TSC1 Asset Surveyor
Software User Guide

Trimble™

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About this Manual

Welcome to the *TSC1 Asset Surveyor Software User Guide*. This manual describes how to operate the Asset Surveyor™ software, in conjunction with a range of Trimble GPS receivers for GIS data collection and update. The Asset Surveyor software provides all the functionality you need to efficiently collect GIS/GPS data.

Even if you have used other Global Positioning System (GPS) products before, we recommend that you spend some time reading this manual to learn about the special features of this product.

If you are not familiar with GPS, visit our web site for an interactive look at Trimble and GPS at:

- www.trimble.com

Related Information

Other manuals in this set include:

- *TSC1 Asset Surveyor Operation Manual*

    This manual describes how to operate the Asset Surveyor software.

- *Mapping Systems General Reference*

    The *Mapping Systems General Reference* explains general GPS and GIS concepts, as well as the Trimble Survey and Mapping Bulletin Board.

- GPS Pathfinder Office Documentation

    The GPS Pathfinder Office Getting Started Guide contains a tutorial chapter that shows you how to use many features that are common to the GPS Pathfinder® Office software and the Asset Surveyor software.

As well as being supplied in hardcopy, these manuals are also available in portable document format (PDF). These files are available from the Asset Surveyor installation CD-ROM.

- Readme.txt file – a Readme.txt file contains information added after the documentation was completed. To read this file, double-click it or use a text editor to open it.

- Release notes – the release notes describe new features of the product, information not included in the manuals, and any changes to the manuals.

- Update notes – there is a warranty activation sheet with this product. Send it in to automatically receive update notes containing important information about software and hardware changes. Contact your local Trimble Dealer for more information about the support agreement contracts for software and firmware, and an extended warranty program for hardware.

- ftp.trimble.com – use the Trimble FTP site to send files or to receive files such as software patches, utilities, service bulletins, and FAQs. Alternatively, access the FTP site from the Trimble web site at www.trimble.com/support/support.htm.

- Trimble training courses – consider a training course to help you use your GPS system to its fullest potential. For more information, visit the Trimble web site at www.trimble.com/support/training.htm

- RTCM – for information on RTCM SC-104 contact:

  Radio Technical Commission for Maritime Services
  P.O. Box 19 087
  Washington, D.C. 20036
  U.S.A.

Technical Assistance

If you have a problem and cannot find the information you need in the product documentation, *contact your local Distributor.* Alternatively, request technical support using the Trimble web site at:

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• Complete the Reader Comment Form at the back of this manual and mail it according to the instructions at the bottom of the form.

If the reader comment form is not available, send comments and suggestions to the address in the front of this manual. Please mark them *Attention: Technical Publications Group*.

Document Conventions

The document conventions are as follows:

Convention	Definition
Italics	Identifies software menus, menu commands, dialog boxes, and the dialog box fields.
Helvetica Narrow	Represents messages printed on the screen.
Helvetica Bold	Identifies a software command button, or represents information that you must type in a software screen or window.
⏎Enter	Is an example of a hardware key (hard key) that you must press on the TSC1 keypad.
Ctrl	Is an example of a hardware function key that you must press on a personal computer (PC). If you must press more than one of these at the same time, this is represented by a plus sign, for example, Ctrl+C.
Del	Is an example of a softkey. The operation of softkeys is explained in the *TSC1 Asset Surveyor Operation Manual*.

Introduction to the Asset Surveyor Software

In this chapter:

- ■ Introduction
- ■ What Is the Asset Surveyor software?
- ■ Which computers does the Asset Surveyor software run on?
- ■ What does the Asset Surveyor Software do?
- ■ Which GPS receivers does the Asset Surveyor software work with?

Introduction

Congratulations on purchasing the Trimble Asset Surveyor™ GIS/GPS data collection system. The combination of sophisticated data collection software and GPS positioning hardware enables you to efficiently collect and update high quality GIS data.

What Is the Asset Surveyor Software?

The Asset Surveyor software is a computer program produced by Trimble Navigation Limited for a wide range of Geographic Information System (GIS) data collection and data update applications.

The Asset Surveyor software works with a range of Global Positioning System (GPS) receivers produced by Trimble Navigation Limited.

Which Computers Does the Asset Surveyor Software Run On?

The Asset Surveyor software runs on the Trimble TSC1™ datalogger. The TSC1 datalogger is an extremely rugged, lightweight, and waterproof handheld computer. The TSC1 datalogger can be used for GIS data collection applications in the most hostile environments. The TSC1 datalogger also runs the Trimble Survey Controller™ software, and a single TSC1 datalogger can be shared between GIS and Land Survey applications. The TSC1 datalogger has 2MB of memory for collected data, as well as a PC card slot where data storage cards can be used for extended memory storage.

What Does the Asset Surveyor Software Do?

The primary function of the Asset Surveyor software is the automated collection and/or update of information related to geographic features. Together with a Trimble GPS receiver, the Asset Surveyor software can quickly and accurately collect or update the attributes and GPS position of geographic points, lines, and areas. This information is stored in one or more data files, which you can load into the Trimble GPS Pathfinder® Office software suite. After postprocessing and editing, data can then be output in a wide range of GIS-compatible formats.

Applications for the Asset Surveyor software include forestry mapping, environmental and resource management, disaster assessment, utility inventories, and urban asset management. For example, a power company could build an asset register of all its power poles, record their positions (to within a meter), their condition and structure, and any attached hardware. A maintenance crew may later use the software's navigation functions to locate poles requiring repair. You can also use the data maintenance capability of the Asset Surveyor software to update the position and attribute information for features in the field to ensure that your GIS database is accurate and up to date.

You can review, edit, or delete data in the field so that the data that you collect and take back to the office is correct and complete.

The Asset Surveyor software provides convenient and powerful control of your Trimble GPS receiver, enabling you to take full advantage of the potential that GPS offers.

The Asset Surveyor software lets you collect carrier phase data for points, lines, and areas to compute positions to decimeter accuracy with version 2.00 or later of the GPS Pathfinder Office software. The Asset Surveyor software, when used with a GPS Pathfinder Pro XR™ or a Pro XRS™ receiver, can also collect data to recorrect real-time differential data collected in the field, for even greater accuracy.

You can operate the Asset Surveyor software as a temporary GPS base station in situations where it is impossible or impractical to set up a permanent base station. The Asset Surveyor software, in combination with one of the GPS Pathfinder Pro XL™, Pro XR, or Pro XRS, GPS Total Station 4700™, GPS Total Station 4800™, Series 4000™ or Site Surveyor 4400™ GPS receivers, can output RTCM messages when operating as a base station. These messages can be received by a number of GPS Pathfinder receivers with a suitable radio link.

The Asset Surveyor software can be used in conjunction with an RTK receiver for Real-time Kinematic (RTK) data collection.

The Asset Surveyor software lets you use your Trimble GPS receiver for navigation to a waypoint or to a previously recorded geographic feature.

The Asset Surveyor software provides integrated support for a number of laser rangefinders used to record offsets to geographical features. The use of offsets makes it possible to collect data in circumstances where the use of GPS alone might be inconvenient or even impossible.

The Asset Surveyor software can collect data from a wide range of external sensors equipped with an RS232 port. Each reading from the external sensor can be stored as an attribute of a feature, or have a GPS position associated with it. This lets you correlate information from instruments such as depth sounders, Geiger counters, and tree calipers, with GPS positions.

The Asset Surveyor software has been translated into a number of languages. For each supported language (French, German, Portuguese, Russian and Spanish) all text displayed by Asset Surveyor appears in that language, instead of English.

Which GPS Receivers Does the Asset Surveyor Software Work With?

The TSC1 Asset Surveyor software works with the following Trimble GPS receivers:

- the GPS Pathfinder receiver family, which includes the GPS Pathfinder Pro XRS, the GPS Pathfinder Pro XR, and the GPS Pathfinder Pro XL

- GPS Total Station 4700

- GPS Total Station 4800

- Site Surveyor 4400

- 4600LS Surveyor

- the Series 4000 GPS receiver family, which includes the 4000SE™, 4000SSE™, and the 4000SSi™

Basics of Operation

In this chapter:

- Introduction
- Starting and stopping the Asset Surveyor software
- Asset Surveyor menu structure
- Screen displays
- User interface components
- Using menus
- File naming conventions
- Software and firmware version numbers

Introduction

This chapter describes how to use the Asset Surveyor software using the TSC1 datalogger as a platform. It provides a description of Asset Surveyor user interface and data entry concepts.

The Asset Surveyor software makes GIS data collection and update a faster and more efficient process. The best way to learn how to use the Asset Surveyor software in conjunction with the TSC1 datalogger is to take it out into the field and practise.

Starting and Stopping the Asset Surveyor Software

You generally do not have to stop the Asset Surveyor software as you can just turn off the TSC1 datalogger when you have finished using it and turn it on again when you next want to use it.

When you turn the TSC1 datalogger on (by pressing $\boxed{\bigcirc}$), the Asset Surveyor software starts and the *Main menu* appears.

You can restart the Asset Surveyor software by rebooting your TSC1 datalogger. This should rarely be necessary.

When you have finished using the Asset Surveyor software, press the $\boxed{\bigcirc}$ key to stop the Asset Surveyor software and turn off the TSC1 datalogger.

If you turn the TSC1 datalogger off while a file is open or the Asset Surveyor software is logging data to a file, the Asset Surveyor software closes the file before shutting down.

⚠ **Warning –** Trimble recommends that you do not turn off the TSC1 datalogger while upgrading software, or while transferring files between the datalogger and the PC or PC card. Otherwise your data or system files may be corrupted.

Asset Surveyor Menu Structure

For an overview of the entire Asset Surveyor menu structure, see the following section. Keep it as a reference until you are familiar with the menu structure.

To display the *Main menu* screen regardless of which window is active, press [Menu].

The Asset Surveyor *Main menu* consists of eight menu entries, each represented by an icon:
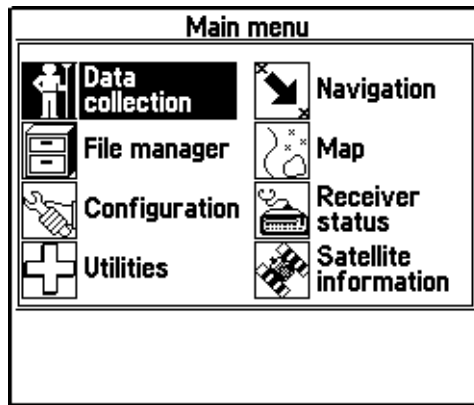
To move between items on the *Main menu*, use the multi-directional arrow key. To select a menu item, highlight the icon and press [Enter].

Figure 2.1 and Figure 2.2 list the commands in each menu.

Data collection

Create new file
Open existing file
Create base file

File manager

Delete file(s)
Rename file
Copy file(s)
Move file(s)
File transfer
Data dictionaries
Coordinate system files

Configuration

GPS rover options
GPS base station options
NMEA/TSIP output options
Coordinate system
Map display options
Navigation options
Units and display
Time and date
Quickmarks
Constant offset
External sensors
Hardware (TSC1)

Logging options
Position filters
Real-time input
Antenna options
Initial position
2D altitude

Logging options
Position filters
Real-time output options
Reference position
Antenna options

Figure 2.1   Data Collection, File Manager, and Configuration menu commands

Utilities

Waypoints
Factory defaults
Reset GPS receiver
Almanac
Disconnect GPS
Note

Navigation (Press `Mode` to switch modes)

Direction dial
Road

Map (Press `Mode` to switch modes)

Map
Text mode

Receiver status

GPS
DGPS

Satellite information (Press `Mode` to switch modes)

Text mode
Skyplot
SNR levels
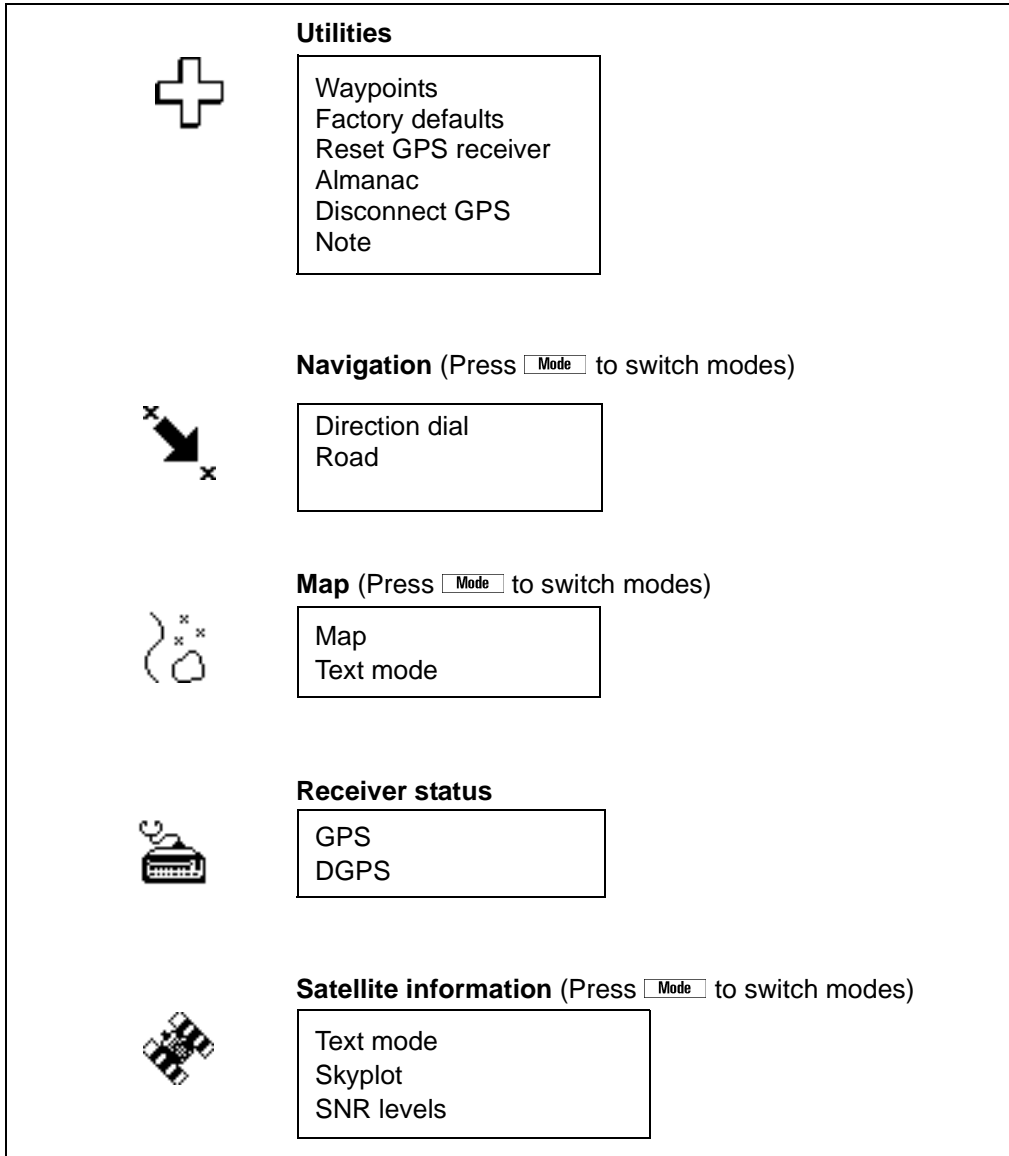
Figure 2.2   Utilities, Navigation, Map, Receiver Status, and Satellite Information menu
commands

Screen Displays

Figures 2.3 to Figure 2.5 show some of the more common TSC1 screen displays and describe some of the features in these screens.
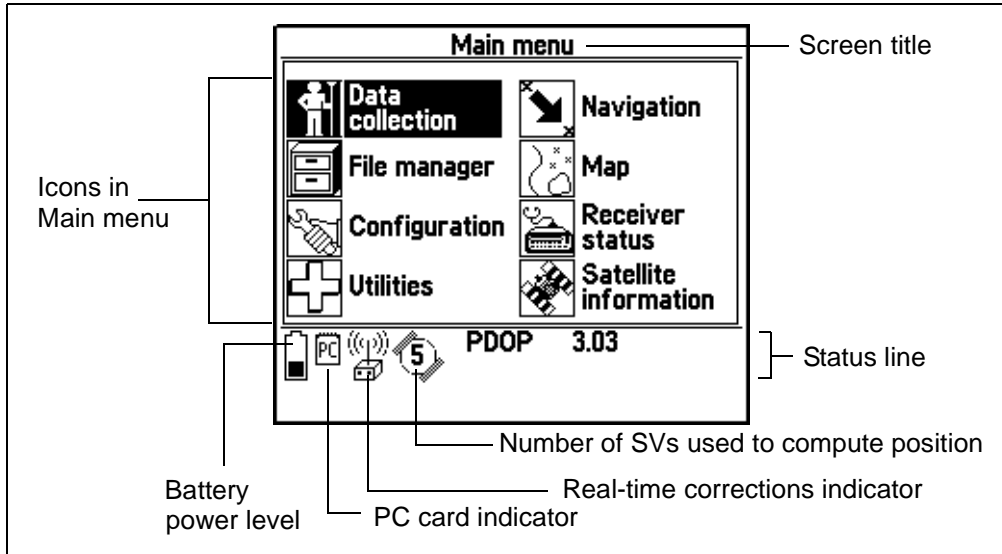
Figure 2.3   Main menu screen
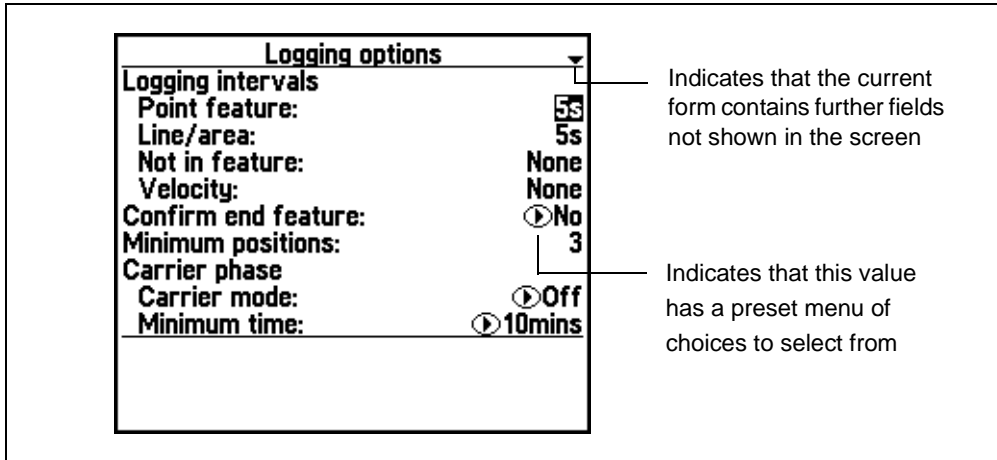
Figure 2.4   Screen indicators
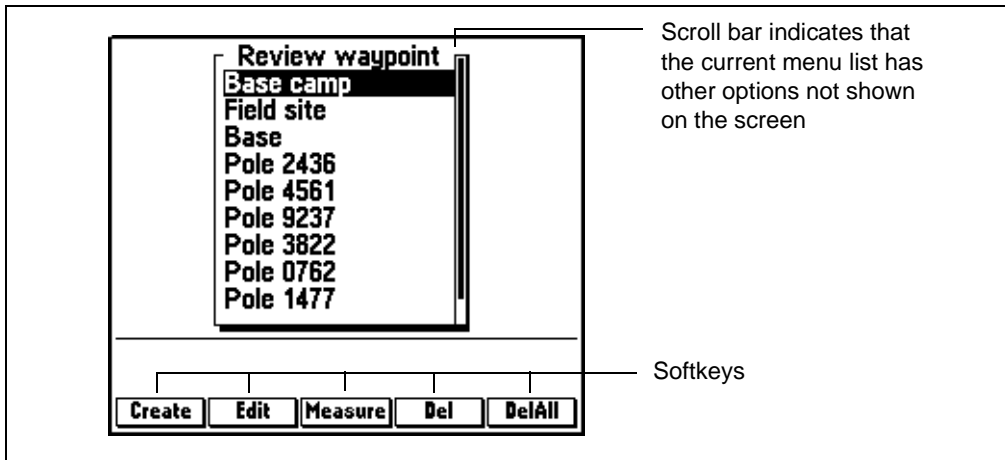
Figure 2.5   Screen indicators

Status Line Display

When you connect the TSC1 datalogger to a receiver, various icons appear in the status line.

Table 2.1 lists and explains these icons.

Table 2.1   Status line icons

The icon …	indicates …
	the level of the power source (external or internal) in use. In this case, the level is 40%.
	that a PC card is inserted.
	that a PC card is in use and that you should not remove it.
	that real-time corrections are being received from an external radio.
	that real-time corrections are being received from a Beacon-on-a-Belt (BoB) receiver.

Table 2.1   Status line icons (Continued)

The icon …	indicates …
	that real-time corrections are being received from the receiver's integrated beacon receiver.
	that real-time corrections are being received from a satellite differential service, using the receiver's integrated satellite receiver.
	that real-time corrections are being received from the Wide Area Augmentation System (WAAS) satellite differential service, using the receiver's integrated satellite receiver.
	the number of satellites the receiver is using to compute GPS positions.

Note – The five real-time icons are also used in the DGPS status summary form to indicate which real-time correction source is currently in use. For more information, see DGPS Status, page 366.

User Interface Components

You can interact with the Asset Surveyor software in a variety of ways, each of which is described below.

Hard Keys

These are the physical keys on the TSC1 keypad. They include alphabetic and numeric keys as well as special-purpose keys such as ⟨Enter⟩ or ⟨Sp⟩.

Softkeys

When the TSC1 datalogger is on, the bottom line of the screen shows a number of *softkeys*, which vary depending on context. Each softkey corresponds to one of the *function* (hard) keys, numbered ⟨F1⟩ to ⟨F5⟩. Pressing the corresponding function key activates the function indicated by the softkey label. Figure 2.6 shows an example of an Asset Surveyor screen with five softkeys.
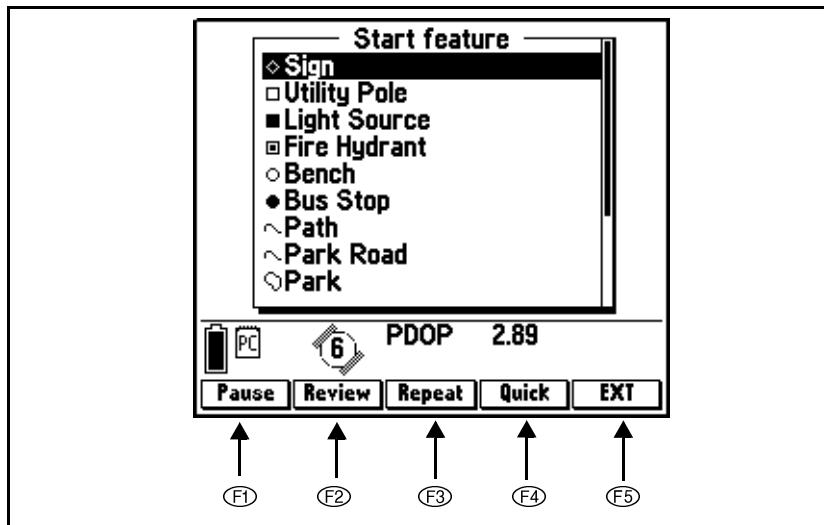
Figure 2.6   Softkeys

For example, press Ⓕ① to activate the ⎡Pause⎤ function, and Ⓕ② to activate the ⎡Review⎤ function.

Occasionally, there are too many softkeys on a particular form or menu to fit on the screen. When this happens, the fifth softkey appears as ⎡·→·⎤. You can press ⎡·→·⎤ to step from one 'page' of softkeys to the next. Press the softkey you require when its 'page' appears. When there are fewer than five softkeys, the remaining function key(s) perform no action.

Pop-up Messages

Occasionally, messages pop up on the TSC1 screen. For example:

```
┌──────────── Warning ──────────────┐
│  Carrier phase data collection works│
│   best when in Overdetermined 3D   │
│              mode.                 │
├────────────────────────────────────┤
│                                    │
│                                    │
│                                    │
│                                    │
│                                    │
│ ┌──────┐                           │
│ │  OK  │                           │
│ └──────┘                           │
└────────────────────────────────────┘
```
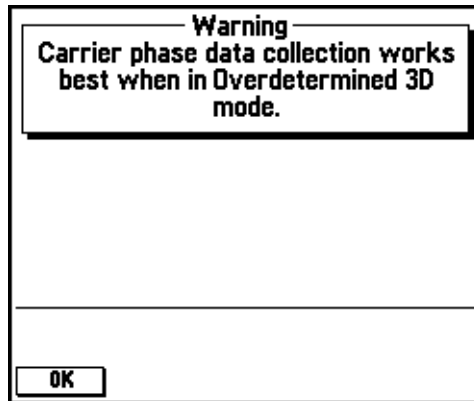
'Warning' messages automatically disappear after four seconds, but can also be dismissed manually by pressing ⎡Esc⎤. 'Error' messages should be noted and can then be dismissed from the screen by pressing ⎡Esc⎤.

When the Asset Surveyor software is performing a lengthy task (anything longer than about two seconds), a message appears. For example:

```
┌Please wait┐
│Processing │
└───────────┘
```
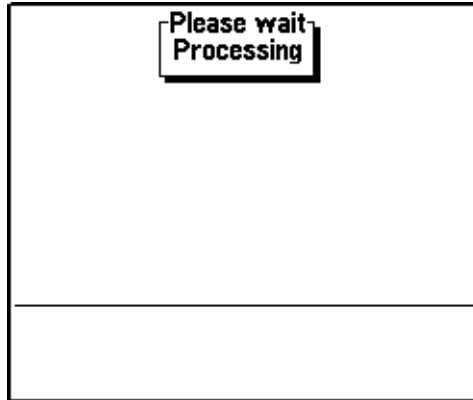
When this message appears, wait until the Asset Surveyor software has completed the task and the message disappears, or press ⌐Esc⌐ to cancel the task.

The Asset Surveyor software may also provide a progress bar to indicate how long the task may take to complete. For example:

```
Calculating. Press Esc to abort
            24%
```
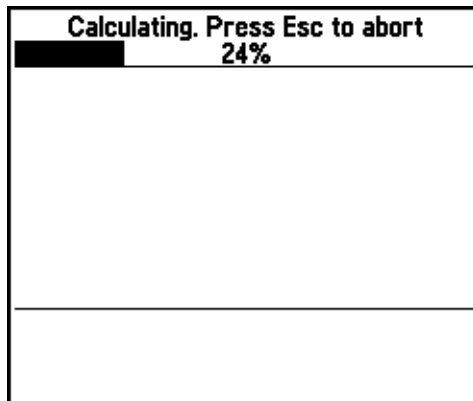
If you do not want to wait for the Asset Surveyor software to complete the task, you can cancel the task by pressing ⌧Esc. There are a few critical tasks which cannot be cancelled. If the software is performing a critical task and you press ⌧Esc to cancel it, the Asset Surveyor software simply beeps and continues with the task.

Menus

All of the Asset Surveyor software's functionality can be accessed easily by selecting menu topics. The *Main menu* is shown below:
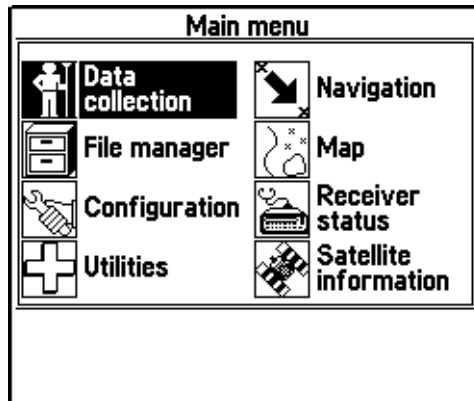
The *Data collection*, *File Manager*, *Configuration*, and *Utilities* entries open into submenus containing further menu entries for you to choose from. For example, selecting the *Configuration* entry takes you to the *Configuration* menu:

```
┌─── Configuration ───┐
│ GPS rover options   │
│ GPS base station options │
│ NMEA/TSIP output options │
│ Coordinate system   │
│ Map display options │
│ Navigation options  │
│ Units and display   │
│ Time and date       │
│ Quickmarks          │
│                     │
│                     │
└─────────────────────┘
```
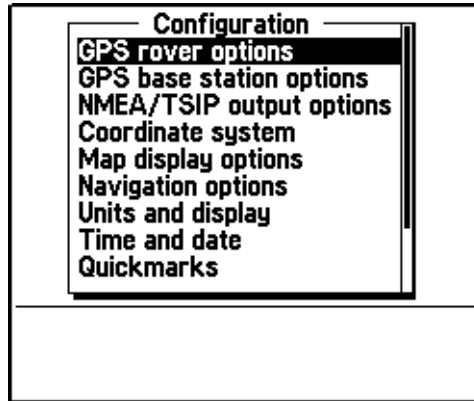
Menu Stacks

The TSC1 menu system lets you open multiple screens in the Asset Surveyor software without having to exit the screen you are currently in. To do this, use the ⌨Menu and ⌨Next keys on the TSC1 keypad.

The ⌨Menu key opens the *Main menu* from anywhere within the Asset Surveyor software so that you can enter a new screen while leaving your current screen open. You can have several screens open in the Asset Surveyor software at any one time.

Use the ⌨Next key to view each open window. It works in much the same way as the ⌨Alt + ⌨Tab key combination does in the Microsoft Windows operating system.

For example, from the *Main menu* select *File manager / Delete file(s)*. Now press ⌂Menu to return to the *Main menu* and select *Satellite information*. Press ⌂Menu again to return to the *Main menu* and select *Configuration / Hardware*. There are now three windows (*Delete file(s)*, *Satellite information*, and *Hardware*) open at the same time. By pressing the ⌂Next key successively, you can quickly view all of the screens open in a menu stack. To remove a window from this stack, simply view the window (by pressing ⌂Next until the window appears) and press ⌂Esc to return to the *Main menu*.

Only one screen from each *Main menu* entry may be open in the window stack at any one time. If you select an entry from the *Main menu* that already has a screen open in the stack, the Asset Surveyor software takes you directly to the open screen and you are not be able to open another screen within that menu until you exit the open screen. For example, if the *Configuration / GPS rover options / Logging options* form is open in the stack, selecting *Configuration* from the *Main menu* takes you directly to the open *Logging options* form. You cannot open another screen within *Configuration* (for example, *Units and Display*) until you exit out of *GPS rover options*.

Using Menus

A menu has a current entry, which is highlighted. For example, the following menu has the *Waypoints* option as its current entry:

```
┌─────── Utilities ───────┐
│ Waypoints               │
│ Factory defaults        │
│ Reset GPS receiver      │
│ Almanac                 │
│ Disconnect GPS          │
│ Note                    │
└─────────────────────────┘
```
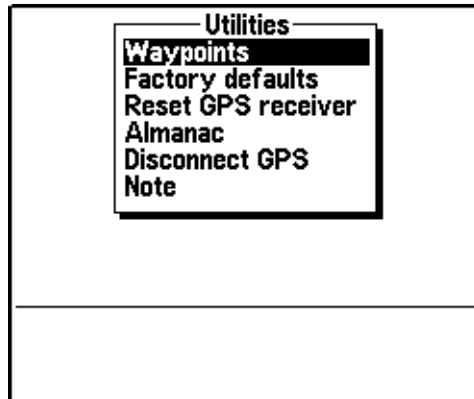
You can choose a different entry from the menu by moving the highlight to your preferred entry and ***selecting*** it (by pressing ⌨Enter or the ⊙ key). You can move the highlight in a number of ways:

- The ⍐ and ⍗ keys move the highlight up or down the menu a single entry at a time.

  If you highlight the first entry in the menu, and press ⍐, the highlight moves to the last entry in the menu. This is a convenient way to travel quickly to the bottom of the menu and lets you browse through a menu circularly. Similarly, if you highlight the last entry in the menu and press ⍗, the highlight moves to the first entry in the menu.

- Pressing (Fn)⍐ and (Fn)⍗ moves the highlight up or down a page at a time. The length of a page is normally 9 entries.

  The (Fn)⍐ and (Fn)⍗ keys do not behave circularly. Once you are less than a page from the top of the menu, pressing (Fn)⍐ again just takes you to the first entry in the menu.

•   Pressing $\boxed{Fn}$⊸ and $\boxed{Fn}$⊶ moves the highlight to the first and last entries in the menu, respectively.

•   Pressing an alphanumeric key corresponding to the first letter of a menu entry moves the highlight directly to that entry. If there is more than one entry in the menu starting with that letter, pressing that alphanumeric key repeatedly steps through the entries beginning with that letter. If you highlight a menu entry by typing the first letter of its name, and it is the only entry in the menu which starts with that letter, the entry is selected automatically.

Tip – This "first-letter" method is often the fastest way of selecting an entry from a menu.

If a menu has more entries than will fit onto the TSC1 screen at one time, the entries in the menu scroll up and down within the visible pop-up menu. If there are entries that you cannot currently see, a scroll bar appears on the right-hand border of the menu. The following menu has further entries below those which can currently be seen:

```
┌──── Coordinate system ────┐
│ Latitude/Longitude        ▓│
│ Argentina                  │
│ Australian Map Grid        │
│ Austria                    │
│ Bangladesh                 │
│ Borneo RSO                 │
│ Brazil                     │
│ Colombia                   │
│ Croatia                    │
│                            │
│                            │
│ [OverUp]                   │
└────────────────────────────┘
```
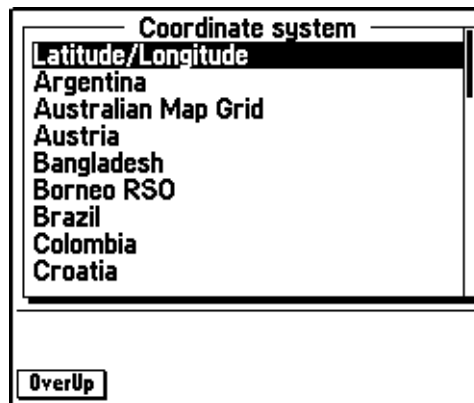
The following is a menu which has entries both above and below those which can currently be seen:

```
┌─────── Coordinate system ───────┐
│ Japanese State Plane            █
│ Korea                           █
│ Malaysian RSO Grid              █
│ Namibia                         █
│ Netherlands                     █
│ New South Wales ISG             █
│ New Zealand LC                  █
│ New Zealand Map Grid            █
│ New Zealand NYG                 █
└─────────────────────────────────┘

┌───────┐
│ OverUp│
└───────┘
```
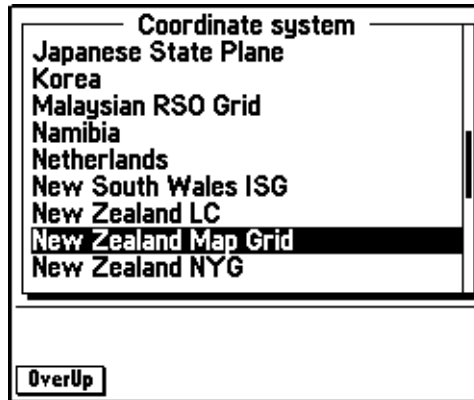
Questions

Whenever a question message appears, use the softkeys provided to respond. An example of a question is:

```
┌──────── Please confirm ─────────┐
│ Clear waypoints file, deleting all │
│         current waypoints?         │
├────────────────────────────────────┤
│                                    │
│                                    │
│                                    │
│                                    │
│                                    │
│ ┌─────┐                  ┌─────┐   │
│ │ Yes │                  │ No  │   │
│ └─────┘                  └─────┘   │
└────────────────────────────────────┘
```

To select [Yes], press one of the following:

- (F1)

- [Y]

- [Enter]

To select [No], press one of the following:

- (F5)

- [N]

- [Esc]

Forms

Data entry in the Asset Surveyor software takes place in *forms*. These are like paper forms, because they are made up of a title and a sequence of lines or fields. An example of an Asset Surveyor form is the following attribute entry form, produced using a data dictionary:

```
┌──────────────────────────────────┐
│        «Fire hydrant (New) »      │
│ Color:                   ▷Green   │
│ Number of spouts:              2  │
│ Last visited:      08/11/1999 Wed │
│ Comment: Needs to be repainted in pla... │
│                                   │
│                                   │
│                                   │
│                                   │
│ ▮     ◈6◈   PDOP  2.32        20  │
│ ┌─────┬────────┬─────┬────────┐   │
│ │Pause│ Review │ EXT │ Offset │   │
│ └─────┴────────┴─────┴────────┘   │
└──────────────────────────────────┘
```

Fields

Each field generally has two parts: a *prompt* (or name) and a *value*. Each prompt is usually followed by a colon (:) to clearly separate it from its value. Some fields are *separator* fields, which have no value and serve simply to divide a form into sections.

The example form shown above has the title 'Fire hydrant (New)' and four fields, each with a prompt on the left and a value on the right.

Each form has a current field, which is highlighted. Any editing operations on a form apply to the current field. If the field's value can be edited, then the value is highlighted. Otherwise, the field's prompt is highlighted. In the example above, the current field is the *Color* field.

If a field's value cannot be shown in full due to the limited width of the TSC1 screen, ellipses (…) indicate that not all of the field's value is visible. For example, the full value of the *Comments* field in the example above is 'Needs to be repainted in places'.

*Note – There is a special field value, called the **null** value, which denotes no value at all. This is often supplied as the default value for a field, to ensure that you enter a real value. The null value is usually displayed as a '?' character, but the Asset Surveyor software lets you configure the null value if you want.*
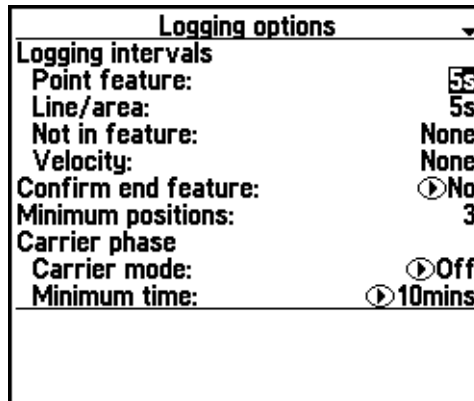
Tip – You can choose the default value for each attribute, and whether data entry is required or prohibited, when you create a data dictionary. For more information, see the GPS Pathfinder Office Help.

Windows

The contents of an Asset Surveyor form are displayed on the full TSC1 screen. Forms vary in length and often a form has too many fields (lines) to fit entirely in its window. When this happens, you can scroll the fields in the form up and down by moving the highlight to see the other fields on the form.

If a form contains too many fields to fit on the TSC1 screen at one time, a ▼ appears on the right side of the form's title line, as shown in the following example:

```
┌──────────────────────────────────┐
│        Logging options        ▾  │
│ Logging intervals                │
│   Point feature:              ▣5s│
│   Line/area:                   5s│
│   Not in feature:            None│
│   Velocity:                  None│
│ Confirm end feature:        ⓘNo  │
│ Minimum positions:             3 │
│ Carrier phase                    │
│   Carrier mode:             ⓘOff │
│   Minimum time:           ⓘ10mins│
│                                  │
│                                  │
│                                  │
└──────────────────────────────────┘
```

When you are on the last page of the form, the ▼ changes to ▲ .

Moving between fields

A form's current field is distinguished by having its prompt or value highlighted. If the field can be edited, then the value is highlighted, but if the field is purely informative, and cannot be edited, then the prompt is highlighted instead. Various keystrokes can be used to move the highlight from field to field, as shown in Table 2.2.

Table 2.2   Moving the highlight using keys

Press ...	To move the highlight ...
ⓐ	Up one field
ⓥ	Down one field
Fn ⓐ	Up one page
Fn ⓥ	Down one page
Fn ◁	To the first field in the form
Fn ▷	To the last field in the form

A page of a form is the same size as the form's window. This means that you can see each page by pressing Fn ⓥ repeatedly.

Some forms are divided into sections, where each section starts with a caption field. Typically, the prompts for the fields following a caption are indented slightly, as shown in the following example:

```
┌─────────────────────────────────┐
│        Logging options       ▼  │
│ Logging intervals               │
│   Point feature:             5s  │
│   Line/area:                 5s  │
│   Not in feature:          None  │
│   Velocity:                None  │
│ Confirm end feature:        ⊙No  │
│ Minimum positions:           3   │
│ Carrier phase                   │
│   Carrier mode:            ⊙Off  │
│   Minimum time:         ⊙10mins  │
│                                 │
│                                 │
└─────────────────────────────────┘
```

A caption field such as *Logging intervals* can never become the current field and can never be edited (as it has no value).

Leaving a form

When you have finished viewing or editing a form, you can choose to leave it with or without saving its (edited) contents.

To leave a form without saving its contents press $\boxed{\text{Esc}}$. If the value of any of the form's fields has changed (that is, been edited), the following message appears:

```
┌─────────┌─ Please confirm ─┐─────────┐
│         │  Abandon changes? │         │
│         └───────────────────┘         │
│                                        │
│                                        │
│                                        │
│                                        │
│                                        │
│ ┌─────┐                      ┌────┐   │
│ │ Yes │                      │ No │   │
│ └─────┘                      └────┘   │
└────────────────────────────────────────┘
```
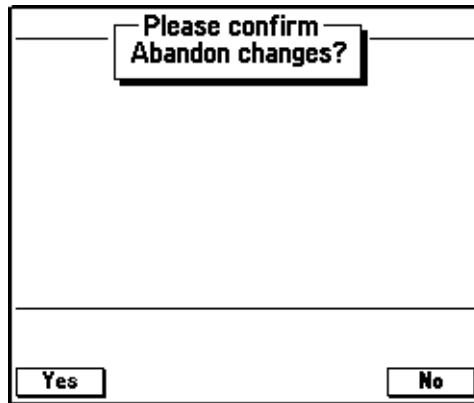
If you press $\boxed{\text{Yes}}$, any changes which you have made to the form's fields are discarded. If you press $\boxed{\text{No}}$, you are returned to the form.

Press $\boxed{\text{Enter}}$ to leave a form and save its contents. When you do this, the Asset Surveyor software validates the form, checking each field for consistency and completeness, and then saves the form's new contents.
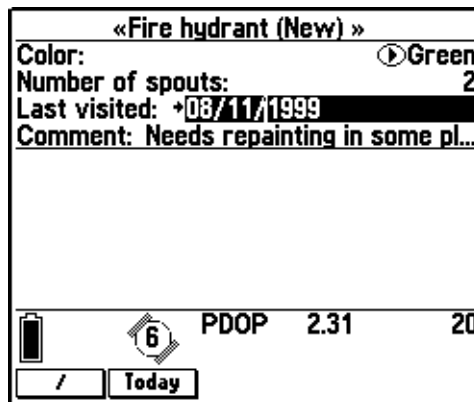
Editing fields

Generally, each field's value can be changed or edited. Before you can change the value of a particular field, you must move the highlight to that field.

The two ways to change the value of the current field are:

- Type the complete new value into the field: Once you have highlighted the appropriate field's value, you can just type in the new value. This replaces the field's old value.

- Edit the field's existing value: Indicate that you want to edit the current field's value by arrowing into it with ⊙ (which starts editing at the leftmost end of the original value) or ⊙ (which starts editing at the rightmost end of the original value).

Once you have started entering a new value for a field, or editing the existing one, the appearance of the field changes and a flashing cursor appears. For example, if you move the highlight to the *Last visited* field of the example *Fire hydrant* form, and press ⊙ to start editing the existing value of that field, the TSC1 screen looks as follows:

```
┌─────────────────────────────────────┐
│        «Fire hydrant (New) »        │
│ Color:                      ⊙Green   │
│ Number of spouts:                 2  │
│ Last visited: →[08/11/1999]          │
│ Comment: Needs repainting in some pl…│
│                                      │
│                                      │
│                                      │
│                                      │
│  ▌     ◈6◈   PDOP    2.31        20  │
│  [  /  ][ Today ]                    │
└─────────────────────────────────────┘
```

Each character you type is inserted into the field at the location of the cursor and the cursor moves one position to the right, ready for the next character to be typed. You can move the cursor about within the field using the ⊙ and ⊙ keys.

You can delete the character to the left of the cursor, and move the cursor one character to the left in the process, by pressing (Bksp). You can delete the character that is to the right of the cursor (for example, the '1' in '1999' in the example above) by pressing (Fn)(Bksp).

Insert and overwrite modes

The Asset Surveyor software operates in *Insert mode*, where each character you type is inserted at the cursor position and pushes the current character in that position to the right, after which the cursor moves one position to the right as well. The Asset Surveyor software does not operate in *Overwrite mode* (where each character you type overwrites the current character at that position).

Upper and lower case letters

Press (CAPS) to change between upper and lower case letters. When you press the (CAPS) key it changes modes, rather than just modifying characters typed while it is held down. The (CAPS) key operates like the (CapsLock) key on a PC.

Leaving field entry

If you start to edit a field but do not want to continue, press (Esc) to revert back to the field's previous value.

When you are satisfied with the field's edited value, you can do one of the following:

- Press (↑) to move to the previous field in the form.
- Press (↓) to move to the next field in the form.
- Press (Enter) to move to the next field in the form.

Before moving to another field, the Asset Surveyor software validates the new value for the field which you have just changed. If the field's new value is inappropriate, you are informed of this fact and asked to change it. The Asset Surveyor software does not accept an inappropriate value for a field.

Certain fields behave in special ways when being edited, and have special validation rules, as explained in the following section.

Field types

Each field belongs to a particular type or class, and the type of the field determines the kind of value it can have. The types of field supported by the Asset Surveyor software are:

- Captions or separators, which have no value. You cannot edit these fields.

- Alphanumeric character string fields, which permit the entry of any characters (that is, letters, digits and punctuation characters), up to a certain maximum length. An example of an alphanumeric string is the comment 'Requires pruning of the lower branches'.

- Numeric fields, which let you enter numbers, with or without attached units. An example of a numeric value is '3.4'.

- Menu fields, which let you select one of a small set of specific values. For example, a menu field might let you choose between values of 'Yes', 'No' and 'Maybe'.

- Date fields, which permit the entry of a calendar date. An example of a date value is '09/03/99 Fri'.

- Time fields, which permit the entry of a time of day. An example of a time value is '10:44:12 am'.

The following sections discuss each of the Asset Surveyor field types in more detail.

Alphanumeric fields

An alphanumeric field accepts values made up of almost any character you can type (and a few you cannot). Such a field could be used for storing a street address, a person's name, or a description of a fault in a piece of equipment.

When you are entering a value into an alphanumeric field, the Asset Surveyor software makes a `Symb` softkey available. Pressing this softkey causes a menu of special punctuation symbols to pop up:
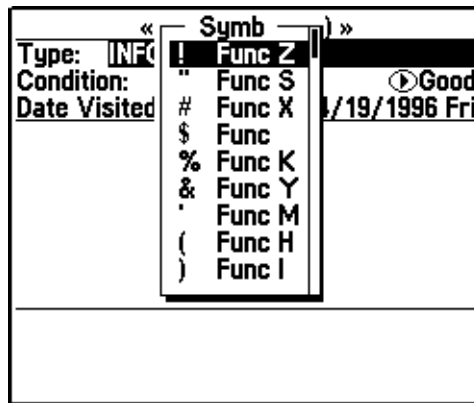
If you select an entry from this menu, the special character is inserted into the alphanumeric field which you were editing, at the current cursor position. If you decide not to insert a special character after all, press `Esc` to dismiss the menu.

The pop-up menu of special symbols highlights the entry that you last selected for convenient reselection.

Note – The Symbols menu also indicates which special characters can also be typed directly using a `Fn` *key sequence shortcut.*

Tip – Text attributes in data files use alphanumeric fields. A text attribute can be set up as an auto-incrementing attribute. This automatically generates a default value depending on the value for this attribute in the last feature you edited, and an increment or decrement value specified in the data dictionary. For more information on auto-incrementing attributes, see Data Dictionaries, page 157.

Numeric fields

Numeric fields store and display numeric values in a range of formats, separated into two main classes:

- For integer (that is, non-fractional) numeric fields, the Asset Surveyor software only lets you enter digits and a minus (–) sign. An integer field could be used to store the number of wheels on a vehicle or the number of ducks on a pond. Examples of integer numeric values are:

  4, 123, –987, 0

- For non-integer numeric fields, the Asset Surveyor software lets you type digits only, a minus (–) sign, a decimal point, and the 'E' (or 'e') convention for scientific notation. A non-integer field could be used to store a bank account balance, or the length of a vehicle. Examples of non-integer numeric values are:

  1.4, 0.005, –1.23, 1.2E10, 5.678e–3

  Note – The notation employing 'E' (or 'e') to represent a power of 10 is called exponential or scientific notation, and is used to enter very large or very small values. For example, a value such as 12000000000.0 could either be entered as 12000000000.0 or as 1.2e10.
  Because scientific notation is very compact, it tends to be used by engineers and scientists, who often have to deal with very large and very small numbers.

Many non-integer numeric values represent a measurement of a physical phenomenon and have associated ***units***. Such values belong to physical domains such as distance, speed, time, and so on. The Asset Surveyor software recognizes each of the base domains, and can convert values from one unit to another within a domain.

If a non-integer numeric data field has an associated units domain, the Asset Surveyor software prohibits the entry of values or units which are inappropriate for that domain. Each field displays its contents in a specific unit or sequence of units, but you can enter values in the most convenient unit, provided you use a unit appropriate for the domain of the field. For example, you can type a value into an *Antenna height* field in meters, feet, or inches, but not in °C or kilograms. If the *Antenna height* field's display units are meters, then values entered in feet or inches are converted to meters and displayed that way once they have been validated.

The Asset Surveyor software lets you configure the units used for most numeric fields to suit your application or preference. For more information, see Chapter 5, Configuring the Asset Surveyor Software.

Some examples of numeric fields with units are as follows:

- If a field represents a distance, and the Asset Surveyor software has been configured to display distances in meters, entering any of the following values yields the final value 54.5 m in the field:

    54.5

    54.5m

    0.0545km

    0.0339029mi

    178.82ft

    2145.84in

    Note – If you want to enter a value in the same units as the field's display units, you do not have to specify units. In the above example, entering '54.5' was the same as entering '54.5m'.

- If a field represents an angle, and the Asset Surveyor software has been configured to display angles in degrees, minutes and seconds, entering any of the following values yields the final value 20°19'58" in the field:

  20.332777778

  20.332777778°

  20 19 58

  0.354873918299 rad

  Note – Some numeric values can be displayed using more than one unit (for example, degrees, minutes and seconds for angular values). You can enter values using a sequence of units (for example, 20°19'58"), or you can just separate values with spaces (for example, 20 19 58), in which case the Asset Surveyor software applies each display unit in sequence to successive values.

- The location of a geographic entity on the earth's surface can be specified as a latitude and a longitude. The Asset Surveyor software displays latitudes and longitudes in degrees, minutes and seconds. For example, to enter the location of Trimble's headquarters in Sunnyvale, California, type the following values into appropriate latitude and longitude fields:

  37°23'40.09" N

  122°02'16.77" W

  where the 'N' and 'W' denote latitude North of the equator and longitude West of the Greenwich meridian. When entering a latitude or longitude, the letters N, S, E, W (for North, South, East or West) may be entered before or after the actual latitude or longitude value.

  Note – Plus (+) or minus (–) signs may be used instead of the letters N, S, E or W, where positive latitude is North of the equator and positive longitude is East of Greenwich. The sign may be entered before or after the value.

