-time status. In order to successfully navigate to the features to update, you may need real-time differential corrections. During data update, if you come across any features that were not previously logged, you can create a new feature, or create a waypoint to represent that feature.

**Check the real-time status**

You should check the real-time status before navigating back to existing features.

*Note: You can use the status bar to quickly check the real-time status. When the TerraSync software is receiving real-time corrections, a real-time icon appears in the status bar. The icon flashes if there is a problem with the real-time source.*

Use the Status section to view detailed information about the real-time status.

Tap the **Section list button** and select **Status**

Tap the **Subsection list button** and select **Real-time**

The Real-time Summary screen appears as shown:

Use this screen to check that the TerraSync software is receiving corrections. When the TerraSync software is receiving corrections, a real-time icon appears beside the source in use. This icon indicates the type of correction source.

Before starting the data update session, open the file that contains the GIS data. You can also open a data or image file in the background.
Open an existing data file

To open an existing file:

1. Tap the Section list button and select Data.
2. Tap the Subsection list button and select Existing File.
3. Review and highlight the file that to open:

4. Tap Open to open the selected file, or double-tap <the file>.

The Update Features screen appears:
This screen shows a list of all existing features in the data file.

Select a background file – from data collector

There are two types of file that can be displayed in the background of the map:

- Data files
- Background files containing vector or raster images

You can open any data file in the TerraSync software in the background, provided it is not already open in the Data section. When you open a data file in the background, its features are visible but cannot be selected, edited, or deleted.
A vector background file is an SSF file or Shapefile that has been transferred to the TerraSync software as a background file (rather than a data file). During the transfer, its attribute information is removed, so it uses less space on the data collector. You cannot open a vector background file for data collection or update, or select, update, or delete its features.

You can also transfer raster images such as aerial photographs to the TerraSync software as background files. The supported formats are bitmap (.bmp), ECW (.ewg), JPEG (.jpg), JPEG 2000 (.jp2 or .j2c), MrSID® (.sid), and TIFF (.tif). Most image files must be transferred with a World (.wld) file that tells the TerraSync software how the pixels in the file relate to real-world coordinates, and a coordinate system file that specifies the coordinate system that the image file uses. You can create the World file in your GIS. You can create the coordinate system file either in the GPS Pathfinder Office main program, or in the Data Transfer utility at the time of transfer.

Select a background file – from an Internet map server (IMS)

In addition to background files that you have transferred to your data collector, you can connect to an Internet map server (IMS) and download raster background images.

1. **In the map, pan or zoom to make sure that the area for which you want a background image is displayed on the map.**
   
   Provided the IMS covers the area you are in, it will provide a background image that matches the current map extents.

2. **Connect to the Internet** using your normal connection method. You cannot connect to the Internet from within the TerraSync software.

3. Once you have established an Internet connection, open the **Background File form** in the TerraSync software:

   ![Background File form](image)

4. In the **Location** field, select **Internet**.

5. Use the fields that appear to specify the server type, a URL, a service, the coordinate system, and the layers from that service that you want to download.
6. Click **Done** to close the *Background File* form and download the selected background map. This may take some time.

When a download is in progress, an animated icon 🔄 appears in the top left corner of the map. Once the background file is downloaded, the hourglass icon appears while the image is rendered.

**Updating a feature**

Once you have opened an existing file and navigated to the feature, you can update the feature. You can update the feature’s attributes or position information, or you can simply mark it as updated.

**Update attributes**

Once you have opened the existing file and navigated to the feature, you can edit its attributes.

To update the attributes for a feature:

1. Tap the **Section list button** and select **Data**, then tap the **Subsection list button** and select **Update Features**.

The *Update Features* screen appears:

![](image)

2. **The feature that you navigated to should be selected. If it is not, select it now.**
3. Tap **Begin** to open the attribute entry form for this feature. Update <the attributes>:

In the example shown above on the left, the *Date Visited* attribute has been set up to auto-generate on update. As soon as you make any change to the attributes or position of the feature, this attribute is automatically updated with today’s date as shown above on the right.

4. Tap **Done** to save the attribute changes and return to the *Update Features* screen.
Update position information

You can update a feature’s position by logging new GNSS data. This data replaces all positions previously recorded for the feature.

To update the position information for a feature:

1. Select <the feature> from the Choose Feature list and tap Begin. The attribute entry form appears:

2. Tap Log.
3. Select <update or append> and then tap OK.
4. When the logging is completed, tap OK and then tap Yes when the TerraSync software prompts you to confirm the position update.

   The TerraSync software starts logging GNSS data and replaces any existing position data.
5. When you have finished collecting positions for a feature, tap Done.

   Note: You can also use digitizing to update a feature’s positions.

Mark a feature as updated

When you mark a feature as updated, the TerraSync software changes the feature status only. It does not change any attributes (except for date attributes that are set to automatically generate on update), offsets, or positions. You can use this function to indicate which features you have visited in the field but have not changed.