If you enter a position as a latitude and longitude, and do not explicitly specify the hemisphere, then the Asset Surveyor software assumes that you want the position to be in the hemisphere in which you are currently operating, as determined by your most recent GPS position.

To help you enter units, the Asset Surveyor software provides a ⎣Units⎦ softkey whenever you are entering a value into a numeric field which has units. Press ⎣Units⎦ to access a menu of available units, and select the unit(s) you want to attach to the value you are entering.

For example, if you press ⎣Units⎦ when entering a *Distance* value, the pop-up menu of available units appears as follows:

```
┌─────────Units─────────┐
│ Meters (m)            │█
│ Millimeters (mm)      │█
│ Centimeters (cm)      │█
│ Kilometers (km)       │█
│ Inches (in)           │
│ Feet (ft)             │
│ US Survey Ft (USft)   │
│ Yards (yd)            │
│ Miles (mi)            │
└───────────────────────┘
```
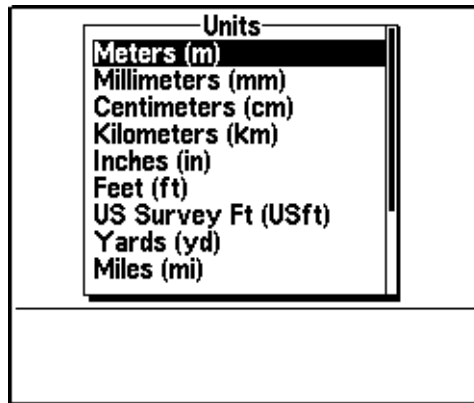
You can select a suitable unit for the *Distance* value you are entering from this list.

Note – The list of available units indicates the abbreviation for each unit in parentheses ( ). You can enter the abbreviation for a unit directly using the keypad, if you prefer.

The TSC1 keypad does not appear to allow the entry of some of the special characters required for specifying units (for example, °, ', and "), but these characters can be typed using ⎡Fn⎤ key sequences. Numeric fields are usually displayed in the appropriate units so that you need not specify units explicitly, or you can use the ⎣Units⎦ softkey.

Tip – Numeric attributes in data files use numeric fields. A numeric attribute can be set up as an auto-incrementing attribute, which automatically generates a default value depending on the value entered for this attribute in the last feature you edited, and an increment or decrement value specified in the data dictionary. For more information on auto-incrementing attributes, see Data Dictionaries, page 157.

Menu fields

Sometimes, fields in a form can also take one of a number of discrete values, and the Asset Surveyor software uses a pop-up menu to let you choose a value for such a field.

In our example form, the first field (the fire hydrant's *Color*) is now a menu field for which a pop-up menu can be accessed by highlighting the field and pressing the ⊙ key:

```
        «Fire I ┌ Color ┐lew) »
Color:          │ ?     │      Green
Number of spo   │ Green │          2
Last visited:   │ Gray  │8/11/1999 Wed
Comment: Nee    │ Other │ting in some pl...
                └───────┘




 ┌─┐    ⬙      PDOP  2.36      20
 │▓│   ⟨6⟩
 └─┘
 ┌────┐
 │Null│
 └────┘
```

Note – A menu field is indicated by a menu symbol (⬙) in front of the field value.

To select a new value for a menu field:

- Access the menu and select a value, as described for normal Asset Surveyor pop-up menus. You can access the menu for a menu field by positioning the highlight on that field and pressing ⊙ (the example form above shows the pop-up menu that would appear by pressing ⊙ when the *Color* field was highlighted).

- Select a value immediately by typing its first letter. This is a very quick way to select a value for a menu, once you know the possible values for that menu field. If the key you press does not correspond to the first letter of any entry in the menu, the menu pops up so that you can see the list of possible values and then select one. Similarly, if the key you press corresponds to the first letter of more than one entry in the menu, the menu pops up and lets you see the various choices.

- Step backward through the values in the menu using the ⊙ key. When you use this method, the menu is circular, so if you reach the first element in the menu and press ⊙, you step to the last element in the menu.

The latter two methods of selecting values for menu fields are provided for the convenience of experienced Asset Surveyor users. You may begin by accessing each menu and selecting from the displayed list of values, but as time goes by you can use these shortcuts to make selecting values for menu fields even faster.

Date fields

A date field can be used to record a calendar date. Different countries use different conventions for the entry and display of calendar dates. The Asset Surveyor software can be configured to display dates in the following formats:

- MM/DD/YYYY

- DD/MM/YYYY

- YYYY/MM/DD

where MM represents the month, DD the day, and YYYY the year. For example, in MM/DD/YYYY format, the 4th of July 1976 would be displayed as:

07/04/1976

Note – If you enter a two-digit year between 00 and 29, the Asset Surveyor software stores it as 20XX (for example, if you enter 15 it is stored as 2015). If you enter a two-digit year from 30 to 99, it is stored as 19XX. If you want to enter a date from a different century, type the year in full with four digits.

When you are entering a value into a date field, the Asset Surveyor software provides two softkeys to assist you:

```
        «Fire hydrant (New) »
Color:                    ⊙Green
Number of spouts:              2
Last visited: ✦08/11/1999
Comment: Needs repainting in some pl...




   ▮      ⟨6⟩    PDOP    2.31       20
   ──/──  ╎ Today ╎
```
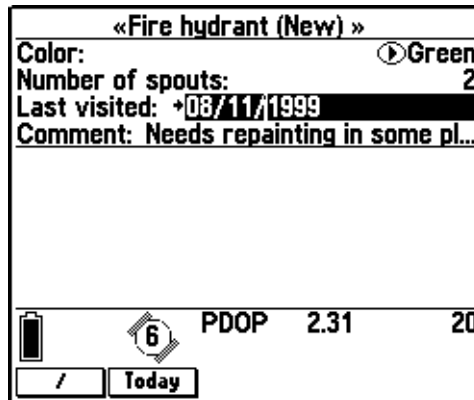
The ⌐ ⁄ ⌐ softkey is a faster way to enter the '/' character than typing on the TSC1 keypad. You can also type the ⌐Fn⌐⌐D⌐ sequence on the TSC1 keypad to obtain the '/' character.

Note – The Asset Surveyor software also accepts dates entered with spaces between the components, for example '7 4 76', but always formats and displays dates with the '/' character as a separator.

The ⌐Today⌐ softkey lets you quickly fill in the field with the current date (as determined from the TSC1 datalogger's internal clock). Many Asset Surveyor date fields are filled in with the current date automatically, and you only need to enter the date manually if this automatic date is incorrect.

The Asset Surveyor software automatically works out the day of the week from the date that you have entered, and displays it as a means of checking that you have entered the correct date.

Time fields

A time field is used to store the time of day, and may either be filled in automatically from the TSC1 datalogger's internal clock, or entered manually. If a GPS receiver is currently connected, the clock is precisely aligned to UTC time.

Note – A time field is not used for storing **elapsed** *time (for example, the amount of time taken for an athlete to complete a race); this is better represented as a numeric field.*

Hours, minutes and seconds are separated by a colon (:) character. Times are displayed using either 12- or 24-hour clock format. In the 24-hour clock format, 4:30 P.M. is displayed as '16:30'. The Asset Surveyor software allows the entry of time in either format. If the entered time is less than '12:00', and 'p.m.' is not specified, then the software assumes the time is before noon. The Asset Surveyor software can be configured to display times in either format.

When you are entering a value into a time field, the Asset Surveyor software makes four softkeys available to assist you:

- The ⌷ : ⌷ softkey is a faster way to enter a colon than typing on the TSC1 keypad. You can also type the (Fn)(P) sequence on the TSC1 keypad to enter a colon.

    Note – The Asset Surveyor software also accepts times entered with spaces between the components, for example '4 30 00', but always formats and displays times with the ':' character as a separator. Neither minutes nor seconds need be entered, but if minutes are desired then hours must be present, and if seconds are desired then both hours and minutes are required. For example, 10 o'clock in the evening could be entered as '10pm', '22', '10:00pm', '22:00', '10:00:00pm', '22:00:00', or '10:0:0pm'.

- You can press ⌷ Now ⌷ to fill in the field with the current time. Many Asset Surveyor time fields are filled in with the current time automatically and you only need to enter the time manually if this automatic time is incorrect.

- You can press ⌷ AM ⌷ to insert the character sequence 'am' into the field. This is generally unnecessary, as the Asset Surveyor software presumes that a time less than 12:00 falls in the morning, in the absence of any explicit 'pm' indication.

- You can press ⌷ PM ⌷ to insert the character sequence 'pm' into the field. This is necessary if you want to enter a time after noon in 12-hour format.

File Naming Conventions

The Asset Surveyor software is designed primarily to collect GIS and GPS data and to store this data in files on the TSC1 datalogger. These files can be individually named, but because you may need to collect a vast quantity of data which is all very similar in nature, it can be difficult to think of meaningful yet distinct names for data files. The Asset Surveyor software automatically suggests a name for each new data file when it is created.

For the purposes of automatic naming, Asset Surveyor data files are divided into two classes: ***rover*** and ***base station*** files. Most data files are rover files. The Asset Surveyor software lets you collect GIS feature and attribute information to rover files, along with GPS positions, and so on. The Asset Surveyor software also lets you use your Trimble GPS receiver as a GPS base station, which results in the creation and recording of base station files. Operating an Asset Surveyor base station is described in detail in Chapter 3, Data Collection.

When a rover data file is created, the Asset Surveyor software suggests a default filename according to the following formula:

•   R MM DD HH x

where the initial letter 'R' identifies the data file as being a rover file, MM is the current month, DD is the current day of the month, and HH is the current hour of the day. The final letter 'x' increments within this hour, starting at 'a' for the first file in that hour, then going to 'b' for the second file and 'c' for the third file, and so on.

***Note** – The date and time used for naming of data files is, by default, UTC (GMT) time. You can specify that the Asset Surveyor software should use local time to name rover files by pressing* Time *and selecting Local from the pop-up menu. If the default filename looks odd, check that the TSC1 datalogger's internal time and date are set correctly.*

Tip – The initial letter 'R' can be changed, in which case subsequent rover data files are given the new initial letter. This lets you uniquely name data files from a fleet of Asset Surveyor rovers, using initial letters like 'X', 'Y', 'Z'. To change the initial letter of a filename to 'X', simply type 'X' and then press ⏎ to move on to the next field in the form. The Asset Surveyor software automatically regenerates the default filename with an 'X' prefix.

Some examples of default rover filenames for the morning of the 15th of September are:

- R091510a

- R091510b

- R091511a

Remember that the default filename suggested by the Asset Surveyor software is simply a suggestion. You can change the suggested name or enter an entirely different name. You can use such filenames as:

- SURVEY1

- SC0090

- RONALD

Filenames can be up to eight characters long, and are composed of letters and digits only (that is, no spaces or punctuation characters are permitted).

Trimble suggests, however, that unless you are dealing with a small number of data files at a time, you should consider using the automatic filenames as these assist with identifying files by time and date.

The Asset Surveyor software suggests default names for base files which are formatted slightly differently from those suggested for rover files. They follow the formula:

- B Y MM DD HH

where 'B' identifies the file as being a base station file, Y is the last digit of the current year, MM is the current month, DD is the current day of the month and HH is the current hour of the day.

Note – As with rover files, the default base filename can be constructed using either local or UTC (GMT) time, the default being UTC. Press the ⌈Time⌉ *softkey to select which time system you want to be used for base station filenames.*

Tip – As with default rover filenames, the initial character 'B' of a default base filename can be changed, in which case subsequent base data files are given the new initial character. This lets you conveniently name data files from a number of base stations separately. For example, Bases A to C could use the initial letters 'A', 'B', and 'C'.

Some examples of default base filenames for the morning of the 25th of January 1995 are:

- B5012510

- B5012511

- B5012512

As with rover files, you can edit the suggested filename or replace it entirely, but Trimble suggests that you use the default names for base files so that they are consistent with base files from other Trimble products and because the time and date of a base file is crucial to its use for differentially correcting rover files.

Note – You can configure the Trimble Reference Station (TRS™) software to use either local time or UTC (GMT) time to construct base filenames. When matching base and rover files for differential correction, you must be aware of the naming conventions and time scales used by this software system.

Software and Firmware Version Numbers

If you ever need to call Trimble Navigation Limited with questions about the Asset Surveyor software, you should first determine the software version you are currently running, using the above procedure.

You can determine the version of the Asset Surveyor software you are currently using in two ways:

1. Turn your TSC1 datalogger off and on again. When it is turned on it briefly displays a screen showing the Trimble logo and the software version number:
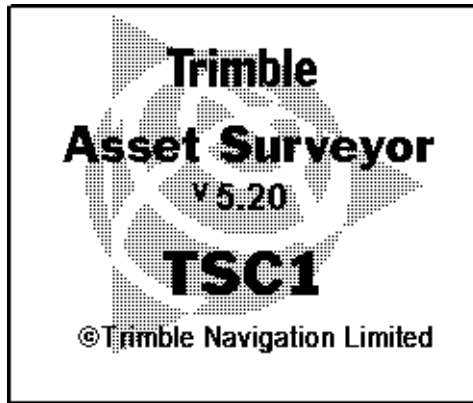
2. Select the *Hardware* (*TSC1*) option from the *Configuration menu*. The *Software version* field in this form shows the current Asset Surveyor software version.

You can also determine which firmware version is installed in your GPS receiver. For more information, see Chapter 9, Receiver Status.

Data Collection

In this chapter:

- ■ Introduction
- ■ Collecting new features
- ■ Data review and update
- ■ Create base file

Introduction

This chapter provides information on rover data collection. The data collection procedure can be broken up into two key operations:

- The collection of new features
- The review and/or update of existing features

The following sections provide a detailed description of how to successfully carry out these operations using the Asset Surveyor software.

This chapter also provides information on logging base data files.

Collecting New Features

This section describes how to use the Asset Surveyor software to create new data files and collect new features to files.

For a description of the review and update capabilities in the Asset Surveyor software, see Data Review and Update, page 80.

Creating New Files

Select *Data collection* from the *Main menu* to display the *Data collection* menu:

```
┌─ Data collection ─┐
│ Create new file   │
│ Open existing file│
│ Create base file  │
└───────────────────┘


    ⬠8    PDOP    2.82
```
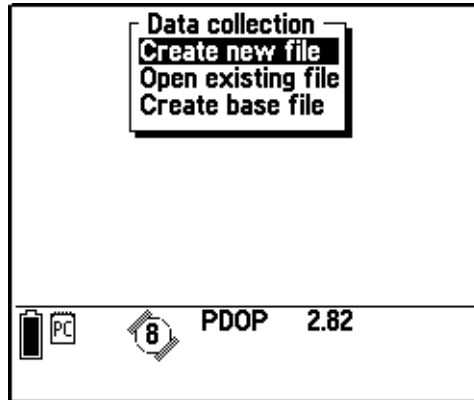
Select *Create new file* from the *Data collection* menu. The Asset Surveyor software displays the *Create new file* form:
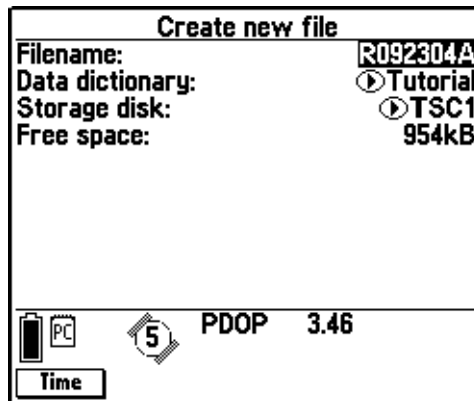
```
            Create new file
Filename:              R092304A
Data dictionary:      ⊙Tutorial
Storage disk:         ⊙TSC1
Free space:            954kB




    ⬠5    PDOP    3.46
 Time
```

The Asset Surveyor software suggests a default filename, as described in File Naming Conventions, page 45. The default name appears in the *Filename* field. You can accept this default name, edit it, or type in a new name. Filenames can be up to eight characters long, and can be composed of letters and digits only (that is, no spaces or punctuation).

After accepting the default filename or entering a new one, select a data dictionary from the menu of data dictionaries that have been loaded onto your TSC1 datalogger. The default *Data dictionary* is the data dictionary that was most recently used to create a data file. The Generic data dictionary is always available. This data dictionary lets you record point, line, and area features, each with a simple description attribute.

Note – The data dictionary you choose when you create a data file is associated with that file for the duration of the data file's 'life'. The data dictionary determines the types of features which can be recorded to this file as well as the attributes these features can have.

The *Storage disk* field lets you specify the storage area that the rover file is logged to. The options are 'TSC1' and 'PC card'. You can only set this field if a PC card is inserted into the TSC1 datalogger.

The last field of the form, *Free space*, informs you of the available data file storage space remaining on your TSC1 datalogger and the PC card, if one is present. The field name will appear as *Free space (TSC1)*, or *Free space (PC card)*, depending on the selected *Storage disk*. You cannot edit this field.

Press ⬚Time⬚ to switch between UTC and local time for the default filename, as described in Chapter 2, Basics of Operation.

Once you have accepted a filename and data dictionary, press ⏎ to create the new data file. The Asset Surveyor software checks to see that the filename is unique before creating a file. If a file with that name already exists, the Asset Surveyor software displays the following message:

```
┌──────────Error!──────────┐
│ Duplicate file names are not allowed. │
│                                       │
│                                       │
│                                       │
│                                       │
│                                       │
│                                       │
│───────────────────────────────────── │
│                                       │
│                                       │
└───────────────────────────────────── ┘
```
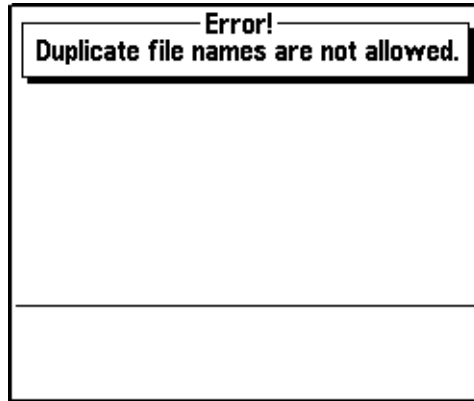
You must think of another name for your new file, or if you are happy to append to the existing file with the same name then you can exit the *Create new file* form by pressing ⎋Esc and just select the file with that name from the *Open existing file* form.

***Note** – The data dictionary associated with the existing file is the data dictionary that was selected when that file was created. It is not necessarily the data dictionary that you selected when attempting to create a data file with the same name.*

If there is insufficient data space to create a new file, or the Asset Surveyor software cannot create a file for some other reason, the Asset Surveyor software displays an appropriate error message. If the problem is simply one of insufficient space, transfer some or all data files to your PC (or PC card if one is inserted), then delete them from the TSC1 datalogger before attempting to create any new data files.

When you create a new rover file and press ⏎, the Asset Surveyor software automatically opens the newly created file, ready to log data to it.

Collecting New Features

The *Start feature* menu lists features as in the following example:

You can choose a feature to collect by selecting it from the menu. You can also perform a number of other operations using the softkeys on the menu.

☀ **Tip** – Press `Review` at any stage to switch to the *Review data* list, where you can view or update features that you have collected so far. The `New` softkey in the *Review data* list lets you switch back to the *Start feature* menu from *Review data*, thus providing for efficient collection and review of new features, and also the review and update of existing features.

Note – *Features are collected one at a time; you normally end one feature before starting the next. A useful exception to this rule is the embedding of point features within line or area features using nesting (see page 66) or quickmarking (see page 63) techniques. While a feature is open for data collection or update, you can also have a second feature open for reference in an edit-only capacity. You can edit its attributes or offsets, but you cannot update its GPS position.*

Selecting a Feature to Collect

When you select a feature from the *Start feature* menu, the Asset Surveyor software starts to collect data for that feature. This includes:

- the GPS position of the feature

- an optional offset to the GPS position

- attributes of the feature (entered using the TSC1 keypad)

- any external sensor data which might be recorded for that feature

Provided a GPS receiver is connected and operational, the Asset Surveyor software records GPS positions automatically for the feature, according to the way that you have configured the GPS interface. If you have configured and activated an external sensor, external sensor data is also recorded automatically. If you have configured and activated a laser rangefinder, you can record an offset for the feature by aiming and firing the rangefinder. Alternatively, you can measure and enter the offset manually.

By taking care of GPS and external sensor data collection, and by integrating the recording of an optional offset to each feature, the Asset Surveyor software lets you concentrate on entering attribute values for the feature.

The attributes describing each feature are determined when you create your data dictionary using the GPS Pathfinder Office software. The following diagrams illustrate attributes for three of the features in the menu shown above. They are a point feature:

```
         «Fire Hydrant (New) »
Color:                          ⊙▶▯
Number of Spouts:                 2
Last Inspection Date:             ?



      ▯ ▣     ⧫6⧫   PDOP   2.85      2
   Pause    Review    EXT    Offset
```

a line feature:

```
            «Path (New) »
Surface Type:                   ⊙▶▯
Width (meters):                 2.0



      ▯ ▣     ⧫6⧫   PDOP   2.95      1
   Pause    Review    Nest    Seg    →
```

and an area feature:

```
┌─────────────────────────────────────┐
│           «Park (New) »             │
├─────────────────────────────────────┤
│ Name:                             ▓ │
│ Parcel Owner:                     ? │
│                                     │
│                                     │
│                                     │
│                                     │
│                                     │
│ ▐ PC    ⟨6⟩   PDOP   2.96         1 │
│ ┌─────┬────────┬──────┬───────┬───┐ │
│ │Pause│ Review │ Nest │ Quick │ → │ │
│ └─────┴────────┴──────┴───────┴───┘ │
└─────────────────────────────────────┘
```
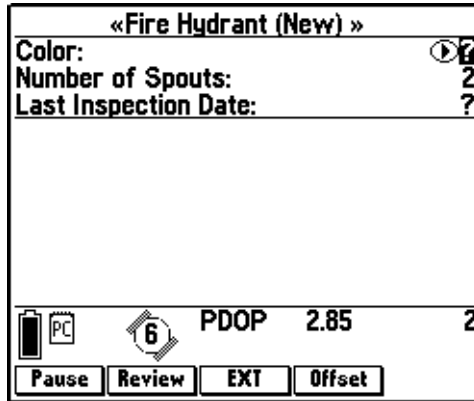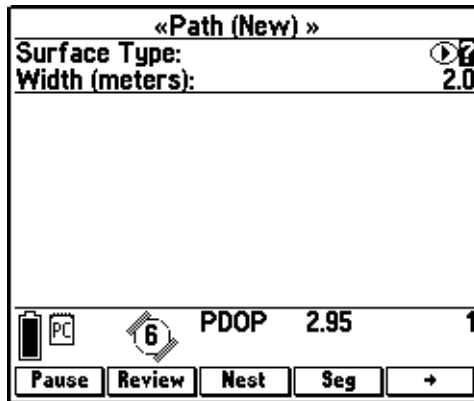
Entering Attribute Values

The attribute entry form for a feature behaves identically to other Asset Surveyor forms. You enter values for each field, according to its type (menu, numeric, character string, time, or date), and move from field to field using Ⓐ, Ⓥ, (Fn)Ⓐ, and (Fn)Ⓥ keys. For further instructions on moving from one field to another, see Moving between fields, page 29.

When you have finished entering attribute values, press ⏎ to save the feature. You can press (Esc) to abandon the feature without saving it, but the Asset Surveyor software always asks you to confirm this:

```
┌────── Please confirm ──────┐ d
│ Abandon feature: "Fire Hydrant"? │ 2
└──────────────────────────────┘
Last Inspection Date:   09/28/1999 Tue



          ⟨5⟩   PDOP   2.59          2
 ┌────┐                        ┌────┐
 │Yes │                        │ No │
 └────┘                        └────┘
```
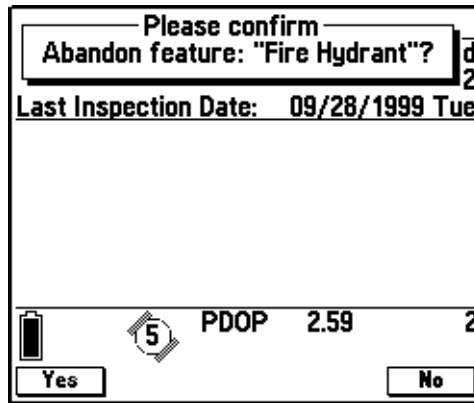
⚠ **Warning –** When you abandon a feature, the Asset Surveyor software discards not only the partially entered attribute values, but also any GPS positions and/or external sensor data records which have been recorded for that feature. The only exception to this rule is a line or area feature, in which case the GPS positions are not discarded, but are treated as not-in-feature positions. These provide a trail showing the path that you traveled.
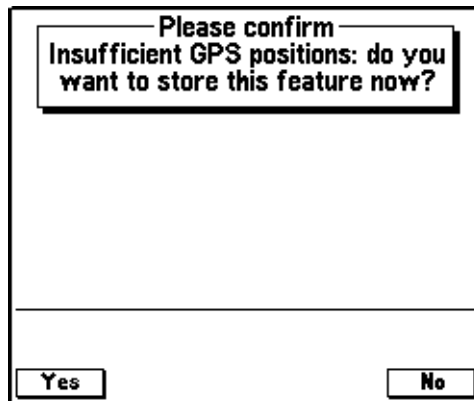
Saving Features

As with a normal Asset Surveyor form, you can press ⏎ to save the attribute entry form's contents, but you will probably not press ⏎ the moment you finish entering attributes for the feature. This is because, while the feature is 'active', any GPS positions and external sensor data which are logged are associated with that feature. If this is a point feature, you should remain stationary at that feature until the configured minimum number of positions have been logged before pressing ⏎. If it is a line or area feature, continue to walk or drive along the feature (or around its perimeter, if it is an area feature). Only press ⏎ when you have traversed it completely.

☼ **Tip –** When traversing a line or area feature you can often pass points of interest that need to be logged or updated. The Asset Surveyor software offers a number of convenient ways to collect point features at the same time as you collect a line or area feature. For more information, see Quickmarking, page 63, and Nested Features, page 66.

If you are collecting a point feature and press ⏎ before the configured minimum positions have been logged, the following message appears:

```
┌──── Please confirm ────┐
│ Insufficient GPS positions: do you │
│   want to store this feature now?  │
└────────────────────────┘



─────────────────────────────

┌─────┐                    ┌─────┐
│ Yes │                    │ No  │
└─────┘                    └─────┘
```

Press ⌷Yes⌷ to store the point feature with fewer GPS positions than the number set in *Minimum positions*, or press ⌷No⌷ to return to the feature and wait for more positions to be logged.

💡 **Tip –** The minimum number of positions for point features can be specified in the *Logging options* form. For more information, see Logging Options, page 166.

Note – When Carrier mode is set to 'On', the configured number of minimum positions is not applied to the collection of point features.

The various other operations that can be performed during the collection of features and/or the entry of attributes are described in the following sections.

Pause and Resume Logging

When you are entering attributes for a feature or are at the *Start feature* menu, the Asset Surveyor software provides a ⌷Pause⌷ softkey. When you press ⌷Pause⌷, the Asset Surveyor software stops logging GPS positions. While logging is paused, the message Logging paused appears periodically on the GPS status line, and the ⌷Pause⌷ softkey changes to ⌷Resume⌷ :

```
            «Path (New) »
Surface Type:              ⏵Concrete
Width (meters):                    2.0




               ┌─┐
               │5│   PDOP   2.64          2
               └─┘      Logging paused
  Resume  Review   Nest    Seg     →
```
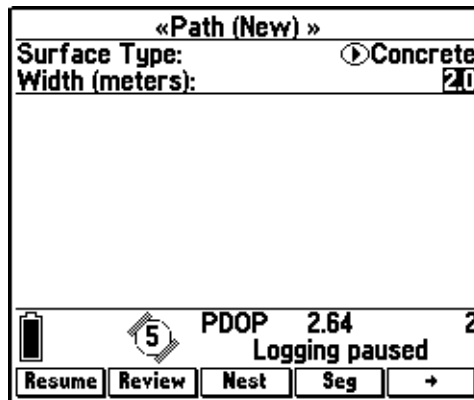
When you press ⌊Resume⌋, the Asset Surveyor software resumes logging and the softkey reverts back to ⌊Pause⌋.

Press ⌊Pause⌋ whenever you want to stop briefly, or if you are collecting a line or area feature and have to travel around some obstacle before picking up the line or area perimeter again. You should also use ⌊Pause⌋ if you want to nest a point feature within a line or area, and the point lies some way off the line or area perimeter. You can then nest the point without ending up with a 'spike' in the line or area.

⚠ **Warning –** When GPS logging is paused, the Asset Surveyor software does not record GPS positions, external sensor data, velocities, or PPRT fields, but continues to record carrier measurements (if *Carrier mode* is set to 'On') and certain critical GPS information that is required for postprocessing. This additional information is relatively small, but it is possible that even when logging is paused your TSC1 datalogger may eventually run out of data storage space.

Each time you resume logging while collecting a line or area feature, the Asset Surveyor software logs a GPS position (irrespective of the logging interval for line or area features).

💡 **Tip –** You can use this feature to make the Asset Surveyor software log a GPS position when you come to a corner or a point of interest while collecting a line or area feature. Press ⌊Pause⌋ and then ⌊Resume⌋ to cause the current GPS position to be logged. After you press ⌊Resume⌋, the Asset Surveyor software continues to log GPS positions at the configured line or area logging interval.

Repeating Features

You usually select a feature to collect using normal menu selection techniques (that is, highlighting a feature and pressing $\boxed{\text{Enter}}$, or using a first-letter selection method). However, you can also select the currently highlighted feature on the *Start feature* menu by pressing $\boxed{\text{Repeat}}$.

The difference between normal selection of a feature and selecting using $\boxed{\text{Repeat}}$ lies in the attribute values that are entered by default when the feature is created. If you select the feature by the normal method, the default attribute values are determined by the data dictionary, which specifies a default value for each attribute belonging to each feature. If you select a feature using $\boxed{\text{Repeat}}$, the attribute values are copied from the last recorded feature of that type.

Tip – The $\boxed{\text{Repeat}}$ softkey lets you record a sequence of similar features very efficiently. You do not have to re-enter the values for all of the attributes; just scroll through checking that each attribute value is correct for the current feature, and change only those that differ.

If you press $\boxed{\text{Repeat}}$ and a feature of the currently highlighted type has not yet been recorded to the current data file, the Asset Surveyor software informs you that it cannot repeat this feature type:

```
┌──────────── Error! ────────────┐
│  This feature has not yet been  │
│            collected            │
└─────────────────────────────────┘
```
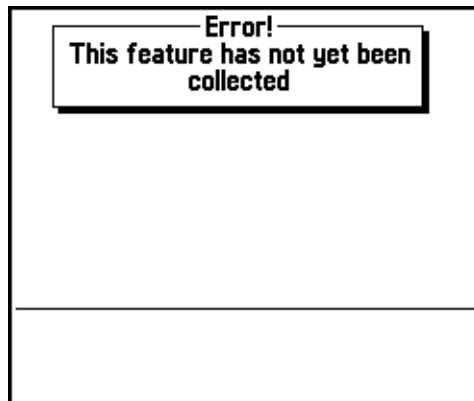
You must first log a feature using the normal method before you can repeat it.

The feature that is repeated is normally the last feature of that type that was collected. However, you can repeat the attributes of any feature in the file by highlighting it on the *Review data* list and opening it for attribute review before you press ⌷Repeat⌷ .

Note – Offsets, except those configured as constant offsets, are not repeated when ⌷Repeat⌷ *is pressed.*

Quickmarking

The Asset Surveyor software provides two ways to collect the GPS position of a point feature. The usual way is to select a point feature from the *Start feature* or *Nest feature* menu, and to stay at that feature long enough to log sufficient GPS positions. Another way is to record a quickmark.

A quickmark is recorded by simply pressing a button on the TSC1 datalogger as you drive, fly, or move past a feature. With quickmarks, the Asset Surveyor software cannot record a number of positions to average together. In fact, the software cannot necessarily even record a single GPS position at exactly the moment that you pass the feature. It therefore records an accurate time (using the very precise GPS satellite timers to keep the TSC1 datalogger's clock perfectly synchronized). This time is used to compute an interpolated position for the quickmark based on two GPS positions: the one logged before you passed the feature and one logged after.

The accuracy of quickmarks is not as high as the accuracy you can achieve by standing at a point and logging positions for some time, but you can use quickmarks to rapidly record reasonably accurate GPS positions for a large number of features.

Tip – Because quickmarks are recorded to the nearest second, if you travel more slowly the quickmarks that you record will be more accurate.

Quickmarking is especially useful if the features all lie along a road or path, and are a reasonable distance apart, so that even with quickmark accuracy their interpolated positions clearly identify them.

You can record quickmarked point features when not logging any other feature, or you can nest them within line or area features. To gain access to the quickmark recording menu, press ⌐Quick⌐. The Asset Surveyor software pops up a menu containing only point features:

```
┌──── Quickmark feature ────┐
Sur│◇Sign                    │rete
Wid│□Utility Pole            │2.0
   │■Light Source            │
   │▣Fire Hydrant            │
   │○Bench                   │
   │●Bus Stop                │
   │⊛Point_generic           │
   └─────────────────────────┘

  ▌       ⟨5⟩   PDOP   2.72        7

 ⌐Setup⌐
```
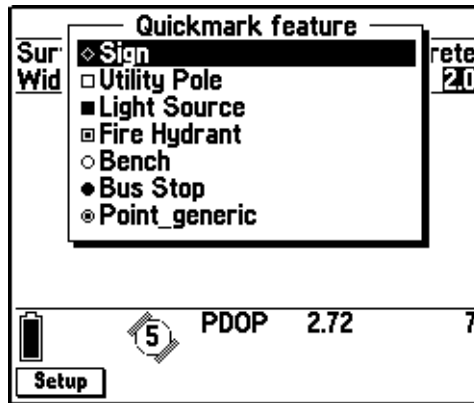
Note – You can only quickmark point features. It makes no sense to instantaneously record a single position for a line or area feature.

The ⌐Setup⌐ softkey provides a shortcut to the *Quickmark options* configuration form. You can choose whether quickmarked features should be assigned default attribute values based on the data dictionary, or whether their attributes should be repeated from previous features. You can also choose whether or not the Asset Surveyor software should permit you to confirm or edit the attribute values associated with each quickmark as it is recorded. For more information, see Quickmarks, page 263.

When you select a point feature from the *Quickmark feature* menu, the Asset Surveyor software records the precise time at which you selected that feature and makes sure that bracketing GPS positions are logged for use when interpolating. It determines the appropriate source for default attribute values (the data dictionary or a previous feature) and logs the feature's default attributes (if any).

Finally, if the *Confirm* configurable field has been set to 'Yes', the Asset Surveyor software automatically lets you review and possibly edit these attributes. By default, the *Confirm* field's value is 'No', and the Asset Surveyor software simply beeps and displays a message on the GPS status line to confirm that it has recorded the quickmark:
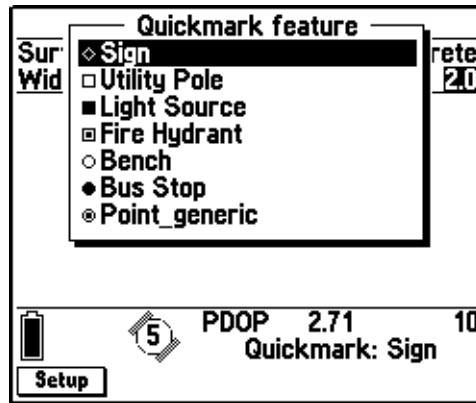
Note – *If you choose to confirm and edit attribute values for quickmarks, remember that even though it takes time to confirm or edit the attribute values, the quickmark position for the feature was recorded the instant you selected the feature. Even if you have traveled some distance from that point by the time you press* to save the edited attributes, the feature's position is not affected.*

Note – The quickmark and its attributes are saved the moment you select the feature from the menu. If you have Confirm set to 'Yes' but then press ⬚Esc *on the attribute form, the feature is still recorded but with unedited default values for its attributes. If you want to delete the feature (perhaps because you selected it at the wrong moment), you must review the data file and delete it from the list of recorded features. For more information, see Reviewing and Updating Existing Features, page 84.*

Tip – It is often not possible to drive directly over a feature, so when collecting data in a vehicle you may want to configure a constant offset for quickmarks. You can then drive past each feature at the pre-specified distance and record offset quickmarks.

Nested Features

When recording a line or area feature, you often come across point features that you would like to record. You do not have to complete the whole line or area before returning to record the point features; you can just nest the point within the line or area.

When you collect a line or area feature, press ⬚Nest to pop up the *Nest feature* menu, which contains a list of point features that can be nested within that line or area feature:
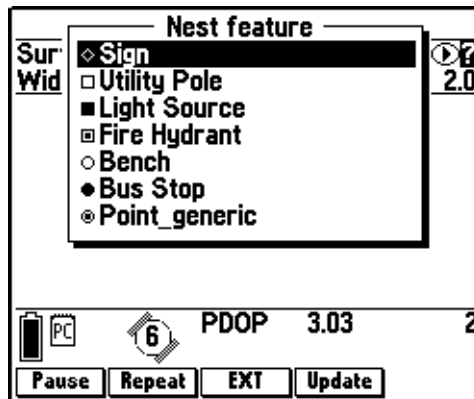
Until you actually select a point feature to nest, any GPS positions logged belong to the outer line or area feature.

Press ⌐Update⌐ to open the *Update point feature* menu, where you can nest the update of an existing point feature. You can do this while updating an existing line or area feature, or while logging a new one. On the *Update point feature* menu, the ⌐Update⌐ softkey changes to ⌐New⌐. Press ⌐New⌐ to return to the *Nest feature* menu.

To nest a point feature that lies off the perimeter of the line or area feature:

1. Press ⌐Pause⌐ to pause logging to the line or area.

2. Travel to the point feature in question.

3. From the *Nest new feature menu*, select the appropriate point feature, or press ⌐Update⌐ and select an existing feature to update.

    When you are ready to record GPS positions for this feature, press ⌐Resume⌐ if it is a new feature, or ⌐Log⌐ if it is an existing feature. Logging begins and continues until you save the nested feature or until you press ⌐Pause⌐ again.

4. When you have finished recording attributes for the point feature and have logged sufficient GPS positions, press ⌐Enter⌐ to save the feature.

    The Asset Surveyor software automatically pauses logging and returns you to the attribute entry form for the outer line or area feature.

5. Do one of the following:

    –   Press ⌐Nest⌐ again to nest another point feature (and repeat steps 2 to 4).

    –   Go back to the line or area's perimeter and press ⌐Resume⌐ to resume logging of GPS positions for the line or area.

> 🔆 **Tip –** You can select the end of the line feature as the Target and use the Asset Surveyor software's navigation functionality to guide you back to it, ready to continue logging.

You can nest as many point features within a line or area as necessary (limited only by storage space on the TSC1 datalogger).

When you have traversed the line or area's perimeter, press ⏎ to save that feature.

> 🔆 **Tip –** If you are traveling rapidly, the points you want to nest have few attributes, and their positions need not be as accurate as averaged point features, consider quickmarking them instead of nesting them. Recording quickmarks is very rapid and efficient.

If you select a point feature to nest from the menu, it has default attribute values as defined in the data dictionary. You can nest a point feature with the same default attributes as the previously recorded feature of that type by highlighting the feature in the *Nest feature* menu and pressing ⌗Repeat⌗.

> 🔆 **Tip –** You can nest a point feature with the same attributes as any feature in the file by highlighting the feature on the *Review data* list and opening the feature for review before you press ⌗Repeat⌗.

Segmented Line Features

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

Tip – Because the segment position is recorded to the nearest second, if you travel more slowly the positions you record will be more accurate.

To segment a line feature, press ⌷ Seg ⌷. The current line feature is saved and another line feature of the same type is immediately started with the same attribute values as the previous feature. The last GPS position of the first segment is identical to the first GPS position of the second segment, so that adjacent segments are joined end-to-end in your GIS.

Warning – When you press ⌷ Seg ⌷, the Asset Surveyor software validates the first line feature's attributes. If you have not finished entering the attributes for that line segment, the Asset Surveyor software does not let you save the feature. You must complete attribute entry before pressing ⌷Enter⌷ or ⌷ Seg ⌷ again to save that feature. In the meantime, you must stop until the first feature has been completed.

Warning – If there is no current GPS position available when you press ⌷ Seg ⌷ (due, for example, to a high PDOP situation), the Asset Surveyor software does *not* start the new line segment with the last GPS position of the previous line segment. Instead, the new line segment starts from the first GPS position that becomes available *after* you press ⌷ Seg ⌷. The Asset Surveyor software may also start the new line segment at a position other than the precise end of the previous line segment if a satellite constellation change occurs at the moment ⌷ Seg ⌷ is pressed.

Averaged Vertices for Line and Area Features

A line or area feature is composed 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 feature with averaged vertices is similar to logging a number of point features, each composed of a number of averaged positions, then joining these features together.

In the attribute entry form for the line or area feature, press Vertex to open the *Vertex* form:

```
        «Path (New): Vertex 1»
Surface Type:                    ⊙?
Width (meters):                  2.0




    PC    ⟨6⟩   PDOP   2.49        2
  Pause  Review    EXT
```

This form contains the same fields as the attribute entry form, so you can enter or edit attribute values for the line feature, including any attribute whose value is supplied by input from an external sensor.

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 record quickmarks, nest point features, or segment a line feature while recording an averaged vertex, so the Quick, Nest, and Seg softkeys are not available. Because your direction of travel (bearing) is unknown when you are stationary, you cannot enter or edit the feature's offset. However, you can use Review to view and edit existing features in the *Review data* list.

While the *Vertex* form is open, you must remain stationary, as though you were recording a point feature. The messages Remain stationary and Vertex open flash alternately in the status line to remind you to stay still. The number of positions recorded for this vertex also appears in the status line. When you have logged as many positions as you require for this vertex, close the *Vertex* form. You are returned to the attribute entry form.

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 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. While the *Vertex* form is open, the ⌐Pause⌐ and ⌐Resume⌐ softkeys control logging of positions for the current vertex.

Offsets

The attribute entry form for each type of feature includes an `Offset` softkey. You can press this to view or enter the offset for the feature being collected. If you have configured a non-zero constant offset for the class of features being collected, then the default offset value for that feature is as configured.

For example, the attribute entry form for a point feature might look like:

Press `Offset` to access the *Point offset* form as follows:

Press ⌑Format⌑ to switch between the slope distance/inclination method of display and the horizontal/vertical distance method:

```
┌─────────────────────────────────┐
│         Point offset            │
│ Bearing:                     ▨  │
│ Horizontal distance:    0.000m  │
│ Vertical distance:      0.000m  │
│                                 │
│                                 │
│                                 │
│ ▯ ▣    ◈6◈  PDOP   2.42      57  │
│ ┌─────┐ ┌──────┐                │
│ │Reset│ │Format│                │
│ └─────┘ └──────┘                │
└─────────────────────────────────┘
```

You can change the configured constant offset for the current feature by measuring and entering a new offset, or by pressing ⌑Reset⌑ to indicate that there is no offset to apply to this feature.

*Note – All Asset Surveyor features (points, lines, areas or quickmarks) can have only **one** offset associated with them. You cannot have two or more offsets for a single feature. In particular, this means that to record a line feature with a given offset and then to change the offset part-way through the line feature, you must segment the line at that point (each segmented line feature has its own offset). You must carefully plan how to collect an area feature using offsets, as the same offset value must apply to the entire area feature.*

You can fill in the three offset fields for a point feature using a laser rangefinder. In the case of a line, area, or quickmark feature, a laser rangefinder can only be used to fill in the last two fields; the first field (*Direction*) must always be filled in manually.

When you transfer features from the GPS Pathfinder Office software, their offsets are transferred as well. However, unless you have updated an offset in the same data collection session, it is reset to the current constant offset value if the feature's GPS position is updated. When this happens the Asset Surveyor software shows the message Existing offset reset.

When using a laser rangefinder, you do not have to visit the offset form for a point feature; simply use the laser to record the offset and watch for an Offset received message on the GPS status line. For line, area, and quickmark features, however, you must visit the offset form before you can record an offset using a laser rangefinder. This is because you have to specify the *Direction* of the offset relative to your current direction of travel.

External Sensors

You can use external sensors to collect data with the Asset Surveyor software.

EXT softkey

When collecting data, press <u>EXT</u> at any time to access the menu of external sensors. From this menu you can:

- activate or deactivate a sensor or laser

- check the status of an active sensor

- manually initiate a reading from an active sensor

- reconfigure a sensor

Automatic activation of sensors

If you have pre-configured an external sensor interface and have set the *Auto-connect* configuration field to 'Yes', the Asset Surveyor software automatically attempts to activate the sensor interface when you create or reopen a rover data file.

If you have not pre-configured the sensor to automatically connect (that is, activate), then you can manually activate it using <u>EXT</u>.

Automatic deactivation of sensors

If you press <u>EXT</u> to access the *Select sensor* menu, active sensors remain active when you exit the *Select sensor* menu. When you exit data collection, however, all active external sensors are automatically deactivated.

Status, reading, and configuration

When collecting data, you can check the status of a sensor, manually take a reading from the sensor, or reconfigure the sensor using the methods described in Testing an External Sensor, page 284.

Activation and configuration of a laser rangefinder is also accessed using the ⎡EXT⎤ softkey.

Automatic activation of the laser interface

If you have preconfigured the laser interface and have set the *Auto-connect* configuration field to 'Yes', then the Asset Surveyor software automatically attempts to activate the laser interface when you start a data file.

If you have not preconfigured the laser interface to automatically connect (that is, activate), you can manually activate it using ⎡EXT⎤.

Automatic deactivation of the laser interface

If you press ⎡EXT⎤ to access the *Select sensor* menu, an active laser interface remains active when you exit the *Select sensor* menu. When you exit data collection, however, the laser interface is automatically deactivated.

Status, reading, and configuration

When collecting data, you can check the status of the laser, take a reading from the laser, or reconfigure the laser interface using the methods described for testing the laser interface in Chapter 5, Configuring the Asset Surveyor Software.

Recording laser offsets

When the laser rangefinder interface is activated within data collection, data received from the rangefinder can be logged to the current data file as an offset for the current feature.

If you activate a laser rangefinder within data collection and then take a laser reading, the Asset Surveyor software responds in one of the following ways:

- If you set the *Confirm offsets* configuration field to 'Yes', the *Offset* form appears when you record an offset with a laser rangefinder:

```
          Point offset
Bearing:                      ⍰
Slope distance:          0.000m
Inclination:               0.0°




  ▯▯        ⟨6⟩   PDOP   2.41        8
 Reset  Format
```

- If you set *Confirm offsets* to 'No', the Asset Surveyor software displays the message Offset received on the status line. The *Offset* form also appears if:

    – you need to enter a bearing for point features if your laser rangefinder does not supply a bearing value

    – you need to enter a direction (Left or Right) for quickmark, line, or area features.

>
>
> **Tip –** You can set constant offset values for each type of feature (point, line, area, and quickmark). When you record an offset using a laser rangefinder, any fields not filled by the rangefinder use the constant offset values.

- If you have more than one feature open (for example, if you have an edit-only feature open for review) then the following message appears when you try to log external sensor data.
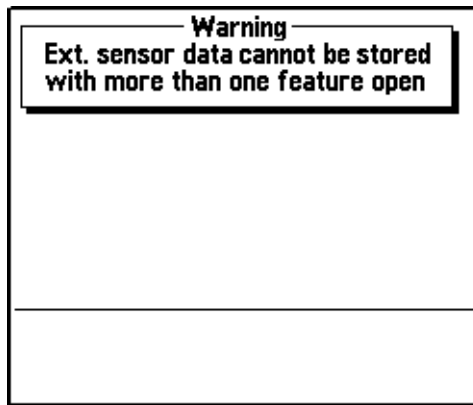
You must close one of the features before you can log data from the external sensor.

- If you are not currently collecting a feature at all, the Asset Surveyor software displays the following warning message:

```
┌──────── Warning ─────────┐
│ Laser offsets can only be recorded │
│        for features       │
│                           │
│                           │
│                           │
│                           │
│                           │
│ _____  │
│                           │
│                           │
└───────────────────────────┘
```
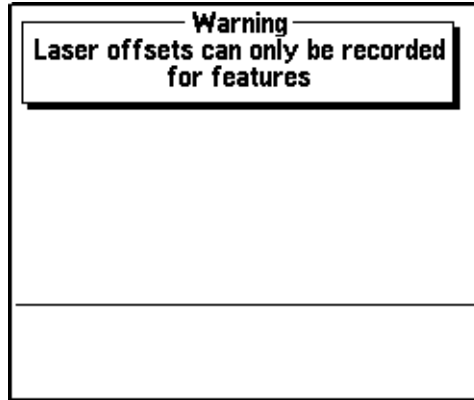
You can record as many offsets as you like for a feature, but only the last offset you record is actually stored by the Asset Surveyor software. A feature only has *one* associated offset.

Tip – If you are recording a line feature using an offset (to travel along parallel to the line) and you reach a point where you are forced to use a different offset (for example, you can no longer travel the same distance from the line feature), segment the line feature (using ⌊ Seg ⌋) and then enter a new offset for the second segment of the line.

Data Review and Update

This section describes how to use the Asset Surveyor software to review existing features and update those features if necessary.

For information on how to collect new features in the Asset Surveyor software, see Collecting New Features, page 50.

Opening Existing Files for Review and Update

You can open an existing data file for review and/or update by selecting *Open existing file* from the *Data collection* menu and pressing ⌨️:

```
┌──────────────────────────────────────┐
│         Open existing file        ▼  │
│ File:                   ⊙TUTORIAL    │
│ Update status:            Imported   │
│ Data dictionary:          Tutorial   │
│ № of features:                 114   │
│ Storage disk:                 TSC1   │
│ File size:                   100kB   │
│ Free space:                  693kB   │
│ File start                           │
│  Time:                   05:12:17 pm │
│  Date:              09/23/1999 Thu   │
│ ▮ PC    ◇7◇  PDOP   2.41             │
│                                      │
└──────────────────────────────────────┘
```

The *Open existing file* form appears. Select a file from the list of available rover files in the *Filename* field. When you first open the *Open existing file* form, the files that are available in the *Filename* field are those that are stored on the TSC1 datalogger.

Note – All files, including base and background files, appear in this list, so that you can view their file statistics. However, you can only use this menu to open a rover file for feature review and update.

If you want to view any data files stored on a PC card, press PCcard. This softkey only appears if a PC card is inserted into the TSC1 datalogger.

When you press ⬚PCcard and the available rover files on the PC card are displayed, the softkey changes to ⬚TSC1 to let you switch back to the files stored on the TSC1 datalogger.

The *Open existing file* form contains a number of fields providing relevant file details for the rover, background, and base files stored on the TSC1 datalogger or a PC card.

- The *Filename* field lets you view the statistics for each file. The field values change as you cycle through the available files on the TSC1 datalogger or the PC card.

- The *Status* field indicates if the selected file has been transferred to the PC:

Table 3-1   Update status

Update status is …	when …
Imported	you have transferred the file from the GPS Pathfinder Office software to the Asset Surveyor software and have not yet made any changes to it
Not transferred	the file is new and you have not yet transferred it to the GPS Pathfinder Office software OR you have transferred the file from the GPS Pathfinder Office software, have made changes to it since, and have not yet transferred it back to the GPS Pathfinder Office software
Transferred	you have transferred the file to the GPS Pathfinder Office software, and have not edited or appended to it since the transfer
File is corrupt	the file is damaged and the Asset Surveyor software failed to rebuild it successfully

- The *Data dictionary* field shows the name of the data dictionary which is associated with the selected data file.

- The *No. of features* field shows the number of point, line, and area features in the selected data file.

- The *Storage disk* field shows the storage location of the file: TSC1 datalogger when the file is stored in the internal memory of the TSC1 datalogger, or PC Card when the file is on a PC card.

- The *File size* field shows the size of this data file in kilobytes.

- The *Free space* field shows the remaining amount of data space, in kilobytes, either on the TSC1 datalogger or the PC card. The field displays as *Free space (TSC1)* when the selected file is stored on the TSC1 datalogger. It displays as *Free space (PC card)* when the selected file is stored on the PC card.

- The *File start* fields show the time and date when this file was created. This may not be the same as the time when the file first had data logged to it, but these two events normally occur one after the other.

  Note – If the file was imported this field will show the current GPS time until you first log new data to the file. Once you log new data it shows the date and time you began updating the file.

- The *File end* fields show the time and date when this file last had data logged to it.

In the *Filename* field, select the file you want to open and press ⏎.

If the status of the selected file is Not transferred and GPS data in the file was collected or appended to the file more than seven days ago, the Asset Surveyor software does not let you reopen that file for further logging of GPS data. This means that you cannot create new features or update the GPS position of existing ones, although you can review and edit attribute data and offsets. This restriction is due to a technical limitation related to the way that GPS times are stored. In order to maintain full accuracy of storage, it is necessary to limit the timespan of a data file to seven days.

If the Asset Surveyor software displays the following message:

```
┌─────────Error!─────────┐
│ Unable to append to a file over one │
│         week old         │
└─────────────────────────┘
```
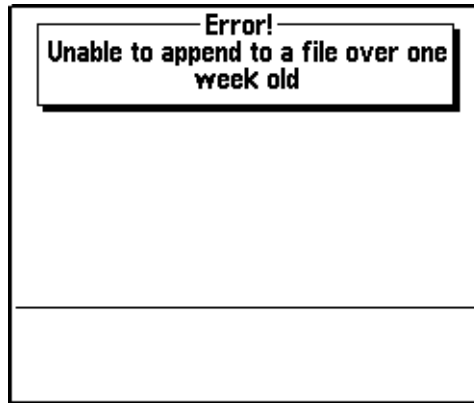
you should create a new data file and collect data to that instead, or transfer the file to the GPS Pathfinder Office software then transfer it back to your datalogger to change the status of the file to Imported.

Tip – You do not have to collect data for one job or session into a single data file. The GPS Pathfinder Office software can differentially correct and export multiple files seamlessly.

Reviewing and Updating Existing Features

Once a file has been opened for review and/or update, the *Review data <filename>* list appears, with the feature and note records for that file displayed in the list, similar to the following:

```
┌─── Review data «R092800A» ───┐
│▤Log start: 12:57:19 pm       │
│1:◇ Sign                      │
│2:⌒ Path                      │
│3:♡ Park Amenities            │
│4:● Bus Stop                  │
│�...Log stop: 12:58:33 pm......│
│                              │
│                              │
├──────────────────────────────┤
│ ▮      ⟨6⟩   PDOP   2.65      │
├──────────────────────────────┤
│ Target │ New │ Sort │ Filters │ → │
└──────────────────────────────┘
```
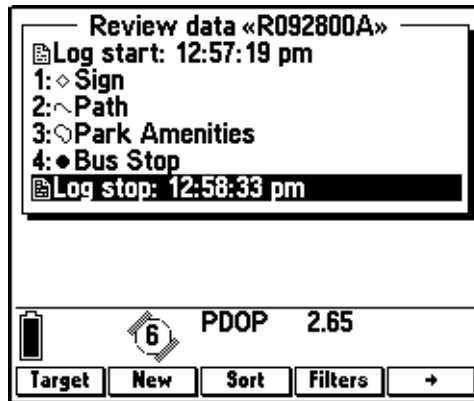
💡 **Tip –** It may take the Asset Surveyor software some time to open a large data file. If you intend to review or update data files frequently, consider creating and maintaining smaller data files to minimize the amount of time you must wait before opening your data. The Asset Surveyor software also takes longer to open a file on a PC card than a file in the internal memory of the TSC1 datalogger.

💡 **Tip –** The ⌐New⌐ softkey can be used to switch to the *Start feature* menu. The ⌐Review⌐ softkey in the *Start feature* menu lets you switch back to the *Review data* list from *Start feature* at any stage, thus providing for efficient review and update of existing features, and also the collection and review of new features.

When the file is opened, the Asset Surveyor software automatically highlights the last feature or note within that file. You can use the highlight to move up and down the features and notes within the file to enable review and/or update of these features.

Icons to the left of the file records indicate the nature of the adjacent record:

📄 notes

∿ line features

◌ area features

Point features appear with the symbol allocated to their point feature type for that data dictionary, as configured in the *Point feature symbols* form. These point feature symbols are the same as the symbols shown in the *Map* screen.

Note – For more information on allocating point feature symbols in the Asset Surveyor software, see Map Display Options, page 239.

When a feature is highlighted, two labels appear below the *Review data* list, displaying attribute information from the selected feature. Each label consists of the attribute name followed by the attribute value for this feature.

If the feature has no attributes, or no labels are selected for this feature type, the *Review data* list extends down to the status line and no label information appears.

Note – For more information on allocating labels in the Asset Surveyor software, see Map Display Options, page 239.

To open a feature for review, attribute edit, or GPS update, highlight the desired feature and press ⟨Enter⟩. The attribute form for the selected feature appears, with the original attribute values displayed, similar to the following:

```
          «Sign (Imported) »
Type:                SPEED LIMIT
Condition:               ⊙Good
Date Visited:        04/19/1996 Fri




 [█][PC]    ⟨6⟩    PDOP    2.97
 ┌─────┬─────┬──────┬─────┬──────┐
 │ Log │ New │ Mark │ EXT │ Offset│
 └─────┴─────┴──────┴─────┴──────┘
```

You can now review or edit the attribute information. You can also press ⟨Log⟩ to update the position information for the open feature as desired.

You can also select features for update and review on the *Map* screen. Simply move the map cursor over a feature and press the ⟨Enter⟩ key.

Tip – Features can be opened for update and review from both the *Review data* list and the *Map* module. You can use this functionality to open two features simultaneously, to check or edit the attributes of a feature while logging another. The first feature you open is opened for full update (attributes and GPS can be changed), while the second feature is opened in edit-only mode for attribute or offset editing only. If you close the first feature, the second feature switches from edit-only to full update capability.

Reviewing and Updating Attribute Data

The Asset Surveyor software lets you review and edit the attribute information for any existing feature. When an existing feature is opened, the attribute values are as they were entered at the time of collection, enabling review and edit if necessary. To review the attributes for a feature, highlight it on the *Review data* list and press ⏎Enter. To edit the attributes simply change them to the new value. You can close the feature without saving any changes to the feature by pressing Esc. This closes the form and returns you to the *Review data* list. To edit the feature's attribute information just change any of the attribute values, then press ⏎Enter to save the changes to the file.

Note – When you update attributes, the original attribute values of a feature are only discarded once the feature is closed and the new attribute values are saved to the file. If the feature update is cancelled by pressing Esc, any changes are discarded and the original attribute values are restored to the feature.

For further details on entering feature attribute values, see Entering Attribute Values, page 58.

Updating Offsets

You can update a feature's offset before, during, or after GPS update. After locating the feature in the *Review data* list or the map, and pressing ⏎Enter to display its attributes, press Offset to open the *offset* form for this feature type. Edit offset values as usual, then press ⏎Enter to close the offset form and press ⏎Enter again to confirm your changes and close the feature.

You can also edit offsets from the feature's *Position Information* form. In the *Review data* list, select the feature, press Pos, then press Offset.

⚠ **Warning –** If you update the offset for an existing feature, you should ensure that you *either* measure the new offset from the same location where you recorded the old offset, *or* log new GPS data from the new offset position.

If you update a point feature's offset before updating its GPS position, and then close the feature, the Asset Surveyor software displays the following message:

```
┌──────────── Warning ────────────┐
│ You have edited an offset. Do you│
│ need to update the feature's GPS │
│      before moving away?         │
├──────────────────────────────────┤
│                                  │
│                                  │
│                                  │
│                                  │
│                                  │
└──────────────────────────────────┘
```
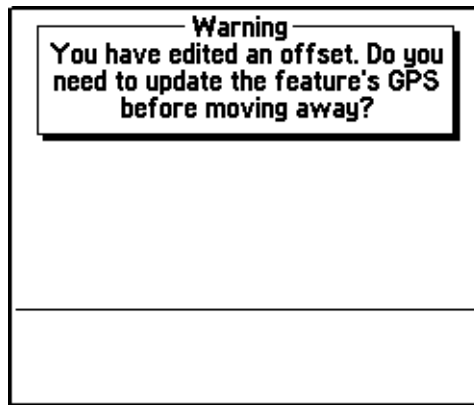
If you update the GPS position for a feature that already has an offset defined, then the offset is replaced with the currently configured constant offset. The message Existing offset reset appears in the status line.

If you want to keep an existing offset, open the offset form for the feature, modify it if necessary, and press ⌑OK⌑ to accept this offset. If you do not confirm the offset while the feature is open for GPS logging, it is cleared and the message Existing offset reset appears in the status line.

Updating GPS Data

The Asset Surveyor software lets you update the position information for an existing feature by providing the capability to replace the existing position information with new GPS data.

When an existing feature is opened for review and/or update, re-logging of GPS data does not happen automatically, to prevent unintentional update of the feature's position information.

You can press ⌷Log⌷ to prompt the logging of new GPS position data to the feature.

The warning message for GPS update looks like this:

```
┌──────Please confirm──────┐
┌─│ Sign: Update GPS data for this │──┐
Ty│         feature?         │VE
Co│                          │od
Da└──────────────────────────┘Fri

      ┌─┐  ╱◇╲
      │ │ ◇ 6 ◇  PDOP    2.67
      └─┘  ╲◇╱
  ┌────────┐              ┌────────┐
  │  Yes   │              │   No   │
  └────────┘              └────────┘
```
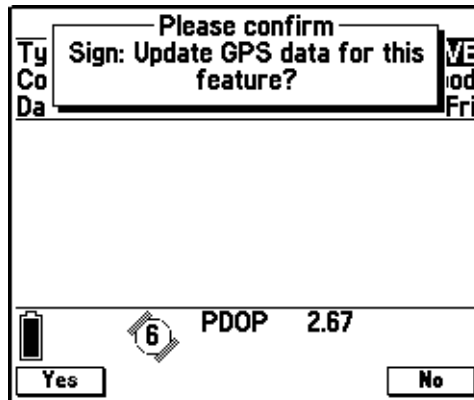
Press ⌷Yes⌷ to begin logging new GPS data to the existing feature, or ⌷No⌷ to cancel the update operation.

Once the update warning has been confirmed, new GPS data will be logged to the open feature, replacing the existing position information associated with that feature. Once you have collected sufficient GPS data for the feature press ⌷Enter⌷ to save the update operation.

Note – The original position data for a feature is only discarded once the feature is closed and the new GPS data is saved to the file. If the feature update is cancelled by pressing ⌷Esc⌷*, any changes are discarded and the original position information is restored to the feature.*

For a detailed explanation of logging GPS data to features, see Pause and Resume Logging, page 60.

The Asset Surveyor software also lets you specify whether update of GPS information is enabled for existing features, and when enabled, the circumstances under which you are to be warned before GPS update proceeds.

This capability is provided by two settings in the *Configuration / GPS rover options / Logging options* form:

```
┌─────────────────────────────────────┐
│         Logging options         ▲    │
│ Dynamics code:          ⟩Land       │
│ Audible click:          ⟩Yes        │
│ Log DOP data:           ⟩Yes        │
│ Allow GPS update:    ⟩Warn first    │
│ Warning distance:          Any      │
│                                     │
│                                     │
│                                     │
│ ┌─┐                                 │
│ │ │    ⟨7⟩   PDOP   2.47            │
│ └─┘                                 │
└─────────────────────────────────────┘
```
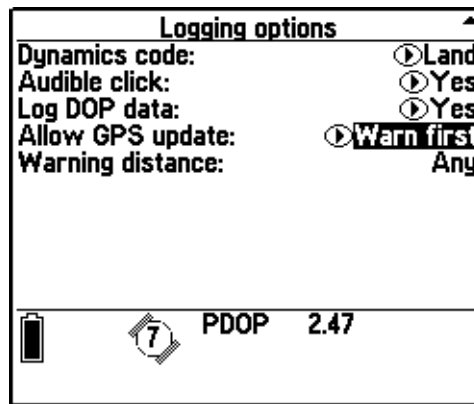
Use the *Allow GPS update* field to specify when GPS update is allowed. By default this field is set to 'Warn first', so that you are prompted with the warning message when you press ☐ Log ☐ to begin logging new GPS positions.

When *Allow GPS update* is set to 'Warn first', the *Warning distance* field is made available. In this field you can set the distance from the feature's existing position that the new GPS position must exceed before the warning message appears. By default the *Warning distance* is set to 'Any', so that the warning message appears at any distance.

If you only want to be prompted to confirm GPS update when you are more than a certain distance from the original GPS position, enter that distance in the *Warning distance* field.

If you want to disable the update of GPS data for existing features, set the *Allow GPS update* field to 'Never'. This prevents the GPS position for a feature being replaced. If you press ⌐ **Log** ⌐, the Asset Surveyor software displays the following message:
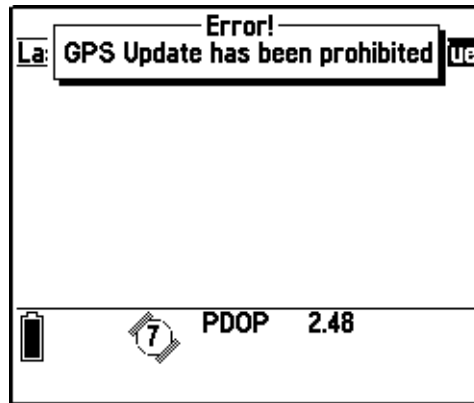
To enable the update of GPS data for all existing features without ever being prompted for confirmation, set *Allow GPS update* to 'Always'.

Note – For more information on the Allow GPS update and Warning distance fields, see Logging Options, page 166.

Update Status

The update status of a feature describes whether a particular feature is new, imported or updated. A feature with the update status New is one that has been created on the TSC1 datalogger and has not yet been transferred to the GPS Pathfinder Office software. A feature with the status Imported is a feature that has been transferred from the GPS Pathfinder Office software and has not yet been updated or 'marked' manually as updated. An Updated feature is one that has had its attribute or position information edited or replaced, or has been marked manually as updated.

New features in a file are shown with no update status icon next to them. Features with an Imported update status are shown in the *Review data* list with a ☐ icon to the far right of the feature record. When an Imported feature is opened and updated (attributes or offsets edited, or position information replaced), and the changes are saved to the feature, the icon is replaced by a ☑ icon, indicating that the update status for the feature has changed from Imported to Updated, similar to the following:
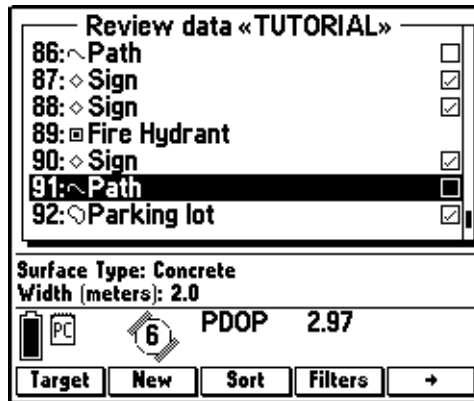
In the example above, the Sign and Parking lot features have been visited and their attributes, offsets, or positions have been updated, as indicated by the Updated icon. The Path features have not yet been updated, as indicated by the Imported icon. The Fire Hydrant feature does not have an update status icon, indicating that it is a New feature, appended to the file since import from the GPS Pathfinder Office software.

Note – Only Imported features are shown with an update check box. New features display without an update check box to indicate that they are new features and cannot have their update status changed to Updated until the GPS Pathfinder Office software has a record of them. If you reopen a feature with the New status and change it, it is displayed with a check mark to show that it has been modified. However, its update status is still New so it is not displayed with an update check box.
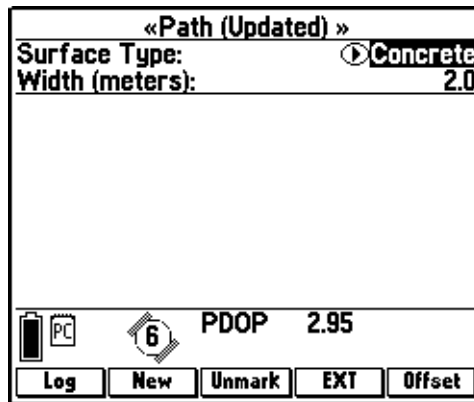
The update status icons are useful when you are doing data update as they enable you to quickly and easily verify which features have been checked and updated and which features have not yet been visited.

Manually marking features as Updated

Imported features automatically become Updated features when their attribute or offset information is edited, or their position information is replaced by new GPS data. However, in many cases, the attribute and position information for a feature will not need to be changed.

It then becomes necessary to manually mark a feature as Updated, so that you are still able to systematically work your way through the Imported features in a file. The capability to do this is provided by the ⌐Mark⌐ softkey, which is available in the attribute forms of all Imported features.

To manually mark a feature as Updated, press ⌐Mark⌐ within the attribute form for that feature. The title of the form will now display *(Updated)* after the feature name to indicate to you that the feature has been marked as updated:

```
         «Path (Updated) »
Surface Type:         ⟩Concrete
Width (meters):            2.0




      ┌─┐┌──┐   ╔═╗  PDOP   2.95
      │ ││PC│   ║6║
      └─┘└──┘   ╚═╝
      ┌────┬─────┬──────┬─────┬──────┐
      │ Log│ New │Unmark│ EXT │Offset│
      └────┴─────┴──────┴─────┴──────┘
```

Note – The ⌐Mark⌐ softkey is not available for New features, as new features cannot have their update status changed.

Once a feature has been manually marked as Updated, the `Mark`
softkey is replaced by the `Unmark` softkey. This lets you unmark a
feature that has been unintentionally marked as updated at any stage.

*Note – The `Unmark` softkey is not available for features that have been
updated by changing their original attribute, offset, or position
information, as they cannot be reverted to an Imported update status.
Once a feature has been saved with modified data it is flagged as
Updated, even if you open it again and change it back to its original
values.*

If you decide that you do not want to continue with an update, you
should reset the values before saving the feature, or press `Esc` to
abandon the update. In both cases the feature's update status remains
unchanged.

Target Selection from Review Data List

A feature can be selected from the *Review data* list as the Target for
navigation. To do this, highlight it in the list and press `Target`. The
Which position menu appears if you selected a line or area feature, and
you must select an option from the menu to specify a point in the
feature. The selected feature, or point from the feature, will then be the
Target in the *Map* and *Navigation* modules. The Target icon ✖
appears next to the feature to show it is the Target:
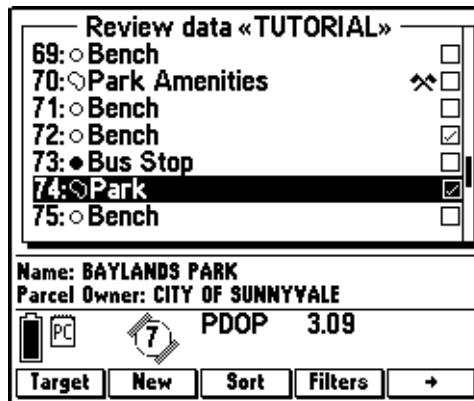
Only one feature can be selected as the Target. If you choose another feature it becomes the new Target. If you highlight the existing Target feature and press the [Target] softkey it is de-selected as the Target, and the current Target selection reverts to 'None'.

Note – You cannot set a Start from the Review data list. This can only be done from within the Map or Navigation modules.

For more information on navigation and setting the Start and Target, see Chapter 7, Navigation, and Chapter 8, Map.

Note – The highlighted option in the Review data list is always the feature currently selected for data update (from either the Review data list or the map), regardless of whether a Target is set or not.

Sorting

The Asset Surveyor software lets you sort the order of records in the current data file according to your data update needs. This capability is accessed by pressing [Sort] from within the *Review data* list. The *Sort by* menu appears:

```
┌──────── Sort by ────────┐
│ Feature                 │
│ Time                    │
│ Update status           │
│ Deletion status         │
│ Distance from GPS (2D)  │
│ Distance from cursor (2D)│
└─────────────────────────┘

  ▌    ⟨7⟩   PDOP   2.08        6
```
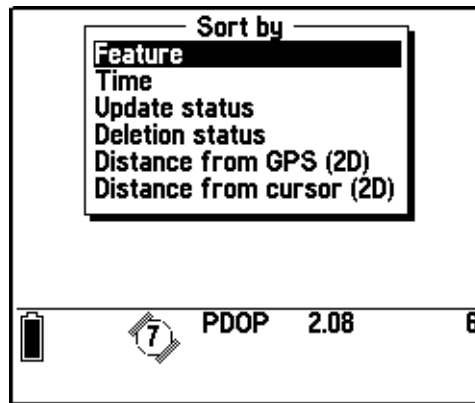
Each feature ID is linked to the feature it is assigned to as long as the file is on the datalogger. Sorting features into a different order from the one they were collected in rearranges their feature IDs accordingly.

The *Sort by* menu contains a number of entries representing different methods for sorting your data file. You can sort by:

- feature type

- time

- update status

- deletion status

- distance from the GPS position

- distance from the map cursor

Note – Sorting is a distinct event and the sort does not remain active. Any new features collected subsequently are not included in the sort and appear at the end of the list. To include them you must re-sort the file. Only one type of sort can be active at a time.

Sorting by feature type

The ability to sort by feature type is particularly useful where the update task to be carried out requires that you visit a certain feature type or types.

To sort the file records according to their respective feature types, select *Feature type* from the *Sort by* menu. The sort reorders the features in the *Review data* list according to their type:
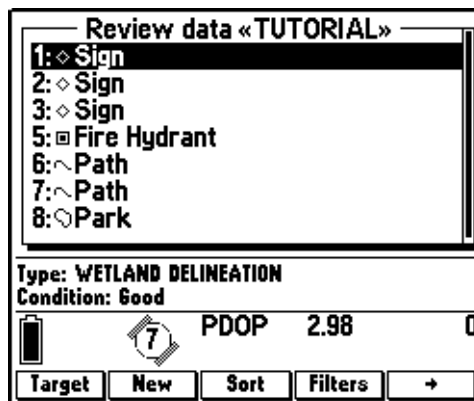
In the example above, you can see that the file's records have been sorted so that feature records of the same feature type are grouped together. The order of the sort is determined by the order of the feature types within the associated data dictionary. As the example above is based on the Tutorial data dictionary, Sign features are sorted to the top, with Fire Hydrant features next, and so on. Amongst the groupings of feature types, the records are ordered chronologically. Notes are sorted to the end of the file, and are also ordered chronologically amongst themselves.

Sorting by time

Select *Time* from the *Sort by* menu to sort the file records according to their chronological order: the order that they were originally collected in. This order represents the default record order that a file is displayed in when it is first opened:
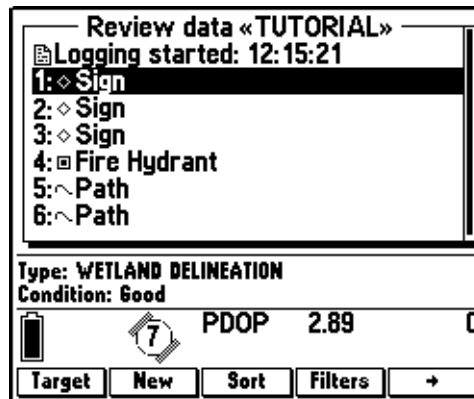
Sorting by update status

Sorting by update status is particularly useful for update operations, as you can quickly identify all the features in the file that have yet to be visited and updated (the Imported features). As with the feature type sorting, all features and notes are ordered chronologically within their respective groupings. Notes are sorted to the end of the file.

To sort the file records according to their update status, select *Update status* from the *Sort by* menu.

The sort reorders the features in the *Review data* list according to their update status:
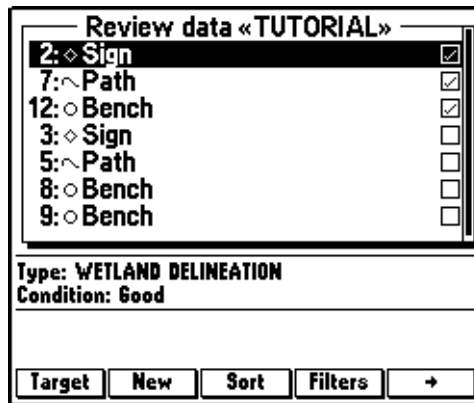
In the example above, the feature records have been sorted according to the update status that is associated with every feature. All Updated features are shown first, followed by Imported features, and finally New features.

Sorting by deletion status

Sorting by deletion status is useful when you want to separate out the deleted features in the file from those that have not been deleted. To sort the file records according to their deletion status, select *Deletion status* from the *Sort by* menu.

The sort reorders the features in the *Review data* list according to their deletion status:

```
┌──── Review data «TUTORIAL» ────┐
│ 117:⌒Path                    ☐ │
│ 118:▣ Fire Hydrant           ☑ │
│ 119:▣ Fire Hydrant           ☑ │
│ 120:◇ Sign                   ☐ │
│ 121:◇ Sign                   ▱ │
│ 122:⊖ Bench                  ▱ │
│ 123:⊖ Bench                  ▱ │
├────────────────────────────────┤
│ Color: White                   │
│ Number of Spouts: 4            │
│                                │
├────────────────────────────────┤
│ Target │ New │ Sort │ Filters │ → │
└────────────────────────────────┘
```
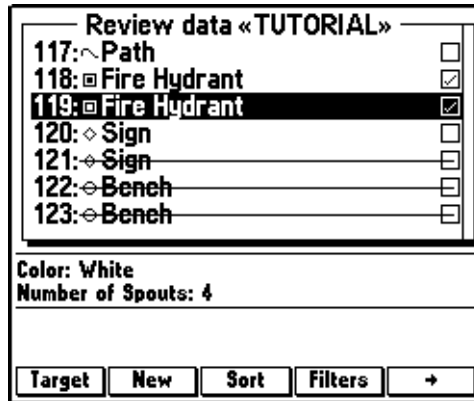
In the example above, the file records have been sorted so that all Undeleted features and notes are shown first, followed by Deleted features and notes. Again, all features and notes are ordered chronologically within their respective groupings and notes are sorted to the bottom of the record menu.

Sorting by distance from GPS

Sorting by distance from GPS is particularly useful when you are updating a file and you would like to work your way from the closest features to those further away.

To sort the file records according to their distance from the current GPS position, select *Distance from GPS* from the *Sort by* menu. The sort reorders the features in the *Review data* list according to their distance from the current GPS position:
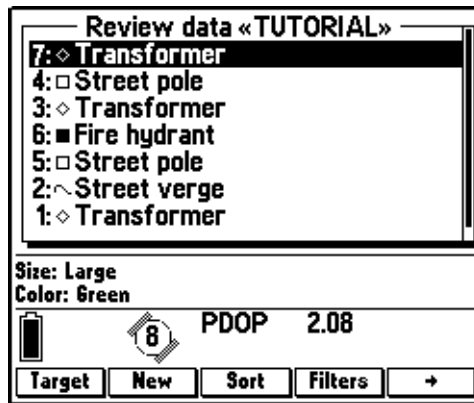
In the example above, the order of the feature records has been sorted so that the features closest to the current GPS position (as shown on the *Map* screen) are shown at the top of the menu, with the distance from the current GPS position increasing as you move down the list of feature records.

In comparing the map with the sorted *Review data* list, it may appear at first glance that some of the line and area features are closer to the current GPS position than the sort indicates. This is because the distance from GPS is measured to the *start* position of a line feature, and to the *start/end* position of an area feature, which is denoted by the ✛ symbol.

Note – Notes are sorted to the bottom of the Review data list when a Distance from GPS sort is performed.

Note – The sort by distance from GPS is valid at the time of selection only. It does not update when the current GPS position changes. The sort operation should be repeated to ensure that the sort is valid at any given time. A sort by distance from GPS uses the most recent GPS position. If GPS is currently unavailable then the 'old position' is used, or if none is available then no sort is performed.

Tip – Sorting by distance may take some time, especially with a large data file. You can abandon the sort at any time by pressing ⌫Esc.

Sorting by distance from cursor

Sorting by distance from cursor is useful if you want to sort the file so that the features are listed in order of how far away they are from a location chosen from the map.

Note – The Distance from cursor entry is only available in the Sort by menu when the cursor is active in the Map screen.

To sort file records according to their distance from the current map cursor position, select *Distance from cursor* from the *Sort by* menu:

```
┌─── Review data «TUTORIAL» ───┐
│ 6:■ Fire hydrant             │
│ 4:□ Street pole              │
│ 5:□ Street pole              │
│ 7:◇ Transformer              │
│ 3:◇ Transformer              │
│ 2:∿ Street verge             │
│ 8:♢ Traffic island           │
├──────────────────────────────┤
│ Size: Large                  │
│ Color: Green                 │
│ ▌      ⟨8⟩   PDOP   2.09     │
│ ┌────┬────┬────┬──────┬───┐  │
│ │Target│New│Sort│Filters│ → │ │
└──────────────────────────────┘
```
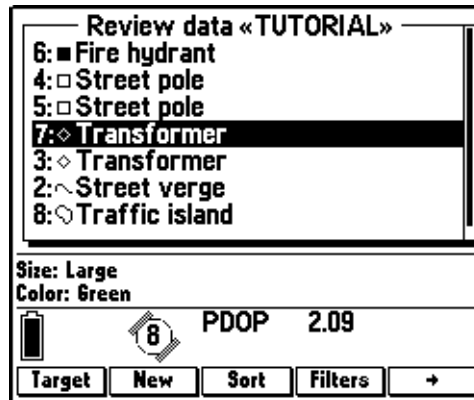
In the example above, the file has been sorted so that the features closest to the current cursor position (as shown on the *Map* screen) are shown at the start of the list, with the distance from the current cursor position increasing as you move down the list. As with the *Distance from GPS*, the *Distance from cursor* is measured to the **start** position of line features and to the **start/end** position of area features.

Note – Notes are sorted to the bottom of the Review data list when a Distance from cursor sort is performed.

Note – The sort by distance from cursor is valid at the time of selection only. It does not update when the current cursor position changes. The sort operation should be repeated to ensure that the sort is valid at any given time. A sort by distance from cursor uses the current location of the map cursor, the precision of which may be affected by the current zoom scale.

Tip – Sorting by distance may take some time, especially with a large data file. You can abandon the sort at any time by pressing ⎋ Esc.

Filtering

Filtering lets you show or hide different features from the feature list. This is useful for showing only specific sets of features that you are interested in and to hide others, removing features that you are not interested in from the *Review data* list and the *Map* screen. It is especially useful if you have a large list with many different feature types.

You can use filtering to show only specific types of features you are interested in (for example, all features that still need to be updated) or to hide features that you do not need to see so that the map display or *Review data* list is less cluttered.

Multiple filters can be applied sequentially. For example, a file can be filtered by feature type and time to show a particular feature type recorded within a certain time frame.

Note – Filters are applied everywhere within the Asset Surveyor software, including the Review data list and the Map screen. Specified filters are associated with the open data file only, and are reset when you close the file. If you open a new data file, or reopen an existing file, the filtering options are returned to their default settings.

Applying filters

To access *Filtering options*, press ⌜Filters⌝ in the *Review data* list. This opens the *Filters* menu for the current file.

To enable a filter, use the arrow keys to highlight it in the *Filters* menu and press the ⌜Enter⌝ key. This activates the filter according to its current settings. When the *Filters* menu is closed, any active filter is applied. A check mark appears in the *Filters* menu next to the filters that have been activated, similar to the following:
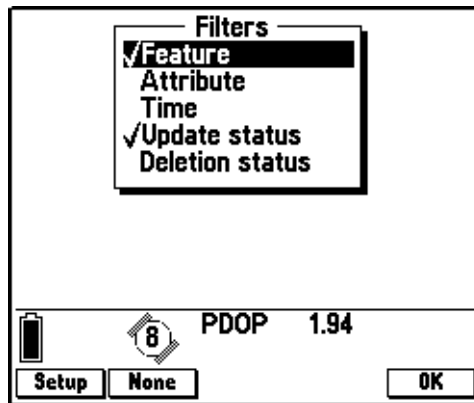
Note – You cannot activate a feature type filter and an attribute filter at the same time.

To deactivate a filter, highlight it in the *Filters* menu and press the ⌜Enter⌝ key again. The check mark disappears to show that the filter is no longer being applied. Use the ⌜None⌝ softkey to deactivate all filters.

To configure the settings for a filter, highlight the filter you want to configure and press ⌈Setup⌉. If you change the settings for a disabled filter, it automatically becomes active.

Any filter settings or selections you have modified do not take effect until you exit the *Filters* menu. To exit the *Filters* menu, press ⌈Esc⌉ or ⌈OK⌉. Note that this will not abandon the filter settings.

The title of the *Review data* list displays the suffix *(Filtered)* to remind you that at least one filter is active on the current file.

Note – Filtering affects the foreground data file only. Filters are not applied to any data file open as the background file.

⚠ **Warning –** Each entry in the *Review data* list is assigned a sequential feature ID number. This number is assigned by position in the list. When you filter the file, the number assigned to a filtered feature is reassigned to the next unfiltered feature in the list, to ensure the list is always numbered in an unbroken sequence.

Feature type filtering

To filter by feature type, highlight the *Feature type* entry on the *Filters* menu and press ⌈Setup⌉. The *Feature type filtering* form appears:

```
┌─────────────────────────────────┐
│ Feature type filtering TUTORIAL ▾│
│▤Notes:                    ⊙Show  │
│◇Sign:                     ⊙Show  │
│▫Utility Pole:             ⊙Show  │
│■Light Source:             ⊙Show  │
│⊡Fire Hydrant:             ⊙Show  │
│○Bench:                    ⊙Show  │
│●Bus Stop:                 ⊙Show  │
│⌒Path:                     ⊙Show  │
│⌒Park Road:                ⊙Show  │
│⌒Park:                     ⊙Show  │
│█    ⟨8⟩    PDOP   2.02           │
│[ShowAll]               [HideAll] │
└─────────────────────────────────┘
```
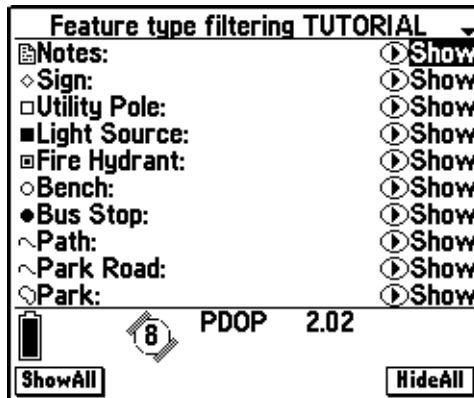
The *Feature type filtering* form contains a number of fields representing the feature types in the data dictionary that is associated with the open data file.

Each field has a value that can be set to 'Show' or 'Hide', depending on whether you want that feature type to be visible or not. If a feature type is set to 'Hide' then no features of that type will appear in the *Review data* list, the *Map* screen, or in any other part of the system such as the *Select start* and *Select target* menus or searches. In the example shown below, Utility Pole and Bench features have been filtered out so they do not appear on the *Review data* list and the *Map* screen, but Path, Sign, or Park features do:

```
┌────────────────────────────────────┐
│ Feature type filtering TUTORIAL  ▾ │
│▣Notes:                      ⊕Show   │
│◇Sign:                       ⊕Show   │
│▫Utility Pole:                ⊕Hide  │
│■Light Source:               ⊕Show   │
│▣Fire Hydrant:               ⊕Show   │
│○Bench:                       ⊕Hide  │
│●Bus Stop:                   ⊕Show   │
│∼Path:                       ⊕[Show] │
│∼Park Road:                  ⊕Show   │
│♡Park:                       ⊕Show   │
│▐       ⟨8⟩   PDOP   2.05            │
│▐                                    │
│[ShowAll]                  [HideAll] │
└────────────────────────────────────┘
```

Attribute filtering

To filter by attribute, highlight the *Attribute* entry on the *Filters* menu and press ⌷Setup⌷. The *Attribute filtering* form appears:

```
┌─────────────────────────────────────┐
│     Attribute filtering TUTORIAL     │
│Feature type:              ⊙Any       │
│Operator:              ⊙Containing    │
│Attribute value:                 ?    │
│                                      │
│                                      │
│                                      │
│ ▐█▌    ⟨8⟩   PDOP   2.05             │
│ ⌷Reset⌷                              │
└─────────────────────────────────────┘
```

The *Attribute filtering* form contains a number of fields representing each of the feature types, attributes, and attribute values in the data dictionary that is associated with the open data file.

The *Feature type* field value contains a menu of all feature types in the data dictionary. The *Attribute* value contains a menu of all attributes associated with the selected feature type. The *Attribute value* lets you enter the attribute value you want to filter on. The *Attribute value* field will be a text entry, numeric entry, menu, time, or date entry value, depending on the type of attribute value specified in the data dictionary.

If an attribute filter is active, then only features with the specified attribute value appear in the *Review data* list and the *Map* screen, and any features with attributes that do not match the criteria are filtered out.

For example, to filter the file to show all Parking lot features that are made of asphalt, the feature type, attribute, and attribute value are selected from the *Attribute filtering* form:

```
 Attribute filtering TUTORIAL
Feature type:          ◐◌Parking lot
Attribute:             ◐Surface type
Operator:                   ◐Equals
Attribute value:            ◐Asphalt


  ▌       ⬧8⬧  PDOP  1.91
  Reset
```

You can choose to filter any feature type or attribute by setting the field value to 'Any'. For example, you could include all features that have attribute values containing the word 'Good', or all features with a height attribute greater than 10. If you include a particular type of feature with any attribute, only features of that type will have their attributes compared by the filter.

Time filtering

To filter by time, highlight the *Time* entry on the *Filters* menu and press ⌐Setup¬. The *Time filtering* form appears:

```
┌────────────────────────────────────┐
│          Time filtering            │
│ Start                              │
│  Time (UTC):        10:24:47 am    │
│  Date:          09/27/1999 Mon     │
│ End                                │
│  Time (UTC):                  ?    │
│  Date:                        ?    │
│                                    │
│                                    │
│ ┌─┐                                │
│ │ │   ⟨8⟩  PDOP   1.76            │
│ └─┘                                │
│ ┌─────┐┌──────┐                   │
│ │Reset││ Local│                   │
│ └─────┘└──────┘                   │
└────────────────────────────────────┘
```

Times can be entered in either your local time or in UTC. If you have not yet configured your local time, the Asset Surveyor software uses the UTC time for the local time.

The time fields default to UTC or local time depending on the file naming convention used for the file. To switch to filtering by local time from UTC time, press ⌐Local¬. To switch from local to UTC time filtering, press ⌐UTC¬.

For details on file naming, see File Naming Conventions, page 45.

The *Time filtering* form contains two sub-fields to let you specify the start time and date as well as the end time and date. Features that were collected outside of the specified time period will be filtered out and will not appear in the *Review data* list or the map.

When editing the end time and date the ⌐Null¬ softkey is available, allowing you to set the time filter with no end time specified. An open-ended time filter such as this includes every feature in the file from the start time up to the present time, and new features appear in the *Review data* list and map as they are added to the file.

The ⌑AM⌑, ⌑PM⌑, and ⌑Now⌑ softkeys are available to set both the start and end time, and the ⌑／⌑ and ⌑Today⌑ softkeys are available to set the start and end date.

Note – You cannot set an end time and date that occur before the start time and date.

Use the ⌑Reset⌑ softkey to reset the start time and date to the time the first feature was logged to the file, and the end time and date to the current time, with a single keypress.

Update status filtering

To filter by update status, highlight the *Update status* entry on the *Filters* menu and press ⌑Setup⌑. The *Update status filtering* form appears:

The *Update status filtering* form contains a field for each of the three possible update states. Each field has a value that can be set to 'Show' or 'Hide', depending on whether you want features with that update status to be visible or not. If an update status field is set to 'Hide' then no features of that status appear in the *Review data* list or the *Map* screen.

In the example shown below, the file has been filtered to show only Imported features, that is, existing features in the file that still need to be visited for update. New features, and those that have already been updated, are hidden:
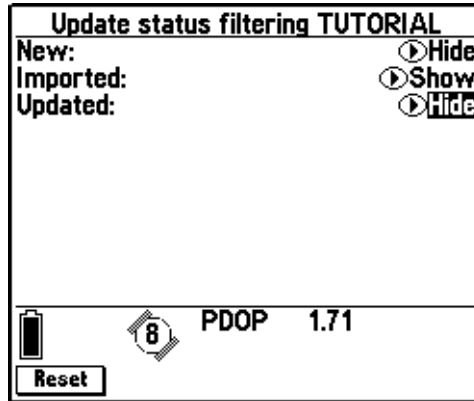
Use the ⎡Reset⎤ softkey to set all *Update status* fields to 'Show' with a single keypress.
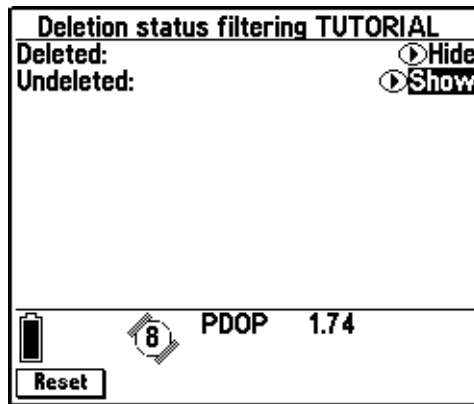
Deletion status filtering

To filter by deletion status, highlight *Deletion status* on the *Filters* menu and press ⎡Setup⎤. The *Deletion status filtering* form appears:
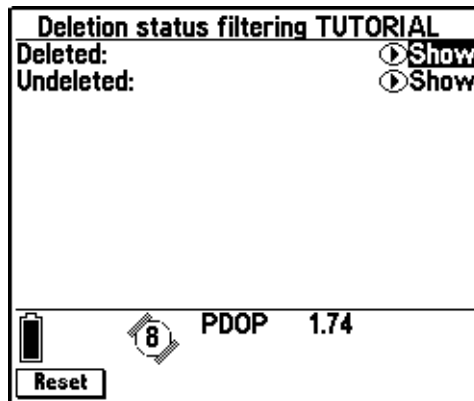
The *Deletion status filtering* form contains a field for each of the two possible deletion states. Each field has a value that can be set to 'Show' or 'Hide', depending on whether you want features with that deletion status to be visible or not. If a deletion status field is set to 'Hide' then no features with that status appear in the *Review data* list, or the map.

In the example shown below, the file has been filtered to show only Undeleted features, and features that have been marked as Deleted are not shown:

Use the ⌐Reset⌐ softkey to set all Deletion status fields to 'Show', with a single keypress.

Searching

Press the ⌐Search⌐ softkey to set up a search through the current data file. The Asset Surveyor software asks you to specify a pattern to search for, and a direction:

```
        Search TUTORIAL
Direction:          ⊙Forwards
Feature type:       ⊙◇ Sign
Attribute:          ⊙Condition
Operator:           ⊙Equals
Attribute value:    ⊙Good




  ▌      ⟨7⟩  PDOP   1.98

 Reset
```

Select a search direction from the *Direction* field. Because the Asset Surveyor software initially positions the highlight on the last feature or note in the data file, the default search direction is 'Backwards'. If you have repositioned the highlight at or near the top of the data file, you may want to change the direction to 'Forwards'.

You can search all feature types, or select one from the *Feature type* field. If you select a feature type from the *Feature type* field, the *Attribute* field appears and you can specify an attribute from the selected feature type. If you select an attribute, the search is limited to that attribute.

After selecting a feature type and attribute, if necessary, select an option from the *Operator* field to limit the search, or select 'None' to search for any feature or attribute of the selected type.

If you select an operator from the *Operator* field, the *Attribute value* field appears. If you have not selected an attribute, or have selected a text attribute, you can simply enter text in this field. If you have selected a menu attribute, you can select from the menu of values, and if you selected a time, date, or numeric attribute, you can only enter appropriate values.

When you have entered search criteria and a direction, press ⌨. The search commences from the currently highlighted feature or note. The Asset Surveyor software searches through each feature and note in turn, comparing it to the specified criteria.

The next feature with a matching value is highlighted in the *Review data* list:

```
┌──── Review data «TUTORIAL» ────┐
│ 1:◇Sign                      ☑ │
│ 2:◇ Sign                     ☐ │
│ 3:◇ Sign                     ☐ │
│ 4:▣ Fire Hydrant             ☐ │
│ 5:⌒Path                      ☐ │
│ 6:⌒Path                      ☐ │
│ 7:⌒Path                      ☐ │
├────────────────────────────────┤
│ Type: WETLAND DELINEATION      │
│ Condition: Good                │
├────────────────────────────────┤
│ ▮       ⟨8⟩   PDOP    1.81      │
├────────────────────────────────┤
│ Search ║ Pos ║ Info ║ Del ║ →  │
└────────────────────────────────┘
```
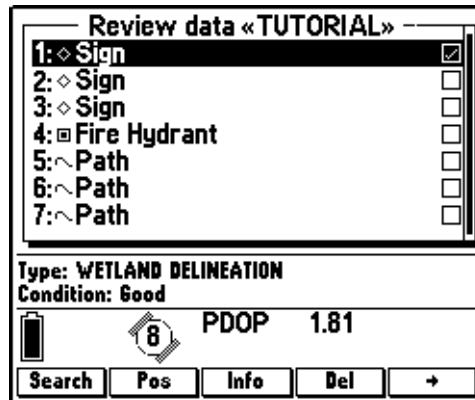
Note – When searching, the Asset Surveyor software only requires a partial match, and you do not need to specify the case of the pattern correctly. For example, searching for the attribute value 'pot' matches attributes with the values 'Pottsville' and 'spotted'.

Press Search again to continue the search, or to change the direction or search parameters and search again.

Note – When the search reaches one end of the list, it loops around and continues searching from the other end. For example, if you search forwards, when the search reaches the end of the list it starts again at the beginning of the list.

If the Asset Surveyor software searches right through the list without finding a match for the pattern, the following message appears:

```
┌──── Review ┬ Search ┬ RIAL» ──┐
│ 1:◇Sign   │ Not found │      ☑ │
│ 2:◇ Sign                     □ │
│ 3:◇ Sign                     □ │
│ 4:▣ Fire Hydrant             □ │
│ 5:∿Path                      □ │
│ 6:∿Path                      □ │
│ 7:∿Path                      □ │
├────────────────────────────────┤
│ Type: WETLAND DELINEATION      │
│ Condition: Good                │
│ ▮        ⟨8⟩   PDOP   1.81     │
├──────┬──────┬──────┬──────┬────┤
│Search│ Pos  │ Info │ Del  │ →  │
└──────┴──────┴──────┴──────┴────┘
```
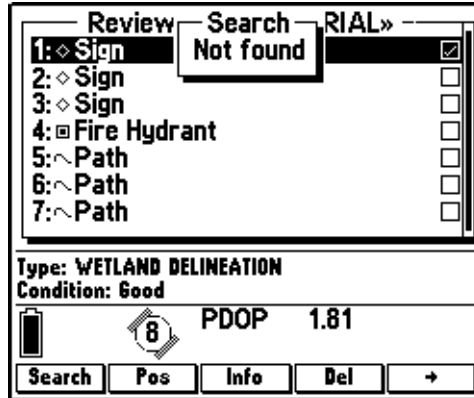
Note – The Asset Surveyor software searches for a match in all features or notes that are currently visible in the Review data list. If you do not want a search to include notes, deleted features, or any other group, then you should first apply a filter to remove them from the list, then start your search.

Tip – Searching the Asset Surveyor software's database can take quite some time, especially if each collected feature has many attributes. If you want to abandon a long search, press ⌐Esc⌐.

Positions

In the list of features and notes for a data file, you can view the GPS position(s) recorded for a feature by highlighting it and pressing ⌐Pos⌐.

Point features

If you press ⌐Pos⌐ when a point feature is highlighted, the Asset Surveyor software averages the GPS positions recorded for the feature and displays the averaged position:

```
            Averaged position
Feature:                    Fire Hydrant
Latitude:              37°24'41.03555"N
Longitude:            121°59'54.32697"W
Altitude (MSL):                   1.47m
Datum:                        WGS 1984
Zone:                             N/A




 ▮ PC    ⟨7⟩   PDOP    2.42
 WayPt   Offset
```

If the point feature was recorded as a quickmark, the Asset Surveyor software displays the interpolated position for the feature:

```
        Quickmark position
Feature:                   Bench
Latitude:         37°24'41.03226"N
Longitude:       121°59'54.09897"W
Altitude (MSL):            1.47m
Datum:                  WGS 1984
Zone:                        N/A



 ┌─┐     ╱5╲   PDOP    3.31
 │ │
 │█│
 └─┘
 ┌──────┐┌──────┐
 │ WayPt ││ Offset │
 └──────┘└──────┘
```
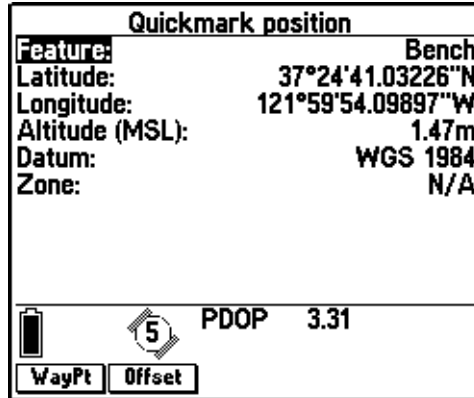
Line features

If you press ⬛Pos⬛ when a line feature is highlighted, the Asset Surveyor software asks you to specify whether you want to see the start or end position for the line feature:

```
      ┌ Which position? ┐
      │ Start of line    │
      │ End of line      │
      └─────────────────┘




 ┌─┐     ╱6╲   PDOP    3.47
 │ │
 │█│
 └─┘
```

Once you have chosen either the start or end position of the line, the Asset Surveyor software displays that position, for example:

```
                    Start of line
Feature:                            Path
Latitude:                37°24'41.32085"N
Longitude:              121°59'49.70180"W
Altitude (MSL):                    1.71m
Datum:                          WGS 1984
Zone:                                N/A



[▮]      (6)    PDOP    3.04

 WayPt    Offset
```

Note – If the line is still being logged then the end position will be the current end point; that is, the most recent GPS position recorded.