To mark a feature as updated:

1. Activate the Map section. If it is not, tap the Section list button and select Map.
   The feature that you navigated to should be the highlighted feature.
2. Double-tap <the feature to display its attribute entry form>.
3. Select the Mark as updated check box.
4. Tap **OK**. The attribute entry form closes and you are returned to the Map section.

**Close the file**

When the data update session is completed, exit the TerraSync software:

1. Tap the **Section icon** in the upper left of the TerraSync window. Select **Exit** from the Section list. A message appears, asking you to confirm that you want to close the file and exit the software.
2. Tap **Yes** to close the file and exit the TerraSync software.
Waypoints and Navigation

When collecting new data or updating your data, you may want to use a waypoint file to aid in navigation. This section shows you how to use the waypoints and navigation capabilities of the TerraSync software.

Chapter objectives

The chapter objectives are:

- Create a new waypoint file
- Use the Data and Nav sections in the TerraSync software for target selection
- Understand the turn-by-turn procedure (if applicable)
- Navigate to features and waypoints
- Understand the difference between a Nav Start and a Nav Target
- Transfer a waypoint file to the GPS Pathfinder Office software

Waypoints

A waypoint is a geographical point that, unlike a feature, holds no attribute information beyond a name and location. Typically, waypoints are used to denote objects whose locations are of primary interest, such as a survey mark. Waypoints are most often used for navigation.

Waypoint files are displayed in the Map section as a separate layer to your data file. The Waypoint subsection is available in the Nav section.
Create a waypoint file and a new waypoint

To create a waypoint file and a new waypoint:

1. Tap the **Section list button** and select **Navigation**.
2. Tap the **Subsection list button** and select **Waypoints**:

One of the following now happens:

- If there are existing waypoint files, the Waypoint File screen appears. Tap **New**.
- Or, if there is no existing waypoint file, the **Create Waypoint File** form appears:
3. Enter `<an appropriate file name>` and then tap **OK**. The Waypoint List appears.

4. To create a waypoint, tap **Options** and then select **New**. The **New Waypoint** form appears as shown.

   Do the following:
   - Enter `<an appropriate name>` for the waypoint.
   - Enter `<the position coordinates>`. You can either do this manually, or tap **Create From** and then select either the **current GNSS position**, or the **last selected map point**.

5. When you have created the waypoint, tap **OK**. The waypoint is created and the **Waypoint List** screen appears. The ID number, visitation status, name, and distance are shown for each waypoint:

   To view the waypoint in the Map screen, tap the **Section list button** and select **Map**. The waypoint icon 📍 marks the location of waypoints. The default color for the waypoint icon is dark magenta.
Navigate to a target
You can now visit each feature displayed and update its attributes. To locate a feature, first select it as the target. You can do this in either the Data section or the Map section.

Once you have selected a target, navigate to it using either a supported version of the turn-by-turn navigation software, the Navigation section, or the Map section.

If you also specify a navigation start point, you can use the graphical lightbar in the Navigation section or the Map section to find the shortest path from the start to the target (the cross-track line). The lightbar guides you towards the navigation target by graphically representing the cross-track error. This is the amount and direction by which your heading differs from the cross-track line.

Navigation start
The navigation start can be any of the following items:

- the selected point feature
- the start, middle, end, or selected vertex of the selected line feature
- the start/end, centroid, or selected vertex of the selected area feature
- the current GNSS position
- a waypoint
- the selected map point in the Map section

Navigation target
The navigation target can be any of the following items:

- the selected point feature
- the start, middle, end, or selected vertex of the selected line feature
- the start/end, centroid, or selected vertex of the selected area feature
- a position that you specify as an offset from the start position
- a waypoint
- the selected map point in the Map section

The following sections describe how to locate a target. First, you will select the start and target in the Data section, and then navigate from the start to the target using the Navigation section. Then, you will use the Map section to select the target and navigate to it.

Select the navigation start in the Data section
You can select the navigation start from the list of existing features in the Data section. To set the navigation start in the Data section:

1. In the Update Features screen, highlight the feature to start from.
2. Tap Options and then select Set Nav Start.
3. Select the required feature option. The feature options are identified by the feature number and...
feature type (for example, 173 Road - Start is the feature option for the start point of the Road feature that has ID number 173).

The start icon † appears beside the selected feature, replacing its feature icon.

**Note:** If you are connected to GNSS, you can also select the current GNSS position as the navigation start. To do this, tap Options, select Set Nav Start, and then select GNSS.

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Select a target in the Data section

You can select the navigation target from the list of existing features in the *Data* section.

To set the navigation target:

1. In the *Update Features* screen, highlight <the feature to update>.
2. Tap **Options** and select **Set Nav Target**.
3. Select <one of the feature options>. The feature options are identified by the feature number and feature type (for example, 5 Traffic Sign is the feature option for the traffic sign that has ID number 5).

The target icon ‡ appears beside the selected feature, replacing its feature icon.