Area features

If you press ⎡ Pos ⎤ when an area feature is highlighted, the *Which position* menu appears:

```
          ┌ Which position? ┐
          Start/end of area
          Centroid of area




[▮]      (6)    PDOP    2.78         8
```

Specify whether you want to see the start and end position of the perimeter of the area feature, or the feature's centroid (the calculated center of the area feature). Once you have chosen one of these positions, the Asset Surveyor software displays that position, for example:

```
┌──────────────────────────────────────┐
│           Centroid of area           │
│ Feature:                       Park   │
│ Latitude:            37°24'44.80550"N │
│ Longitude:          121°59'49.57481"W │
│ Altitude (MSL):               0.52m   │
│ Datum:                    WGS 1984    │
│ Zone:                          N/A    │
│                                      │
│                                      │
│  ┌─┐      ╱──╲   PDOP   3.11          │
│  │▓│     ╱ 6 ╲                        │
│  └─┘     ╲──╱                         │
│  ┌──────┐┌──────┐                    │
│  │ WayPt ││ Offset│                   │
│  └──────┘└──────┘                    │
└──────────────────────────────────────┘
```
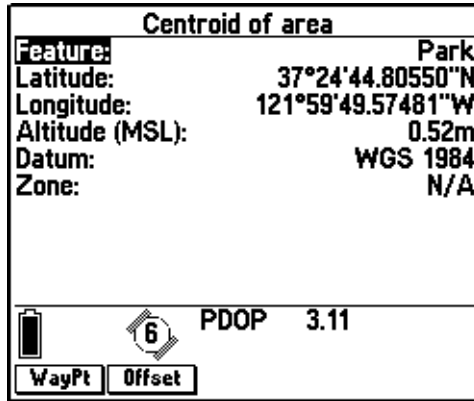
Note – If the area is still being logged then it will be treated as a line and the end point is the most recent GPS position recorded. The position of the centroid cannot be calculated until the feature has been completed, so the entries on the Which position menu are the same as for a line.

Creating waypoints from features

Any form that displays a particular position includes a ⌷WayPt⌷ softkey. You can press ⌷WayPt⌷ to create a waypoint from the displayed position (and therefore a waypoint can be created for a particular feature):

```
┌──────────────────────────────────────┐
│          Create waypoint 1           │
│ Name:                    Fire Hydrant│
│ Latitude:          37°24'41.03555"N  │
│ Longitude:        121°59'54.32697"W  │
│ Altitude (MSL):              1.47m   │
│ Datum:                    WGS 1984   │
│ Zone:                          N/A   │
│                                      │
│                                      │
│ ┌─┐┌──┐   ╱──╲                       │
│ │ ││PC│  ⟨ 7 ⟩  PDOP   2.46          │
│ └─┘└──┘   ╲──╱                       │
└──────────────────────────────────────┘
```
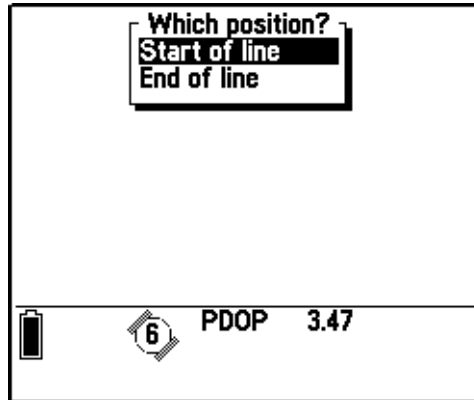
> ‐ᕯ‐ **Tip –** By creating a waypoint for a feature, you can navigate back to that feature at a later date. This is useful if you are using a different datalogger which does not support navigation to features. Waypoints are easily transferred between all Trimble dataloggers and use much less storage space than features, which store numerous positions and attributes for each feature. You can also create a waypoint for a feature using the GPS Pathfinder Office software after the feature's GPS position has been differentially corrected by postprocessing. You can then transfer this waypoint back into the TSC1 datalogger.

Note – The Asset Surveyor software suggests the type of feature as a name for the waypoint. However, you can enter a new name which identifies the feature more precisely if you want to.

Offsets

Any form that displays the position of a feature contains an [Offset] softkey. To view and/or edit the offset for this feature, press [Offset].

*Note – If a feature has a non-zero offset, the position(s) displayed for that feature have the feature's current offset applied. **All** features have an associated offset, but by default (and typically), this offset is zero.*

Point feature offsets

If you press [Offset] when viewing the position of a standard (or nested) point feature, the Asset Surveyor software displays the current offset for that feature, for example:

You can then view or edit this offset.

You can access the offset form for any feature from the *Review data* list and change the offset at any time.

*Note – The Asset Surveyor software lets you record a new offset for this point feature automatically using a laser rangefinder, **provided** you have activated the laser rangefinder interface (that is, in the External sensors entry in the Configuration menu, or by using the* `EXT` *softkey in data collection). You must be viewing the feature's offset form when you record the new offset. If you are not, the Asset Surveyor software applies the newly recorded offset to the feature that is currently being **collected**, if any.*

Quickmark offsets, line offsets, and area offsets

If you press `Offset` when viewing a position for a quickmark, line (start or end) or area (start/end or centroid) feature, the Asset Surveyor software displays the current offset for that position, for example:

You can then view or edit this offset.

Using a laser to update offsets when reviewing data

When reviewing a data file, you can view or edit the offsets associated with each feature. To use a laser rangefinder to update the offset associated with a feature:

1. From the *Configuration* menu, select *External sensors*.

2. Highlight the *Laser* entry in the *Select sensor* list and press ⏎ to activate it.

3. In the *Review data* list, highlight the feature whose offset you want to update.

4. Press ⌷Pos⌷ to display the *Averaged position* form for that feature.

   If the feature is a line, the Asset Surveyor software requires that you select the start or end of the line. If the feature is an area, the Asset Surveyor software requires that you select the start/end or centroid of the area. For the purposes of updating the feature's offset, it does not matter which of the feature's positions you choose to view.

   For example, the form for a Path line feature might be as follows:

```
                Start of line
Feature:                          Path
Latitude:             37°24'41.32085"N
Longitude:           121°59'49.70180"W
Altitude (MSL):                 1.71m
Datum:                       WGS 1984
Zone:                             N/A




  ▮        ⟨6⟩    PDOP    3.04
 ┌──────┬────────┐
 │ WayPt│ Offset │
 └──────┴────────┘
```

5. The *Averaged position* form contains an ⬚Offset softkey. To view or edit the offset for the feature, press ⬚Offset :

6. Provided the laser rangefinder interface has been previously activated (as described in steps 1 and 2), you can now record an offset with the laser. This becomes the new offset for the feature.

   Note – When using a laser rangefinder to update the offset for a line, area, or quickmark feature, you must manually enter a value for the Direction field.

7. Press ⬚Enter to save the modified offset.

Note – Offsets are imported along with features when they are transferred from the GPS Pathfinder Office software. However, unless they were updated during the same data collection session, they will be reset to the current constant offset value if the feature's GPS position is updated. When this happens the Asset Surveyor software displays the message Existing offset reset.

Feature Information

In the list of features and notes for a data file, you can view key information for a feature by highlighting it and pressing [Info]. The information displayed (depending on the feature type) includes the length, area, and perimeter of features, as well as the number of positions and the percentage of real-time positions.

Point features

If you press [Info] when a point feature is highlighted, the position information form for that feature appears, similar to the following:

```
                    Sign
Number of positions:              8
Real-time positions:            50%




 ▌        ⟨5⟩  PDOP   3.53          8
```

The point feature information form includes the *Number of positions* field, representing the number of GPS positions that were collected and averaged to produce the position for the specified point feature, and the *Real-time positions* field, which displays the percentage of real-time positions in the total *Number of positions*. Point features with real-time positions are averaged using only the real-time positions collected to the feature.

Note – If the point feature was recorded as a quickmark, the value in the Number of positions field is always '1'. The Real-time positions field is not displayed for quickmark point features.

Line features

If you press ⌐Info⌐ when a line feature is highlighted, the Asset
Surveyor software displays:

- the number of positions

- the percentage of real-time positions

- the two-dimensional line length

- the three-dimensional line length, which takes into account the
  altitudes of the points along the line:

```
                      Path
Number of positions:                73
Real-time positions:                0%
Length (2D):                  497.791m
Length (3D):                  497.919m




  ▮ PC        ⟨7⟩   PDOP   2.38
```

To calculate the 2D length the positions are treated as though they are
in a straight line and are simply added together. 3D length mirrors the
topography of the land, and the sum of the distances between the
positions in the line takes into account the vertical altitude of each.

Figure 3.1 shows the difference between 2D length and 3D length. In
the example shown, the 2D length of the line shown is the sum of the
distances from A to B. The 3D length is the sum of the distances from
A to C.
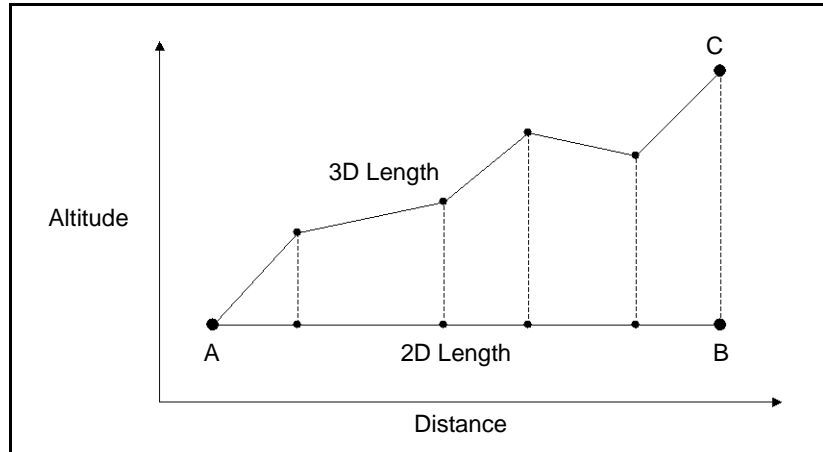
Figure 3.1 Two-dimensional and three-dimensional line length

If an offset has been applied to the selected line feature, the Asset Surveyor software may take some time to calculate the line length. A progress bar is displayed to indicate the progress of the calculation. Press the ⌐Esc key if you want to cancel the calculation.

The length of a line feature represents the ***combined*** length of the line's sections (the sections between the line's GPS positions). If you have segmented a line feature, the Asset Surveyor software treats the segment point as the end of the line when calculating its length.

When taking into account offsets for calculation of line lengths, the Asset Surveyor software uses a slightly different algorithm than the GPS Pathfinder Office software. Subsequently, there may be small differences in the values displayed by the Asset Surveyor software compared with those displayed by the GPS Pathfinder Office software.

Note – All other lengths in the Asset Surveyor software, such as the Distance to go value in Navigation, are calculated in a straight line to the end position. As with two-dimensional line lengths, the height of the feature above the WGS-84 ellipsoid is assumed to be the average of the heights of the start and end positions.

Area features

If you press ▭▭ when an area feature is highlighted, the Asset
Surveyor software displays:

- the number of positions

- the percentage of real-time positions

- the two-dimensional area

- the two-dimensional area perimeter

- the three-dimensional area perimeter which takes into account
  the altitudes of the points along the perimeter:

```
                 Parking lot
Number of positions:                    38
Real-time positions:                    0%
Area (2D):                      7602.739m²
Perimeter (2D):                  359.218m
Perimeter (3D):                  359.317m




  ▐        ⟨7⟩   PDOP    2.43

```

2D and 3D perimeters are calculated in the same way as line lengths,
except that the ends are joined up so that the start and end points share
the same position.

If an offset has been applied to the selected area feature, the Asset
Surveyor software may take some time to calculate the area and
perimeter. A progress bar indicates the progress of the calculation.
Press the ▭Esc key if you want to cancel the calculation.

The perimeter of an area feature represents the ***combined*** length of the segments that make up the area. An extra segment is measured from the end position to the start position of the feature to close it off. The two-dimensional and three-dimensional perimeters are calculated in the same manner as with two-dimensional and three-dimensional line length. The two-dimensional area is the region enclosed by the segments calculated for the two-dimensional perimeter.

When taking into account offsets for calculation of area and perimeter, the Asset Surveyor software uses a slightly different algorithm than the GPS Pathfinder Office software. Subsequently, there may be small differences in the values displayed by the Asset Surveyor software compared with those displayed by the GPS Pathfinder Office software.

Deleting and Undeleting Features and Notes

You can delete a feature or a note by highlighting it and pressing ⌐ Del ⌐. The Asset Surveyor software asks you to confirm your intention:
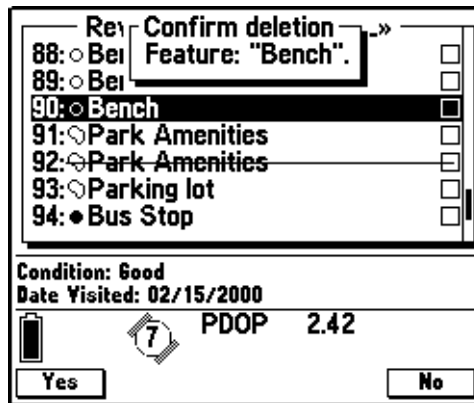
When a feature or note is deleted from an Asset Surveyor data file, it is not physically deleted. It remains in the file and can be restored on the datalogger or later in the GPS Pathfinder Office software.

When a feature is deleted from an Asset Surveyor data file, it appears in the *Review data* list with a line through it:
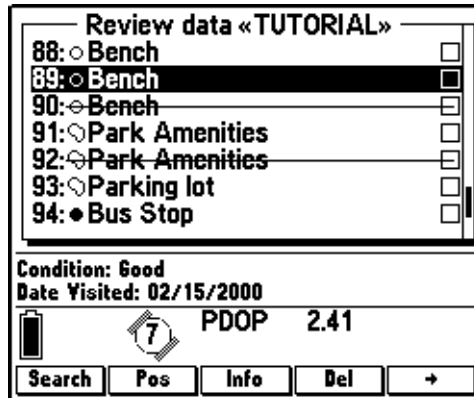
A deleted feature or note is still transferred to the GPS Pathfinder Office software when the data file is transferred, and it appears in the resulting SSF file (where it is also marked Deleted). The GPS Pathfinder Office software does not display deleted features or notes and they do not appear in any GIS output.

Undeleting

Because deleted features and notes are not physically removed from an Asset Surveyor data file, you can reverse the deletion process. To restore a deleted feature or note, highlight it and press ⌐Undel⌐.

Once a feature or note has been restored, it is as if it had never been deleted in the first place. The feature or note is treated by both the Asset Surveyor software and the GPS Pathfinder Office software as a normal feature or note and can be displayed and exported to a GIS.

Starting to Log Data

When you create a new data file or reopen an existing one, the Asset Surveyor software can log data to that file, as described in this section.

When a new data file is opened, the Asset Surveyor software spends a few seconds writing initial data to the file and reading its associated data dictionary before displaying a menu of features (as determined by the data dictionary) which can be collected to this file.

You can open an existing file for review without increasing its size, but as soon as you press ⌈New⌉ to go to the *Start feature* menu, the Asset Surveyor software begins to store data. This can include external sensor data, carrier phase data, PPRT records, velocity records, and Not in Feature positions.

When logging to a data file commences, the Asset Surveyor software writes a note to the data file recording the time and date. For example:

```
┌─────────────────────────────────┐
│          Review note            │
├─────────────────────────────────┤
│ Logging started: 09:24:38 am    │
│ 09/27/1999 (UTC time)           │
│                                 │
│                                 │
│                                 │
│                                 │
│                                 │
│                                 │
├─────────────────────────────────┤
│ ▮      ◈6◈     PDOP   2.94       │
└─────────────────────────────────┘
```
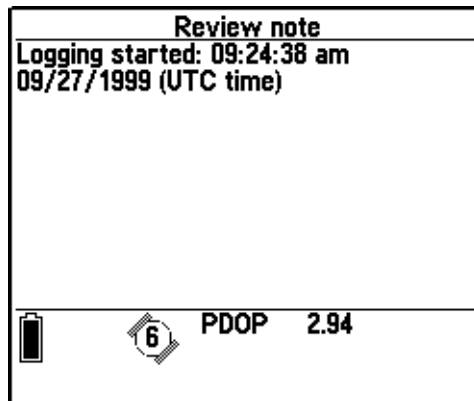
After creating or reopening a file for data collection, the *Antenna options* form appears:

```
               Antenna options
Height:                         0.000m
Measure:                    ⏺Vertical
Confirm:                    ⏺Per feature
Type:            ⏺Integrated GPS/Beacon
Part number:               ⏺ 29653-00
```

You should verify that the configured antenna height and type are correct before pressing ⏎ to proceed to collect data. For a list of antenna types and further details on configuring the *Antenna options* form, see Table 5.2 on page 201.

The *Confirm* field lets you specify how often you would like to be prompted to enter the height of your GPS antenna. By default, this is set to 'Per feature', so that the *Antenna options* form appears whenever you open a new feature for data collection. The other options are 'Per file', and 'Never'.

💡 **Tip –** Remember to enter a new antenna height, in *Antenna options* in the *GPS rover options* configuration menu, if you alter the height of your GPS antenna, and have changed *Confirm* to anything other than 'Per feature'.

Note – When a data file is opened, the Asset Surveyor software activates any external sensor or laser rangefinder interfaces that have been configured to automatically connect.

Exiting Rover Data Collection

When you have finished collecting features, you can exit data collection and close the file by pressing $\boxed{\text{Esc}}$ from the *Start feature* menu or *Review data* list. When you do, the Asset Surveyor software asks you to confirm your intentions:

```
┌─ Please confirm ─┐
│ Exit Data collection? │
└──────────────────┘




─────────────────────────────────

 Yes                        No
```
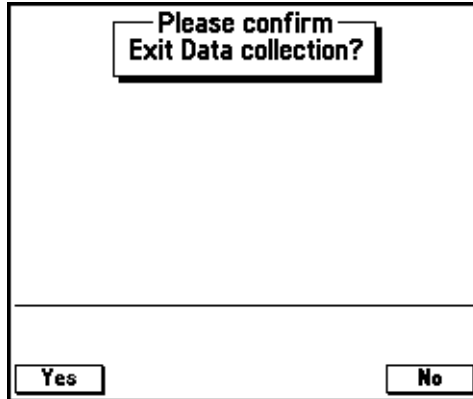
If you have been logging to a file with the *Carrier mode* set to 'On', and the *Minimum time* has not been achieved, the Asset Surveyor software asks you to confirm your intentions:

```
┌──── Please confirm ────┐
│ Insufficient carrier data; do you │
│   want to close this file now?    │
└───────────────────────┘




─────────────────────────────────

 Yes                        No
```
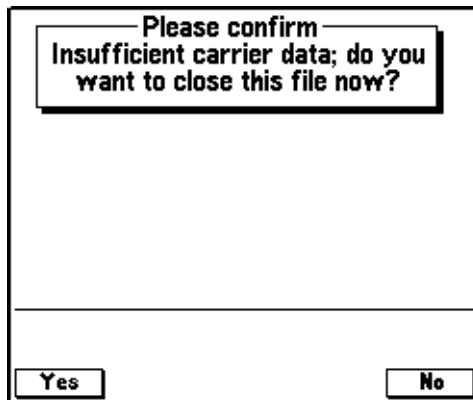
When you exit data collection and logging to that data file stops, the
Asset Surveyor software writes another note. For example:
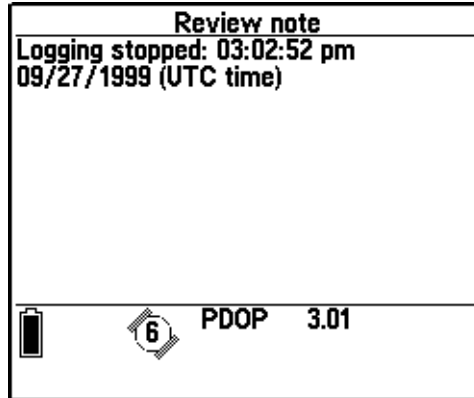
Create Base File

Base data is used to differentially correct rover data. A base station records GPS data from a receiver at a known, fixed location. Provided the rover is relatively close to the base station (within about 250 km), certain errors in GPS positions, such as Selective Availability, clock errors, transmission delays, and orbital errors, are common to both the base station and rover. Thus the difference between the base station's actual position and its reported position at any time can be used to correct the reported position of the rover at the same time, by canceling out the common error components.

Although it also uses the .ssf extension, a base data file records different information from a rover data file. It includes data on satellite positions and health, and all its position data is for approximately the same location. It does not record feature or attribute information, and cannot be used as a rover file.

The first step in setting up a GPS base station is to configure the *GPS Base station options*. For information on configuration options, see GPS Base Station Options, page 205.

You can reconfigure the base station options once the base station has started operating, but it is good practice to configure the Asset Surveyor software first, so that when a base station is started it can immediately log the data you require.

When you select the *Create base file* entry from the *Data collection* menu, the Asset Surveyor software first checks that it is connected to, and able to communicate with, a GPS receiver. If it is not connected to a GPS receiver at all, the Asset Surveyor software does not continue with the base station session.

Note – If the connected receiver is a Series 4000, GPS Total Station 4800, or Site Surveyor 4400 receiver the Real-time output mode in the Real-time output options form must be set to 'On' if you want to start a base station session.

When you select *Create base file* from the *Data collection* menu, the *Create new file* form appears:

```
┌─────────────────────────────────┐
│          Create new file        │
│ Filename:              B061621A │
│ Storage disk:              TSC1 │
│ Free space:              1152kB │
│                                 │
│                                 │
│                                 │
│  ┌─┐    ⬦    PDOP   2.16        │
│  │ │   (7)                       │
│  └─┘                             │
│ ┌──────┐                         │
│ │ Time │                         │
│ └──────┘                         │
└─────────────────────────────────┘
```

The Asset Surveyor software suggests a default filename, as described in File Naming Conventions, page 45. The default name appears in the *Filename* field. You can accept this default name, edit it, or type in a new name altogether. Filenames can be at most eight characters long, and can be composed of letters and digits only (that is, no spaces or punctuation characters).

The *Storage disk* field lets you specify the storage area the file is logged to. The options are TSC1 and PC card. This field is only configurable when a PC card is detected by the software.

The *Free space* field reminds you how much data file storage space remains on your TSC1 datalogger and the PC card, if one is present. You cannot edit this field.

Press ⌨ when you have entered a different filename, or to accept the default name. The Asset Surveyor software checks that the name of the new file is unique. If it is not, the Asset Surveyor software warns you:

```
┌──────────── Please confirm ─────────────┐
│ A file with this name exists. Do you     │
│           wish to append to it?          │
│                                          │
│                                          │
│                                          │
│                                          │
│                                          │
│                                          │
│                                          │
│  ┌─────┐                      ┌─────┐    │
│  │ Yes │                      │ No  │    │
│  └─────┘                      └─────┘    │
└──────────────────────────────────────────┘
```
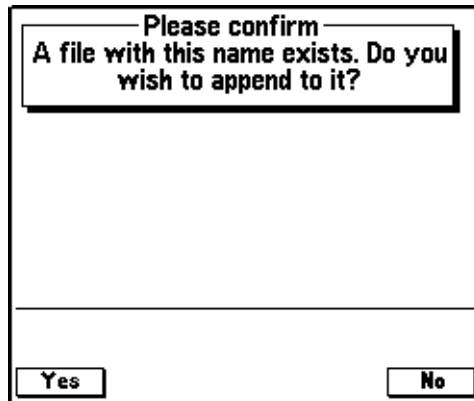
If you press ⌷Yes⌷, the Asset Surveyor software reopens the existing file and logs base station information to it. If you press ⌷No⌷, you are returned to the *Create new file* form where you can enter a new filename.

Note – When operated as a base station, the Asset Surveyor software always opens a data file to which it can log GPS measurement data for subsequent postprocessing. If you want to operate an exclusively real-time base station, and do not want to log data to the TSC1 datalogger, you should configure the Position and Measurement logging intervals for the base station to 'None'.

Antenna Height

After creating or selecting a base station file, the base station *Antenna options* form appears:

```
                Antenna options
Height:                       0.000m
Measure:                     Vertical
Type:         ⊕Integrated GPS/Beacon
Part number:            ⊕ 29653-00
```

You should verify that the configured antenna height is correct, then press ⌂ to proceed. For a list of antenna types, see Table 5.2 on page 201.

Reference Position

The reference position you enter is typically the position of some reference mark on the ground. The Asset Surveyor software combines this with the *Antenna height* that you previously specified to calculate the position of the GPS antenna's phase center (APC). This is the position that is logged in the base station file.

Once you have accepted a filename, the Asset Surveyor software lets you enter a reference position for the base station. This is the known position at which the base station is situated. The default given is the value that was last specified as a reference position:

```
              Reference position
Latitude:                         ?
Longitude:                        ?
Alt (MSL):                        ?
Datum:                     WGS 1984
Zone:                           N/A



  _____

  WayPt  Unknown  Here
```

You can enter the reference position from a map, or from the results of a previously-conducted control survey. If you provide a reference position for the base station, you must enter values into all three fields in the *Reference position* form.

If you do not know the location of your base station, and want to enter it later in the office, you can press ⌐Esc or Unknown to proceed. You can use the GPS Pathfinder Office software to change a base file's reference position once you return to the office.

*Note – If you have set the Real-time ouptut mode to 'On', you **must** enter a reference position.*

If you have previously recorded the location of the base station as a waypoint, press ⬚WayPt⬚ to access the menu of waypoints. Selecting a waypoint from this menu automatically fills in the *Reference position* fields with the location of that waypoint.

Tip – If you regularly operate a base station on more than one location, you can set up waypoints for each base location. This makes selection of the reference position very easy.

You can press ⬚Here⬚ to fill in the reference position with the current GPS position (if any).

Note – Unless you are receiving differential corrections, the accuracy of the current GPS position is subject to Selective Availability (S/A).

Warning – If you choose to append to an existing data file, you cannot specify a new reference position. If you have moved to a different location, you *must* create a new base file. Consequently, if you reopen a base file, make sure that you are at the same exact location that the base file was initially created. The reference position of the base station is stored when the base file is first created, and positions subsequently appended to the file will be inaccurate if the receiver is not at the same reference position.

Status Form

Once you have created a base station file and (optionally) entered a reference position for the base station, the Asset Surveyor software starts logging base station information. When operating as a base station, the Asset Surveyor software displays the *Base station* status form:

```
           Base station
Free space:              784kB
Start
  Time:             04:25:02 pm
  Date:          07/04/1997 Fri
Logging for:               0hr00m
```

Note – If real-time output has been enabled through the Real-time output options form, the title of this form is Real-time base station.

The fields on the *Base station* status form are as follows:

- The *Free space* field shows the amount of available data storage space remaining on the TSC1 datalogger.

- The *Start* field shows the time and date that the base station started logging to this data file.

- The *Logging for* field shows the time, in hours and minutes, for which the Asset Surveyor software has been logging base station data to this data file (in the current session).

None of these fields are editable.

Note – If real-time output has not started because you have failed to correctly configure the settings in the Real-time output options form, you must exit base station mode, reconfigure the settings in the Real-time output options form, and then restart your base station.

When you have finished operating the Asset Surveyor software as a GPS base station, you can exit base station mode by pressing ⌨ or ⌨.

Exiting Base Station Data Collection

When you have finished collecting base station data, you can exit data collection by pressing ⌨. When you do, the Asset Surveyor software asks you to confirm your intentions:

```
┌─ Please confirm ─┐
│ Exit base station? │
└────────────────────┘



─────────────────────────────

 Yes                      No
```
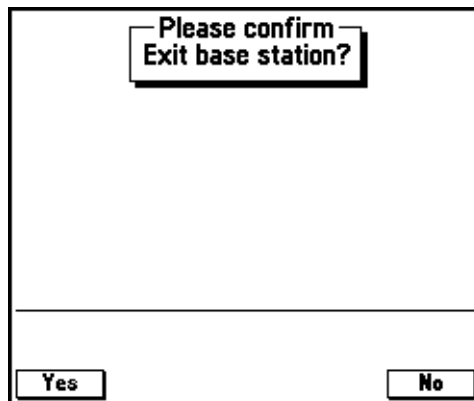
File Manager

In this chapter:

- ■ Introduction
- ■ Deleting data files
- ■ Rename file
- ■ Copy file(s)
- ■ Move file(s)
- ■ File transfer
- ■ Data dictionaries
- ■ Coordinate system files

Introduction

When you select *File manager* from the *Main menu*, the *File manager* menu appears:

```
┌─────File manager─────┐
│ Delete file(s)        │
│ Rename file           │
│ Copy file(s)          │
│ Move file(s)          │
│ File transfer         │
│ Data dictionaries     │
│ Coordinate system files│
└──────────────────────┘
```
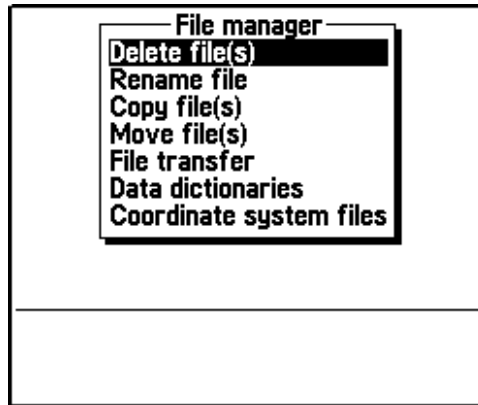
The *File manager* menu provides all of the functionality for the management of data files, including deleting, renaming, copying, moving, transferring, and reviewing files, as well as selecting data dictionaries for files to use and deleting extra coordinate system files.

Note – The Copy file(s) and Move file(s) entries only appear if a PC card is detected by the software.

Note – The Coordinate system files entry only appears if extra coordinate system files have been transferred to the TSC1 datalogger.

Deleting Data Files

If you select *Delete file(s)* from the *File manager* menu, the Asset Surveyor software displays the *TSC1:Delete file(s)* form:
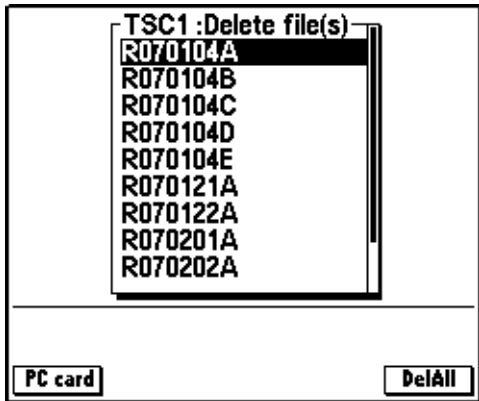
To view any data files stored on a PC card, press the ⎡PC card⎤ softkey. The softkey changes to ⎡TSC1⎤ when you are viewing files on the PC card.

> **Tip –** To see details of each file, including its update status, size, data dictionary, number of features, and start and end times, select the file from the *Open existing file* form in *Data collection*. For more information, see Opening Existing Files for Review and Update, page 80.

To delete a single data file, select it in the *Filename* field and press ⎡Enter⎤. To delete all data files at once, press ⎡DelAll⎤.

When you select a single data file to delete, the Asset Surveyor software asks you to confirm that you want to delete the file:

```
┌─ Confirm deletion ─┐
│ File: "R070104A".  │
└────────────────────┘




_____

 Yes                              No
```

When you press ⌷DelAll⌷, the Asset Surveyor software asks you to confirm that you want to delete all data files:

```
┌──── Please confirm ────┐
│ Do you want to delete ALL data │
│          files?         │
└─────────────────────────┘




_____

 Yes                              No
```
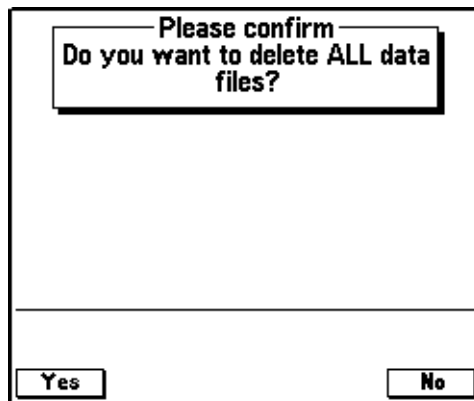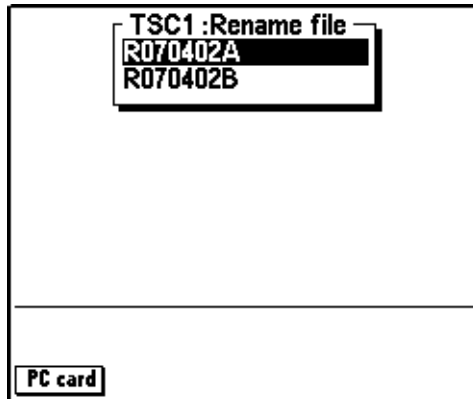
For each data file to be deleted, the Asset Surveyor software checks whether the file has been transferred to your PC. If it has not yet been transferred, the Asset Surveyor software warns you of that fact and asks you to confirm once more that you want to delete it:

```
┌──────────── Confirm deletion ────────────┐
│ This file has not been transferred to     │
│          the PC: "R093022B".              │
├───────────────────────────────────────────┤
│  R092802A                                 │
│  R093022B                                 │
│  TUTORIAL                                 │
│                                           │
│                                           │
│  ┌─────┐                        ┌─────┐  │
│  │ Yes │                        │ No  │  │
│  └─────┘                        └─────┘  │
└───────────────────────────────────────────┘
```
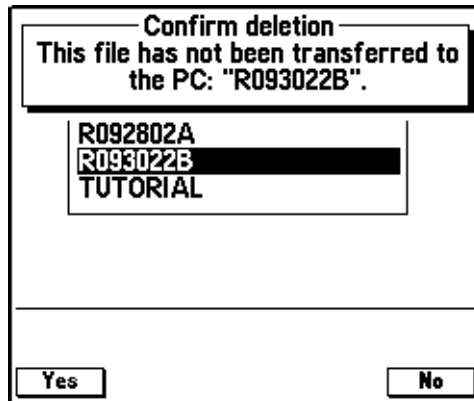
If you press ⌐Yes⌐ to this question, or if the file has previously been transferred to your PC, the Asset Surveyor software deletes the data file and recovers the space that it used.

Rename File
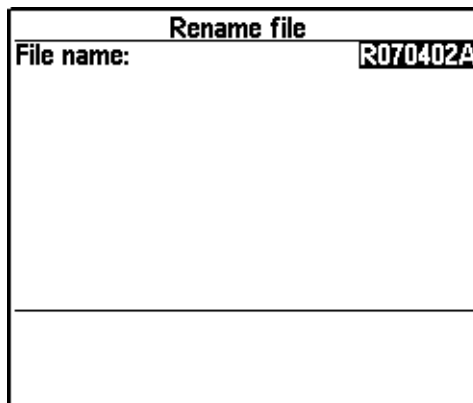
If you select *Rename file* from the *File manager* menu, a menu of files similar to the following appears:

```
┌ TSC1 :Rename file ┐
│ R070402A          │
│ R070402B          │
│                   │
│                   │
│                   │
│                   │
│                   │
│                   │
│                   │
│_____│
│                   │
│ ┌────────┐        │
│ │ PC card│        │
└─┴────────┴────────┘
```

To view any files stored on a PC card, press the ⌷PCcard⌷ softkey. The softkey changes to ⌷TSC1⌷ when you are viewing files on the PC card.

Select the file you want to rename and press the ⌷Enter⌷ key. A *Rename file* form similar to the following appears:

```
┌──────── Rename file ────────┐
│File name:          R070402A │
│                             │
│                             │
│                             │
│                             │
│                             │
│                             │
│                             │
│_____│
│                             │
│                             │
│                             │
└─────────────────────────────┘
```

You can now type in the new name for the file. If you select a name which is already in use by another file, an error message similar to the following appears:

```
┌─────── Error!──────┐
│ Duplicate file names are not │
│     allowed."MAPJOB23"     │
└────────────────────┘
```

Select a new name that is not being used by another file, and press ⏎(Enter). The *Rename file* form appears with the renamed file shown:

```
┌─ TSC1 :Rename file ─┐
│ MAPJOB24            │
│ R070704A            │
│ R070820A            │
│ R070821A            │
│ R070822A            │
│ R070822B            │
│ R070901A            │
│ R071021A            │
│ R071021B            │
└─────────────────────┘

 PC card
```
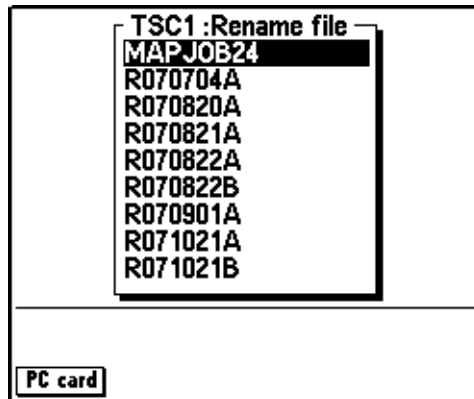
Copy File(s)

If you select the *Copy file(s)* entry from the *File manager* menu, a
Copy file(s) menu similar to the following appears:
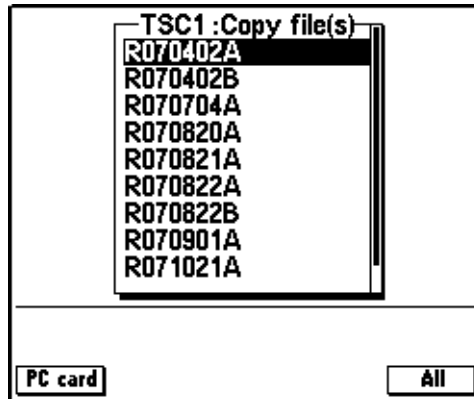
If a PC card is installed, the *Copy file(s)* menu lets you copy files from
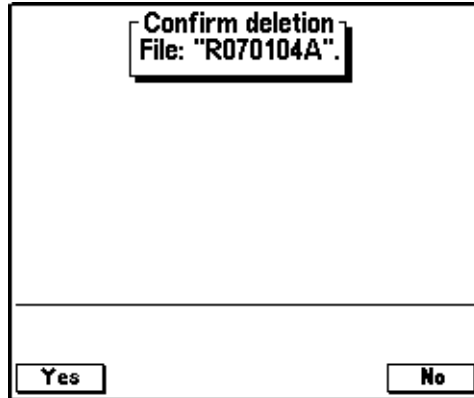the TSC1 datalogger's internal memory to the PC card, or from the PC
card to the TSC1 datalogger.

To view any files stored on the PC card, press the `PC card` softkey. The
softkey changes to `TSC1` when you are viewing files on the PC card.

Select the file you want to copy and press the `Enter` key, or if you want
to copy all of the available files, press the `All` softkey.

If you have selected a file or files from the TSC1 menu, then these
files are copied to the PC card. If you have selected a file or files from
the PC card, then these files are copied to the TSC1 datalogger.

Move File(s)

If you select the *Move file(s)* entry from the *File manager* menu, the *Move file(s)* menu similar to the following appears:

```
┌─ TSC1 :Move file(s) ─┐
│ R070402A            ▓│
│ R070402B            ▓│
│ R070704A            ▓│
│ R070820A            ▓│
│ R070821A            ▓│
│ R070822A            ▓│
│ R070822B            ▓│
│ R070901A            ▓│
│ R071021A            ▓│
│                      │
│                      │
│ PC card         All  │
└──────────────────────┘
```
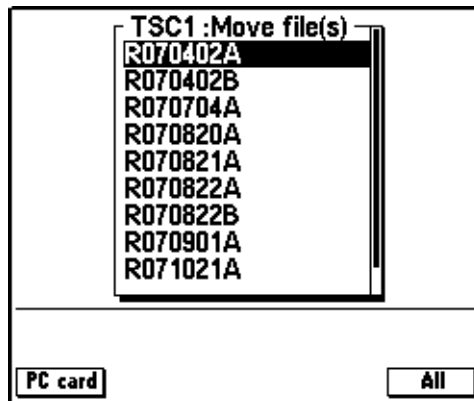
If a PC card is installed, the *Move file(s)* menu lets you move files from the TSC1 datalogger's internal memory to the PC card, or from the PC card to the TSC1 datalogger.
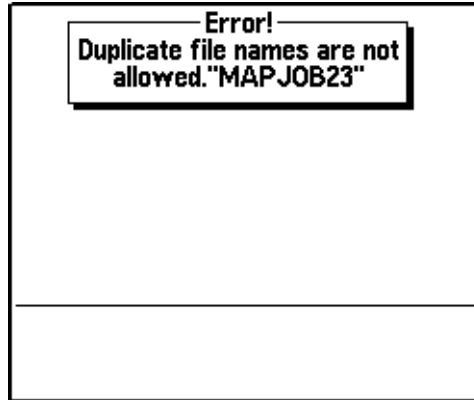
To view any files stored on the PC card, press the [PCcard] softkey. The softkey changes to [TSC1] when you are viewing files on the PC card.

Select the file you want to move and press the [Enter] key, or if you want to move all of the available files, press the [All] softkey.

Note – Moving a file from the TSC1 datalogger to the PC card (or vice versa) results in the original file being removed from the source (TSC1 datalogger or PC card).

If you have selected a file or files from the TSC1 menu, then these files are moved across to the PC card. If you have selected a file or files from the PC card, then these files are moved across to the TSC1 datalogger.

File Transfer

If you select the *File transfer* entry from the *File manager* menu, the Asset Surveyor software enters file transfer mode. You can use this mode to transfer data files, data dictionaries, language files, waypoints, almanacs, and coordinate system files between the Asset Surveyor software and the GPS Pathfinder Office software.

⚠ **Warning –** You should not put the TSC1 datalogger into File Transfer mode if you are performing a software upgrade. For more information, see Chapter A, Installing the Asset Surveyor Software.

You cannot transfer files while the TSC1 datalogger is connected to GPS, so you must disconnect GPS before selecting *File transfer*. If you do not, the following message appears:

```
┌─────────── Error! ───────────┐
│ Disconnect GPS before selecting this │
│              option              │
│                                  │
│                                  │
│                                  │
│                                  │
│ ─────────────────────────────── │
│                                  │
└──────────────────────────────┘
```
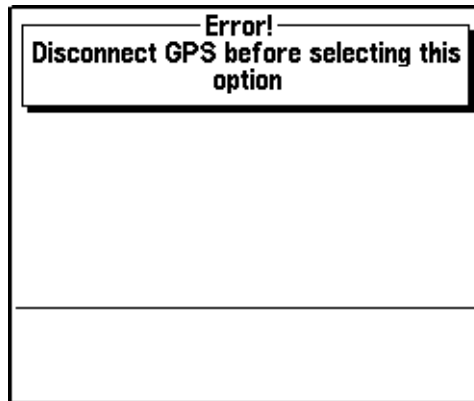
💡 **Tip –** You can cause the Asset Surveyor software to cease communications with the GPS receiver by selecting the *Disconnect GPS* entry in the *Utilities* menu. You do not have to physically disconnect the cables from your GPS receiver for file transfer to proceed, you only need to prompt the Asset Surveyor software to cease communications with the GPS receiver.

Once GPS is disconnected, make sure your TSC1 datalogger is connected to your PC, and select *File transfer* again. The Asset Surveyor software then displays the file transfer status form:

```
┌─────────────────────────────────────┐
│            File transfer            │
│ Connect cable to PC                 │
│ ─────────────────────────────────── │
│                                     │
│                                     │
│                                     │
│                                     │
│                                     │
│ ─────────────────────────────────── │
│                                     │
│                                     │
│                                     │
└─────────────────────────────────────┘
```

Throughout the file transfer session, the Asset Surveyor software displays status information on the second line of this form, indicating whether or not the file transfer operations are proceeding correctly.

All file transfer operations are controlled from the Data Transfer utility in the GPS Pathfinder Office software. You can exit file transfer mode at any time by pressing ⟨Esc⟩ on the TSC1 datalogger. If a transfer operation was in progress at the time, it is cancelled.

Transferring Data Files to and from the PC

Table 4.1 shows the data types that are available for transfer between a Asset Surveyor datalogger running the Asset Surveyor software and your office computer.

Table 4.1   Data types

Data Type	Send to Asset Surveyor	Receive from Asset Surveyor
Data	Yes	Yes
Waypoint	Yes	Yes
Data Dictionary	Yes	No*
Almanac	No	Yes
Base data	No	Yes
Background file	Yes	No*
Coordinate system	Yes	No
Grid files	Yes	No
Other	Yes	No

Tip – You cannot receive a Data Dictionary (.ddf) file from the TSC1 datalogger, but you can extract it from a data file transferred to your PC. You can also receive a data file that was sent to the TSC1 datalogger as a background file by transferring it as a standard data file.

For more information on how to transfer files to and from the Asset Surveyor software, refer to the GPS Pathfinder Office Data Transfer utility documentation.

Other File Types

Other file types that can be transferred to the Asset Surveyor software are as follows:

- satDGPS.ini

  A file containing the most recent details of DGPS satellites and their frequencies.

- *.cse

  A file containing coordinate system definitions. This can be edited on your PC using the Coordinate System Manager in the GPS Pathfinder Office software, and then loaded onto a fleet of TSC1 dataloggers to ensure that they all have the same coordinate systems (and only those coordinate systems that are required for your application). Four other file types are associated with the transfer of custom coordinate systems:

    – *.dgf (datum grid file)

    – *.mrf (multiple regression file)

    – *.pgf (projection grid file)

    – *.ggf (geoid grid file)

  For more information about these file types, refer to the GPS Pathfinder Office documentation.

- *.lng.

  A number of specific Asset Surveyor language files. You can change the language used by the Asset Surveyor software in the *Language* field in the *Units and display* configuration form. The languages loaded at installation are:

  – English

  – Spanish

  – German

  – French

  – Russian

  – Portuguese

- *.hlp.

  Help files for the supported languages. You can load the help file for the language(s) you require onto your TSC1 datalogger, so that the Help is displayed in the language used by the Asset Surveyor software. The help files available are shown in Table 4.2.

Table 4.2   Help files

Help file	Language
English.hlp	English (default language)
Espanol.hlp	Spanish
Deutsch.hlp	German
Francais.hlp	French
Russian.hlp	Russian
Portugue.hlp	Portuguese

Note – The Help files for English are loaded onto the TSC1 datalogger during general installation, and do not need to be individually loaded onto the TSC1 datalogger, as with the other supported languages.

Data Dictionaries

If you select *Data dictionaries* from the *File manager* menu, the Asset Surveyor software displays a menu of the data dictionaries currently stored on the TSC1 datalogger:

```
┌──── Data dictionary ────┐
│ Generic                 │
│ Tutorial                │
│                         │
│                         │
│                         │
│                         │
│ ▌    ⟨6⟩  PDOP   3.21    │
│ Del                     │
└─────────────────────────┘
```
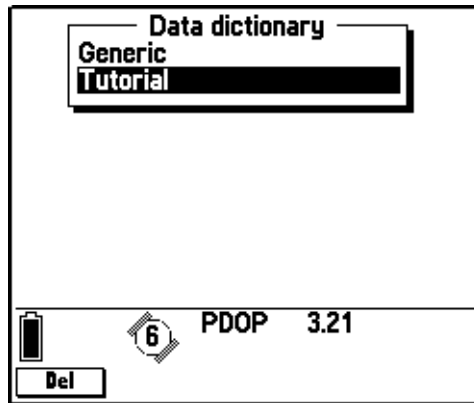
The currently highlighted data dictionary is the one used when you last created a data file. If you select a different data dictionary from this menu, the new data dictionary becomes the current data dictionary, and is offered as the default when you next create a data file.

The Asset Surveyor software lets you have a number of data dictionaries available for various data collection operations. You can maintain two or more current data files, with possibly different associated data dictionaries and you can swap between them very easily.

Tip – The Asset Surveyor software automatically extracts the data dictionary from an imported data file, so you do not have to send the data dictionary separately.
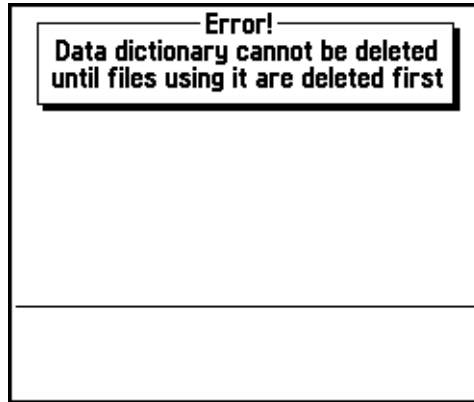
Deleting Data Dictionaries

You can press the [Del] softkey to delete the currently highlighted data dictionary from the TSC1 datalogger. If you attempt to delete a data dictionary that is still associated with a data file on the TSC1 datalogger, the Asset Surveyor software refuses to delete that dictionary:

```
┌──────────── Error! ────────────┐
│ Data dictionary cannot be deleted │
│ until files using it are deleted first │
└─────────────────────────────────┘
```

You must delete (or transfer and delete) all data files associated with a data dictionary before you can delete the data dictionary itself.

Note – You cannot delete the Generic data dictionary, which is always available in the Asset Surveyor software. This is the data dictionary associated with base station data files, and it can also be used for creating rover files for off-the-cuff data collection.

Select a new data dictionary from the menu or press [Esc] to return to the *File manager* menu.

Press [Enter] to open the *Feature type* list. This list shows all the feature types defined in the selected data dictionary. From this list you can configure auto-incrementing attributes, change point feature symbols, and select the labels that appear to identify a selected feature in the *Data* and *Map* modules.

Auto-Incrementing Attributes

From the *Feature type* list, select a feature and press ⌊Auto Inc⌋ to display the *<feature> Auto increment settings* form. From this form you can configure the auto-incrementing attributes for that feature in the selected data dictionary. If the selected feature has no text or numeric attributes, the ⌊Auto Inc⌋ softkey is not available.

The *Auto increment settings* form contains a field for each text or numeric attribute in the selected feature. To set the auto-increment options for an attribute, highlight its field and enter an increment or decrement value. To indicate an increment, enter a positive number. To indicate a decrement, use the ⌊ - ⌋ softkey to enter a negative number. To turn automatic incrementing off for this attribute, enter **0** or press ⌊ None ⌋ .

Rules for auto-incrementing

The auto-incrementing function lets you configure an increasing or decreasing sequence of values for numeric attributes or numeric values in text attributes. Auto-increment settings can also be configured in the Data Dictionary Editor utility in the GPS Pathfinder Office software.

Each time you create a new feature, any auto-incrementing attribute is automatically filled in with a default value. This value is calculated by adding the increment or decrement specified for this attribute to the value stored in the last feature of this type that you added or edited. In a text attribute, only numeric characters are incremented. Alphabetic characters are never incremented. For example, if the last value was 27A, the next number in a sequence with an increment of 1 is 28A.

Note – If a text attribute consists of numeric characters interspersed with alphabetic characters, for example Z496-JD98, only the rightmost number is incremented. In this example, the next number in a sequence with an increment of 1 is Z496-JD99. Only the number 98 is incremented; 496 is always left unchanged.

If the last attribute value was null or contained no numeric characters, the attribute is not automatically incremented and the last attribute's value is used again. The first attribute you add also defaults to null, as there is no previous value from which to calculate the increment.

Auto-incrementing obeys any restrictions set on the attribute's length, minimum value, or maximum value. If incrementing or decrementing the last value would result in a value that was not allowed, the attribute value is null and you must enter a value yourself.

An attribute's auto-increment value is only a default. Provided the attribute settings allow editing, you can change it to any value that is permitted for this attribute. Once you change an auto-incrementing attribute's value, the sequence continues from the value you enter, not the default generated by the software.

Point Feature Symbols

From the *Feature type* list, select any point feature and press ⎡Symbols⎤ to configure the point feature symbols to be used for the selected dictionary. This lets you select the symbol that will represent this type of feature on the *Map* screen and in the *Review data* list. For more information on configuring point feature symbols, see Symbols, page 243.

If the selected feature is not a point feature, this softkey is not available.

Note – In the File manager module you can configure the symbols for any data dictionary, regardless of whether there is a file open that uses it or not. You can also access the ⎡Symbols⎤ *softkey from the Map display options form. However, in the Map module, you can only configure the symbols for the dictionary that is used by the currently open file.*

Labels

From the *Feature type* list, select a feature and press ⌷Labels⌷ to configure the two attributes to be used for as labels for that feature in the selected dictionary. This lets you select the attribute information that will be displayed with this type of feature on the *Map* screen and in the *Review data* list. For more information on configuring feature labels, see Labels, page 246.

If the selected feature has no attributes, this softkey is not available.

Note – In the File manager module you can configure the labels for any data dictionary, regardless of whether there is a file open that uses it or not. You can also access the ⌷Labels⌷ softkey from the Map display options form. However, in the Map module, you can only configure the labels for the dictionary that is used by the currently open file.

Coordinate System Files

If you select *Coordinate system files* from the *File manager* menu, the Asset Surveyor software displays a list of user-configured (non-system) coordinate system files, which you can delete to make space on the TSC1 datalogger:
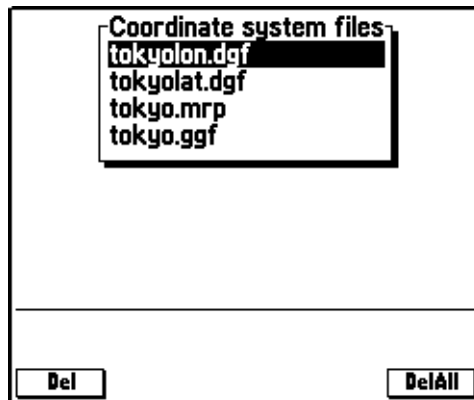
Press ⌷Del⌷ or ⌷DelAll⌷ to delete one or all of the files shown.

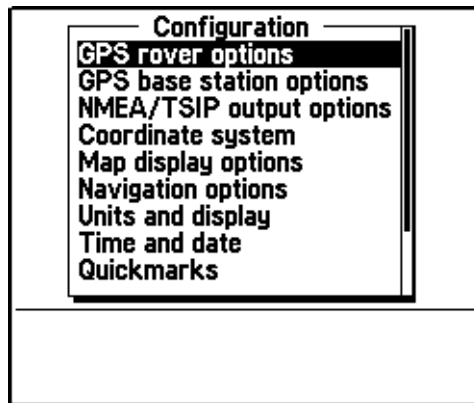# Configuring the Asset Surveyor Software

In this chapter:

- Introduction
- GPS rover options
- GPS base station options
- Coordinate system
- Map display options
- Navigation options
- Units and display
- Time and date
- Quickmarks
- Constant offset
- External sensors
- TSC1 hardware

Introduction

This chapter describes the *Configuration* menu. There are a number of critical aspects of the Asset Surveyor software's operation which must be configured before you collect data. There are also many non-critical configuration options which you can set to suit your application or your preferences. This chapter describes in detail each option that you can configure in the Asset Surveyor software.

You need to check the Asset Surveyor configuration before beginning a data collection session, but you can also (re)configure the Asset Surveyor software at any point while it is being used. Select *Configuration* from the *Main menu* to access the Asset Surveyor software's *Configuration* menu, from which you can select the aspect(s) of the system you want to check or change. The *Configuration* menu is as follows:

```
┌──── Configuration ────┐
│ GPS rover options      │
│ GPS base station options│
│ NMEA/TSIP output options│
│ Coordinate system      │
│ Map display options    │
│ Navigation options     │
│ Units and display      │
│ Time and date          │
│ Quickmarks             │
│                        │
└────────────────────────┘
```

GPS Rover Options

If you select *GPS rover options* from the *Configuration* menu the following *GPS rover options* menu appears:
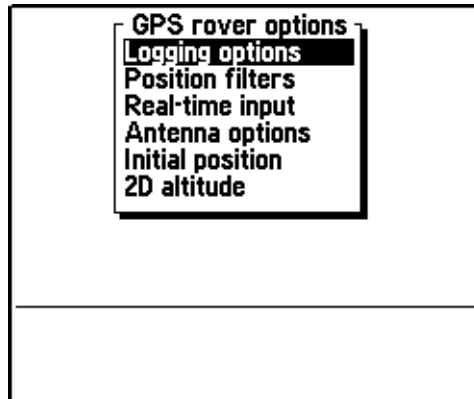
This menu provides access to forms where you can configure the Asset Surveyor software to log GIS data according to the requirements of your project.

Logging Options

The *Logging options* form contains the configurable fields that control the manner in which the Asset Surveyor software logs GPS/GIS data. The *Logging options* form is as follows:

```
         Logging options          ▼
Logging intervals
  Point feature:                  5s
  Line/area:                      5s
  Not in feature:               None
  Velocity:                     None
Confirm end feature:           ⊙No
Minimum positions:               3
Carrier phase
  Carrier mode:                ⊙Off
  Minimum time:              ⊙10mins
```

```
         Logging options          ▲
Dynamics code:                ⊙Land
Audible click:                 ⊙Yes
Log DOP data:                  ⊙Yes
Log PPRT data:                 ⊙Yes
Log QA/QC data:                ⊙Yes
Allow GPS update:        ⊙Warn first
Warning distance:              Any
```

The above shows the default values for each configurable logging option. These are the values configured in the Asset Surveyor software when you run it for the first time. You do not need to change any of these settings in order to test your Trimble GPS equipment, but you may want to change some of the logging options before setting out to collect data.

Note – The Log PPRT data and Log QA/QC data fields do not appear if you are currently connected to a GPS receiver that does not support these modes.

Note – The Carrier phase sub-heading and the Carrier mode and Minimum time fields do not appear if you are connected to a GPS receiver that does not support logging of carrier phase data.

Note – The Warning distance field does not appear unless Allow GPS update is set to 'Warn First'.

The following sections describe each configurable logging option in detail.

Logging intervals

The *Logging intervals* heading refers to the following four configuration options, which specify intervals (periods of time) between the logging of various types of information, in varying circumstances.

- *Point feature*: The interval between logged GPS positions when you are collecting a point feature. The default logging interval for point features is five seconds. This means that when you start a point feature, the Asset Surveyor software logs GPS positions once every five seconds, until you end the feature.

- *Line/area*: The interval between logged GPS positions when you are collecting a line or area feature. The default logging interval for line and area features is five seconds. This means that when you start a line or area feature, the Asset Surveyor software logs positions once every five seconds, until you end the feature. The Asset Surveyor software also logs a GPS position immediately after starting the feature and just before ending it.

- *Not in feature*: Although most of the GPS data that you log is probably associated with a feature (that is, a point, line or area), you can use the Asset Surveyor software to log GPS positions **between** features, so that your final data file contains a trail showing where you went during the data collection session. By default, the Asset Surveyor software does not log positions unless in a feature, so the *Not in feature* logging interval has the default value 'None'.

- *Velocity*: You can request the Asset Surveyor software to log your velocity at regular intervals by setting the *Velocity* option to a value other than 'None' (the default).

  Velocities might be logged in order to map and analyze traffic flow, or to show that you performed a data collection session at a constant velocity (for example, when required to traverse a region at a certain optimal speed in order to conduct other experiments).

  Recent enhancements to the GPS Pathfinder Office processing software enable the differential correction of velocities logged from GPS Pathfinder receivers. Corrected velocities can be used by the GPS Pathfinder Office software to slightly increase the accuracy of differentially corrected positions.

  Note – Velocities logged from the Series 4000, GPS Total Station 4800, and Site Surveyor 4400 receivers cannot currently be differentially corrected.

Note – You can change the logging intervals at any time, even when you are already logging a feature.

Tip – When you are editing an interval field, the Asset Surveyor software makes two softkeys, ⌐All⌐ and ⌐None⌐, available. Press ⌐All⌐ to specify that you want every available GPS position to be logged. Press ⌐None⌐ to indicate that you want no positions to be logged.

The position logging interval you specify has an impact on the accuracy of differentially corrected positions. Ideally, the position logging interval at the roving receiver should be identical to, or an exact multiple of, the measurement logging interval at the base station. This enables precisely synchronized differential corrections to be computed.

If rover logging of positions is not synchronized with base station logging of measurements then interpolated differential corrections must be computed, with an associated loss of accuracy. When logging carrier phase data, interpolation of processed positions is not possible, so synchronization of base and rover logging intervals is especially important.

Confirm end feature

The *Confirm end feature* field lets you enable confirmation before features are ended and saved to a rover file. The options for the *Confirm end feature* field are 'Yes' and 'No'. The default is 'No'.

When *Confirm end feature* is set to 'Yes', the Asset Surveyor software prompts you to confirm your action when you press ⏎ to end a feature:
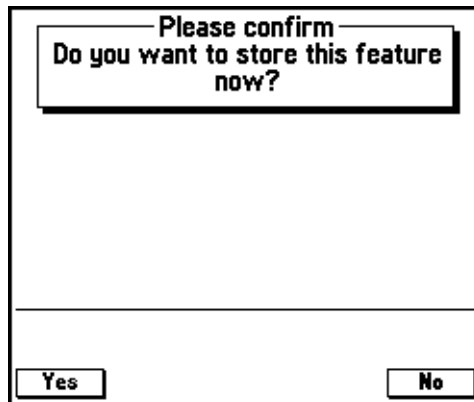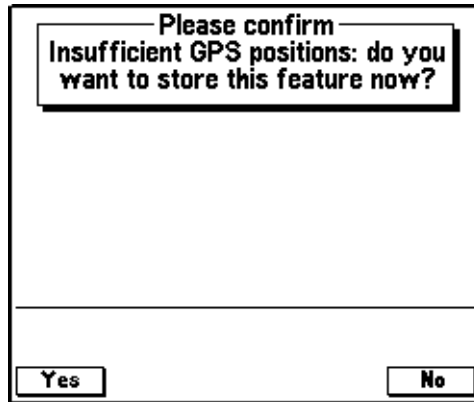
Press ⌑Yes⌑ to end the current feature and save it to the rover file, press ⌑No⌑ or ⌑Esc⌑ to continue logging GPS positions to that feature. By setting *Confirm end feature* to 'Yes', you make sure that features are never ended and saved to the rover file unintentionally.

Minimum positions

In order to obtain the best GPS accuracy for a point feature, remain at that feature for some time, logging a number of GPS positions. If these positions are subsequently differentially corrected and averaged, the average position is better than a single GPS position. Certain occupation periods are recommended in order to obtain varying degrees of accuracy with a given GPS receiver (subject to prevailing GPS conditions). However, with a Pro XL, Pro XR, or Pro XRS system, you can obtain submeter accuracy with a single position.

Note – For up-to-date information on recommended occupation times, see the most recent documentation or release notes associated with your specific Trimble GPS receiver.

When the Asset Surveyor software has logged the specified minimum number of positions for a point feature, it beeps to let you know that you have logged sufficient positions to achieve your required accuracy. If you attempt to save a point feature before the minimum number of positions have been logged, the Asset Surveyor software warns you:

```
┌─────── Please confirm ───────┐
│ Insufficient GPS positions: do you │
│   want to store this feature now?  │
└────────────────────────────────────┘



─────────────────────────────────────────

 ┌─────┐                        ┌─────┐
 │ Yes │                        │ No  │
 └─────┘                        └─────┘
```

You can choose to store the feature anyway, accepting a possible loss of accuracy, or you can remain inside the feature until more positions have been logged.

In general, you log positions for line and area features until you have traveled the length of the line or the perimeter of the area. There is no minimum number of positions for these feature types.

Note – The Minimum positions field is ignored by the Asset Surveyor software during RTK operation and when Carrier mode is set to 'On', as position averaging does not provide significantly better results for RTK and carrier data.

Carrier phase

The *Carrier phase* subheading contains two fields relating to the logging of carrier phase measurements for high accuracy data collection. These fields are *Carrier mode* and *Minimum time*.

For more information on using carrier phase data for high accuracy data collection, see Chapter 7, Carrier Phase Data Collection, in the *TSC1 Asset Surveyor Operation Manual*.

Note – The Carrier phase subheading, Carrier mode field, and Minimum time field do not appear if you are connected to a GPS receiver which does not support logging of carrier phase data.

Carrier mode

The *Carrier mode* field enables the recording of carrier measurements to the rover file. The options available are 'On', and 'Off' (default). 'On' sets the Asset Surveyor software to log synchronized carrier measurements with each position collected for a feature. 'Off' sets the Asset Surveyor software to log code-phase data only.

For a more detailed explanation of the *Carrier mode* field, see Chapter 7, Carrier Phase Data Collection, in the *TSC1 Asset Surveyor Operation Manual*.

Minimum time

The *Minimum time* field lets you set the minimum amount of time that you want to collect carrier phase information. There are four available options ranging from 10 to 45 minutes.

In order to obtain the best carrier phase precision, you should collect enough carrier phase information for the *Differential Correction* utility in the GPS Pathfinder Office software to compute high accuracy positions. Generally, the longer the block of continuous carrier data, the greater the precision of the features that are collected within it. Features collected within a block of carrier data that exceeds the time set in the *Minimum time* field achieve a level of precision relative to this time.

For a more detailed explanation of the *Minimum time* field and the significance of carrier data blocks, see Chapter 7, Carrier Phase Data Collection in the *TSC1 Asset Surveyor Operation Manual*.

Note – Trimble recommends that you switch your Position mode setting to 'Overdetermined 3D' when logging carrier phase data.

Dynamics code

The *Dynamics code* field lets you configure the way in which your GPS receiver behaves by informing it of your usual mode of operation. The *Dynamics code* helps to control the initial acquisition of satellites, the subsequent handling of satellite signal obstructions, and the receiver's behavior in high multipath situations. There are three available dynamics codes:

Code	Description
Land	The default dynamics code, and the best for most GIS data collection. This code informs the receiver that you are operating on land, where you may encounter canopy or other obstacles which might obscure satellite signals, and where you are moving at a relatively low velocity.
Sea	Informs the receiver that you are on the water, at a constant altitude, where you might also encounter obstructions but are unlikely to be moving at a very high velocity. The receiver caters for the possibility that its antenna may be mounted on a mast and be moving backwards and forwards reasonably rapidly.
Air	Informs the receiver that you are in the air, where you are unlikely to suffer obstruction of satellite signals but where you are likely to be moving at a higher velocity.

These are, of course, general categories into which your application may not necessarily fit. For example, if operating from a balloon, the '*Land'* code, which caters for slow velocity, the occasional obstruction, and variations in altitude, is better than the '*Air'* code.

Note – If you configure the Dynamics code incorrectly, this generally does not cause significant harm. You may notice a slightly degraded initial acquisition of satellite signals, and slightly different behavior when satellite signals are obscured.

Note – The Series 4000, GPS Total Station 4800, and Site Surveyor 4400 GPS receivers are configured to operate using the 'Land' dynamics code at all times. The Asset Surveyor software's Dynamics code field is completely ignored when connected to the Series 4000, GPS Total Station 4800, and Site Surveyor 4400 GPS receivers.

Audible click

By default, the Asset Surveyor software causes the TSC1 datalogger to click audibly each time a GPS position is logged. This assures you that your system is operating normally, without you having to watch the TSC1 datalogger's screen. If the clicking stops, then it is likely that some significant event has occurred (such as a high PDOP value, too few satellites, and so on). Set *Audible click* to 'No' to disable clicking.

Log DOP data

You can choose to log dilution of precision (DOP) values, so that you have a record of the GPS conditions that prevailed during a mapping session. These DOP values can be used to provide a degree of quality assurance, especially if you are collecting data and supplying it under contract to a third party, which may require evidence that the data was surveyed carefully and under acceptable GPS conditions.

When the *Log DOP data* configurable option is set to 'Yes', the Asset Surveyor software logs values of PDOP, HDOP, VDOP, and TDOP whenever the PDOP value varies by 0.1 or more, provided the PDOP is below the configured PDOP mask. This provides a good record of each DOP situation which occurred throughout a data collection session. The logging of DOP information increases the size of the data file by up to 10%, depending on the number of constellation changes due to satellites being frequently obstructed (for example, when driving near trees or buildings).

Note – The Trimble Series 4000 GPS receivers do not provide TDOP information, so the TDOP values logged by the Asset Surveyor software are always 0.0 when connected to a Series 4000 receiver.

The default setting for *Log DOP data* is 'Yes'.

Log PPRT data

With the Pro XR and Pro XRS receivers, you can elect to log additional data so that GPS positions which were corrected in real-time (RTCM) can be reprocessed in the office, provided you have access to a base station which logs data for postprocessing. Postprocessing of RTCM-corrected GPS positions is worthwhile if the real-time base station you are using is a considerable distance from where you are collecting data (and your postprocessing base station is nearer), or if the real-time base station which you are using is inaccurate for other reasons (such as a slow update rate).

Logging of PPRT (Postprocessed Real-time) data approximately halves the number of RTCM-corrected GPS positions which you can store in the memory of your datalogger.

Note – The Log PPRT data option does not appear if you are connected to a GPS receiver other than the Pathfinder Pro XR or Pro XRS.

The default setting for *Log PPRT data* is 'Yes'.

Log QA/QC data

The *Log QA/QC data* field enables the logging of any QA/QC (Quality Assurance/Quality Control) data that is being sent by the receiver. You can choose to log QA/QC records to provide a degree of quality assurance for the position data you have collected. Enabling QA/QC logging also lets you filter positions according to precision before exporting them to a GIS.

The options for the *Log QA/QC data* field are 'Yes' and 'No'. The default setting for *Log QA/QC data* is 'Yes'.

For more information about using QA/QC record information, refer to the *RTK for Mapping and GIS General Reference* manual.

Allow GPS update

The *Allow GPS update* field controls whether a feature's GPS position can be updated. The options for this field are 'Always' to allow update under any circumstances, 'Never' to prohibit it, and 'Warn first' to display a warning message before update of GPS positions begins.

The default setting for *Allow GPS update* is 'Warn first'.

Warning distance

If you set the *Allow GPS update* field to 'Warn first', the *Warning distance* field appears. You can select 'Any', to display the warning message before any GPS update, or enter a distance. If you enter a distance, the warning message only appears if you are further than this distance from the original GPS start position of the feature.

The default setting for *Warning distance* is 'Any'.

Position Filters

The *Position filters* form contains the configuration fields that specify the conditions controlling the computation and application of positions:

```
                  Position filters
Position mode:              ▷Manual 3D
Elevation mask:                    15°
SNR mask:                          6.0
PDOP mask:                         6.0
PDOP switch:                       6.0
```

The screen above shows the default values for each configurable item in the *Position filters* form. These are the values configured in the Asset Surveyor software when you run it for the first time. You do not need to change any of these settings in order to test your Trimble GPS equipment, but you may want to change some of the position filters before collecting data.

The following sections describe each configurable logging option in detail.

Position mode

To configure the position mode in which your Trimble GPS receiver operates, choose one of four values ('Manual 3D', 'Auto 2D/3D', 'Manual 2D', or 'Overdetermined 3D'*)* from the *Position mode* menu. This mode affects the operation of your GPS receiver, so only modify it if you fully understand the consequences.

The four modes are described below.

- 'Manual 3D': This is the default mode. Your Trimble GPS receiver uses as many satellites as it is capable of using (but at least 4) to compute positions. This usually yields the most accurate GPS positions and is the most flexible mode in which the receiver can be operated. If your GPS receiver is capable of computing overdetermined GPS positions, it does so in Manual 3D mode when there are more than four satellites available.

  You should always use Manual 3D mode or forced Overdetermined 3D mode in order to achieve a high level of accuracy for logged positions.

- 'Auto 2D/3D': In Auto 2D/3D mode, your Trimble GPS receiver uses four satellites to compute GPS positions when it is able to, but when the number of visible satellites falls to three, it continues to compute positions, using the last known altitude. A position computed when there are only three usable satellites is called a two-dimensional position, and the accuracy of two dimensional positions is crucially affected by the accuracy of the altitude.

  In Auto 2D/3D mode, when the GPS receiver switches to 2D mode (that is, when there are only three usable satellites), it uses the altitude of the last available 3D position, or any altitude that you have entered manually since the last 3D position was computed. You can manually enter a 2D altitude by selecting *2D altitude* from the *GPS rover options* menu.

  If you are operating in conditions where satellite visibility is poor and you can determine your altitude above the WGS-84 ellipsoid very accurately at all times, then you may want to try Auto 2D/3D mode. However, there is a high probability that your data is not always very accurate due to altitude input errors.

⚠ **Warning –** If you use Auto 2D/3D mode and specify an inaccurate altitude, this has a *significant* impact on the position computed by your GPS receiver. As a rule, every meter of error in the altitude you supply will cause *at least* three meters of error in the position computed by your GPS receiver.

> *Note – The Pro XR, Pro XRS, 4600LS, Site Surveyor 4400, GPS Total Station 4800, and Series 4000 GPS receivers support overdetermined 2D mode, meaning that they can use **four or more** satellites to compute a 2D solution. When the Position mode is set to 'Auto 2D/3D', this occurs in circumstances when the 3D PDOP exceeds the configured PDOP mask, but the overdetermined 2D PDOP is below the PDOP mask.*

- 'Manual 2D': In Manual 2D mode, a Pathfinder GPS receiver *always* uses the best three satellites available, even if there are four or more which could be used for computing positions. You must supply an accurate altitude above the WGS-84 ellipsoid before using Manual 2D mode. This mode is useful if you are absolutely sure of your altitude above the WGS-84 ellipsoid, as it avoids the inaccuracies experienced in Auto 2D/3D mode when the GPS receiver switches from using a 3D altitude obtained from GPS to using the 2D altitude that you supply. Unless you are operating exclusively at the same altitude, you *must* manually enter a new altitude whenever you move up or down.

⚠ **Warning –** If you use Manual 2D mode and specify an inaccurate altitude, this has a *significant* impact on the position computed by your GPS receiver. As a rule, every meter of error in the altitude you supply will cause *at least* three meters of error in the position computed by your GPS receiver.

*Note – The Pro XR, Pro XRS, 4600LS, Site Surveyor 4400, GPS Total Station 4800, and Series 4000 GPS receivers support overdetermined 2D mode, meaning that they can use **four or more** satellites to compute a 2D solution. When the Position mode is set to 'Manual 2D', the Series 4000 GPS receiver uses as many satellites as it can to compute an overdetermined 2D position.*

- 'Overdetermined 3D': In Overdetermined 3D mode, your Trimble GPS receiver uses as many satellites as it can to compute positions. These GPS positions are logged only if there are at least five satellites available, so that all logged positions are forced to be overdetermined. This yields the most accurate GPS positions. It is the recommended mode when logging carrier phase data.

Elevation mask

You can restrict your Trimble GPS receiver to using only those satellites above a certain elevation in the sky by imposing an *Elevation mask*. The default elevation masks recommended by Trimble are 15° for rovers and 10° for base stations. This difference ensures that a base station can always 'see' all of the satellites which can be seen by any rovers. If you choose to alter the rover elevation mask, make sure that your base station (if any) still has a lower mask, so that you can still differentially correct data files collected by that rover.

There is rarely a need to use an elevation mask lower than 15°, given the number of GPS satellites in service, but if you do decide to lower your elevation mask(s), be aware that the increased ionospheric noise associated with satellites low on the horizon can easily counter any improvement in PDOP given by a lower elevation mask. Additionally, the effects of multipath increase as lower satellites are used.

⚠ **Warning –** You *must* make sure that the elevation mask for a rover is set higher than the base station so that the base station always tracks any satellites visible to each rover. Remember that as a rover gets further from the base station, the difference between the elevation mask of the rover and the base becomes more and more critical (due to the curvature of the earth). As a rule of thumb, the difference must be at least 1° for every 100 km between the base and the rover.

SNR mask

The signal strength of a satellite is a measure of the information content of the signal relative to the signal's noise. As this proportion decreases, information gets lost in the noise. The typical signal strength of a satellite at 30° elevation is between 12.0 and 20.0. A value above 20.0 is very good. The quality of a GPS position is degraded if the signal level of one or more satellites in the constellation falls below 6.0.

The Asset Surveyor software lets you set a mask, called the Signal-to-Noise Ratio mask (or SNR mask), the value of which is used to determine whether the signal strength of each satellite is sufficient for that satellite to be used by the GPS receiver. The default value for the Asset Surveyor software's *SNR mask* is 6.0.

Note – Trimble's Site Surveyor 4400, GPS Total Station 4800, and Series 4000 GPS receivers have a fixed internal SNR mask (of 4.0). The Asset Surveyor software's SNR mask option has no effect on the operation of the Site Surveyor 4400, GPS Total Station 4800, and Series 4000 receivers.

⚠ **Warning –** If you lower the *SNR mask*, you let your GPS receiver use satellites with weaker signals. While this may increase the GPS coverage you can obtain in environments where the GPS signal is weakened (such as forests), it probably causes a reduction in GPS accuracy.

PDOP mask and PDOP switch

The accuracy of a position computed by a GPS receiver is essentially a function of the geometry of the GPS constellation visible at that moment in time. When the visible satellites are well separated in the sky, your GPS receiver is able to compute accurate positions. If two or more satellites are close together in the sky, the small errors inherent in measuring their signals compound, reducing the accuracy of computed positions.

There are several ***Dilution of Precision*** (DOP) factors associated with GPS, and these DOP factors express an aspect of the expected accuracy of the GPS system. DOP factors are linear multipliers on the expected error, so a small DOP value is better than a large one. The best overall indicator of constellation geometry is known as ***Position Dilution of Precision***, or PDOP.

A PDOP value of 4.0 or less tends to give excellent positional accuracy. A PDOP between 4.0 and 8.0 provides acceptable accuracy, while a PDOP of 8.0 or more implies poorer accuracy. When satellites nearly line up in the sky, the PDOP values can briefly go into the hundreds or even thousands, and for those periods computed GPS positions may be quite inaccurate.

The Asset Surveyor software lets you specify a *PDOP mask*, which the GPS receiver uses as an upper bound on PDOP values. When the PDOP climbs above this mask, the receiver ceases computing GPS positions. This enables you to program a desired level of positional accuracy, and make sure that any positions which you log are of a certain quality. The default *PDOP mask* value is 6.0.

Note – Some Trimble GPS systems specify a maximum PDOP of 4.0 in order to achieve submeter accuracy. The Pro XR and Pro XRS receivers achieve submeter accuracy with a PDOP of 6.0 or less.

⚠

Warning – Increasing the *PDOP mask* lets you log positions for more of the time, but position quality may be seriously degraded. It is better to retain a lower *PDOP mask* and use Trimble's mission planning software to identify the brief times of high PDOP, and to schedule other activities (like lunch!) in these times, rather than to continue surveying and compromise the accuracy of your data collection session. Conversely, you should not reduce your *PDOP mask* too far below the value recommended for your particular Trimble GPS receiver, as this significantly decreases the amount of time you can spend collecting data, without significantly increasing the accuracy of your data collection session.

For a more detailed discussion of DOP values, refer to the *Mapping Systems General Reference* manual.

Note – In 2D mode the PDOP mask ought to be set lower than in 3D mode, as two dimensional PDOP values are inherently smaller than PDOP values in three dimensions. Despite this difference, 3D positions are almost always more accurate than 2D positions due to the difficulty of accurately specifying your 2D altitude above the WGS-84 ellipsoid.

In addition to the *PDOP mask*, the Asset Surveyor software provides a *PDOP switch* configuration option for users of the *Auto 2D/3D Position mode*. Unlike the *PDOP mask*, which determines a cutoff value above which GPS positions are not computed, the *PDOP switch* is the value at which the receiver switches from 3D to 2D mode (the *PDOP switch* is therefore effectively a *PDOP mask* for 3D mode, with the configured *PDOP mask* being applied in 2D mode).

The default values of the *PDOP mask* and *PDOP switch* are the same (6.0), but by altering the value of the *PDOP switch*, you can force your GPS receiver to switch to 2D mode (and deliberately ignore one or more satellites in the process) in order to achieve a lower PDOP-induced error. Of course, your 2D altitude must be very accurately known and entered, otherwise it induces a greater error in your GPS position than would a higher 3D PDOP.

Real-Time Input Options

Selecting *Real-time input* from the *Rover options* menu leads to the *Real-time input options* form, where you can configure the operation of your GPS receiver's real-time correction link. The Asset Surveyor software can be used to receive real-time differential corrections over a radio, modem or other telemetry link (or a geostationary satellite if you are using a GPS Pathfinder Pro XRS receiver).

All of the GPS receivers supported by the Asset Surveyor software version 5.20 are capable of real-time input. Some are capable of real-time input in several different forms, including RTCM, RTK, beacon and satellite DGPS.

Because you may not always be able to receive real-time corrections from your preferred correction source, you need to specify what the Asset Surveyor software should do when your first choice real-time source is lost. This can include switching to an alternative source of corrections, using autonomous GPS, or suspending logging until real-time corrections are reacquired.

To configure real-time input you specify an ordered list of choices that determines what correction source is used, and in what order sources are used if you specify more than one. Whenever possible, the Asset Surveyor software uses the first choice, but when this correction source is not available, the software switches to the next choice on the list. If that source becomes unavailable, the software switches to the next choice, and so on. This list of choices is located in a single form, so it is easy to see what correction options you have selected.

Selecting real-time sources

To select the real-time correction sources that you want to use, choose *Configuration* from the *Main menu*, then select *GPS rover options*, then *Real-time input*. The *Real-time input* form opens:

There are restrictions on some combinations of correction sources. For example, 'External source' can only ever be selected in the *Choice 1* field. Also, the last (least preferred) choice you make must be either 'Use uncorrected GPS' or 'Wait for real-time'. Once you select either of these options in a *Choice* field, there are no further logical choices you can make, so any subsequent *Choice* fields disappear.

Tip – To record uncorrected GPS positions only, without using any real-time corrections, select 'Use uncorrected GPS' from the *Choice 1* field. You can correct these positions back in the office using postprocessing.

You do not have to remember which combinations are valid; the Asset Surveyor software manages this for you by hiding invalid options or *Choice* fields depending on your existing choices. For example, you cannot use 'Integrated satellite' if you have already selected 'Integrated beacon' for a higher choice, so when you select 'Integrated beacon' in the *Choice 2* field, 'Integrated satellite' is removed from the options for the *Choice 3* field.

The Asset Surveyor software always uses the most preferred real-time source available, according to your list of preferences. If the source it is currently using becomes unavailable, the Asset Surveyor software switches to the next best choice. If the Asset Surveyor software reacquires a 'higher priority' real-time source, it switches back to this source. For example, the Asset Surveyor software will not use your third choice if your first choice is available.

The options in the *Choice* fields are outlined in Table 5.1.

Table 5.1   Real-time options

Option	Description
External source	Use an external correction source such as Trimble's Beacon-on-a-Belt (BoB) receiver or a radio.
	This option is only available as a first choice.
Integrated beacon	Use corrections from the Pro XR or Pro XRS internal beacon receiver.
Integrated satellite	Use corrections from the Pro XRS internal satellite differential receiver.
Integrated WAAS	Use corrections generated from signals from a Wide Area Augmentation System (WAAS) satellite.
Use uncorrected GPS	Use autonomous GPS positions without applying real-time corrections.
	No further choices are available after this option is selected.
Wait for real-time	Suspend logging until one of your configured real-time correction sources becomes available. This option is never available as a first choice.
	No further choices are available after this option is selected.

Configuring real-time sources

Once you have selected the real-time sources you want to use, you may need to configure each source before you can start collecting data.

To configure a real-time source, highlight the *Choice* field that has this source selected and press ⌷Setup⌷. Alternatively, highlight a *Choice* field and press the ⊙ key to display the pop-up menu of possible values. Highlight the correction source in the menu that you want to configure, and press ⌷Setup⌷. You can use this second method to configure choices even when they are not selected for use.

Tip – You can also configure any selected source by pressing ⌷Setup⌷ in the source's *DGPS status details* form in the *Receiver status* module.

The correction age limit is common to all real-time sources, so it is configured from the *Real-time input* form. Use the *Correction age limit* field to set the maximum age (the time that has elapsed since the message was received) at which a real-time correction message will be used. If no corrections are received after this time, the Asset Surveyor software treats the real-time source as lost and switches to your next choice.

Note – There are no configuration fields for the Integrated WAAS, Use Float Solution (RTCM), Use Uncorrected GPS, or Wait for Real-time options.

When you press ⌷Setup⌷, the setup form for the selected correction source appears. The fields that appear in the form depend on the correction source.

Configuring an external real-time source

When a *Choice* field that is set to 'External source' is selected in the *Real-time input* form, and you press ⎣Setup⎦, the *External source* form appears:

```
                    External source
Radio type:                    ⊙►Custom
Correction type:                ⊙►RTCM
RTCM options
  Station ID:                       1002
Baud rate:                      ⊙►9600




  _____

  Port
```

This form contains the following configuration fields for an external source:

- *Radio type*: This field lets you select from a list of predefined radio settings for the external source. There is also a custom setting for radios not defined in the menu list. Selecting a Trimble-defined radio automatically updates the *Port Settings* fields.

  Note – If you are connected to a GPS Total Station 4800 receiver with an internal radio, the '4800 Internal' option becomes available in the Radio type field. If the '4800 Internal' option is selected, a field titled Frequency appears in place of the four communication fields.

- *Correction type*: Set this field to 'RTCM' to accept RTCM correction messages. Set this field to 'RTK' to accept RTK corrections.

- The fields under the heading *RTCM options* relate to the input of RTCM only. This heading and its fields only appear when the *Correction type* field is set to 'RTCM':

  – *Station ID*: Typically, there is only one GPS base station broadcasting RTCM differential corrections at a particular frequency in the area where you operate. Occasionally, however, there is more than one base station available, particularly as you move from one area to another. By default, your Trimble GPS receiver attempts to choose the 'best' RTCM base station (based typically on the distance to the base station). You can, however, indicate that you want to use a particular GPS base station by entering its station ID in the *Station* field. If you enter any value other than the default ('Any'), the Asset Surveyor software instructs your GPS receiver to accept differential corrections only from the indicated base station. You should leave the *Station* field set to 'Any' unless you specifically require this functionality.

Tip – If your RTCM link appears to be functioning correctly, but the Asset Surveyor software indicates that RTCM is not being used, check that you have the *Station* set to 'Any', or that you have entered the correct station ID for the GPS base station which you want to use.

- The fields under the heading *RTK options* relate to the input of RTK only. This heading and its fields only appear when the *Correction type* field is set to 'RTK':

  – *RTK record type*: This field specifies the type of correction message the base station transmits. Select 'CMR' or 'RTCM ver 2.1' as appropriate.

- *Baud rate*: This field lets you specify the serial baud rate to be used by your telemetry link. This is necessary for your GPS receiver to understand and decode the real-time data stream which is being carried over the telemetry link.

⚠️ !   **Warning –** You must determine the precise serial parameters used by your telemetry link and real-time base station, and that you accurately enter them into these fields. Any errors made when specifying these serial parameters can cause the real-time link to fail.

> *Note – If you are using the beacon component of the Pro XR or Pro XRS or the satellite DGPS component of the Pro XRS receiver to compute real-time positions, you do not need to alter the serial parameters.*

• *Frequency*: The *Frequency* field lets you specify the frequency that the internal radio of the GPS Total Station 4800 operates at. The values available in this field vary according to the setup of the connected 4800 radio.

> *Note – The Frequency field only appears when connected to a 4800 receiver (with the internal radio option installed).*

Certain fields may not be available, or may become read-only, when the TSC1 datalogger is connected to certain receivers.

The screen below shows the configuration fields for using the Beacon-on-a-Belt (BoB) receiver:

```
┌─────────────────────────────────┐
│        External source          │
│ Radio type:              ⊙ BoB  │
│ Correction type:          RTCM  │
│ RTCM options                    │
│  Station ID:               Any  │
│ Baud rate:                9600  │
│                                 │
│                                 │
│                                 │
│ ─────────────────────────────── │
│                                 │
│ ┌──────┐                        │
│ │ Port │                        │
│ └──────┘                        │
└─────────────────────────────────┘
```

The fields available when the real-time source is 'BoB' are the same as those available for any other external source.

Port settings

When you select an option from the *Radio type* field in the *External source* form, the correct port settings for that radio type are automatically selected. To view or edit the current settings, press <kbd>Port</kbd> in the *External source* form. The *General port settings* form appears:

```
            General port settings
Data bits:                          ▶8
Stop bits:                          ▶1
Parity:                            ▶Odd

```

Note – You cannot edit port settings while you are using a BoB receiver as your external correction source.

These port settings also apply when transmitting NMEA or TSIP messages. When you change general port settings for one of these options, you also change the settings for the other option.

You can also open the *General port settings* form from the *NMEA/TSIP output options* form. However, the software does not let you have two copies of the *General port settings* form open at the same time.

Because changes to your selected real-time sources or their configuration can also affect the port settings, the software also prevents you from opening both the *General port settings* form and any real-time configuration form that could change port settings.

Thus, if you open the *General port settings* form from the *NMEA/TSIP output options* form, you cannot open the *Real-time input options* form. This prevents you from opening the *External source* form, or its *General port settings* form.

Similarly, if you already have the *Real-time input options* form, the *External source* form, or its *General port settings* form open, you cannot open the *General port settings* form from the *NMEA/TSIP output options* form.

RTK precision options

The *RTK precision options* form is accessed by pressing the ⬚RTK⬚ softkey in the *External source* form. This softkey is only available when the *Correction type* field is set to 'RTK':

```
        RTK precision options
Static precision
  Horizontal:              0.050m
  Vertical:                0.050m
Roving precision
  Horizontal:              0.100m
  Vertical:                0.150m
```

The settings in the *RTK precision options* form let you set precision tolerances for RTK positions, so that RTK positions are *only* logged if they fall within these tolerances.

For more information on RTK precision tolerances and RTK operation in general, refer to Chapter 8 of the *TSC1 Asset Surveyor Operation Manual*.

Configuring an integrated beacon source

When a *Choice* field that is set to 'Integrated beacon' is selected in the *Real-time input* form, and you press $\boxed{\text{Setup}}$, the *Integrated beacon* form appears:

```
            Integrated beacon
Mode:                   ⊙Auto power
Frequency:                    N/A
```

This form contains the following configuration fields:

- *Mode*: The *Mode* field only appears when using the beacon component, which uses advanced digital-signal processing techniques to track and demodulate signals from DGPS radiobeacons. The *Mode* field configures the beacon receiver component of the Pro XR and Pro XRS receivers to track radiobeacon signals in one of three ways:

  – Auto range: When the *Mode* is set to 'Auto range', the Pro XR and Pro XRS receivers automatically track and lock onto the nearest differential radiobeacon signal. If a differential radiobeacon becomes unreliable (that is, out of range), the Pro XR and Pro XRS receivers automatically begin searching for the nearest radiobeacon signal, and if one is available, the receivers continue to maintain continuous DGPS coverage. This is the default and recommended control mode.

– Auto power: When the *Mode* is set to 'Auto power', the Pro XR and Pro XRS receivers automatically track and lock onto the differential radiobeacon signal that is detected as being the most powerful. If a differential radiobeacon becomes unreliable (that is, becomes too weak), the Pro XR and Pro XRS receivers automatically begin searching for the most powerful radiobeacon signal, and if one is available, the receivers continue to maintain continuous DGPS coverage.

Note – If the receiver is tracking more than one beacon signal, it locks onto the signal that is transmitted by a reference station using an integrity monitor, even if it is further away or has a weaker signal than a signal transmitted by a reference station that is not using an integrity monitor.

– Manual: When the *Mode* is set to 'Manual', the Pro XR and Pro XRS receivers use only the radiobeacon frequency you specify in the *Frequency* field. If the differential radiobeacon transmitting on the specified frequency becomes unreliable, the warning message Radio link down flashes in the status line. From this point forward, the receiver computes and stores positions without real-time corrections being applied, until either the receiver locks onto the specified frequency again or until a new frequency is specified.

• *Frequency*: This field lists the frequency of the DGPS MSK radiobeacon or DGPS satellite that the receivers track to receive RTCM corrections.

Configuring an integrated satellite source

When a *Choice* field that is set to 'Integrated satellite' is selected in the *Real-time input* form, and you press ⌷Setup⌷, the *Integrated satellite* form appears.

The screen below shows the configuration fields for integrated satellite using the LandStar service:

```
          Integrated satellite
Service provider:         ⊙LandStar
Satellite:                 ⊙Custom
Frequency:             1556.255MHz
Data rate:                    ⊙1200
Station preference:         ⊙Virtual



    _____

```

The screen below shows the configuration fields for integrated satellite using the OmniSTAR service:

```
          Integrated satellite
Service provider:         ⊙OmniSTAR
Satellite:                 ⊙Custom
Frequency:             1556.255MHz
Data rate:                    ⊙1200



    _____

```

The following fields are available in the *Integrated satellite* form:

- *Service provider*: There are two service providers you can use to receive satellite DGPS signals. These are 'LandStar' and 'OmniSTAR'. For more details of these services, see the *Pro XR/XRS Receiver Manual*.

- *Satellite*: This lists the DGPS satellites by name that the receiver can track. Select the appropriate satellite for the area you are collecting data within. For more details of each satellite and the area each covers, see the *Pro XR/XRS Receiver Manual*.

- *Frequency*: This lists the frequency of the DGPS MSK radiobeacon that the receivers track for RTCM corrections.

- *Data rate*: This lists the data rate of the satellite DGPS signal. Some satellites output DGPS signals at a different rate from others, and this field needs to be configured correctly in order to receive the signals. This field is automatically updated when you select a predefined satellite from the *Satellite* field. If you have selected 'Custom' in the *Satellite* field, you may need to configure the *Data rate*.

  ***Note** – The details for the Satellite, Frequency, and Data rate fields are sourced from the file SatDGPS.ini. You can get an up-to-date version of this file from Trimble's ftp site (at ftp://ftp.trimble.com or from http://www.trimble.com/support/support.htm) and transfer it to the Asset Surveyor software to provide the most recent details for DGPS satellites and their frequencies. For details on transferring files to the Asset Surveyor software, see File Transfer, page 152.*

- *Station preference*: When 'LandStar' is selected as the *Service provider* the *Integrated satellite* form displays the *Station preference* field. The *Station preference* field enables you to specify the type of reference station that you *prefer* to use to obtain satellite DGPS corrections. The options for the *Station preference* field are 'Virtual' (the default) and 'Closest'. 'Virtual' sets the GPS receiver to compute DGPS corrections using a 'virtual' reference station position. A virtual reference station position is an interpolated position that is derived from the centroid of the reference station network. It provides a reference position based on the approximate position of your roving receiver. 'Closest' sets the GPS receiver to compute DGPS corrections using the *nearest* reference station position. This may be an 'actual' reference station, a 'cell' reference station (an interpolated fixed reference position), or the network centroid (a position representing the centroid of the reference station network).

Note – The Station preference field is only available when 'LandStar' is selected as the Service provider.

Note – Trimble recommends setting the Station preference field to 'Virtual' where possible. Setting the Station preference field to 'Closest' may be used when the GPS receiver is used on the fringe of a satellite reference station network where the transmission of corrections may be intermittent.

Activation code entry

When 'OmniSTAR' is selected as the *Service provider*, and the TSC1 datalogger is connected to a Pro XRS receiver, the *Integrated satellite* form displays a ⌐Code⌐ softkey, as follows:

If you press ⌐Enter⌐ in the *Integrated Satellite* form, the software prompts you to enter a 24-digit activation code if you have one.

Alternatively, pressing the ⌐Code⌐ softkey opens the *Activation code entry* form:

The *Activation code entry* form lets you enter a 24-digit activation code provided by OmniSTAR for your DGPS subscription.

Antenna Options

The *Antenna options* configuration form lets you configure the GPS antenna options:

```
              Antenna options
Height:                         0.000m
Measure:                    ⊙Vertical
Confirm:                    ⊙Per feature
Type:              ⊙Integrated GPS/Beacon
Part number:                ⊙ 29653-00
Measurement method
  To:          ⊙bottom of antenna mount
```

Typically, you operate your Trimble GPS system with a GPS antenna on a pole, on a backpack, or mounted on top of a vehicle. If you are interested in collecting the altitude of geographic features, the altitude of the feature is usually that of the base of the pole, or your feet, or the wheels of your vehicle. In order to accurately record the true altitude of surveyed features, the Asset Surveyor software lets you specify the height of the antenna above the point in which you are actually interested. The specified height is written to the current data file when you commence data collection and whenever you change its value.

For precise location of a feature's altitude, you must specify the height from the point of interest (for example, the ground) to the electronic center of the antenna (also called the *Antenna Phase Center* or APC). Because you cannot run a tape measure from the actual center of the antenna, it is usually most convenient to measure to a different part of the antenna and let Trimble's Differential Correction utility apply a correction to the specified height which takes account of the antenna type to yield the true height to the center of the antenna.

A measured antenna height is said to be ***vertical*** if it is the true height from the point of interest to the center of the antenna, or ***uncorrected*** if it is the height from the point of interest to some designated measuring point on the exterior of the antenna.

The fields in the *Antenna options* form are:

- The antenna *Height* is the height from the point of interest (typically on the ground) to the antenna. Whether this is a vertical or uncorrected height is determined by the following field. The *Height* field has attached units, which can be altered by changing the *Height* units under *Units and display.* If you are working in one unit and your antenna pole is calibrated in another, you can enter a value in whatever units you like; this value is then converted to the units in which you are working. For example, if you enter a height of '2 ft 6 in' when the configured *Height* units are meters, the Asset Surveyor software automatically converts '2 ft 6 in' into '0.762 m'.

- The *Measure* field indicates whether the height has been measured to the antenna's center ('Vertical') or to a point on the antenna's exterior ('Uncorrected').

- The *Confirm* field indicates whether the antenna height form is displayed before starting each feature ('Per feature') or file ('Per file'). If you do not want to be prompted for the antenna height, select 'Never'. The default is 'Per feature'.

- The *Type* field specifies the antenna being used. Specifying the antenna type enables the Differential Correction utility to transform an uncorrected height to a true vertical height.

The antenna type part numbers are listed in Table 5.2.

Table 5.2   Antenna type part numbers

Antenna	Part #	Measure to ...
Unknown External	N/A	N/A
4000ST Internal	N/A	Reading from internal tape
4000ST Kinematic (Ext)	14156-00	Bottom of antenna mount
Compact dome	16741-00	Bottom of antenna mount
4000ST L1 Geodetic	14177-00	Bottom of notch
4000ST/SSE L1/L2 Geodetic	14532-00	Bottom of notch on ground plane
4000SE Internal	N/A	Reading from internal tape
4000SSE Kinematic L1/L2	14532-10	Bottom of antenna mount
Compact L1/L2 w Groundplane	22020-00 23158	Bottom of notch on ground plane
Compact L1/L2 Antenna	22020	Bottom of antenna
Integrated GPS/MSK Beacon	29653-00	Bottom of antenna mount
Integrated GPS/Beacon/Satellite	33580-50	Bottom of antenna mount
4600LS Surveyor	28615-20	Read to tape mounting hook
4800 Internal	32119	Read to tape mounting hook

• The *Part number* field specifies the Trimble part number of the antenna shown in the *Type* field. If you are unsure of the antenna type you are using, you can enter the part number into the *Part number* field and the Asset Surveyor software automatically selects the antenna *Type* from this.

• The *To* field under the *Measurement method* subheading lets you select the method which you have used to measure the distance from the point of interest to the antenna. For the Pro XR, the default method is to the 'Bottom of the antenna mount'. See Table 5.2.

The Asset Surveyor software maintains two sets of antenna details, one for *Rover options* and one for *Base station options*, as you typically set up your GPS system differently if you are planning to operate a GPS base station.

⌁ **Tip –** You only need to measure your antenna height accurately if you want to record accurate feature altitudes, or if you are using carrier phase mode to fix the position of features to the higher accuracy. Many GIS applications do not even store the altitudes of geographical features.

Initial Position

The *Initial position* form introduces two fields which together specify your approximate position as either a latitude and longitude pair, or as a north and east pair (depending on your selected coordinate system):

```
            Initial position
Latitude:           37°24'44.70106"N
Longitude:         122°00'02.43660"W




  ▯      ⬖6⬗   PDOP   3.35
```

When GPS is operating, these fields are kept up to date with the current GPS position. When GPS is not operating, you can consult these fields to see where you were (or more precisely, where the TSC1 datalogger was when it was last used).

The initial position has one important use. Some Trimble GPS receivers have no internal battery-backed memory of their own (to reduce their weight and to save you having to disassemble them periodically to change the battery). These receivers must be sent a GPS almanac when they are powered up, so that they can rapidly acquire signals from satellites and begin to compute GPS positions. Part of a GPS almanac is an approximate initial position, from which the GPS receiver can infer the set of satellites that should be visible at any point in time. With a reasonably accurate (that is, ±200–300 km) initial position, the startup time of the GPS receiver should be very good (30 seconds to 90 seconds, presuming visibility to satellites). If the initial position is very inaccurate (for example, the wrong side of the world), startup may take between five and 15 minutes.

If you travel a long way between mapping locations (for example, if you fly from one state to another, or from one country to another), you can ensure a rapid GPS startup by entering an approximate initial position for your new mapping site.

Tip – If you do not know your new mapping site's position, even approximately, you need not worry. Just set up your GPS receiver and start the Asset Surveyor software running. Once your GPS receiver starts to compute positions, its initial position is updated and thereafter restarts at or near that location are rapid.

2D Altitude

When you operate a GPS receiver in either *Auto 2D/3D* or *Manual 2D Position mode*, the Asset Surveyor software asks you to provide a 2D altitude before it activates the GPS receiver. You can access this form at any other time through the *2D altitude* entry in the *GPS rover options* menu:

```
                    2D altitude
Altitude (MSL):                        8.50m
Computed at
  Time:                         09:57:13 am
  Date:                      07/08/1999 Tue
```

Press ⟨Esc⟩ to continue with the previous 2D altitude, or enter a new altitude and press ⟨Enter⟩ to send that new altitude to the GPS receiver.

Only the first field on this form is editable. The other fields show when the last 2D altitude was recorded, and whether it was entered manually (*Entered at*) or computed by the GPS receiver (*Computed at*).

The 2D altitude sent to the receiver is converted to an altitude above or below the WGS-84 datum. The value that you enter is relative either to mean sea level (MSL) or the local ellipsoid (HAE).

⚠ **Warning –** You must make sure that any 2D altitude you enter is accurate, otherwise it has a detrimental effect on the accuracy of positions computed by your GPS receiver when operating in a 2D mode.

Tip – You can change the value of the *Altitude reference* field in the *Coordinate system* configuration form, accessible from the *Configuration* menu.

Note – The altitude you specify is that of the ground, not the altitude to the GPS receiver's antenna. The Asset Surveyor software takes the currently configured antenna height into account when converting the altitude you supply into an altitude above the WGS-84 datum.

GPS Base Station Options

If you select *GPS base station options* from the *Configuration* menu the following *GPS base station options* menu appears:
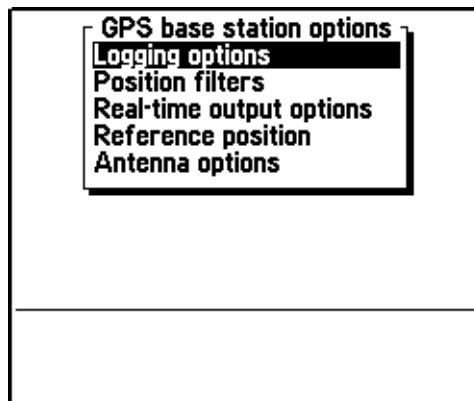
This menu provides access to forms where you can configure the Asset Surveyor software to log base station files according to the requirements of your project.