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**Note:** You can also specify the navigation target as an offset from the navigation start. To do this, tap **Options**, select **Set Nav Target**, select **Construct**, and then specify <the offset bearing and direction>.
Navigate to a target in the Navigation section

Once you have selected a target, you can use the Navigation section to navigate to it, or the TerraSync software will launch a supported version of turn-by-turn navigation software. To open the Navigation section, tap the Section list button and select Navigation. The Direction Dial screen appears, as shown:

![Direction Dial Screen](image)

Note: In this view, the center of the screen is your current position. This screen is not depicted “North Up” but is “Heading Up”.

This screen displays all the information that you need to navigate to the target. The information fields at the bottom of the screen show different types of navigational information. To change the information that is shown on each button, tap the drop-down arrow on the right side of the button, and select <an information field> from the list that appears. For a list of the information fields that are available, refer to the TerraSync Software Getting Started Guide.

To navigate to the selected target using the direction dial, start moving so that the TerraSync software can calculate your initial heading. When the direction dial shows the turn arrow, keep moving and turn until the arrow is lined up with your current heading, which is always at the top of the screen. Then move towards the target, adjusting your direction to ensure you are always heading towards the target.

Note: If you are moving very slowly, or are stationary, the direction dial does not update, and the message Heading locked appears.

When you are within a few meters of the target, the view switches to the Close-up screen. In the Close-up screen, your position is indicated by the X and the target is represented by the bull's-eye 🍀:
As you move closer to the target, the position symbol gets closer to the target symbol. You have reached the target when the position symbol is over the top of the target symbol.

*Note:* If you are using Autonomous GNSS, the position may jump around on the screen.

*Note:* In the Close-up screen, your heading is not updated. It is best to face in the same direction and move sideways, backwards, or forwards, rather than turn.

If you have selected a navigation target, you can use the lightbar instead of the direction dial to navigate along the shortest path from the start to the target (the cross-track line).

When the three center icons in the lightbar are green and all the other icons are gray, you are traveling along the cross-track line. When other icons are lit in green or red, you are off track. To get back on track, turn in the direction of the lit arrow icons. Continue to adjust your heading until the three center icons are green.

The lightbar’s appearance and behavior depend on the lightbar mode that you have selected: Center or Chase.

**Center mode**

In Center mode, the center of the lightbar represents the cross-track line, and the lit icons represent your heading. To stay on track you must “pull” the lit icons towards the center of the lightbar. The arrow icons point towards the cross-track line. If you are off track, turn in the direction that the lit arrow icons are pointing. For example, if arrow icons on the left side of the lightbar are lit, your heading is to the left of the cross-track line, so you must turn to the right to correct your heading.

**Chase mode**

In Chase mode, the center of the lightbar represents your heading, and the lit icons represent the direction of the cross-track line. To stay on track you must “chase” the lit icons. The arrow icons point towards the cross-track line. If you are off track, turn in the direction that the lit arrow icons are pointing. For example, if arrow icons on the left side of the lightbar are lit, the cross-track line is to the left of your heading, so you must turn to the left to correct your heading.
Selecting features and waypoints as targets in the Map section

You can use the Map section to select a target. To select a target using the Map section:

1. Tap the Section list button and select Map.
2. If necessary, zoom in or out until all the features in the data file are visible.
3. Tap the target and hold (or right click if you are running the software on a computer):
4. Select one of the Set Target feature options (for example, Set Target is the option for the selected feature).
5. The blue target icon appears at the Nav target:
6. If you select a Nav start and a Nav target, a blue flag appears at the Nav start, and a vector is drawn between the Start and Target icons:

Navigate to a target in the Map section

Once you have selected a target, you can use the map to guide you to this target, or if you have a supported version of turn-by-turn navigation software, the TerraSync software switches to it to navigate to the feature.

The GNSS cursor ➤ shows your current position and heading. If you have also selected a navigation start, the cross-track line appears on the TerraSync map, and you can use the lightbar to guide you along the cross-track line to the target – both are shown in this example.

To navigate to the target, make sure the heading arrow on the GNSS cursor points towards the target as you move. You may need to zoom or pan to ensure the target and GNSS cursor are both visible. When the target is not in the visible display, the bearing arrow ❯ appears at the edge of the map to show its direction.

When the GNSS cursor lies over the target icon, you have successfully navigated to the target.
Transfer a waypoint file to the office computer

To transfer the rover file from your data collector to the office computer:

1. In the GPS Pathfinder Office software, select Utilities / Data Transfer. The Data Transfer dialog appears.
2. From the Device list, select GIS Datalogger on Windows Mobile. Alternatively, if you have set up a device definition for your data collector, select that device name from the list.
   The Data Transfer utility automatically connects to the data collector.
3. Select the Receive tab.
4. Click Add and select Waypoint from the drop-down list. The Open dialog appears.
   Note: The files that appear are the files in the TerraSync software data folder on the data collector.
5. Highlight <the waypoint file to upload> and then click Open. The Open dialog disappears and the selected file appears in the Files to Receive list.
6. To transfer the data file to the office computer, click Transfer All.
7. A message box showing summary information about the transfer appears. To close it, click Close.
8. Click Close to exit the Data Transfer utility.

Note: For more information, refer to the GPS Pathfinder Office Help.