Base Station Logging Options

The *Logging options* form contains the configurable fields that control the manner in which the Asset Surveyor software logs base station data. The *Logging options* form is as follows:

```
            Logging options
Logging intervals
  Measurements:                      5s
  Positions:                        30s
Audible click:                    ⏵ Yes
Log DOP data:                     ⏵ Yes
```

The screen above shows the default values for each configurable logging option. These are values configured in the Asset Surveyor software when it runs for the first time. You do not need to change any of these settings in order to test your Trimble GPS equipment, but you may want to change some of the logging options before starting a base station file.

*Note – Many of the fields in this configuration form are similar to those in the GPS rover options menu forms. Remember that the rover options are used whenever you are not operating the Asset Surveyor software as a GPS base station (that is, when logging data to a rover file, when outside Data collection, or when navigating). The base station options are used **only** when you are operating the Asset Surveyor software as a GPS base station in conjunction with a GPS Pathfinder or Series 4000 receiver. For more information about using the Asset Surveyor software as a GPS base station, see Create Base File, page 134.*

Note – *The Asset Surveyor software can be used to control a real-time (that is, RTCM-emitting or RTK-emitting) GPS base station, provided your GPS receiver is a Series 4000, GPS Total Station 4800, or Site Surveyor 4400 (for RTK and RTCM), or a Pro XL, Pro XR, or Pro XRS (for RTCM only), and has the appropriate firmware option installed. RTCM and RTK output is configured from the Real-time output options entry in the GPS base station options menu. For more information on operating the Asset Surveyor software in RTK mode, see the RTK for Mapping and GIS General Reference manual.*

Note – *The Asset Surveyor software does not support logging of a conventional base station file (for the purposes of post-processed differential correction) using a Series 4000, GPS Total Station 4800, or Site Surveyor 4400 receiver. The Series 4000, GPS Total Station 4800, and Site Surveyor 4400 receivers can only be used for real-time (RTK/RTCM) operations. However, a base file containing time and ephemeris information can still be logged.*

Note – *The Pro XR and Pro XRS (for RTCM), and the Series 4000, GPS Total Station 4800, and Site Surveyor 4400 (for RTCM/RTK) receivers can be operated as Unattended Real-Time Base Stations. To operate the Pro XR and Pro XRS receivers as Unattended Real-Time Base Stations you must have the Unattended Real-Time Base Station power cable (P/N 32247).*

Tip – Trimble recommends that you always log sufficient data at your base station to permit differential correction by postprocessing, as radio links rarely provide 100% coverage of a data collection site. However, if you want to set up your Pro XR or Pro XRS receiver as a real-time base station only, and want to leave it operating for a period of several days, set the *Measurements* and *Position* logging intervals to 'None'.

Because many of the fields of the *GPS base station options* configuration form are similar to those in the *GPS rover options* form, only the fields which differ significantly are described in this section. For details of fields not described below, see GPS Rover Options, page 165.

Measurements

The primary task of a GPS base station is to log raw GPS measurements from satellites for use when differentially correcting rover files. In order to provide accurate differential corrections, raw measurements should be logged reasonably often. The maximum permitted measurement logging interval is 15 seconds. You can reduce the interval to a minimum of one second, but as this results in up to 15 times as much data being logged by the Asset Surveyor software, you may find that your TSC1 datalogger's storage is consumed very quickly and that differential correction of rover files is slow. The default setting of five seconds provides a good compromise between the quality of postprocessed positions and the space and processing time required.

Tip – For the best accuracy, make sure that the position logging interval for each GPS rover is an exact multiple of the measurement logging interval at the base station. If you set the position logging interval to a value which is *not* an exact multiple of the base station's measurement logging interval, the Differential Correction utility has to compute interpolated differential corrections. These are less accurate than those computed when the logging intervals of the base station and rover(s) are synchronized.

Note – If your GPS receiver is capable of supplying synchronized carrier phase measurements, the Asset Surveyor software requests these when operating as a base station. Otherwise, the Asset Surveyor software logs (unsynchronized) raw pseudorange measurements. Only receivers capable of supplying synchronized carrier phase measurements can be used as base stations for rovers operating in carrier phase mode.

Positions

The logging of GPS positions by a base station is not essential for differential correction. You can, however, choose to log a few positions in order to be able to graphically display the position of the base station in the GPS Pathfinder Office software. If you set up a temporary base station on an unknown point, you may want to log positions frequently to a base file. You can then differentially correct that base file against another (perhaps more distant) base station in order to discover the reference position for the temporary base station. Once this is known, you can use the local base file to correct local rover files.

Log DOP data

You can choose to log dilution of precision (DOP) values when operating as a base station, so that you have a record of the prevailing GPS conditions.

When the *Log DOP data* option is set to 'Yes', the Asset Surveyor software logs values of PDOP, HDOP, VDOP and TDOP whenever the PDOP value varies by 0.1 or more, provided the PDOP is below the configured PDOP mask. This provides a good record of each DOP situation that occurred throughout a data collection session. The logging of DOP information typically increases the size of a base file by approximately 2–3%.

Position Filters

The *Position filters* form contains the configuration fields that specify the conditions controlling the computation and application of positions:

```
                 Position filters
Position mode:              ⊙ Manual 3D
Elevation mask:                    10°
SNR mask:                          4.0
PDOP mask:                         8.0
PDOP switch:                       8.0



_____


```

The screen above shows the default values for each configurable position filter option. These are the values configured in the Asset Surveyor software when you run it for the first time. You do not need to change any of these settings in order to test your Trimble GPS equipment, but you may want to change some of the position filters before starting a base station file.

Note – Many of the fields in the this configuration form are similar to those in the GPS rover options menu forms. Remember that the rover options are used whenever you are not operating the Asset Surveyor software as a GPS base station (that is, when collecting data to a rover file, when outside Data collection, or when navigating). The base station options are used **only** *when you are operating the Asset Surveyor software as a GPS base station in conjunction with a Pathfinder GPS receiver. For details on using the Asset Surveyor software as a GPS base station, see Create Base File, page 134.*

Position mode

You can operate a base station in any of the position modes which are permitted for a rover, that is, 'Manual 2D', 'Auto 2D/3D', 'Manual 3D' or 'Overdet 3D'. In general, however, you can select a location for a base station such that it always tracks at least four satellites, so that there is no need to use any mode other than 'Manual 3D' (the default).

Elevation mask

The default elevation mask for a GPS base station is 10° (as opposed to the default of 15° for rovers).

⚠ **Warning –** You *must* make sure that the elevation mask for the base station is set sufficiently low that the base can always track any satellites visible to the rovers. As the rovers get further from the base station, the difference between the elevation mask of the rovers and the base becomes more critical (due to the curvature of the earth). As a rule, the difference must be at least 1° for every 100 km between the base and the rover.

SNR mask

The default signal-to-noise ratio mask for a GPS base station is four. The SNR mask does not influence the choice of satellites tracked by the base station, but does determine when the base station can log GPS positions. Note, however, that the logging of positions is not essential for differential correction.

Note – Trimble's Site Surveyor 4400, GPS Total Station 4800, and Series 4000 GPS receivers have a fixed internal SNR mask (of 4.0). The Asset Surveyor software's SNR mask setting has no effect on the operation of the Site Surveyor 4400, GPS Total Station 4800, and Series 4000 receivers.

PDOP mask and PDOP switch

The default PDOP mask and PDOP switch for a GPS base station are both 8.0, and are slightly higher than their equivalents for rovers. This makes sure that the base station is always able to log positions whenever a rover is logging positions. Note, however, that the logging of positions is not essential for differential correction.

Real-Time Output Options

When operating in base station mode, the Asset Surveyor software can log GPS measurements for the differential correction of rover files. When connected to a Pro XR, Pro XRS, Pro XL, Series 4000, GPS Total Station 4800, or Site Surveyor 4400 GPS receiver with the appropriate firmware option installed, the Asset Surveyor software can be used to control a real-time base station, transmitting real-time differential corrections over a telemetry link.

Selecting *Real-time output options* from the *GPS base station options* menu leads to a form where you can configure the real-time output to be produced by your GPS receiver.

Note – The Real-time output options menu entry only appears when you are connected to a GPS receiver that supports real-time output.

Note – You cannot use the Series 4000, GPS Total Station 4800, and Site Surveyor 4400 receivers to log GPS measurements for the differential correction of rover files. Use them to operate a real-time emitting base station only.

The two pages of the *Real-time output options* configuration form look as follows:

```
┌─────────────────────────────────────┐
│     Real-time output options    ▼   │
│ Real-time output mode:      ⊙ Off   │
│ Radio type:               ⊙ Custom  │
│ Baud rate:                 ⊙ 9600   │
│ Data bits:                   ⊙8     │
│ Stop bits:                   ⊙1     │
│ Parity:                   ⊙ None    │
│ RTCM options                        │
│  Station:                       1   │
│  Message type:          ⊙ Type 1   │
│  Message interval:             5s   │
│                                     │
│                                     │
│  ┌──────┐                           │
│  │ RTK  │                           │
│  └──────┘                           │
└─────────────────────────────────────┘
```

```
┌─────────────────────────────────────┐
│     Real-time output options    ▲   │
│ Message suffix:           ⊙ None    │
│ CTS flow control:          ⊙ Off    │
│ CTS xmit delay:               0ms   │
│ RTS mode:                 ⊙ High    │
│ RTS edge delay:               0ms   │
│                                     │
│                                     │
│                                     │
│                                     │
│                                     │
│  ┌──────┐                           │
│  │ RTK  │                           │
│  └──────┘                           │
└─────────────────────────────────────┘
```

The various fields in this form are described below:

- *Real-time output mode*: This field lets you enable the output of real-time messages from a base station. By default, real-time output is disabled ('Off').

- *Radio type*: This field lets you select from a list of predefined radio settings for the external radio option. There is also a 'Custom' setting for radios not defined in the menu list. This is the default setting.

- *Baud rate*, *Data bits*, *Stop bits*, *Parity*: These four fields let you specify the serial parameters your telemetry link uses. Selecting a Trimble-defined radio in the *Radio type* field automatically updates the following four communication fields for that particular radio. This is necessary for your GPS receiver to encode the RTCM data stream carried over the telemetry link.

The fields under the subheading RTCM options relate to the output of RTCM only:

- *Station*: Every RTCM base station must specify an ID, which is a number in the range 0 to 1023. This ID number identifies the RTCM station and lets roving GPS receivers specify a particular base station which they want to use. The default is 1.

- *Message type*: When RTCM output is enabled, your GPS receiver emits a variety of RTCM messages. The most important (and most frequent) of these contains satellite pseudo-range corrections as measured by the base station receiver. These corrections are used by roving receivers to correct the GPS positions they compute. The RTCM standard allows for two main types of pseudo-range corrections— 'Type 1' and 'Type 9' messages. Each Type 1 message contains pseudo-range corrections for all satellites currently tracked by the base station. 'Type 9' messages split pseudorange corrections for the set of tracked satellites over several messages. 'Type 9' messages are used by the U.S. Coast Guard beacons, as they allow telemetry links with lower throughput.

- *Message interval*: The message interval determines the rate at which the selected RTCM message type ('Type 1' or 'Type 9') is emitted by your GPS base station. The default of five seconds tends to provide a reasonable compromise between optimal accuracy (which would be achieved with a one-second message interval) and the throughput of typical telemetry links.

- *Message suffix*: Each RTCM message can be followed by no suffix (the default setting 'None'), an ASCII carriage-return character ('CR'), an ASCII line-feed character ('LF'), or a carriage-return/line-feed pair ('CR/LF').
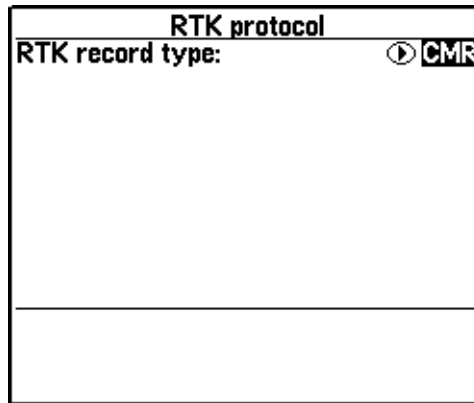
- *CTS flow control*: Many telemetry links transmit data quite slowly, and there is a need for flow control between the base station GPS receiver and the radio. The Pro XR and Pro XRS receivers implement hardware flow control using a CTS (Clear To Send) line. By default, *CTS flow control* is 'Off', so the receiver sends data regardless of the state of the CTS line.

- *CTS xmit delay*: This field lets you specify a delay, in milliseconds, between when the radio raises the CTS line and the GPS receiver continues to transmit RTCM data. If *CTS flow control* is 'Off', the *CTS xmit (transmit) delay* is still used to delay transmission of data by the specified period. By default, this delay is '0 milliseconds'. The *CTS xmit delay* allows for radios which require a brief 'warm up' period before receiving data for transmission.

- *RTS mode*: This field lets you specify the RTS mode, which can be one of the following values: 'Rx' (for 'receive', meaning that the RTS (Ready to Send) signal is asserted by the receiver when its receive buffer is nearly full and input must stop), 'Tx' (for 'transmit', meaning that the RTS signal is asserted when the receiver has data ready to output), 'High' (meaning that the RTS signal is always asserted by the receiver), and 'Low' (meaning that the RTS signal is never asserted by the receiver). The default *RTS mode* is 'High'.

- *RTS edge delay*: The RTS trailing edge field lets you specify a delay for the deactivation of the RTS signal after the last bit of data is sent. This can be useful in radio data transmission systems where RTS is used for the Push-to-talk signal.

⚠ **Warning –** It is very important that you match your RTCM output serial parameters with the requirements of your transmitting and receiving radios. Any errors made when specifying serial parameters can cause the RTCM link to fail.

RTK protocol

The *RTK protocol* form is accessed by pressing the ⌐RTK⌐ softkey in the *Real-time output options* form. This softkey only appears when using an RTK system. The *RTK protocol* form looks as follows:

```
                RTK protocol
RTK record type:              ⊙CMR
```

The form contains only the one field, *RTK record type*, which lets you specify the record type that you would like your radio to output when a real-time base station is operating. The two options in this field are 'CMR' and 'RTCM 2.1'. The default is 'CMR'.

Note – The CMR record type supplies only RTK messages, while the RTCM 2.1 type supplies both RTK and RTCM messages, making it possible for multiple rovers doing RTK and RTCM operations to use the same source of corrections (to output RTCM 2.1 messages your receiver must have the RTCM option installed). If you output CMR as your base station record type, any rovers using those corrections are only able to perform RTK real-time operations (unless they are using an integrated source of RTCM such as a beacon or satellite DGPS).

For further information on RTK protocol, refer to the *RTK for Mapping and GIS General Reference* manual.

Reference Position

The *Reference position* form lets you enter the known position at which the base station is situated. The default given is the value that was last specified as a reference position:

You can enter the reference position from a map, or from the results of a previously conducted control survey. If you provide a reference position for the base station, you must enter values into all three fields in the *Reference position* form. If you do not know the location of your base station, you can press Unknown to proceed.

Note – You do not have to enter a reference position for a base file in the field, unless you are operating a real-time base station. You must specify a reference position (using the GPS Pathfinder Office software) before using a base file to differentially correct rover files. You can also use the GPS Pathfinder Office software to change a base file's reference position.

Note – The reference position you enter is typically the position of some reference mark on the ground. The Asset Surveyor software combines this with the antenna height to calculate the position of the Antenna Phase Center (APC). This is the position which is logged in the base station file.

If you have previously recorded the location of the base station as a waypoint, you can press ⌐WayPt⌐ to open the menu of waypoints. Selecting a waypoint from this menu automatically fills in the *Reference position* fields with the location of that waypoint.

Tip – If you regularly operate a base station on more than one location, you can set up waypoints for each base location. This makes selection of the reference position very easy. You can also use the Asset Surveyor software's navigation abilities to assure yourself that you are specifying the correct waypoint as the reference position for a base station.

Press ⌐Here⌐ to fill in the reference position with the current GPS position (if any).

Warning – If you choose to append to an existing data file, you cannot specify a new reference position. If you have moved to a different location, you *must* create a new base file. Consequently, if you reopen a base file you should make sure that you are at the exact location where the base file was initially created. The reference position of the base station is stored when the base file is first created and positions subsequently appended to the file will be inaccurate if the receiver is not at the same reference position.

Antenna Options

The base station *Antenna options* form looks as follows:

```
          Antenna options
Height:                    0.000m
Measure:                  Vertical
Type:        ⊕Integrated GPS/Beacon
Part number:          ⊕ 29653-00
```

You can enter details into the *Antenna options* configuration form to configure the antenna details before setting up a base station. When you actually set the Asset Surveyor software into Base Station mode, you are asked to confirm the preconfigured base station antenna details. It is important that you enter the antenna details for your base station correctly, as the GPS Pathfinder Office software uses these details to transform the reference position (on the ground) into the position of the Antenna Phase Center (APC). This APC position is used by the Differential Correction utility in the GPS Pathfinder Office software.
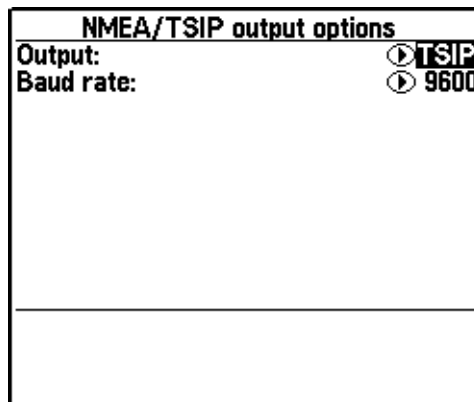
Note – For base stations the measured antenna height must be 'Vertical', so the Measure field is a non-editable field in the base station Antenna options form.

Note – The values entered into this form are independent of any settings entered in the corresponding Antenna options form in the GPS rover options menu.

NMEA/TSIP Output Options

Selecting *NMEA/TSIP output options* from the *Communications* menu leads to a form where you can configure the output to be produced by your GPS receiver. The appendixes at the back of the *TSC1 Asset Surveyor Operation Manual* provide details of which outputs are supported by your specific GPS receiver. For more information about the NMEA output format, see Appendix K, NMEA Output Messages, of the *TSC1 Asset Surveyor Operation Manual*.

The *NMEA/TSIP output options* form looks as follows:

```
┌─────────────────────────────────┐
│      NMEA/TSIP output options    │
│ Output:                   ⊙TSIP  │
│ Baud rate:                ⊙ 9600 │
│                                  │
│                                  │
│                                  │
│                                  │
│                                  │
│  ──────────────────────────────  │
│                                  │
│                                  │
└─────────────────────────────────┘
```

The two fields on this form are described below:

- *Output*: The options for this field are '*None'* (the default), '*NMEA* or '*TSIP'*.

- *Baud rate*: The *Baud rate* field lets you configure the baud rate at which your selected output (if any) is transmitted by the GPS receiver.

Note – Although the baud rate for receiver outputs can be set in the NMEA/TSIP output options form, the other serial communications parameters (that is, Stop bits, Data bits and Parity) must be shared with the incoming real-time stream, if any. Check the other Communications options forms to make sure that these serial parameters are appropriate for your output device.

Whenever you change the *NMEA/TSIP output options*, the Asset Surveyor software reminds you to check the other communications settings and make sure that all of the serial communications parameters are set appropriately:

```
┌──────────── Warning ────────────┐
│ Check the General port settings for │
│    more input/output parameters.    │
└─────────────────────────────────┘
```
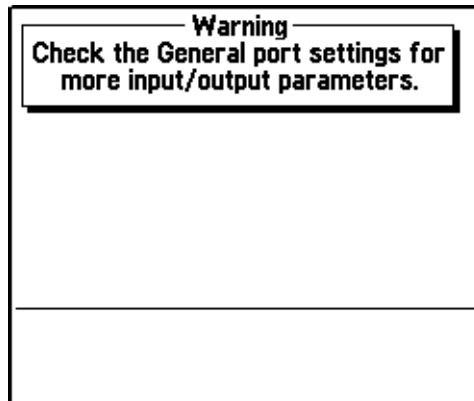
⚠ **Warning –** If you want to use a GPS Pathfinder receiver in conjunction with a radio and another output device, the radio/modem and output device **must** use the same *Stop bits*, *Data bits*, and *Parity*.

⚠ **Warning –** Some radio receivers may be confused or jammed if you attempt to transmit data through them. Unless you are actually making use of a receiver output, and unless you have an appropriate splitter cable which separates the real-time input line from the receiver's output line, you should leave the *Output* field set to 'None'.

NMEA output

The NMEA 0183 protocol is a widely used standard for communication with GPS devices and other navigational systems.

Trimble GPS Pathfinder receivers which support the NMEA-0183 protocol can be configured by the Asset Surveyor software to output NMEA messages at a specified rate, and a subset of the available messages can be selected.

When you set the *Output* field to '*NMEA'*, the Asset Surveyor software extends the *NMEA/TSIP output options* form as follows:

```
   NMEA/TSIP output options      ▾
Output:                       ⊙▸NMEA
Baud rate:                    ⊙▸9600
Output interval:                 5s
NMEA-0183 messages
 ALM:                         ⊙▸No
 GGA:                         ⊙▸Yes
 GLL:                         ⊙▸No
 GSA:                         ⊙▸No
 GSV:                         ⊙▸No
 RMC:                         ⊙▸No
```

The additional fields on this form are:

- *Output interval*: The interval at which NMEA messages are to be emitted by the GPS receiver.

- *ALM*: Almanac information for each satellite.

- *GGA*: GPS time, position, and fix-related data.

- *GLL*: GPS position fix, time of fix, and status.

- *GSA*: GPS receiver operating mode, satellites used for navigation, and DOP values.

- *GSV*: Number of visible satellites, satellite PRN numbers, elevation, azimuth, and SNR values.

- *RMC*: Recommended minimum specific GPS/TRANSIT data.

- *VTG*: Actual track made good and speed over ground.

- *ZDA*: UTC day, month, year, and local time zone offset.

For a detailed description of each supported NMEA-0183 packet, see Appendix K, NMEA Output Messages, in the *TSC1 Asset Surveyor Operation Manual*.

Once you save the contents of the *NMEA/TSIP output options* form with the *Output* field set to '*NMEA*', your Pathfinder GPS receiver begins to emit the selected NMEA-0183 messages at the configured *Output interval*, provided the receiver supports NMEA output.

TSIP output

Trimble's Standard Interface Protocol (TSIP) is a complex binary protocol for controlling GPS Pathfinder receivers. This is the protocol which the Asset Surveyor software uses to communicate with your GPS Pathfinder receiver.

When you set the *Output* field to '*TSIP*', your GPS Pathfinder Series receiver starts to output TSIP messages to its auxiliary serial port. You may require a special cable to make use of this information. You cannot control the frequency or nature of the TSIP messages that are output by the receiver, as these are determined by the Asset Surveyor software.

Note – Certain GPS Pathfinder receivers, including the Pro XL, can emit an electronic pulse precisely on each GPS second (1 PPS). This forms a stream of pulses that can be used for precise synchronization of external devices, and for correlation of external events with GPS times and positions. For cabling details and pin configurations for the Pro XL, refer to the Pro XL System Operation Manual. you do not have to configure the Asset Surveyor software to obtain this 1 PPS output; the Pro XL emits it at all times.

Coordinate System

Trimble's GPS receivers provide you with your position anywhere on the earth's surface. GPS positions are normally expressed as latitudes and longitudes relative to a mathematical model called a datum. The datum used by GPS is called the World Geodetic System 1984 datum (or 'WGS-84'). A datum is defined by the relationship between an ellipsoid and an origin point. An ellipsoid is a three-dimensional surface shaped like a squashed sphere, which approximately models the shape of the earth (either as a whole or over a part of the earth). The WGS-84 datum is defined in terms of the GRS80 ellipsoid.

For some applications (for example, marine navigation and aviation), GPS latitudes and longitudes can be used directly.

For most land-based GPS applications, and particularly for GIS data collection applications, latitudes and longitudes are less convenient. Typically, a GIS represents the coordinates of geographic features in a locality of interest using a rectangular grid (running North and East) and presumes that the earth is locally flat. A local ellipsoid can be defined to provide a good approximation to the shape of the earth in that locality. A datum transformation and a map projection are then used to transform coordinates from this local ellipsoid to the GIS's flat-earth model.

Heights can be displayed by the Asset Surveyor software relative to either a local ellipsoid, or an empirically defined surface known as the geoid. This is a surface of constant gravitational equipotential which approximates mean sea level.

In summary, there are three models for describing geographic locations:

- The flat North/East model of the GIS, possibly with heights as well.

- The curved local ellipsoid, used by the GIS as a model of the earth's surface locally.

- The curved GRS-80 ellipsoid, used by GPS as a model of the earth's surface as a whole.

Figure 5.1 shows how these surfaces model the earth's surface.

The earth's surface

The geoid

The local Ellipsoid

The GRS-80 Ellipsoid (WGS-84 datum)
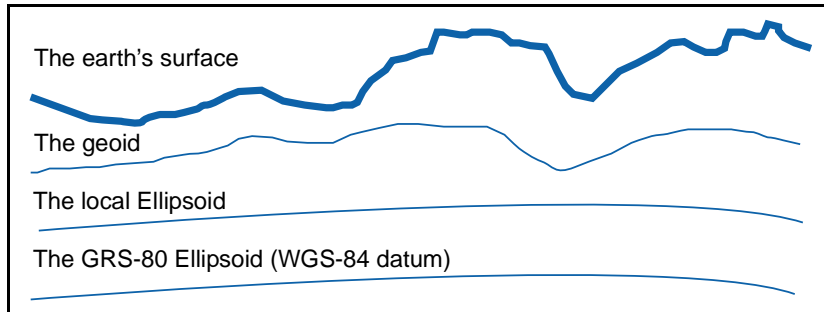
Figure 5.1   Coordinate system models

These models can describe heights as being relative to an ellipsoid or the geoid (mean sea level).

In order to collect the positions of features using GPS (and hence the WGS-84 datum) and then send them to a GIS as North/East coordinates, the GPS latitudes and longitudes must be processed in a number of ways:

- They must be transformed from latitudes, longitudes, and altitudes on the WGS-84 datum into latitudes, longitudes, and altitudes on the local datum. This operation is called a datum transformation.

- Once the coordinates are expressed as latitudes and longitudes on the local datum, they must then be projected into North and East values on a flat grid, using an operation called a map projection.

- Finally, if altitudes are to be stored by the GIS, they must be transformed from heights above the GRS-80 ellipsoid to heights above some other reference level. The most common reference level is the geoid, more commonly referred to as mean sea level. The Asset Surveyor software and the GPS Pathfinder Office software both contain a geoid separation model which enables them to transform altitudes relative to GRS-80 into heights relative to mean sea level.

Note – The geoid separation models used by the Asset Surveyor software and the GPS Pathfinder Office software differ in accuracy. The Asset Surveyor software is necessarily approximate, while the GPS Pathfinder Office software is more accurate. If you require altitudes relative to a different reference level, or relative to a more accurate (perhaps local) mean sea level mode, you must process the heights in the GPS Pathfinder Office software before exporting them to your GIS. However, depending on space requirements, you can transfer geoid models to the TSC1 datalogger to produce similar results.

The Asset Surveyor software lets you specify a datum transformation and a map projection, so that you can see your GPS position (and the position of features you may have recorded) in your local coordinate system. This makes it easy for you to check your position or navigate using a map produced by your GIS.

Note – The Asset Surveyor software lets you specify that heights are shown relative to your local ellipsoid, or relative to mean sea level.

For your convenience, the Asset Surveyor software hides the complexities of datum transformations and map projections behind the common names for the coordinate systems with which you may be familiar. Each named coordinate system has an associated datum (which encapsulates an ellipsoid) and a number of zones (each of which is a named instance of a particular map projection).

You can create your own coordinate systems and sites using the Coordinate System Manager utility program in the GPS Pathfinder Office software. With the set of pre-defined coordinate systems supplied by Trimble this should rarely be necessary.

Selection

When you select the *Coordinate system* entry from the Asset Surveyor software's *Configuration* menu, the *Coordinate system* menu appears:

```
┌───── Coordinate system ─────┐
│ Latitude/Longitude          ▓│
│ Argentina                   ▓│
│ Australian Map Grid         ▓│
│ Austria                      │
│ Bangladesh                   │
│ Borneo RSO                   │
│ Brazil                       │
│ Colombia                     │
│ Croatia                      │
└──────────────────────────────┘

 ┌────────┐
 │ OverUp │
 └────────┘
```
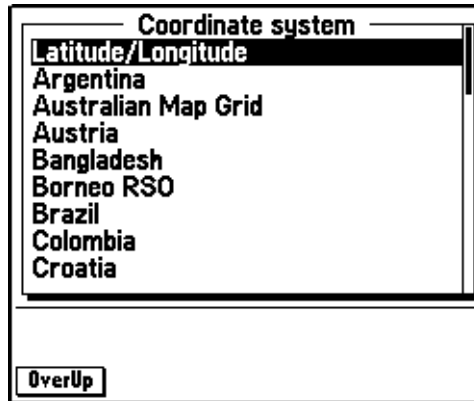
You can select a coordinate system from this menu by highlighting the entry and pressing ⌧ (or by using a first-letter search).

The Asset Surveyor software lets you load a set of user-configured coordinate systems which can be viewed separately from the pre-loaded menu of coordinate systems. If you load specific coordinate systems onto the TSC1 datalogger, the ⎕Hide⎕ softkey is made available to let you 'hide' the menu of preloaded coordinate systems so that only the coordinate systems that are loaded are displayed. Press ⎕Show⎕ to make the full menu of coordinate systems available once again.

Note – You can delete any added coordinate systems through the Coordinate system files entry in the File manager module. For more information, see Coordinate System Files, page 161.

Note – The ⎕OverUp⎕ *softkey lets you configure and enable display of coordinates using the Trimble Over and Up™ map referencing system. For more information see Over and Up, page 235.*

Latitude/Longitude

When you select *Latitude/Longitude* from the menu of available coordinate systems, you are asked to select the datum relative to which latitudes and longitudes are displayed:

```
                Latitude/Longitude
Datum:                        ⊙ WGS 1984
Altitude units:               ⊙ Meters (m)
Altitude ref:                     ⊙ MSL
Geoid model:        ⊙ DMA 10x10 (Global)
```

The *Datum* field lets you access a menu of available datums. The default datum is 'WGS 1984'. Once you have selected a datum, press Enter to save your selection of the *Latitude/Longitude* coordinate system.

The *Latitude/Longitude* coordinate system is unique in that it has no 'zones', as such. Once you have chosen this coordinate system and have selected a datum, all positions displayed by the Asset Surveyor software are shown as latitudes and longitudes relative to the selected datum.
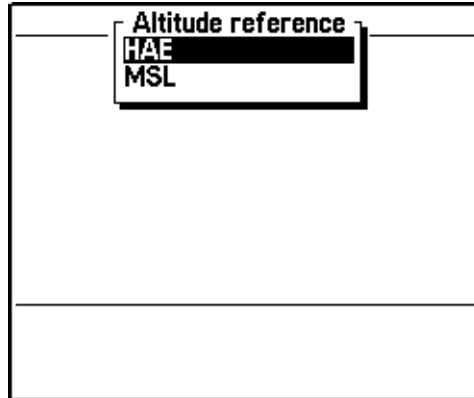
The *Altitude units* and *Altitude reference* fields let you specify the units in which the software displays information when using the Latitude/Longitude coordinate system.

For the *Altitude units* field, the available options are:

- Meters (m) – default setting

- Feet (ft)

- US Survey Ft (USft)

- Inches (in)

- Yards (yd)

- Kilometers (km)

- Miles (mi)

- Nautical Miles (nm)

- Millimeters (mm)

- Namibian Meters (NAm)

- Chains (ch)

- Links (li)

- Centimeters (cm)

The *Altitude reference* field specifies how the Asset Surveyor software displays the altitude component of positions, either as 'HAE', the height above or below the current ellipsoid (that is, datum), or as 'MSL', the height above or below mean sea level. Altitudes relative to the ellipsoid are precise, but may be meaningless for many applications, as altitudes shown on maps are usually relative to mean sea level. When the Asset Surveyor software displays altitudes relative to mean sea level these are approximate, having been derived from the Asset Surveyor software's internal mean sea level model. This model is typically accurate to within 2–5 meters.

You can change the altitude reference by changing the value of the *Altitude reference* field in the *Coordinate system* configuration form:

The *Geoid model* field is available wherever the *Altitude reference* is set to 'MSL'. This field lets you select the geoid model you would like to be used by the selected coordinate system. The only supplied geoid is the 'DMA 10x10 (Global)' model. You can load other geoids onto the TSC1 datalogger from the GPS Pathfinder Office software.

Universal Transverse Mercator

Universal Transverse Mercator (UTM) is a system which uses Transverse Mercator map projections and a set of country-wide datums to span most of the earth's surface. In order to use UTM at a specific location, you must know which datum to use and which UTM zone you are in. There are 120 UTM zones (60 each for the northern and southern hemispheres), numbered 1 to 60 (North and South), starting at the International Date Line and proceeding in an easterly direction around the earth, in steps of 6°.

When you select *Universal Transverse Mercator* from the menu of available coordinate systems, the Asset Surveyor software displays a form where you can specify the zone, datum, altitude and coordinate units, altitude reference, and geoid model:

```
 Universal Transverse Mercator
Zone:                    ⓘ 1 North
Datum:                  ⓘWGS 1984
Altitude units:         ⓘMeters (m)
Coordinate units:       ⓘMeters (m)
Altitude reference:         ⓘMSL
Geoid model:     ⓘDMA 10x10 (Global)



 ───────────────────────────


 Auto
```

The *Zone* field requires you to select a zone from the options available in the pop-up menu. Then select a datum from the menu in the *Datum* field.

⚠️ **Warning –** It is very important that you specify the correct datum when using UTM. Traditionally, the NAD-27 datum has been used for UTM throughout the United States, but recently the NAD-83 datum has been used as the U.S. base for UTM in some applications. If you want the Asset Surveyor software to display GPS positions which are compatible with UTM maps produced by your GIS, you must make sure that the UTM zone, datum and scale factor used by the GIS are all entered into the Asset Surveyor software correctly.

Once you have entered the *Zone* and *Datum*, press 🔲Enter to save your selections. Once you have chosen the UTM coordinate system and accepted a zone, all positions displayed by the Asset Surveyor software are shown in UTM coordinates.

The *Altitude units*, *Coordinate units*, and *Altitude reference* fields let you specify the units in which the software displays information when using the UTM coordinate system.

For the *Altitude units* and *Coordinate units* fields, the options are:

- Meters (m) - default setting
- Feet (ft)
- US Survey Ft (USft)
- Inches (in)
- Yards (yd)
- Kilometers (km)
- Miles (mi)
- Nautical Miles (nm)
- Millimeters (mm)
- Namibian Meters (NAm)
- Chains (ch)
- Links (li)
- Centimeters (cm)

For a detailed description of the *Altitude reference* field, see Latitude/Longitude, page 228.

The *Geoid model* field is available wherever the *Altitude reference* is set to 'MSL'. This field lets you select the geoid model you would like to be used by the selected coordinate system. The only supplied geoid is the 'DMA 10x10 (Global)' model. You can transfer other geoids to the TSC1 datalogger from the GPS Pathfinder Office software.

Other

Apart from the special *Latitude/Longitude* and *Universal Transverse Mercator* coordinate systems, the Asset Surveyor software comes with a selection of predefined coordinate systems. You can also edit these predefined coordinate systems, or create new ones using the Coordinate System Manager utility in the GPS Pathfinder Office software.

Some of the available coordinate systems are shown here:

```
─── Coordinate system ───
Sri Lanka
Sweden (RT-90)
Switzerland
Taiwan
United Kingdom
UPS
US State Plane 1927
US State Plane 1983
UTM

[ OverUp ]
```
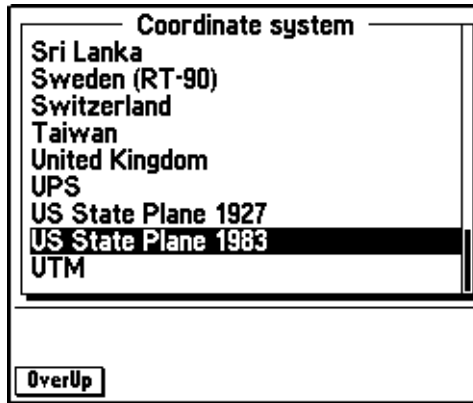
To select a coordinate system from this menu, move the highlight to
the entry you require and press ⏎. For example, if you wanted to use
a U.S. State Plane coordinate system under the NAD-83 datum,
highlight *US State Plane 1983* and select it:

```
          US State Plane 1983
Zone:              ⊙Alabama East 0101
Altitude units:        ⊙Meters (m)
Coordinate units:      ⊙Meters (m)
Altitude reference:         ⊙MSL
Geoid model:    ⊙DMA 10x10 (Global)



 ▯    ⟨6⟩   PDOP   3.17
```
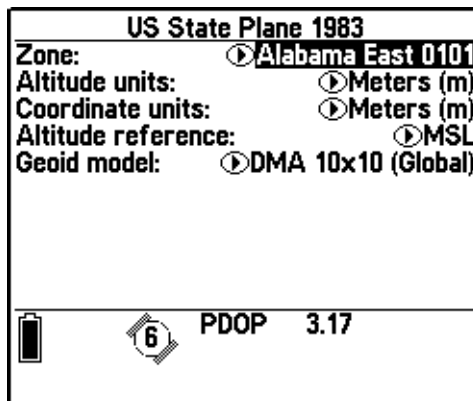
Then select the *Zone* for this coordinate system. For the *US State Plane 1983* coordinate system, there are many available zones, ranging from:
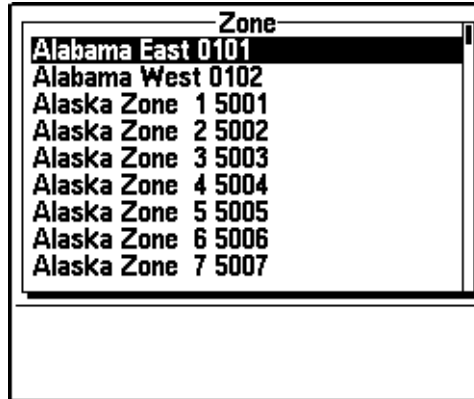
to:
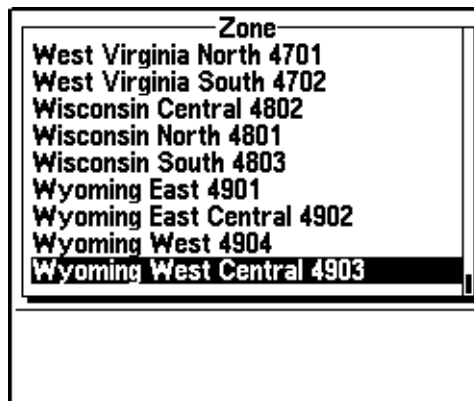
You should be able to easily identify the correct U.S. State Plane zone from this menu. Select it using ⌐⌐Enter⌐. From that point on the Asset Surveyor software displays positions as coordinates in the selected State Plane zone.

The *Altitude units*, *Coordinate units*, and *Altitude reference* fields let you specify the units in which the software displays information when using the selected coordinate system. For a detailed description of these fields, see Universal Transverse Mercator, page 230.

The *Geoid model* field is available wherever the *Altitude reference* is set to MSL. This field lets you select the geoid model you would like to be used by the selected coordinate system. The only supplied geoid is the 'DMA 10x10 (Global)' model. You can transfer other geoids to the TSC1 datalogger from the GPS Pathfinder Office software.

Over and Up

The Trimble Over and Up map referencing system is a very convenient way to represent coordinates on a paper map. Coordinates are not viewed or entered as latitudes and longitudes, or as northings and eastings; they are expressed as paper distances from a reference position somewhere on your map.

If you press the ⌷OverUp⌷ softkey after selecting a coordinate system, the *Over and Up* configuration form appears:

By default, Over and Up mode is disabled. You can enable it by changing the *Mode* field from 'Off' to 'On'. The Asset Surveyor software lets you enable Over and Up mode only if you supply non-null coordinates for the *Reference positi*on and the map's *Scale*.

*Note – The Reference position waypoint coordinates must be entered in terms of the **currently selected** coordinate system. The WayPt softkey can be used to select a pre-entered waypoint as the reference position for your map.*

Once you have entered appropriate values, press ⌨Enter to save the Over and Up settings.

When you subsequently view positions (for example, the current GPS position, the position of a collected feature, or that of a waypoint), the Asset Surveyor software shows these positions relative to the Over and Up reference position, in paper units. The position is shown as Left or Right of the reference position, and either Up or Down from the reference position. If your configured distance units are metric, the Over and Up distances are shown in centimeters (cm); otherwise they are shown in inches (in).

Note – Over and Up mode only works with maps which are aligned to True north.

⚠ **Warning –** Remember to change your Over and Up settings whenever you change maps.

Site Selection

The Asset Surveyor software also lets you select a local site to be used as the configured coordinate system. A local site is an adjustment to the zone of a coordinate system, consisting of a translation, scaling, rotation about an origin, and an optional height adjustment. It is applied in order to calibrate GPS positions against existing survey marks to derive a vertical and horizontal plane adjustment. For further explanation of local site creation, see the Coordinate System Manager documentation.

If you have transferred a local site to the Asset Surveyor software, a ⌐Sites⌐ softkey appears on the *Coordinate system* menu:
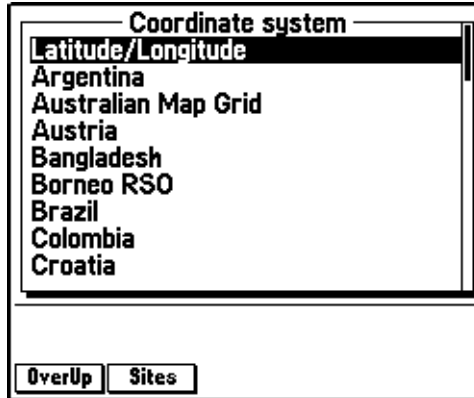
Pressing the ⌐Sites⌐ softkey opens the list of available sites on the TSC1 datalogger:
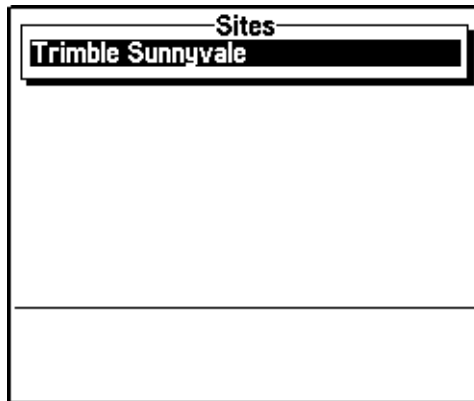
In the example above, there is only the one site available to select, called *Trimble Sunnyvale*. Press ⏎Enter to display a form similar to the following:

```
                 Trimble Sunnyvale
Altitude units:           ⊕ Meters (m)
Coordinate units:         ⊕ Meters (m)
Altitude reference:          ⊕ MSL
Geoid model:     ⊕ DMA 10x10 (Global)




           _____

```

The *Altitude units*, *Coordinate units*, and *Altitude reference* fields let you specify the units in which the software displays information when using a local site. For a detailed description of these fields, see Universal Transverse Mercator, page 230.

The *Geoid model* field is available wherever the *Altitude reference* is set to 'MSL'. This field lets you select the geoid model you would like to be used by the selected coordinate system. The only supplied geoid is the 'DMA 10x10 (Global)' model. You can transfer other geoids to the TSC1 datalogger from the GPS Pathfinder Office software.

Map Display Options

The *Map display options* form lets you customize and configure different aspects of the *Map* module. It can also be accessed by pressing the ⌷Options⌷ softkey from the *Map* screen. The *Map display options* form appears as follows:

```
         Map display options
Layers
  Features:              ▶Show
  Update check-marks:    ▶Show
  Not in feature:        ▶Show
  GPS trail:             ▶Show
  Navigation:            ▶Show
Scale display:           ▶Show
Coordinate display:      ▶Show
Background file:         ▶None

 ┌─┐
 │ │     ╱7╲   PDOP   2.44
 └─┘     ╲_╱
```

Layer Control

The *Layers* caption contains a number of fields that let you control which layers are displayed in the *Map* screen. Layers are like the layers in a GIS, and allow all the data of a certain type to be shown on the *Map* screen. You can hide or show layers depending on the type of information that you want displayed on the *Map* screen. For examples of how various items are displayed on the *Map* screen, see Table 8.1 on page 344.

Features

The *Features* field lets you show or hide display of the feature layer, which shows all features in the currently open data file. If no foreground file is open then no features will be displayed. The *Features* field is set to 'Show' by default. Its setting has no effect on filtered features, which are automatically hidden on the *Map* screen.

Update check-marks

The *Update check-marks* field controls the display of the map layer which shows Updated feature check marks. Features that have had their attributes or positions updated, or have been marked as visited, have a check mark shown next to their first position, similar to the following:
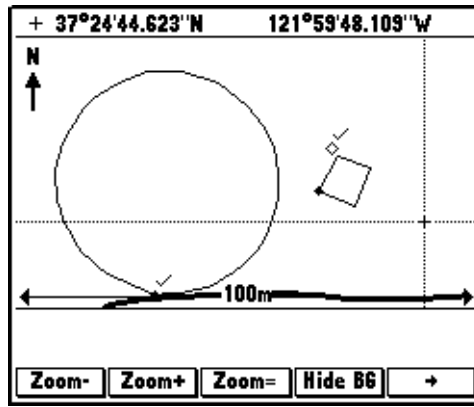
Features without check marks have not yet been visited and/or updated.

The *Update check-marks* layer is set to 'Show' by default and is only shown if the *Features* layer is also set to 'Show'.

Not-in-feature

The *Not-in-feature* field controls the display of Not-in-feature positions. Not-in-feature positions are actual GPS positions that are logged at a specified logging interval **between** features. Not-in-feature positions can be transferred to the GPS Pathfinder Office software (unlike the GPS trail). Not-in-feature logging is controlled from the *Configurations / GPS Rover options / Logging options* form.

The *Not-in-feature* field is set to 'Show' by default.

Note – If Not-in-feature logging is set to 'Off', then no Not-in-feature positions are available to be displayed on the Map screen.

GPS trail

The *GPS trail* field lets you control display of the layer showing up to 60 recent GPS positions. These appear as a trail of small dots to show where you have been recently, and as more are added the old ones are dropped off the end. *GPS trail* positions are for visual reference only, are not permanently recorded to a data file, and cannot be sent to the GPS Pathfinder Office software.

The *GPS trail* field is set to 'Show' by default.

Navigation

The *Navigation* field lets you control display of the layer consisting of all the navigation information that can appear on the *Map* screen. It includes waypoints, the bearing to Target arrow, the heading arrow, Start and Target locations, and the cross-track error line.

The *Navigation* field is set to 'Show" by default.

Scale Display

The *Scale display* field controls whether or not the scale arrow and current map scale are displayed on the *Map* screen. While the scale arrow does not completely obscure data underneath it, you may want to disable it to maximize the available screen size.

The *Scale display* field is set to 'Show' by default.

Coordinates

The *Coordinates* field controls whether or not the coordinate box is displayed on the *Map* screen. If the GPS cursor is active, the coordinate box displays the coordinates of the current GPS position:
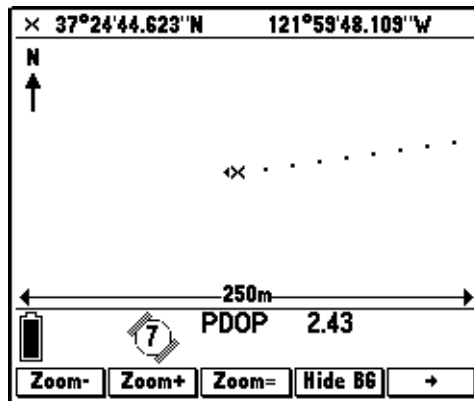
If the map cursor is active then the coordinates box displays the coordinates of the current map cursor location:
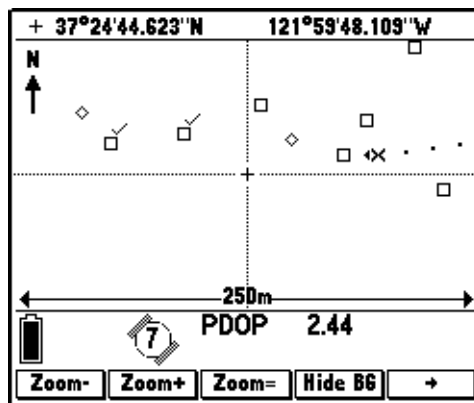
The icon next to the coordinates shows either the GPS or map cursor, indicating which is currently being displayed. For more information on activating the map cursor, see The Map Cursor, page 345.

The *Coordinates* option is set to 'Show' by default.

Note – To change to a different coordinate system, select the Coordinate Systems entry on the Configuration menu. To change the coordinate order, select Units and display.

Background File

The *Background file* field lets you select a data file to be displayed on the *Map* screen as a read-only background file. The background file is for visual reference only and features in it cannot be selected or queried. The *Background file* field is set to 'None' by default. Select the data file you want to open from the list, which shows all rover and background files on the system. Base files cannot be opened as background files.

Use the ⌞Show BG⌟ and ⌞Hide BG⌟ softkeys on the *Map* screen to show or hide the specified background file. For more information, see Background File, page 243.

Note – You cannot use the same file as the background and the foreground data file.

Symbols

The Asset Surveyor software lets you customize the symbols displayed for point features on the *Map* screen and in the *Review data* list. This makes it easier to distinguish between particular types of point features.

Press ⌞Symbols⌟ to open the *Point feature symbols* menu, where you can customize the symbols used for the display of point feature types on the *Map* screen. The ⌞Symbols⌟ softkey can also be accessed from the *Data dictionary* menu in the *File manager* module, or the *Map display options* form in the *Map* module.

> **Tip –** The *Map display options* form (which can be accessed from the *Map* module or the *Configuration* module) will only let you customize point feature symbols for the currently open data file. If you don't have a file open yet, the ⌜Symbols⌟ and ⌜Labels⌟ softkeys do not appear. You can go to the *Select data dictionary* menu in the *File manager* module where you can configure the symbols and labels for any data dictionary, regardless of whether there is a file open that uses it or not.

All the point feature types in the currently open data file appear in the *Point feature symbols* list, with a default symbol assigned to each, similar to the following:
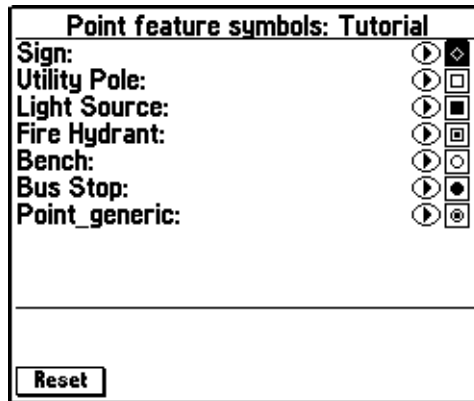
To change the symbol displayed for a point feature type, simply highlight the feature type and choose a new symbol from the menu of symbols, as follows:
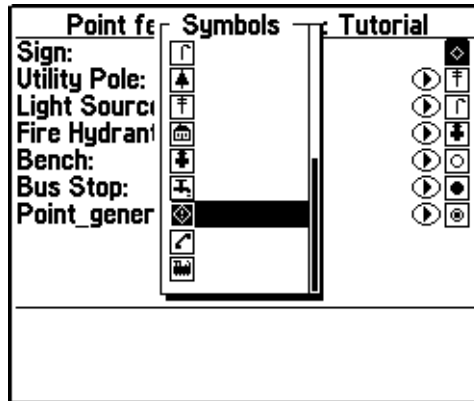
The same symbol can be assigned to several different point feature types. Press Reset to return to the default symbol allocations.

Note – Symbol allocations are specific to a data dictionary, not a file. The symbol specified for a point feature type in one file will also be applied to any other data files which use the same data dictionary. Point feature symbol allocations are retained as long as the data dictionary remains on the TSC1 datalogger.

Note – Point feature symbols cannot be customized for a file opened as the background file in the Map module.

Labels

The Asset Surveyor software lets you specify two attribute values to be displayed for the selected feature on the *Map* screen and in the *Review data* list. These two labels make it easier to distinguish between features.

When you create a feature in the Data Dictionary Editor utility in the GPS Pathfinder Office software, the first two attributes in the feature are selected by default as the labels. You can change the selected labels in the Data Dictionary Editor utility, or in the Asset Surveyor software. Any changes you make to label assignments in the Asset Surveyor software remain in effect until you remove the data dictionary from the TSC1 datalogger.

In the *Map display options* form, press ⬛Labels⬛ to open the *Select feature to label* list. The ⬛Labels⬛ softkey can also be accessed from the *Select data dictionary* menu in the *File manager* module, or the *Map display options* form in the *Map* module.

⚬֯ **Tip –** The *Map display options* form (which can be accessed from the *Map* module or the *Configuration* module) will only let you customize labels for the currently open data file. If you do not have a file open yet, the ⬛Symbols⬛ and ⬛Labels⬛ softkeys do not appear. You can go to the *Select data dictionary* menu in the *File manager* module where you can configure the symbols and labels for any data dictionary, regardless of whether there is a file open that uses it or not.

All the feature types in the currently open data file appear in the *Select feature to label* list:
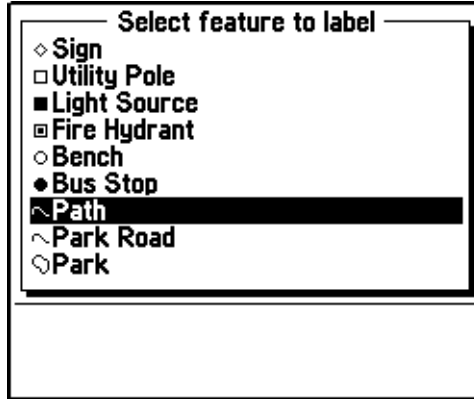
To change the labels displayed for a feature type, highlight the feature type and press ⟨Enter⟩ to open the *<feature> label options* form for that feature type:
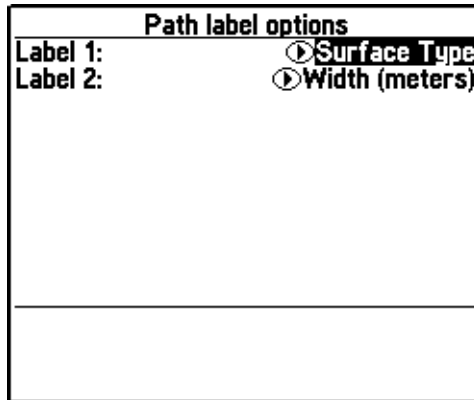
To set the values for the feature labels, from the *Label 1* or *Label 2* field select an attribute name, or 'None'. You can specify the same attribute, or 'None', for both labels.

Note – Label allocations are specific to a data dictionary, not a file. The labels specified for a feature type in one file will also be applied to any other data files which use the same data dictionary.

For information on the display of labels, see Reviewing and Updating Existing Features, page 84, and Selecting Features for Update, page 347.

Navigation Options

When you select *Navigation options* from the *Configuration* menu, the *Navigation options* form appears. You can also display this form by pressing ⌐Options⌐ from any navigation screen. It contains options for configuring all navigation screens.

Direction Dial Options

This set of options is for the *Direction Dial* screen:

```
         Navigation options        ▼
Direction dial options
  Dial info panel 1:        ⊙▶Turn
  Dial info panel 2:        ⊙▶Heading
  Dial info panel 3:        ⊙▶Velocity
  Dial info panel 4:        ⊙▶Time
  Close-up range:              5.00m
  Close-up style:   ⊙▶Target-centered


Road options
```

You do not have to be in the *Direction Dial* screen to configure them.

Dial info panel fields: Configure which *Info* panels appear in the four spaces on the *Direction Dial* screen. For a list of the *Info* panels available, see Info Panels, page 328.

Close-up range: Configure the distance (from the Target) at which the *Direction Dial* screen changes to the *Close-up* screen. If you set this distance to zero, the *Close-up* screen never appears. The value you set here also determines the distance from the Target at which the proximity alarm sounds.

Close-up style: Configure the focal point of the *Close-up* screen: **Target-centered** or **GPS-centered**. The default style is 'Target-centered'.

Road Options
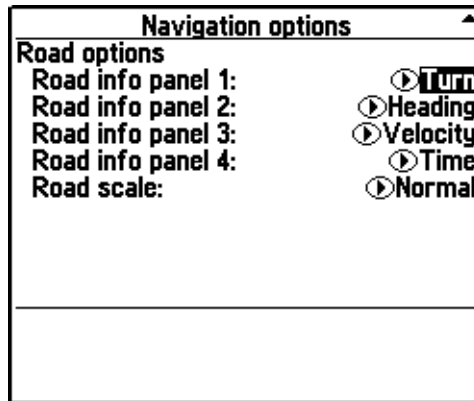
This set of options is for the *Road* screen:

You do not have to be in the *Road* screen to configure them.

Road info panel fields*:* Configure which *Info* panels appear in the four spaces on the *Road* screen. For a list of the *Info* panels available, see Info Panels, page 328.

Road scale: Configure the scale (width) that the *Road* screen represents. For example, if you are walking and you want to stay close to the path you are traveling, set the *Road scale* to 'Narrow'. If traveling by vehicle in an open field, and staying on track is less important, set the *Road scale* to 'Wide'.

Units and Display

When you select the *Units and display* entry from the *Configuration* menu, the following configuration form appears:

```
┌────────────────────────────────────────┐
│       Units and display         ▼       │
│ Units                                   │
│  Distance (2D):        ⊙Meters (m)      │
│  Area:            ⊙Square meters (m²)   │
│  Velocity:            ⊙Km/Hour (kph)    │
│  Angles:               ⊙Degrees (°)     │
│ Angle format:          ⊙DD.MMSSss       │
│ Order:            ⊙Latitude/Longitude   │
│ North reference:          ⊙True         │
│ Magnetic declination:        Auto       │
│ Null string:                    ?       │
│ ▌       ◈6◈   PDOP   3.87               │
│                                         │
└────────────────────────────────────────┘
```

The Asset Surveyor software lets you configure many of the ways in which it displays information on the TSC1 datalogger. The default values for each field are as illustrated above. The configurable unit and display style fields are described in detail in the following sections.

Units

The Asset Surveyor software displays units on a number of fields, and permits the specification of units when values are entered into these fields. Four classes of units can be configured here:

- Horizontal *Distance* units
- *Area* units
- *Velocity* units
- *Angle*s

If you position the highlight on any of these fields in the *Units and display* configuration form and press ⌨, the menu of units available for that field appears.

Note – The Altitude units, Coordinate units, and Altitude reference are configured in the Coordinate system configuration form.

For *Distance* units, the available options are:

```
┌──── Distance (2D) ────┐
│ Meters (m)            │
│ Feet (ft)             │
│ US Survey Ft (USft)   │
│ Inches (in)           │
│ Yards (yd             │
│ Kilometers (km)       │
│ Miles (mi)            │
│ Nautical Miles (nm)   │
│ Millimeters (mm)      │
│ Namibian Meters (NAm) │
│ Chains (ch)           │
│ Links (li)            │
│ Centimeters (cm)      │
└───────────────────────┘
```
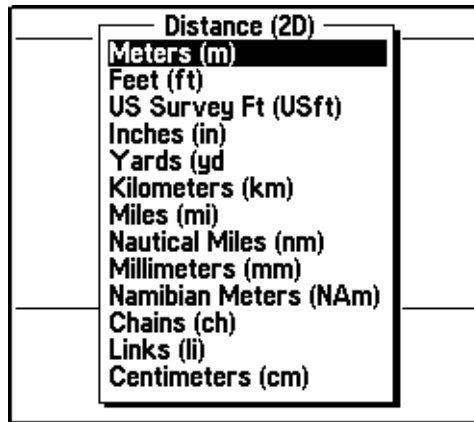
For *Area* values, the available options are:

```
┌──────── Area ────────┐
│ Square meters (m²)   │
│ Square feet (ft²)    │
│ Hectares (Ha)        │
│ Acres (A)            │
│ Square kilometers (km²) │
│ Square miles (mi²)   │
└──────────────────────┘
```
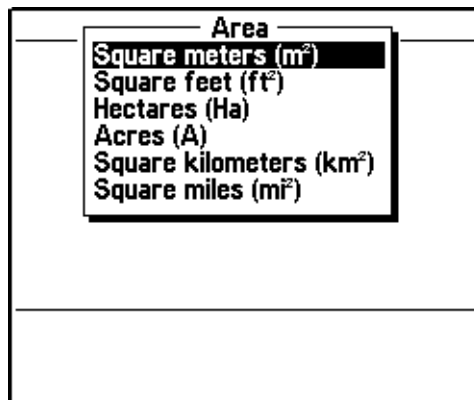
For *Velocity* values, the permitted units are:

```
┌──────── Velocity ────────┐
│ Meters/Second (m/s)      │
│ Feet/Second (ft/s)       │
│ Km/Hour (kph)            │
│ Miles/Hour (mph)         │
│ Knots (kt)               │
│                          │
│                          │
│                          │
│                          │
│                          │
└──────────────────────────┘
```
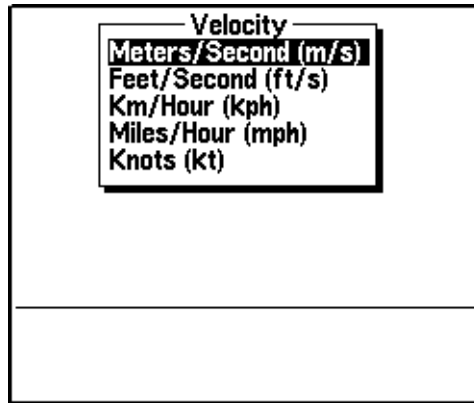
For *Angles*, the permitted units are:

```
┌──────── Angles ────────┐
│ Degrees (°)            │
│ Gradians (gon)         │
│ Rhumbs (rh)            │
│ Mils (mil)             │
│                        │
│                        │
│                        │
│                        │
│                        │
└────────────────────────┘
```
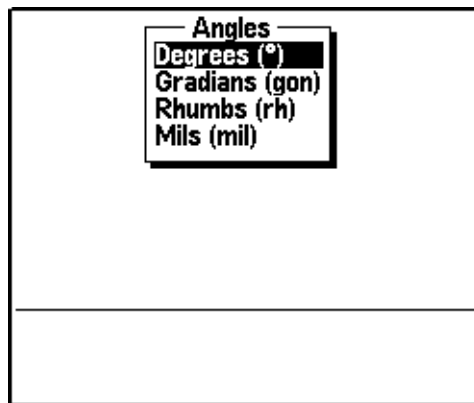
Note – The configured units for angles affect only the angles displayed when navigating, measuring between waypoints and entering offsets. They do not affect the bearings shown in the Satellite information form and they have no effect on the entry or display of latitudes or longitudes (which are always entered and displayed in degrees with optional minutes and/or seconds).

You can select convenient units for *Distance*, *Area*, *Velocity*, and *Angles*, and then move on to the other *Units and display* fields.

Angle Format

You can configure the format for the entry of angles which use degrees (including latitudes and longitudes) into the Asset Surveyor software fields. The available formats are:
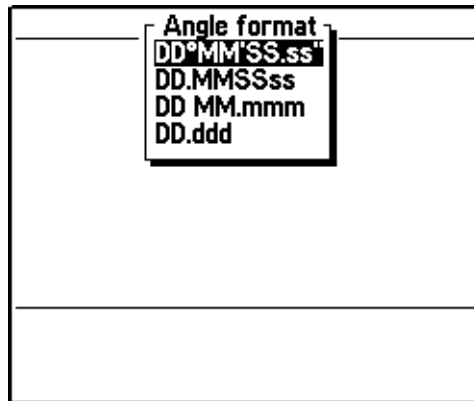
All full angles are displayed in the '*DD°MM'SS.ss*' format. Angles can also be entered in this format by typing each punctuation character, by selecting them from the ⌐Units⌐ menu, or by separating each of the components of the angle by a space.

The default '*DD.MMSSss*' format lets you enter a full angle in degrees, minutes, and seconds with the minimum of punctuation.

The '*DD MM.mmm*' format lets you enter an angle as degrees and decimal minutes, with a space character as punctuation to separate the two components. The '*DD.ddd*' format lets you enter an angle in decimal degrees.

Tip – When entering latitudes and longitudes, remember that these are signed values, with the sign being used to indicate the hemisphere (North or South for latitudes, East or West for longitudes). You can enter the sign as '+', '–', 'N', 'S', 'E' or 'W', at either the start or end of the field. If you do not specify a sign then the Asset Surveyor software defaults to the hemisphere in which you are currently operating, as determined by your most recent GPS position.

Order
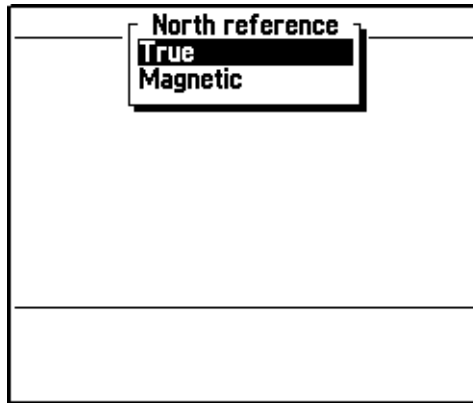
Whenever the Asset Surveyor software displays a position, it shows *North*, *East*, and *Altitude* fields (or *Latitude*, *Longitude* and *Altitude* fields, if the current coordinate system is *Latitude/Longitude*):

You can choose the order of the first two fields of each position (that is, *North/East* versus *East/North*, or *Latitude/Longitude* versus *Longitude/Latitude*) by changing the value in the *Order* field of the *Units and display* configuration form. The default order is *North/East* (or *Latitude/Longitude*).

North Reference

Whenever the Asset Surveyor software displays a *bearing* (that is, an angle other than a latitude or a longitude), it does so relative either to *true* north or to *magnetic* north. True north is more useful if you are navigating relative to a background map, while magnetic north is best if you are navigating with the assistance of a magnetic compass. You can change the north reference in the *North reference* field in the *Units and display* configuration form:

By default, the *North reference* is 'True'. The difference between true and magnetic north depends on where you are on the earth's surface, and is called the magnetic declination. You can tell the Asset Surveyor software the current magnetic declination using the following field on the *Units and display* form.

⚠ **Warning –** Remember to set the *North reference* field to 'Magnetic' before using a magnetic compass to enter offsets for features manually.

Magnetic Declination

If you know the magnetic declination for your area (it is printed on most accurate maps), you can type it into the *Magnetic declination* field of the *Units and display* configuration form.

Note – If you move a significant distance you may need to update a manually entered magnetic declination.

Because you may not always know your magnetic declination, or may prefer not to update it as you move about, the Asset Surveyor software provides an ⌐Auto⌐ softkey when you are entering a value into the *Magnetic declination* field, for example:

When you press ⌐Auto⌐, the Asset Surveyor software inserts the special value 'Auto' into the *Magnetic declination* field. From then on, whenever the Asset Surveyor software requires the magnetic declination, it consults its internal magnetic declination table, based on your current location.

Note – In order to compute your magnetic declination automatically, the Asset Surveyor software needs to know where in the world you are. It uses the most recent GPS position, or the configured Initial position, if no GPS positions are currently available. Until the Asset Surveyor software knows your Initial position, it treats true and magnetic north as being identical.

Tip – You only need to enter explicit declinations when you are navigating over reasonably large distances, entering magnetic offsets for features (with or without a laser rangefinder) or when there is a local variation in the earth's magnetic field. The Asset Surveyor software's declination table models the earth's overall magnetic field. It does not take any account of local variations due to such things as mineral deposits. If you need to temporarily enter a precise declination for a particular area, remember to change back to 'Auto' when you leave that area.

Null String

Whenever the Asset Surveyor software has no value for a particular field in a form, it displays the *null* character string, which by default is the single character '?'. Usually, you are not permitted to save a form if one or more of its fields still have the null value, but occasionally a field is permitted to remain null.

You can change the null character string by editing the *Null string* field in the *Units and display* configuration form. You can use any character string for the null value, but the null string should be distinctive and preferably brief.

When you are editing the *Null string* field, the Asset Surveyor software displays two softkeys:

- You can press ⌷Space⌷ to change the *Null string* to a single space character.

- You can press ⌷Symb⌷ to insert a special character.

Language

The Asset Surveyor software has been translated into a number of European languages that are pre-loaded onto the TSC1 datalogger. The language can be changed as desired by selecting them from the *Language* field's pop-up menu. The Asset Surveyor software supports the following languages:

- English

- French

- German

- Portuguese

- Russian

- Spanish

The distribution CD-ROM for the Asset Surveyor software contains each of the language files supported at the time of purchase. If the language you require is not on the CD-ROM, please contact your Trimble distributor, as new translations of the Asset Surveyor software may be available. For instructions on how to transfer new language files onto your TSC1 datalogger, refer to the Data Transfer utility documentation.

To delete an unwanted language, highlight it and press ⬚ Del ⬚.

Note – The Asset Surveyor software does not let you delete the default language, which is English.

Keypad

The Asset Surveyor software can be translated into languages that do not use the Roman alphabet (that is, A…Z). For example, the Russian language uses the Cyrillic alphabet.

In order to use the Asset Surveyor software when running in a language such as Russian, it is necessary to map the TSC1 datalogger's Ⓐ, Ⓑ, Ⓒ, …, Ⓩ keys to letters in that language's native alphabet, as shown in Figure 5.2.
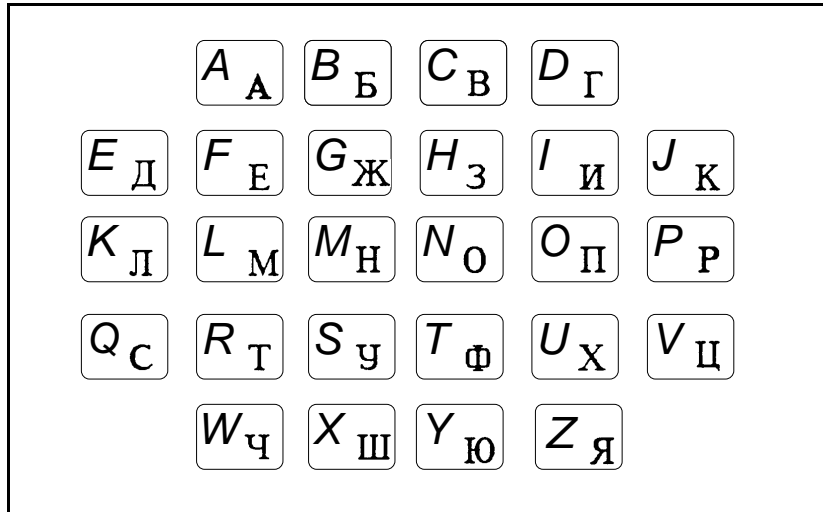
Figure 5.2   Cyrillic characters for TSC1 keypad

When running the Asset Surveyor software in Russian, you generally enter all information using the Cyrillic alphabet. Occasionally, however, it may be necessary to enter Roman letters (for example, when entering attributes for certain features, perhaps).

If you select a language such as Russian which uses an alphabet other than the default Roman alphabet, the Asset Surveyor software adds a *Keypad* field to the *Units and display* configuration form. The *Keypad* field takes one of two values, the first being 'ABC...XYZ', and the second being the alphabet used by the selected language. In the case of the Russian language, this is **АБВ...ШЮЯ**.

You can switch between the Roman alphabet and the native alphabet of your selected language by changing the value of the *Keypad* field. This lets you mix the Roman and native alphabets freely when entering information on your TSC1 datalogger's keypad.

Time and Date

When you select the *Time and date* entry from the Asset Surveyor software's *Configuration* menu, the following configuration form appears:

```
          Time and date
24-hour clock:              ⊙No
Time:             06:02:43 pm
Date format:    ⊙MM/DD/YYYY
Date:           09/28/1999 Tue
```

The Asset Surveyor software lets you check or set the local time and date, which is maintained by the clock hardware inside your TSC1 datalogger. In addition, you can configure the formats in which times and dates are displayed and entered.

Note – GPS time is extremely accurate, and the Asset Surveyor software uses GPS time to correct any errors in the TSC1 datalogger's internal clock. It also applies an offset to obtain UTC (or GMT) time. Because the Asset Surveyor software does not know which time zone you are using, the datalogger's date is aligned to within one day of the local date. Because some time zones are only 15 minutes 'wide', the datalogger's time is aligned to the time zone that is within 7½ minutes of the TSC1's accurate clock. If you do not use the TSC1 datalogger with GPS for a long period, the TSC1's clock drifts away from the correct time; when you eventually reconnect to GPS, the Asset Surveyor software realigns the TSC1 datalogger's clock again.

24-Hour Clock

The Asset Surveyor software can operate either using a 24-hour clock or a 12-hour clock (where A.M. and P.M. are used to distinguish times in the morning from those in the afternoon). By default, the Asset Surveyor software operates in 12-hour mode, but if you want to view and enter times in 24-hour format, you can change the value of the *24-hour clock* field to 'Yes'.

Note – Remember that even if you view times in 12-hour format, you can enter them in 24-hour format. The Asset Surveyor software automatically converts them to 12-hour format before displaying them.

Time

The *Time* field is used for setting the local time of the TSC1 datalogger. When you open the *Time and date* configuration form, this value is ticking over in pace with the TSC1 datalogger's internal clock. If you change the time it ceases to tick over, and whatever time you have entered is used to set the TSC1 datalogger's clock hardware when the form is saved.

When you are entering a new time the Asset Surveyor software makes a number of useful softkeys available. For more information, see Time fields, page 43.

⚠ **Warning –** Make sure that you enter the time correctly. If you are using a 12-hour clock, make sure that you enter **pm** if appropriate.

*Note – You can either configure the Time and Date fields to show the **local** time and date, or you can configure these fields to show **UTC** **time** (also known as GMT). The local time and date are generally more useful, especially if you want to record the current time and date as attribute values. You can choose whether to name data files using local or UTC time by pressing the Time softkey in any of the Create file forms.*

Date Format

The three supported date formats are:

- MM/DD/YYYY

- DD/MM/YYYY

- YYYY/MM/DD

The Asset Surveyor software's default format is 'MM/DD/YYYY'. You can change the Asset Surveyor software's date format by editing the *Date format* field of the *Time and dat*e configuration form.

Date
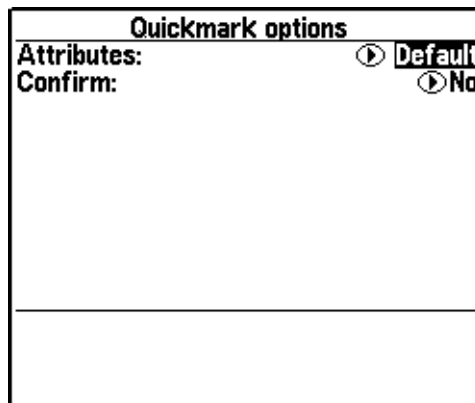
The *Date* field is used for setting the local date of the TSC1 datalogger.

When you are entering a new date, various useful softkeys are made available. For more information, see Date fields, page 42.

When you turn your TSC1 datalogger on for the first time, and when it is turned on again after having had its batteries removed or discharged, the internal clock is set to January 1st, 1980. You should reset the clock before using the TSC1 datalogger for data logging, so that the [Now] and [Today] softkeys and automatic time and date fields operate correctly.

Quickmarks

When you select the *Quickmarks* entry from the Asset Surveyor software's *Configuration* menu, the *Quickmark options* configuration form appears:

```
        Quickmark options
Attributes:              ▶ Default
Confirm:                  ▶No
```

These two configurable fields are used to determine how the collection of point features using quickmarks should proceed.

Attributes

The *Attributes* field has the values 'Default' or 'Repeat'. This field determines the source of the attribute values associated with the quickmarked feature. They are either the default values specified when the data dictionary was defined ('Default'), or they are the attributes of the most recent feature of that type ('Repeat').

Confirm

Often when collecting point features using quickmarks you cannot enter attributes for these features (as you are moving too rapidly). Sometimes, however, there are few enough attributes and the features can be clearly seen at speed, and it then becomes practical to record one or more attributes for quickmarked features. If the *Confirm* field's value is 'Yes', then just after each quickmark is recorded you have an opportunity to review and optionally edit the feature's attributes. If the *Confirm* field's value is 'No' (the default), the quickmark is immediately saved with default attributes determined solely by the *Attributes* field described above.

*Note – When collecting point features by quickmarking them, the Asset Surveyor software fixes the feature's position and saves its default attributes **before** letting you edit these attributes (if the Confirm field's value is 'Yes'). If you press ⎯Esc⎯ to exit the attribute review form, the feature is not abandoned or deleted. It simply retains its default attributes.*

Constant Offset

When you select the *Constant offset* entry from the Asset Surveyor software's *Configuration* menu, the menu of constant offsets appears:
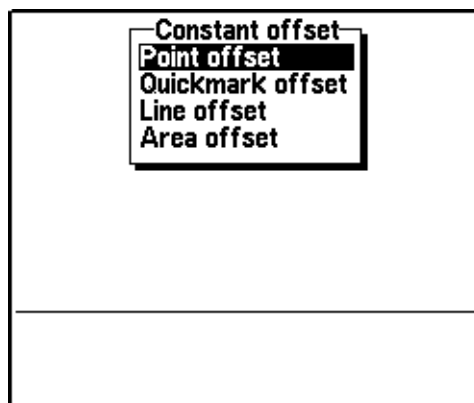
The Asset Surveyor software lets you specify a constant offset for point features, quickmarks, line features, and area features.
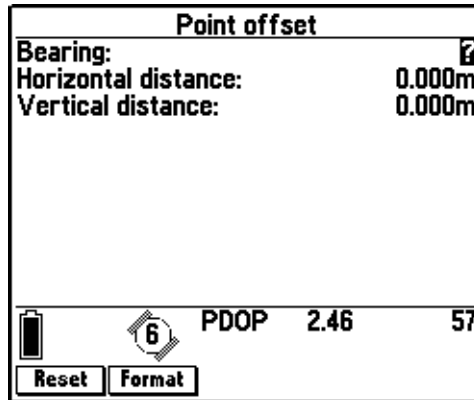
You should configure a non-zero constant offset if most or all of the features you intend to collect can most conveniently be logged by standing or moving past the feature at a distance. You can easily override the constant offset for the few features which may differ from the norm.

Point Features

A constant offset for a point feature consists of a *Bearing (*an angle from either true or magnetic north), a *Slope distance* (range), and an *Inclination* (to the horizontal). If you select *Point offset* from the above list, the *Point offset* configuration form appears:

```
┌─────────────────────────────────────┐
│           Point offset              │
│ Bearing:                         ▣  │
│ Slope distance:             0.000m  │
│ Inclination:                  0.0°  │
│                                     │
│                                     │
│                                     │
│  ▐  ◈6◈  PDOP  2.43           8   │
│  Reset  Format                     │
└─────────────────────────────────────┘
```

A constant offset can also be displayed and entered as a *Bearing*, a *Horizontal distance*, and a *Vertical distance*:

```
┌─────────────────────────────────┐
│          Point offset           │
│ Bearing:                      ？ │
│ Horizontal distance:     0.000m │
│ Vertical distance:       0.000m │
│                                 │
│                                 │
│                                 │
│                                 │
│   ▮    ◈6◈   PDOP   2.46     57 │
│  Reset  Format                  │
└─────────────────────────────────┘
```

You can switch between these two modes of offset display and entry by pressing the `Format` softkey.

The default offset, as always, is essentially no offset at all (that is, zero). Once a non-zero *Constant offset* has been configured for point features, this automatically applies to each (normal, nested, or carrier phase) point feature which is subsequently recorded.

Tip – You can use a laser rangefinder to fill in the three fields for a constant point feature offset, provided you configure constant offsets when the laser interface is active (that is, under the *External sensors* entry in the *Configuration* menu, or under the `EXT` softkey in *Data collection*).
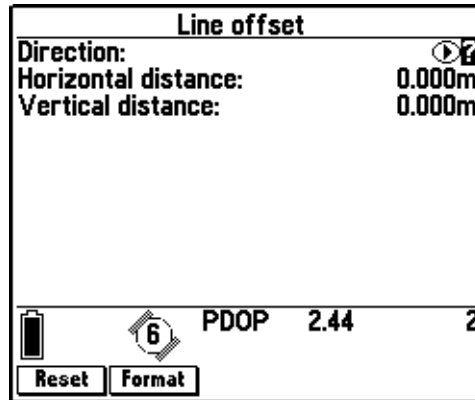
Quickmarks, Lines, and Areas

A constant offset for a quickmark, line feature, or area feature consists of a *Direction* (left or right) relative to the direction of travel at the time the feature is recorded, a range (*Slope distance*), and an *Inclination*. If you select one of the *Quickmark offset*, *Line offset*, or *Area offset* entries from the *Constant offset* menu, then the following configuration form (with an appropriate heading) appears:

```
┌─────────────────────────────────┐
│          Line offset            │
│ Direction:                 ⊙▶️?  │
│ Slope distance:         0.000m   │
│ Inclination:               0.0°  │
│                                  │
│                                  │
│  ▐ ▌    ⟨6⟩  PDOP  2.41      2   │
│  Reset  Format                   │
└─────────────────────────────────┘
```

As with normal point features, once a non-zero offset has been configured, it is applied to each feature of the corresponding type which is subsequently recorded. The ⸢Reset⸥ softkey can be used to reset a configured constant offset to the default value (a zero offset).

A constant offset can also be displayed and entered as a *Direction*, a *Horizontal distance* and a *Vertical distance*:

```
                    Line offset
Direction:                          ⊙🔋
Horizontal distance:             0.000m
Vertical distance:               0.000m




  ┌─┐
  │█│      ⟨6⟩    PDOP   2.44          2
  │█│
  └─┘
  Reset    Format
```

Press ⌊Format⌋ to switch between the two modes of offset display.

💡 **Tip –** You can use a laser rangefinder to fill in the last two fields for a line, area or quickmark constant offset, provided you configure constant offsets when the laser interface is active (that is, through *Configuration/External sensors* or under the ⌊EXT⌋ softkey in *Data collection*). You must always fill the *Direction* field manually.

Note – Although a constant offset determines the default offset value stored for a feature, this default offset can always be edited, either during the collection of that feature or later, when reviewing data.

⚠ **Warning –** If you forget to reset a constant offset when it ceases to be required, you may inadvertently record features which are offset when they should not be. If you open a new or existing data file while a non-zero constant offset is active, the Asset Surveyor software displays the message Constant offset(s) are active.

External Sensors

The Asset Surveyor software lets you configure, activate, and test an external sensor or a laser rangefinder from the *External sensors* entry in the *Configuration* menu.

Note – The TSC1 datalogger does not support the use of a barcode wand as an external sensor.

When you select *External sensors* from the *Configuration* menu, or press ▭EXT▭ in *Data collection*, the Asset Surveyor software opens the menu of external sensors:
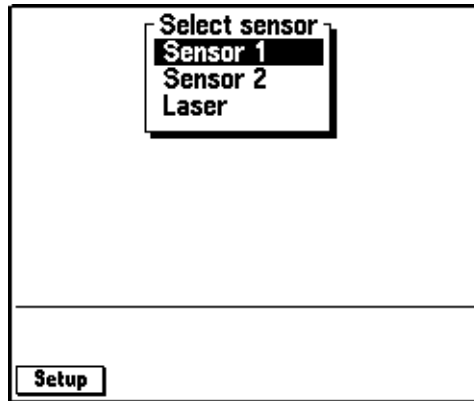
The Asset Surveyor software supports up to two configurable external sensors, which by default are named *Sensor 1* and *Sensor 2*. It also supports a single laser rangenfinder interface, as described later in this chapter.

Note – Although you can preconfigure two external sensors, you can only connect and use one at a time.

> ☀ **Tip –** Configuration of the Asset Surveyor external sensor interface requires a reasonable understanding of how your sensor communicates through its RS232 port. You should always allow plenty of time for configuring and testing a sensor with the Asset Surveyor software before beginning data collection. There are often a number of ways in which to configure the external sensor interface to work with a particular sensor and usually one way is better than the others for a given application.

Press ⌐Setup⌐ to open the configuration form for the highlighted sensor.

Configuring an External Sensor

You can configure an external sensor by pressing ⌐Setup⌐ when the desired sensor is highlighted. Pressing ⌐Setup⌐ when one of the two configurable sensor entries is highlighted displays that sensor's configuration form, which looks similar to the following:

```
┌────────────────────────────────┐
│          Sensor 1           ▼   │
│ Auto connect:            ⊙No   │
│ Name:                 Sensor 1 │
│ Channel:                     0 │
│ Connect:                     ? │
│ Disconnect:                  ? │
│ Data request:                ? │
│ Intervals                       │
│  Point feature:           None │
│  Line/area:               None │
│  Not in feature:          None │
│                                 │
│                                 │
│ ┌───────┐                       │
│ │ COMMS │                       │
│ └───────┘                       │
└────────────────────────────────┘
```

The following sections describe each of these fields in detail.

Auto connect

An external sensor can be activated manually each time data collection commences. If the same external sensor is to be used every time you use the Asset Surveyor software, it may be more convenient to configure this sensor interface to automatically connect (that is, activate) whenever data collection commences. This can be achieved by setting the value of the *Auto connect* field to 'Yes'.

Name

Each external sensor can be assigned a more meaningful name than *Sensor 1* or *Sensor 2*. For example, if you configured the first external sensor to interface to a geiger counter, you can rename it *Geiger counter*. The menu of external sensors would then be:
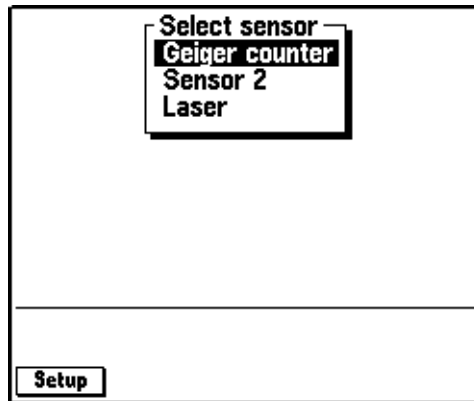
Channel

The *Channel* field lets you allocate a number in the range 0 to 32767 to this sensor. The channel number is attached to every UNINTERPRETED_SENSOR_DATA data record logged from this sensor, and could be used by the GPS Pathfinder Office software or other postprocessing software to identify the sensor which originated a particular data record. The default channel number is 0.

Note – The channel number is not related to the number of channels in your GPS receiver, and neither is it related to radio frequency channels. It is simply a number that you can assign to data received from a particular external sensor.

Connect and Disconnect

The *Connect* field specifies a character string which is automatically sent by the Asset Surveyor software to the external sensor when the interface with that sensor is activated. It might be used to reinitialize the sensor, or to set it into the correct mode.

The *Disconnect* field specifies a character string which is automatically sent by the Asset Surveyor software to the external sensor when the interface with that sensor is deactivated. It might be used to turn off the sensor, or reset its mode.
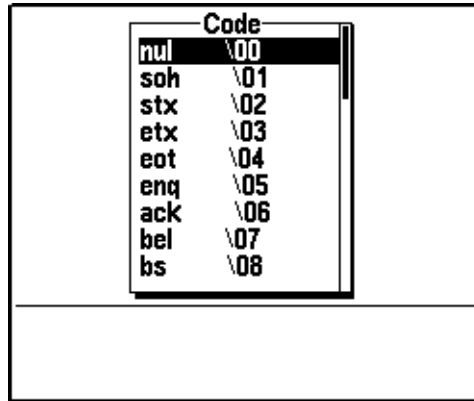
Tip – If either the *Connect* or *Disconnect* fields has a null value, it is not sent to the external sensor. If you need to send to the sensor the same character(s) that make up your configured null string, you must enter them as hexadecimal codes, as described below.

As with all configurable character strings which can be sent to or received from the external sensor, the *Connect* and *Disconnect* fields let you include both printable and non-printable ASCII characters. Non-printable ASCII characters are included in a field's value using a special *escape* character (the backslash character, '\').

When the backslash character is followed by two **hexadecimal** (base 16) digits, it is treated as a single ASCII character with a value equivalent to that two-digit hexadecimal number. For example:

- \01 is the hexadecimal value 01_{16}, or ASCII character '1'.

- \4C is the hexadecimal value $4C_{16}$ or ASCII character '76'. This character corresponds to the letter 'L'.

- \FF is the hexadecimal value FF_{16}, or '255'. This is the largest ASCII character that can be specified.

Because it is difficult remembering the ASCII codes corresponding to special characters like carriage-return and line-feed, and because it is even more difficult converting these values to hexadecimal codes, the Asset Surveyor software provides a special [Code] softkey. When you press this softkey, a menu of the first 32 ASCII characters appears:

Each line of the menu shows an ASCII character's mnemonic name and the \XX code which is associated with that character. When you select a character code from this menu, the Asset Surveyor software inserts the \XX code into the field which you were editing when you pressed [Code].

The usual [Symb] softkey is also available for convenient entry of other printable characters (for example, punctuation).

Data request

The value of the *Data request* field is a character string which, if non-null, is periodically sent to the external sensor. This is used to request data from the sensor if it requires an explicit request. Many sensors emit data continuously, or when triggered by the user, and for these sensors the *Data request* field should be left null.

When you are entering a value for the *Data request* field, the Asset Surveyor software makes [Symb] and [Code] softkeys available, as described above.

If non-null, the *Data request* string is periodically sent to the external sensor as determined by the *Intervals* fields. All data emitted by the external sensor is then logged by the Asset Surveyor software.

If the *Data request* string is null, then whatever data is emitted by the external sensor is logged at a rate determined by the *Intervals* fields, described below.

Intervals

There are three intervals applying to point, line, or area features, and when not recording a feature. These intervals are used for one of two purposes, depending on the value of the previous *Data request* field:

• If *Data request* is non-null, then depending on the context (whether in a feature or not, and if so, which type of feature), the appropriate interval is used to periodically send the *Data request* character string to the external sensor. In this case, any response from the sensor is logged.

• If *Data request* is null, then data which just arrives from the external sensor unsolicited is logged at the interval appropriate to the context (whether in a feature or not, and if so, which type of feature).

*Note – If you have a sensor that emits unsolicited data, you do not need to set up any kind of Data request string. However, you **do** need to set one or more of the Interval fields to a value other than 'None', otherwise the Asset Surveyor software does not log any data received from the sensor. **When all intervals are set to 'None', the Asset Surveyor software does not log any data from an external sensor.***

Note – As with all interval fields in the Asset Surveyor software, these fields can be filled in by pressing ⌷All⌷ *or* ⌷None⌷ *or by typing an interval in seconds (or some other convenient unit of time).*

Attribute

Data from an external sensor can be stored by the Asset Surveyor software in one of two ways:

- As independent UNINTERPRETED_SENSOR_DATA records. These can be exported from the GPS Pathfinder Office software with interpolated GPS positions, and fed into processing software such as a contouring package. An example of an application that might store sensor data for contouring is a radiation survey where a Geiger counter is passed backwards and forwards over a nuclear waste storage site.

- As attributes of a feature. When sensor data is stored as an attribute, it is tied to a particular geographic feature. It can be exported to a GIS along with all of the other attributes of that feature. An example of an application where sensor data should be stored as attributes is a forestry survey where each tree has a number of attributes, one of which is its trunk diameter, which is measured using an electronic tree-caliper.

You specify which of these two methods of sensor data storage you require by configuring the *Attribute* field of the external sensor configuration form.

By default, the *Attribute* field has the special value 'None', which means that sensor data is not stored as an attribute. Instead, it is stored as independent UNINTERPRETED_SENSOR_DATA records.

You can specify that you want sensor data to be stored as an attribute by typing the name of the attribute that you want to associate with this data. For example, the forestry application mentioned above might involve recording the following attributes for each tree:

```
                        «Tree»
Species:                      ⊕ Pine
Diameter:                           ?
Pruned:                       ⊕ Yes
To height:                       3.0
Date:                 07/11/1997 Fri




 ▯▣ ⦅⋆⦆⦉7⦊    PDOP   2.37         2
 ▭▭▭▭▭
 Pause    EXT    Offset
```

To make sure that each measurement from the tree-caliper sensor goes into the *Diameter* attribute, you should configure the sensor's *Attribute* field to contain the character string 'Diameter'.

When a message from an external sensor is received by the Asset Surveyor software, it is stored as an attribute value provided you are currently logging a feature which has an attribute of the specified name, and provided:

- This attribute is a character string attribute which is long enough to hold the data,

  or

- This attribute is a numeric attribute and it is possible to interpret the data from the sensor as a number (which must comply with the ranges permitted for this attribute).

💡 **Tip –** Typically it is easiest to use a character string attribute to store sensor data. Remember to make the character string as long as the longest possible message from your sensor.

⚠ | **Warning –** You must take care to make sure that the character string which you enter into the *Attribute* field exactly matches an attribute name in your current data dictionary. If it does not, the Asset Surveyor software fails to store data from your external sensor into any attribute field. Attribute name-matching is **not** case sensitive.

Note – More than one sensor data message may arrive during the collection of a particular feature. Each time a message arrives, the Asset Surveyor software overwrites the value stored in the named Attribute. Therefore only the last sensor message per feature is actually saved (when the feature itself is saved).

Note – When Attribute is set to 'None', and the Asset Surveyor software is storing external sensor data as UNINTERPRETED_SENSOR_DATA records, the Asset Surveyor software attempts to bracket each such record with at least two GPS positions (just as it does for quickmarks). This enables the GPS Pathfinder Office software to compute an interpolated GPS position for each external sensor data record, based on the time at which that record was recorded.

Data received

The most complex part of configuring an external sensor interface is the description of the data stream which is emitted by the sensor. Data can be received from the sensor in response to a request, in a continuous stream, or when a switch or trigger is pressed on the sensor itself.

In order to correctly separate the messages which are emitted by the sensor, the Asset Surveyor software lets you describe how messages are structured using any combination of the following four fields:

• The *Prefix* field can be used to specify that each message from the sensor is prefixed with a constant sequence of characters. For example, all NMEA-compliant sensors output messages preceded with a '$' character and one or more characters which identify the specific sensor. Enter the null string if you do not want to specify a prefix.

• The *Suffix* field can be used to specify that each message from the sensor ends with a constant sequence of characters. For example, all NMEA-compliant sensors output messages terminated by carriage-return and line-feed characters. Enter the null string if you do not want to specify a suffix.

• The *Max bytes* field can be used to limit the length of each message to a specific number of bytes. This length includes the length of any defined *Prefix* or *Suffix* strings, and the Asset Surveyor software does not let you specify a maximum number of bytes which is less than the combined length of the prefix and suffix. Enter the null string (by pressing ⌷Null⌷) if you do not want to specify a maximum number of bytes. The maximum value for the *Max bytes* is 242 (this is the limit permitted for UNINTERPRETED_SENSOR_DATA SSF records).

- The *Timeout* field can be used to distinguish separate messages by a certain amount of elapsed time between them. When the Asset Surveyor software receives a character from the sensor, it starts a timer. If another character is not received from the sensor before the timer expires (that is, before *Timeout* seconds have elapsed), the Asset Surveyor software considers the message is complete, and logs the characters it has received. If a character arrives before the timer expires, the timer is reset and the procedure repeats.

  The default value for the *Timeout* field is 0.1 seconds (100 ms); the maximum permitted value is 0.5 seconds and the minimum is 0.0 seconds.

⚠ **Warning –** While the Asset Surveyor software is waiting for a *Timeout* period, it cannot communicate with the GPS receiver. Do not specify a large *Timeout* value unless you need it to process data from a particular external sensor.

The Asset Surveyor software uses a combination of the above fields to separate messages from an external sensor.

Note – You do not necessarily need to fill in all of these fields. A field is ignored by the Asset Surveyor software if its value is null.

Audible click

If you want the TSC1 datalogger to click each time data from an external sensor is received and logged, set the value of the *Audible click* field to 'Yes'.

Status line

If it is crucial to see when data is received from the sensor, set the *Status line* field to 'Yes'. This displays a separate status line for the external sensor being configured. To maximize the TSC1 datalogger's screen, set the *Status line* field to 'No'.

The sensor's status line appears just above the GPS status line (if GPS is running):
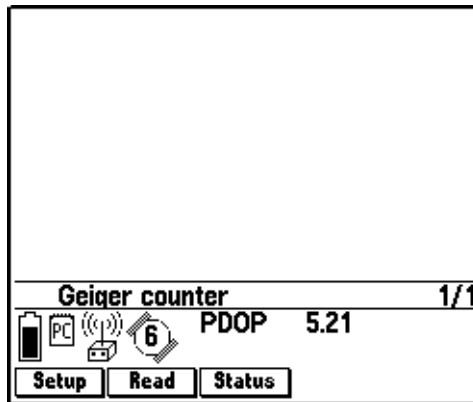
The sensor's status line shows the name of the sensor, followed by two numbers separated by a slash (/). The first of these is the number of messages received from the sensor and logged since the start or end of the last feature; the second number is the total number of messages received from the sensor and logged since the Asset Surveyor software started communicating with the sensor.

Communication options

At the bottom of the external sensor configuration form is a `Comms` softkey. Press this to configure the RS232 communications protocol to be used when the Asset Surveyor software and the sensor are communicating:

```
                    Sensor 1
Serial port:                      ⓘ Top
Baud rate:                        ⓘ 9600
Data bits:                        ⓘ 8
Stop bits:      .                 ⓘ 1
Parity:                           ⓘ None



_____


```

Note – The `Comms` *softkey is not available when the sensor is activated.*

This RS232 communications configuration form lets you specify all of the standard RS232 parameters:

- The *Serial port* field can be set to 'Top' (the default) or 'Bottom'. This equates to the top or bottom serial ports on the TSC1 unit.

- The *Baud rate* field is a menu of available baud rates, up to a maximum of 38400 baud. The default is 9600.

- The *Data bits* field is a menu permitting either seven or eight data bits to be specified.

- The *Stop bits* field is a menu permitting either one or two stop bits to be specified.

- The *Parity* field is a menu permitting values of 'None', 'Odd' and 'Even' to be specified.

The RS232 configuration form requires a reasonable understanding of the RS232 concepts. If you enter any of these fields incorrectly, the Asset Surveyor software may not communicate with your sensor.

⚠ **Warning –** It is easy to make an error when specifying the RS232 parameters for an external sensor. Make sure that you test any configuration changes.

When you have entered values for each field, press ⌐Enter⌐ to save the contents of this form and return to the external sensor configuration form.

Press ⌐Enter⌐ again to save the entire definition of the external sensor, ready for use.

Activating an External Sensor

You can manually activate an external sensor by selecting it from the *Select sensor* menu (accessed either from the *Configuration* menu or from the ⌐EXT⌐ softkey when collecting data). To activate a sensor, highlight its entry in the menu and press ⌐Enter⌐. When a sensor is active, a check mark (✓) appears to the left of its name in the *Select sensor* menu. For example, if you want to activate the *Geiger counter* sensor, highlight it and press ⌐Enter⌐. The *Select sensor* menu looks as follows:
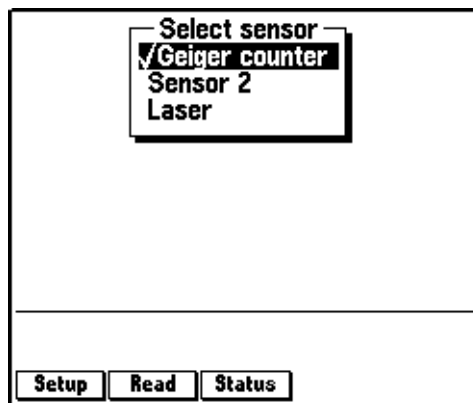
When a sensor is active (and highlighted), two further softkeys (⬚ Read ⬚ and ⬚ Status ⬚) appear.

When a sensor is activated, the Asset Surveyor software starts to communicate with it. If you have configured the Asset Surveyor software to display a status line or to emit an audible click whenever it logs data from the sensor, then you may begin to see or hear the Asset Surveyor software and the sensor communicating.

If you try to activate an external sensor on a serial port which is already in use by GPS, the laser rangefinder interface, or another sensor, the Asset Surveyor software refuses to activate the new sensor and displays a message similar to the following:

```
┌──────────── Error! ────────────┐
│ Unable to open bottom serial port. │
│  This port may already be in use   │
└─────────────────────────────────┘
```
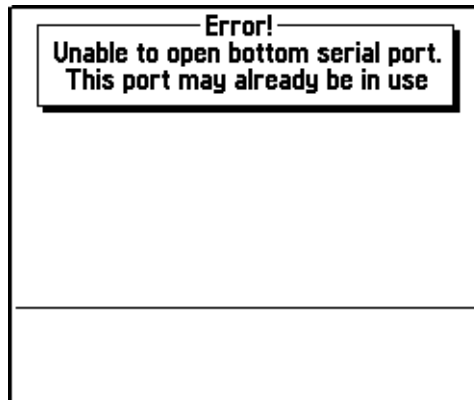
Deactivating a sensor interface

You can manually deactivate an active external sensor by again highlighting and selecting it from the *Select sensor* menu. When a sensor is deactivated, the check mark (✓) to the left of its name disappears, as do the ⬚ Read ⬚ and ⬚ Status ⬚ softkeys.

When you exit the *Select sensor* menu and return to the *Configuration* menu, all active external sensors are automatically deactivated.

Testing an External Sensor

The Asset Surveyor software lets you test an external sensor interface from the *Select sensor* entry in the *Configuration* menu.

> **Tip –** Always test an external sensor interface before attempting to use the sensor for data collection. This ensures that the sensor and the Asset Surveyor software communicate correctly, and that the interaction is workable under field conditions. Testing is important because configuration of a sensor interface is relatively complicated, and can usually be done in several ways.

The examples in the following sections presume that you have already configured two external sensors as follows:

```
┌─Select sensor─┐
│Geiger counter │
│Tree caliper   │
│Laser          │
└───────────────┘


────────────────────

 Setup 
```
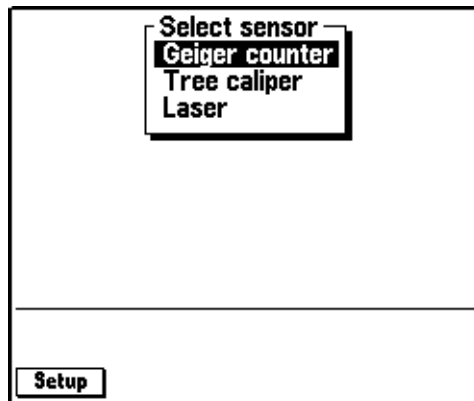
The Geiger counter is a sensor which records radiation levels. It outputs a reading to its RS232 port if requested by the Asset Surveyor software. The tree caliper is a sensor which is used to measure the diameter of tree trunks. It emits a reading to its RS232 port whenever you press the *Measure* button on the caliper itself.

Note – Although you can preconfigure two external sensors, you can only connect and use one at a time, as the Asset Surveyor software only lets you use one port for external sensors at a time. You can preconfigure two external sensors, but you can only connect and use one of them at a time.

Reading from a sensor

If an active sensor emits unsolicited data, you are unable to manually request data from the sensor; the Asset Surveyor software logs data as it is received, using the configured logging *Intervals* for that sensor. As an example, most depth-sounders operate in this fashion, emitting one or more readings per second.

If an active sensor emits data only when a trigger or button is pressed on the sensor itself, you cannot manually request data from the sensor using the Asset Surveyor software. A typical example of a triggered sensor is an electronic tree caliper.

If the sensor emits data only when requested over its RS232 line, the Asset Surveyor software can obtain data from the sensor by sending the configured *Data request* string. This is sent to the sensor in two circumstances:

- As determined by the configured *Interval* fields (the *Not in feature* interval is used).

- When you press the ⬚ Read ⬚ softkey.

Tip – If the sensor is of the type where you want to take only one reading per feature, or very few readings, and you need to be able to trigger the readings at precise moments, configure the sensor with intervals of 'None', and use the ⬚ Read ⬚ softkey to take readings when required.

Sensor status

When an external sensor is active (and highlighted), you can press ⌷Status⌷ to access a status form for that sensor. For example:

```
                    Geiger counter
Records:                                    3
Display as:                          ⊙ASCII
            512.34, 332.13 \ OD \ OA
```

The first field of this form shows the number of data 'records' (or messages) which have been received from the sensor since it was activated, while the third field shows the content of the most recent record (using '\XX' escape sequences to show any non-printable characters).

If the sensor to which you are connected emits purely binary data (that is, no part of the data is ASCII text), change the value of the *Display as* field from 'ASCII' to 'Binary'. The third field of the form then displays every byte of data using a '\XX' escape sequence.

*Note – The Asset Surveyor software does not know when to expect data from an external sensor. It cannot, therefore, warn you when nothing is received from the sensor; its status form only shows you what **has** arrived from the sensor.*

The Asset Surveyor software can interface to a wide range of external sensors and laser rangefinders equipped with an RS232 serial port. When the Asset Surveyor software receives a data message from an external sensor, it can log this data together with an associated GPS position, or it can log the sensor data as an attribute value for a feature.

Storage of sensor data

If data from a sensor is logged together with a GPS position, each sensor data message is logged as a separate UNINTERPRETED_SENSOR_DATA record in the Trimble SSF file format. You can use the GPS Pathfinder Office Export utility to output UNINTERPRETED_SENSOR_DATA records together with their associated GPS position. To ensure that the GPS position associated with each sensor message is as accurate as possible, the Asset Surveyor software records two GPS positions to 'bracket' the sensor message (just as it does for quickmarks) and the GPS Pathfinder Office software uses a GPS time tag which is fixed to each UNINTERPRETED_SENSOR_DATA record to compute an interpolated GPS position for that record.

If a sensor message is stored as an attribute of a feature, it is stored in the same way as any other attribute. From that point on, the Asset Surveyor software and the GPS Pathfinder Office software treat it as if you had typed it in, and you are free to edit the message if you want.

Sensor messages are not actually interpreted by the Asset Surveyor software, whether they are stored as UNINTERPRETED_SENSOR_DATA records or as the attributes of features. You may need to edit these messages using the Export utility, or you may be able to write a program or script which transforms the raw sensor data into a more readable or usable format once the data has been imported into your GIS, database, or CAD package.

Limitations of the Asset Surveyor external sensor interface

The Asset Surveyor software may not work with a particular external sensor unless each of the following conditions is met:

- The sensor must emit ASCII (7- or 8-bit) characters; the Asset Surveyor software does not support the use of an RS232 line to transmit other electronic pulses.

- The sensor must emit distinct messages of no more than 256 characters each. Each message can be as small as a single character.

- The sensor must emit messages which can be delimited either by a recognizable prefix, a recognizable suffix, a maximum length or an elapsed period of time between messages. If the sensor emits messages whose format cannot be described in terms of these factors, the Asset Surveyor software cannot determine where one message ends and the next begins.

- The sensor must not emit messages faster than the Asset Surveyor software can process them. The actual throughput that can be handled by the Asset Surveyor software depends on a number of factors, including:

    - The connected GPS receiver

    - The prevailing GPS conditions (that is, number of visible satellites)

    - The amount of GPS data being logged

    - The nature of the messages being received from the external sensor (such as the way in which they are delimited and the length of each message)

Tip – Trimble recommends that before purchasing an external sensor, you should always test the sensor with your Trimble Asset Surveyor/GPS system under a range of conditions to ascertain that the combination performs acceptably.

Configuring a Laser Rangefinder

You can configure an external sensor by pressing ⌐Setup⌐ when the desired sensor is highlighted. Pressing ⌐Setup⌐ when the laser entry is highlighted displays the *Laser range-finder* configuration form, which looks as follows:

```
┌─────────────────────────────────┐
│      Laser range-finder         │
│ Type:              ⊙Criterion 400│
│ Auto connect:              ⊙No   │
│ Confirm offsets:           ⊙Yes  │
│ Serial port:               ⊙Top  │
│                                 │
│                                 │
│                                 │
│ ─────────────────────────────── │
│                                 │
│                                 │
│                                 │
└─────────────────────────────────┘
```

The following sections describe each of these fields in detail:

- *Type*: The laser *Type* field contains the values of 'Criterion 300', 'Criterion 400', 'ProSurvey 1000', 'Atlanta Advantage', 'LEDHA-GEO', or 'MDL LaserAce 300'.

- *Auto connect*: The laser interface can be configured to Auto-connect whenever you create or reopen a rover data file; this can be useful if you often or always use the Asset Surveyor software together with a laser rangefinder.

- *Serial port*: Select either 'Top' or 'Bottom' for the *Serial port* depending on which port you have the laser plugged into.

Once you have selected the type of laser rangefinder, specified whether or not it should automatically connect, and entered which port to receive the data from, no further configuration of the laser rangefinder interface is required. Press ⌐Enter⌐ to save the laser interface configuration form and return to the menu of external sensors.

Activating the Laser Rangefinder

You can manually activate the laser rangefinder by selecting the *Laser* entry from the *Select sensor* menu (that is, highlight the *Laser* entry and press ⌐Enter⌐). When the rangefinder interface is active, a check mark (✓) appears to the left of the *Laser* entry in the *Select sensor* menu. For example:

```
┌─Select sensor ─┐
│ Geiger counter  │
│ Tree caliper    │
│✓Laser           │
│                 │
│                 │
│                 │
│                 │
│                 │
│─────────────────│
│ Setup   Status  │
```
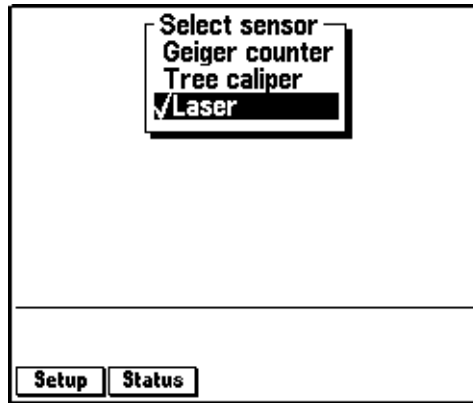
When the laser rangefinder interface is active (and highlighted), a `Status` softkey also appears. Once the laser rangefinder interface has been activated, the Asset Surveyor software accepts communications from the laser.

You can configure the Asset Surveyor software to automatically activate a laser rangefinder on entry to data collection. For cabling and connection diagrams for a particular laser rangefinder, see Appendix I, Laser Rangefinders, in the *TSC1 Asset Surveyor Operation Manual*.

If you try to activate a laser rangefinder on a serial port which is already in use by the GPS receiver or an external sensor, the Asset Surveyor software refuses to activate the new sensor and displays a message similar to the following:

```
┌─────────── Error! ───────────┐
│ Unable to open bottom serial port. │
│   This port may already be in use  │
└────────────────────────────────────┘
```
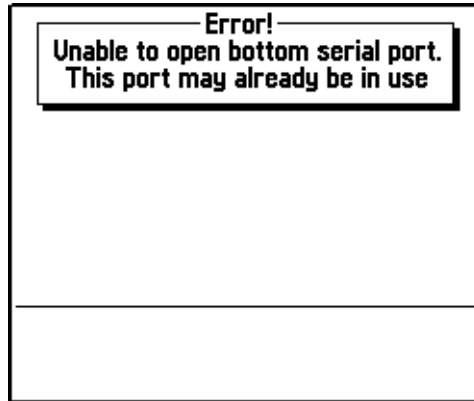
Deactivating the laser interface

You can manually deactivate an active laser interface by again highlighting and selecting the *Laser* entry from the *Select sensor* menu. When the laser interface is deactivated, the check mark (✓) to the left of the *Laser* menu entry disappears, as does the ⌧Status⌧ softkey.

When you exit the *Select sensor* menu and return to the *Configuration* menu, the Asset Surveyor software automatically deactivates the laser interface.

Testing the Laser Rangefinder Interface

This section tells you how to take a reading from a laser rangefinder, and how to check the status of the rangefinder.

Reading laser offsets

To take a reading from a laser rangefinder, aim at a target point and press the trigger on the rangefinder. You may also need to press a button on the rangefinder to send the measurement to the datalogger. For more information, see Appendix I, Laser Rangefinders, in the *TSC1 Asset Surveyor Operation Manual*.

Laser status

When the laser rangefinder interface is active (and the *Laser* entry is highlighted in the *Select sensor* menu), you can press Status to pop up a status form for the rangefinder. For example:

This form shows the most recent offset received from the laser rangefinder. If you take further readings using the rangefinder, these appear on the status form, replacing the previous reading. You cannot edit the fields in the laser rangefinder's status form.

Note – If you take a laser measurement in the laser status form when a point feature is open, this offset is recorded to the point feature.

TSC1 Hardware

If you select *Hardware (TSC1)* from the *Configuration menu*, the Asset Surveyor software displays the *Hardware (TSC1)* configuration form:

```
┌─────────────────────────────────┐
│        Hardware (TSC1)        ▾  │
│ LCD contrast:              ⊙50% │
│ Backlight:                 ⊙Off │
│ Low voltage charging:      ⊙Off │
│ Auto shutoff:                20 │
│ Beep volume:              ⊙High │
│ Free space:               296kB │
│ PC card free space:       195kB │
│ Battery source:        External │
│ Internal battery:       Unknown │
│ External battery:       Unknown │
│                                 │
│ ┌────────┐                      │
│ │Licenses│                      │
│ └────────┘                      │
└─────────────────────────────────┘
```

The various features of the TSC1 hardware that can be configured are described in detail in the following sections.

LCD Contrast

The contrast level of the TSC1 datalogger's Liquid Crystal Display (LCD) can be varied to suit the conditions; typically you want the level to be higher in bright light and lower in dim light. If you have the TSC1 datalogger's backlight on (for example, when operating at night), set the LCD contrast level quite low.

The LCD contrast level can vary between a low of 0% and a high of 100%. You can change the contrast by entering a new value into the *LCD contrast* field of the TSC1 hardware configuration form, or by making use of the ⌈Fn⌉⌈E⌋ and ⌈Fn⌉⌈F⌋ sequences:

- Pressing ⌈Fn⌉⌈E⌋ lowers the contrast level by 5%.

- Pressing ⌈Fn⌉⌈F⌋ raises the contrast level by 5%.

> **Tip –** The advantage of the ⌐Fn⌐⌐E⌐ and ⌐Fn⌐⌐F⌐ sequences is that you can use them anywhere in the Asset Surveyor system. This can be particularly important if you turn the TSC1 datalogger on in conditions which are different from those in which it was previously used. The LCD screen may be so dark or so light that it is barely readable. It is easier, under these circumstances, to press ⌐Fn⌐⌐E⌐ or ⌐Fn⌐⌐F⌐ a few times than it is to navigate to the *Hardware (TSC1)* configuration form and change the value of the *LCD contrast* field.

Backlight

You can turn the TSC1 datalogger's backlight on or off by changing the value of the *Backlight* field. You can also turn the backlight on or off by pressing ⌐Fn⌐⌐L⌐.

Low Voltage Charging

The *Low voltage charging* field lets you charge the internal battery of the TSC1 datalogger using a power source of less than 15 V. By default, this is set to 'Off', so that the datalogger will not draw power from your receiver batteries to charge the TSC1 battery during normal operation. To enable low power charging (using a GPS receiver with an external power source or directly from a camcorder battery) set the *Low voltage charging* field to 'On'.

Auto Shutoff

In order to maximize battery life, the TSC1 datalogger turns off if no key is pressed for a period of time (unless it is operating as a GPS base station, navigating, or logging data to a rover file, in which case it does ***not*** turn off automatically). The value of the *Auto shutoff* field determines how long the TSC1 datalogger waits after you last pressed a key on its keypad, before turning off. The minimum value permitted for *Auto shutoff* is one minute and the maximum is 60 minutes. The default value is 20 minutes.

Note – *The Auto shutoff setting does not cause the TSC1 datalogger to turn off in File Transfer mode, but after 10 minutes of inactivity the Asset Surveyor software exits file transfer mode and returns to the File manager menu. Once File Transfer mode has been exited, the Auto shutoff setting again becomes active and turns off the TSC1 datalogger after the specified time has elapsed unless you press a key.*

Note – *The Auto shutoff setting does not cause the TSC1 datalogger to turn off when the Data collection or Navigation modules are open, or during software upgrade.*

Beep Volume

Whenever the Asset Surveyor software emits a beep of any kind, it does so either at high or low volume. You can select the volume by changing the value of the *Beep volume* field or turn it off altogether.

Free Space

The *Free space* field shows you how much data file storage space remains on your TSC1 datalogger. You cannot edit this field. When the Asset Surveyor software is installed, but no data files have been transferred to the TSC1 datalogger, there is approximately 1787 kB free space.

PC Card Free Space

The *PC card free space* field shows you how much data file storage space remains on the PC card, if one is available. You cannot edit this field.

Battery Fields

The next three fields of the TSC1 hardware configuration form cannot be edited. They provide information regarding the power supply and battery levels currently detected by the TSC1 hardware.

The *Battery source* field has values of 'Internal' (if the TSC1 datalogger is running on its own internal batteries) or 'External' (if an external source of power, such as the GPS receiver's battery, is being used to run the TSC1 datalogger).

The *Internal battery* field indicates the level of charge remaining in the TSC1 datalogger's main internal batteries. This field is expressed as a percentage.

The *External battery* field shows the level of the external power source (that is, GPS receiver battery), if applicable. This field is also expressed as a percentage.

The level of charge is calculated by comparing the actual voltage reported with the theoretical voltage range for the battery type. For example, 12 V external batteries are compared to the range 10 V (a dead battery) to 13 V (the maximum charge). The percentage is calculated with the following formula:

$$\% = (\text{reported - minimum}) / (\text{maximum - minimum}) \times 100$$

So, for example, for a battery charged to 11.5 V:

$$\% = (11.5 - 10) / (13 - 10) \times 100$$

$$= 50\%$$

Note – The percentage reported for new batteries may be less than 100%. Used batteries may report percentages well under 100%. This is because repeated recharging of batteries normally results in a reduced potential maximum voltage.

Automatic Contrast

Set the *Automatic contrast* field to 'Yes' to allow the Asset Surveyor software to automatically adjust the screen contrast depending on the current lighting conditions.

Software Version

The *Software version* field shows the Asset Surveyor software version currently loaded on the TSC1 datalogger.

Licenses

Press ⌷Licenses⌷ to open the *Installed application options* form, where the active applications are displayed. This form may look similar to the following:

```
     Installed application options
Survey Controller:            Enabled
  Software support expiry:    09 / 1999
  Real time processing
  Conventional instrument support
  Roading
  GPS instrument support
Asset Surveyor:               Enabled


_____


```

Utilities

In this chapter:

- Introduction
- Waypoints
- Factory defaults
- Reset GPS receiver
- Almanac
- Disconnect/connect GPS
- Entering a note

Introduction

The *Utilities* menu, accessed from the Asset Surveyor software's *Main menu*, provides a number of miscellaneous operations:
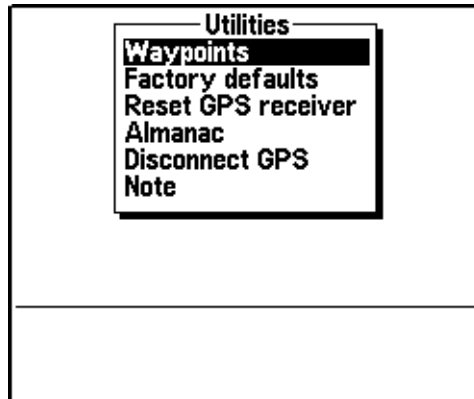
The following sections describe the functionality of the entries in the *Utilities* menu.

Waypoints

An Asset Surveyor waypoint is a named three-dimensional position. A waypoint can be used to record a geographic point of interest such as a survey mark, an excavation site, or a previously surveyed feature.

Waypoints can be specified in local coordinates (that is, as north, east, and altitude in a local coordinate system), but the Asset Surveyor software stores all waypoints as latitudes, longitudes, and altitudes on the WGS-84 datum. This lets you use waypoints in other coordinate systems.

The Asset Surveyor software maintains a single waypoint file, which contains a list of waypoints. There is no fixed limit to the number of waypoints you can record in the Asset Surveyor software, apart from the limit of available data storage space on the TSC1 datalogger.

You can view the menu of waypoints and perform waypoint management operations in a number of ways:

- By selecting the *Waypoints* entry from the *Utilities* menu

- Whenever you are selecting a Start or Target for navigation

- Whenever you are selecting a waypoint as a reference position for a GPS base station

- Whenever you are selecting a waypoint as a reference position for Over and Up mode

The menu of waypoints would look similar to the following:

```
┌─ Review waypoint ─┐
│ Base camp         │█
│ Field site        │
│ Base              │
│ Pole 2436         │
│ Pole 4561         │
│ Pole 9237         │
│ Pole 3822         │
│ Pole 0762         │
│ Pole 1477         │█
└───────────────────┘

│Create││ Edit ││Measure││ Del ││DelAll│
```
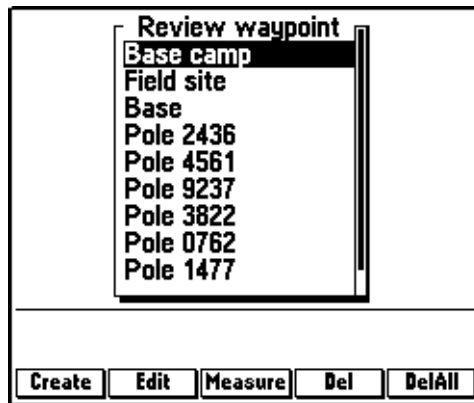
You can select a waypoint by using the normal menu selection method (highlight then press ⏎). You can perform various waypoint management operations using the softkeys. These operations are described in the following sections.

Creating Waypoints

You can create a waypoint and add it to the *Review waypoint menu* in a number of ways:

- By pressing ⌷Create⌷ on the *Waypoints* menu.

- By pressing ⌷WayPt⌷ on the *GPS position* form. This creates a waypoint using the current GPS position. You can then rename the waypoint and edit its position before saving it to the Waypoints file.

- By pressing ⌷WayPt⌷ on a position form when reviewing data (see Reviewing and Updating Existing Features, page 84). This creates a waypoint using a particular feature's position. You can then rename the waypoint and edit the position before saving it to the Waypoints file.

The waypoint creation form is as follows:

```
┌─────────────────────────────────┐
│        Create waypoint 1        │
│ Name:                   GPS001  │
│ Latitude:        37°24'41.03555"N│
│ Longitude:      121°59'54.32697"W│
│ Altitude (MSL):           1.47m │
│ Datum:                 WGS 1984 │
│ Zone:                       N/A │
│                                 │
│                                 │
│                                 │
│ ▐█▌[PC]   ◆⟨7⟩  PDOP   2.45     │
└─────────────────────────────────┘
```

The title of the form displays the number of this new waypoint. As waypoints are created they are added to the end of the *Review waypoint* menu. This number tells you how many waypoints are currently in the menu. However, these numbers vary as waypoints are deleted, so do not rely on any waypoint retaining the same number.

Enter a waypoint's name and location in the remaining fields on this form. You must supply non-null values for all fields before pressing ⏎[Enter] to save and add the waypoint to the *Review waypoint* menu.

Note – *When entering waypoints from a map, you may have to estimate the waypoint's altitude, using the map's contours, or using your knowledge of the area; you cannot leave the altitude field empty.*

Tip – If you normally use one coordinate system and want to enter waypoints from a map which uses a different coordinate system, switch to the map's coordinate system (using the *Coordinate system* entry on the *Configuration* menu), enter the waypoints, then switch back to your normal coordinate system. Because the Asset Surveyor software projects all waypoints back to the WGS-84 datum, the positions can be used in any coordinate system defined for that area. Although the actual coordinates of a waypoint change when the coordinate system is changed, the physical position of the waypoint is preserved.

The *Create waypoint* form supplies a ⎢Here⎢ softkey which, when GPS is active, can be pressed to fill in the waypoint's location with your current GPS position.

Editing Waypoints

You can view the details of a particular waypoint, and optionally edit them, by highlighting that waypoint in the *Review waypoint* menu and pressing ⌐Edit⌐. The *Edit waypoint* form is similar to that for creating new waypoints, but is filled in with details of the selected waypoint:

```
              Edit waypoint 5
Name:                        GPS005
Latitude:            37°24'41.05646"N
Longitude:          121°59'54.35460"W
Altitude (HAE):              14.56m
Datum:                     WGS 1984
Zone:                           N/A
```

When you have finished viewing or editing the waypoint, press ⌐Enter⌐ to save it and return to the *Review waypoint* menu, or press ⌐Esc⌐ to return to the menu without saving any changes.

Tip – Selecting a waypoint from the menu is equivalent to pressing ⌐Edit⌐, if you have accessed the *Review waypoint* menu from the *Utilities* menu.

The *Edit waypoint* form supplies a ⌐Here⌐ softkey which, when GPS is active, can be pressed to fill in the waypoint's location with your current GPS position.

Note – Unless you are receiving RTCM differential corrections or operating in RTK mode, the accuracy of the current GPS position is subject to Selective Availability (S/A).

The *Datum* and *Zone* fields are displayed to remind you of the currently configured coordinate system; they are not editable in the *Edit waypoint* form.

Deleting Waypoints

You can delete either a single waypoint or all waypoints.

Deleting single waypoints

You can delete a particular waypoint from the *Review waypoint* menu (and the waypoints file) by highlighting that waypoint and pressing ⌷Del⌷. The Asset Surveyor software asks you to confirm your intention:
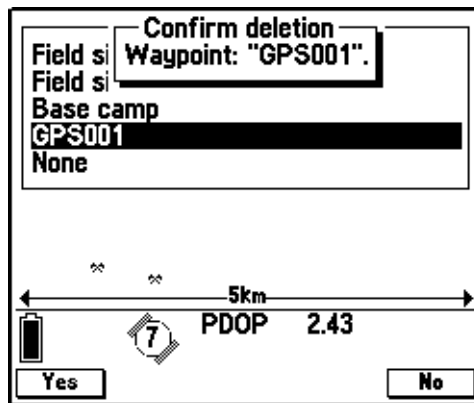
Press ⌷Yes⌷ to delete the waypoint, or ⌷No⌷ to retain it.

Deleting all waypoints

You can delete all waypoints from the *Review waypoint* menu (and the waypoints file) by pressing the ⌐DelAll⌐ softkey. The Asset Surveyor software asks you to confirm your intention:

```
┌──────── Please confirm ────────┐
│ Clear waypoints file, deleting all │
│         current waypoints?         │
└────────────────────────────────┘



─────────────────────────────────

  ┌─────┐                    ┌─────┐
  │ Yes │                    │ No  │
  └─────┘                    └─────┘
```
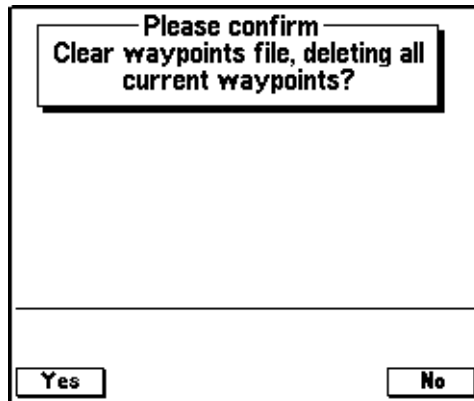
Measuring Between Waypoints

The Asset Surveyor software provides a facility for measuring the distance and bearing between selected waypoints. Press ⌐Measure⌐ to display the *Measure* form:

```
                Measure
From waypoint:              ◉GPS001
To waypoint:                ◐Cursor001
Distance (2D):                6.630m
Bearing:                 301°16'56"T




─────────────────────────────────
 ┌─┐      ╱7╲    PDOP   2.42
 │█│     ╲──╱
 └─┘ ┌──────┬──────┬──────┐
     │ Prev │ Next │ Step │
     └──────┴──────┴──────┘
```
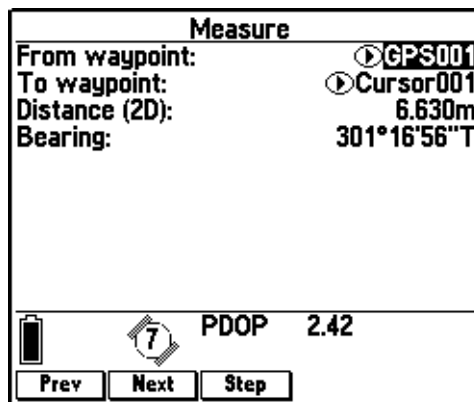
When you select a waypoint for either the *From waypoint* or *To waypoint* field, the Asset Surveyor software computes and displays the distance and bearing from *From waypoint* to *To waypoint*. The measuring function is used to calculate distances only. It does ***not*** set the Start or Target for navigation.

You can change the value of the *From waypoint* or *To waypoint* menu fields in the usual way, or by making use of the three softkeys provided by this form:

- Press Prev to select the previous waypoint in the *Review waypoint* menu.

- Press Next to select the next waypoint in the *Review waypoint* menu.

  Note – If you press Prev or Next when the From waypoint field is highlighted, it is this waypoint which is changed. If you press Prev or Next when any other field of the Measure form is highlighted, it is the To waypoint which is changed.

- Press Step to put the *To waypoint* value into the *From waypoint*, and the next waypoint in the *Review waypoint* menu into the *To waypoint* field.

Note – The measuring function works for waypoints only, not features. It uses the stored coordinates for waypoints, so you do not have to be connected to GPS to measure the distance and bearing between them.

Tip – You can use Step to step through a route (a sequence of waypoints recorded in the order that you want to visit them) and see the distance and bearing for each leg of the route.

Tip – You can change the units in which the *Distance* field is displayed by changing the value of the *Distance* units in the *Units and display* configuration form (see Units, page 250). In that same configuration form, you can also change the north reference from 'True' to 'Magnetic', or vice versa, by changing the value of the *North reference* field (Magnetic Declination, page 256).

Factory Defaults

You can reset all of the Asset Surveyor software's configurable aspects to the Trimble factory defaults by selecting the *Factory defaults* entry from the *Utilities* menu. If you select *Factory defaults*, the Asset Surveyor software asks you to confirm your intention:

```
┌─ Please confirm ──┐
│ Reset to factory defaults? │
└──────────────────┘




────────────────────────────

 ┌─────┐              ┌─────┐
 │ Yes │              │ No  │
 └─────┘              └─────┘
```
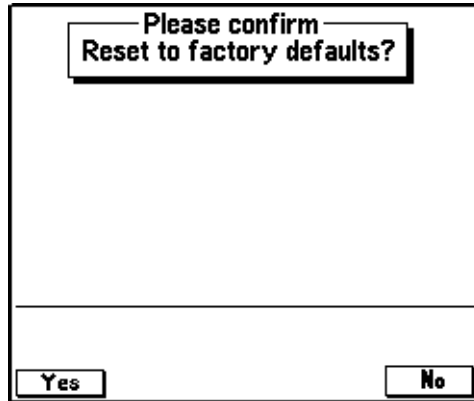
If you press ⌐No⌐, you are returned to the *Utilities* menu and the system configuration remains as it is.

If you press ⌐Yes⌐, the Asset Surveyor software deletes its configuration files and rebuilds them with factory default values, then it reboots the TSC1 datalogger to make sure that the factory default settings take effect. If the Asset Surveyor software has previously recorded an almanac from a Pathfinder GPS receiver, this is also deleted.

*Note – Resetting the factory defaults does **not** delete data dictionaries, data files, languages, coordinate systems, or waypoints. However, it **does** reset the Asset Surveyor software to the default language (English), the default coordinate system (latitude/longitude on the WGS-84 datum), and the default data dictionary (Generic).*

Reset GPS Receiver

You can reset the memory of a Pathfinder GPS receiver using the *Reset GPS receiver* entry in the *Utilities* menu. It is normally unnecessary to reset the GPS receiver's memory, but if for some reason the receiver firmware malfunctions, resetting its memory can often fix the problem.

Note – The Reset GPS receiver entry is not available if the Asset Surveyor software is connected to a Series 4000 or Site Surveyor 4400 receiver. Instead, consult the receiver's Operation Guide for instructions on how to manually reset the 4000 or 4400 receiver's battery-backed memory.

⚠ **Warning –** Resetting the GPS receiver's memory forces the receiver to perform a cold restart. The receiver may take up to 15 minutes to reacquire signals from the GPS satellites.

When you select *Reset GPS receiver*, the Asset Surveyor software asks you to confirm that you want to reset its battery-backed memory:

```
┌───Please confirm───┐
│ Reset GPS receiver? │
└─────────────────────┘


 Yes                          No
```
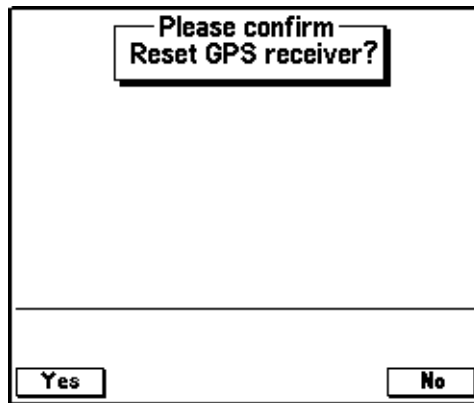
If you press ⬚ Yes ⬚, the receiver's memory is reset. After you have answered this question, you are returned to the *Utilities* menu.

If, after you have reset your receiver, it still fails to acquire GPS satellite signals within 15 minutes, contact your Trimble dealer.

Almanac

You can check the date on which the Asset Surveyor software last recorded an almanac from a Pathfinder GPS receiver by selecting the *Almanac* entry in the *Utilities* menu. The Asset Surveyor software displays an information form similar to the following:

```
                       Almanac
Date:                          07/02/1999 Wed



```

If the Asset Surveyor software has not recorded an almanac since the software was installed or reformatted, it displays '?' instead of the almanac date.

Note – The Almanac form is not updated when connected to a Series 4000, GPS Total Station 4800, or Site Surveyor 4400 GPS receiver, as the Asset Surveyor software cannot read an almanac from these receivers.

Most Trimble GPS receivers have internal battery-backed memory, which stores a current GPS almanac. This almanac describes the orbits of each of the GPS satellites in fine detail, and is used by the GPS receiver to determine which satellites it can expect to receive signals from at any point in time, and where these satellites are in the sky at that time.

Even now that the GPS satellite constellation is essentially complete, satellites are regularly removed from operation for servicing and testing, and it is important that your GPS receiver has an up-to-date almanac to ensure rapid acquisition of signals from all available satellites on startup. Using a current almanac also ensures that the Quick Plan utility has up-to-date information on satellite availability and paths, for accurate mission planning.

An almanac should be no more than three or four weeks old. A GPS receiver records an almanac whenever it is receiving data from satellites. If your almanac is not current, your receiver will update it automatically, but until it has done so it may take longer than usual to acquire satellites. It can take up to 15 minutes to record an almanac.

Disconnect/Connect GPS

When you select *Disconnect GPS* from the *Utilities menu*, the Asset Surveyor software ceases communications with the GPS receiver and shuts down all GPS operations. Before doing so, it asks you to confirm that you have not selected this option by mistake:

```
┌─────── Please confirm ───────┐
│ Are you sure you want to     │
│    disconnect from GPS?      │
└──────────────────────────────┘


─────────────────────────────────

 ┌─────┐                  ┌─────┐
 │ Yes │                  │ No  │
 └─────┘                  └─────┘
```
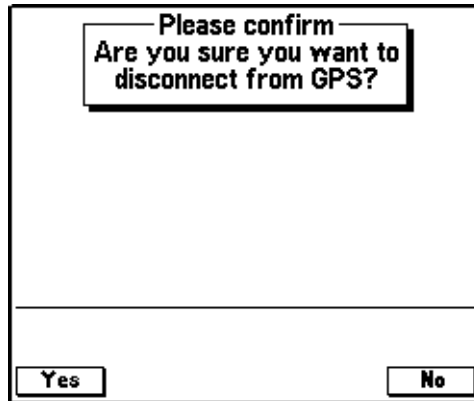
If you press `Yes`, the GPS receiver is turned off, if possible, and the Asset Surveyor software closes down its GPS operations.

Normally, you do not need to disconnect (deactivate) the GPS receiver; you can just turn the TSC1 datalogger off when you finish using it. If you want to use the Asset Surveyor software for a while without needing GPS, and want to preserve the GPS receiver's batteries, you may choose to deactivate the receiver. You can use either port for both file transfer and GPS connection, so it is not necessary to physically disconnect the GPS cable before commencing file transfer. However, you must disconnect GPS before file transfer is initiated, as the Asset Surveyor software does not allow these functions to be performed simultaneously.

When GPS is disconnected, the *Disconnect GPS* entry changes to *Connect GPS,* letting you re-activate GPS from the *Utilities* menu.

Tip – You can also reactivate GPS by entering one of the GPS-related entries in the *Main menu* (*Receiver status* or *Satellite information*), or by opening a base station file, either of which automatically prompts the Asset Surveyor software to attempt to connect with the GPS receiver.

Note – When the Asset Surveyor software deactivates and turns off a Series 4000 or Site Surveyor 4400 GPS receiver, it cannot turn the receiver back on remotely. You must turn the Series 4000 or Site Surveyor 4400 receiver on by pressing the POWER *button on the receiver's front panel, before the Asset Surveyor software can re-establish communications with the receiver.*

Entering a Note

Whenever you are logging data to a file, you can select the *Note* entry from the *Utilities* menu to enter a note to the current file (you must use the [Menu] key to access *Utilities*). The Asset Surveyor software lets you type any characters at all into a note, which can be up to 100 characters long:

```
┌─────────────────────────────────────┐
│            Enter note                │
│ ─────────────────────────────────── │
│ |                                    │
│                                      │
│                                      │
│                                      │
│                                      │
│                                      │
│                                      │
│                                      │
│ ─────────────────────────────────── │
│                                      │
│ ┌──────┐                             │
│ │ Symb │                             │
│ └──────┘                             │
└─────────────────────────────────────┘
```
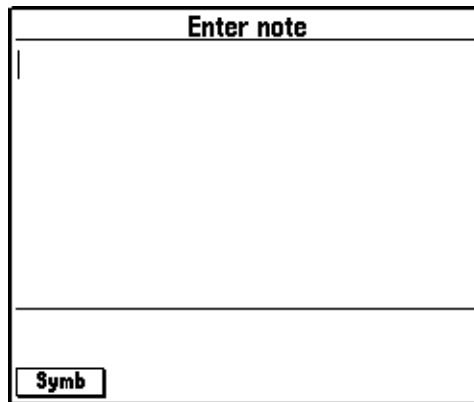
Note – The Note option in the Utilities menu is only available if you are logging data to a file.

Use the [Symb] softkey to enter any special characters. Pressing ⊙ moves the cursor to the next line of the note; pressing ⊙ moves the cursor to the previous line of the note. Pressing [Fn]⊙ moves the cursor to the start of the current line, and [Fn]⊙ moves the cursor to the end of the current line.

When you have finished entering the note, press [Enter] and the Asset Surveyor software stores the note at the end of the current data file. If you decide not to save the note, press [Esc] to discard the note.

Notes can be reviewed and edited as described in Reviewing and Updating Existing Features, page 84. When the data file is transferred to the GPS Pathfinder Office software, the resulting SSF file contains any notes which you entered, as well as some which the Asset Surveyor software writes to the data file itself (for example, 'Logging started' and 'Logging stopped').

Navigation

In this chapter:

- Introduction
- Graphical navigation modes
- Text-based navigation
- Navigation and waypoints

Introduction

You can use the Asset Surveyor software together with a Trimble GPS receiver to determine and record your current position. You can also navigate to a position of interest (the Target). The Target can be:

- a position that you have keyed in coordinates for

- a position that you have chosen from the map

- a waypoint that has been transferred from the GPS Pathfinder Office software

- a feature created in the Asset Surveyor software

- a feature transferred from the GPS Pathfinder Office software or your GIS

You can also navigate from a position (the Start). Like the Target, the Start can be any feature, waypoint, or position.

Navigation is traditionally associated with ensuring that you follow a prescribed course when traveling to your destination. You can also use navigation to visit features that have been previously mapped, and to identify a specific feature that may require maintenance.

As with other Trimble products, the Asset Surveyor software maintains a list of waypoints (positions that you can name for future reference and for navigating to or from). You can also navigate to and from features in a data file.

Even if you do not want to navigate to a particular point, you can use the *Navigation* module to view information such as your current speed, heading, or (atomic accuracy) GPS time.

Note – If you are using an RTK capable receiver (such as a Series 4000, 4400, 4700, or 4800 receiver) there will be a slight delay while positions are corrected. Try to avoid large changes of direction, or wait until the navigation display is updated before you change direction again.

⚠ | **Warning –** Do not rely on GPS as your primary source of navigation when you require greater accuracy than your system is currently providing, or when significant damage to property or personal safety could result from the effects of GPS inaccuracies.

Graphical Navigation Modes

The Asset Surveyor software provides two different navigation modes: *Direction Dial* and *Road*. These modes let you navigate to a Target using two different graphical styles to display the navigation information.

Press ⌷Mode⌷ to switch between the navigation modes. Whenever you enter the *Navigation* module (by selecting *Navigation* from the *Main menu)*, the Asset Surveyor software displays the navigation mode and configurations you were last using. When you first use the Asset Surveyor software to navigate, the default mode is the *Direction Dial*.

Direction Dial Screen

When you first open the *Navigation* form the default mode is the *Direction Dial*. Figure 7.1 shows the parts of the *Direction Dial* screen.
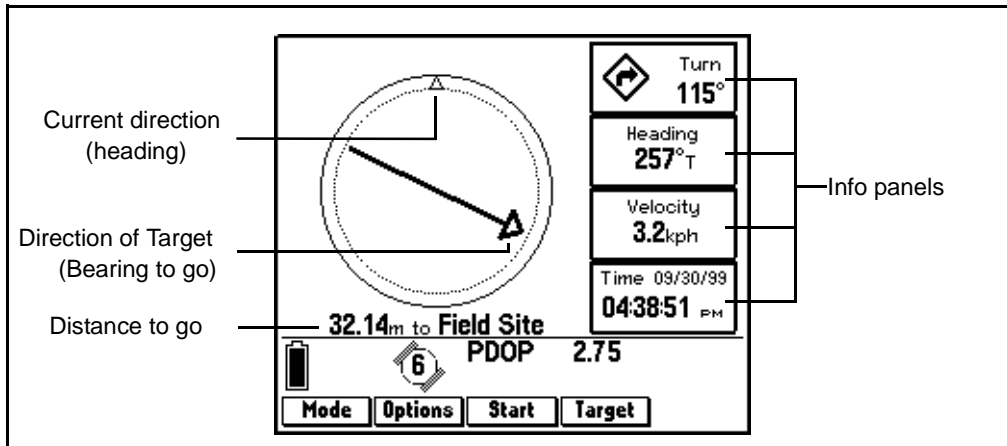
Figure 7.1   Parts of the Direction Dial screen

The *Direction Dial* screen provides a simple dial which shows you all the information you need to get to the Target. It is very useful for navigation in open country or where you can follow a direct route to the Target.

The heading along which you are moving is always shown at the top of the dial. The Bearing arrow shows where the Target is relative to that. The arrow always points in the direction of the bearing to go to the Target. To navigate to the Target, simply line up the arrow, which represents the direction of the Target, with the triangle at the top of the dial, which represents your current direction of travel (your **heading**).

In the example above, the user is navigating to the 'Field Site'. The arrow on the dial is pointing 115° to the right of the triangle at the top of the circle. This indicates that the user needs to turn to the right by that amount so that they are moving directly towards the 'Field Site'.

The arrow on the dial rotates according to your direction of travel, which is calculated from the angle between the last two computed GPS positions. Consequently, the dial only provides an accurate reading when you are moving and a direction of travel can be determined by the receiver. If you are moving too slowly, the Heading arrow freezes. For more information, see Heading Lock, page 326.

Tip – Because the *Direction Dial* screen is based on your heading (which is calculated from the vector between your last two GPS positions), it works best if you do not move backwards.

Note – Until GPS is acquired and a Target specified the heading cannot be calculated, so the arrow does not appear.

You can also configure up to four *Info* panels to display relevant text-based navigation information next to the direction dial. These are configured from the *Navigation options* form. For more information, see Navigation Options Form, page 325.

Close-up Screen

When you are in the *Direction Dial* screen and within a certain distance of the Target, the *Close-up* screen replaces the *Direction Dial* screen. It looks similar to the following:
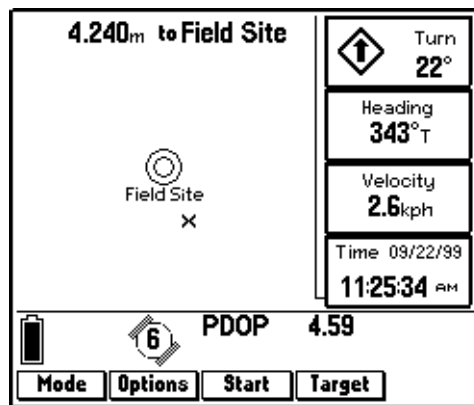
The *Close-up* screen consists of a bull's-eye ring representing the Target, and a cross representing the current GPS position. For precision navigation right up to the Target, move so that the GPS position cross is in the center of the bull's-eye.

Note – The top of the Close-up screen is relative to the direction of travel (heading) when you entered the Close-up screen. The heading is not updated on the Close-up screen, so the screen does not move if you change the direction you are facing while using it.

Tip – Because the *Close-up* screen does not update your heading, it works best if you maintain your original direction of travel and if necessary move sideways or backwards rather than turning.

Note – Due to the heading not being updated on the Close-up screen, all Info panels that depend on the heading are automatically locked as well. For more information, see Heading Lock, page 326.

Close-up range

The close-up range value controls the distance from the Target at which the *Direction Dial* screen switches to the *Close-up* screen. You can configure the close-up range value to control the distance at which the *Close-up* screen appears, or to disable it.

The close-up range also determines the scale that is represented on the *Close-up* screen. The distance from the edge of the screen to the center represents the close-up range distance.

Tip – If you are zoomed in to a scale that is too close for the GPS accuracy you currently have, the GPS cross appears to leap around the screen. To minimize this effect, select a larger close-up range.

Configure the close-up range from the *Navigation options* form. For more information, see Navigation Options Form, page 325.

Proximity alarm

When you reach the close-up range to the Target, a proximity alarm sounds. This alarm sounds even if the *Direction Dial* screen is not open or visible, so that you always have an audible warning that you are approaching the Target.

The proximity alarm sounds whenever you move ***into*** close-up range, but it does not sound when you move ***out of*** close-up range.

Tip – You cannot disable the proximity alarm, but you can prevent it from sounding, either by turning all sounds off (under *Configuration / Hardware (TSC1)*), or by setting the close-up range to zero.

Close-up style

The close-up style can be set to either ***Target-centered*** or ***GPS-centered***. It controls which is the fixed reference point in the center of the *Close-up* screen. For the target-centered style, the Target bull's eye is fixed in the center of the screen and the GPS cross moves around it as your position changes. For GPS-centered navigation the opposite occurs; the GPS cross is fixed in the center of the screen and the bull's-eye effectively moves around it.

Configure the close-up style from the *Navigation options* form. For more information, see Navigation Options Form, page 325.

Road Screen

To access the *Road* screen, press ▭Mode▭ from the *Direction Dial* screen. Figure 7.2 shows the parts of the *Road* screen.
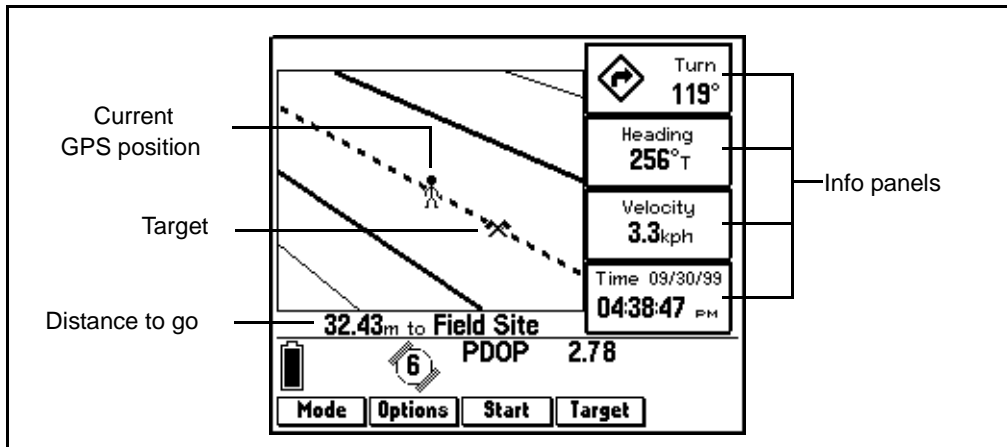
Figure 7.2   Parts of the Road screen

The *Road* screen shows all the information you need to navigate to a Target.

The stick figure represents your current position, and is always displayed in the center of the *Road* screen. The heading along which you are moving is always represented by the top of the *Road* screen. The direction the road is pointing shows where the Target is relative to that (the ***bearing to go***).

The direction that the road is pointing rotates according to your direction of travel. The Target ✖ and Start ▶ icons are also shown on the *Road* screen if you have set a Target or Start. As you approach them they move closer to you, and the *Road* screen zooms in as you get closer to the Target. To navigate to the Target, simply turn 'around the corner' (in the same direction that the road is pointing) until the road is pointing to the Target which is straight ahead. If you are 180° off course then the stick figure appears to be moving away from the Target, which is shown at the bottom of the screen.

In the example above, the user is navigating to the 'Field Site'. The road is pointing approximately 119° to the right of straight ahead, indicating that the user needs to turn to the right by that amount so that they are moving directly towards the 'Field Site'.

The heading is calculated from the angle between the last two computed GPS positions. Consequently, the *Road* screen only provides an accurate reading when you are moving and a direction of travel can be determined by the receiver. If you are moving too slowly the road freezes. For more information, see Heading Lock, page 326.

If you have selected a Start as well as a Target, your position is shown relative to the shortest path between the Start and Target (the ***cross-track line***). The stick figure remains in the center of the screen, but the road scale and position change according to how far from the cross-track line you are:
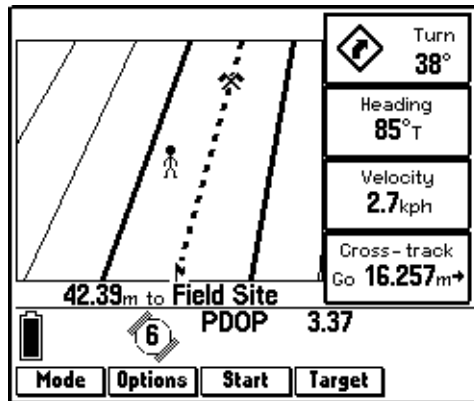
The center of the road is the cross-track line. As usual, when you are moving in the correct direction, the road points directly ahead. However, if you are not traveling along the cross-track line, the road moves to the left or right to show that you are not traveling the shortest path. In the example above, the user is moving in approximately the correct direction, but is to the left of the cross-track line. The Cross-track *Info* panel shows the user's exact distance from the cross-track line (16.257 meters). This is known as the ***cross-track error***.

Tip – Because the *Road* screen is based on your heading (which is calculated from the vector between your last two GPS positions), it works best if you do not move backwards.

Note – Until GPS is acquired and a Target is specified the heading cannot be calculated, so the road points straight ahead.

Up to four *Info* panels can also be configured to display relevant text-based navigation information next to the road. These are configured from the *Navigation options* form. For more information, see Navigation Options Form, page 325.

Road scale

The Road scale changes the actual distance on the ground that the width of the *Road* screen represents, and whether it appears narrower (zoomed out) or wider (zoomed in), similar to the following:
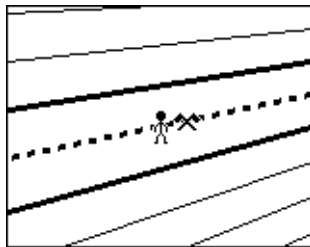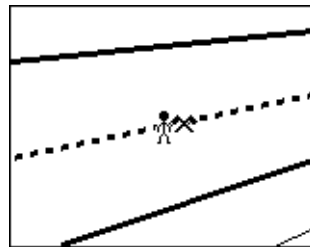
Narrow scale   Wide scale

Set the road width according to how accurately you want to follow a path. For example, if you are walking and you want to stay close to the path you are traveling, set the *Road scale* to 'Narrow'. If traveling by vehicle in an open field, and staying on track is less important, set the *Road scale* to 'Wide'.

Navigation Options Form

To access the *Navigation options* form, press $\boxed{\text{Options}}$ from any navigation screen. It contains options for configuring all navigation screens, although it defaults to show the page for the mode you are currently in.

Direction Dial options

This set of options is for the *Direction Dial* screen. You do not have to be in the *Direction Dial* screen to configure them.

Dial info panel fields – Configure which *Info* panels appear in the four spaces on the *Direction Dial* screen.

Close-up range – Configure the distance from the Target at which the *Direction Dial* screen changes to the *Close-up* screen.

Close-up style – Configure the focal point of the Close-up screen. Select 'Target-centered' or 'GPS-centered'.

Road options

This set of options is for the *Road* screen. You do not have to be in the *Road* screen to configure them.

Road info panel fields – Configure which *Info* panels appear in the four spaces on the *Road* screen.

Road scale – Configure the scale (width) that the *Road* screen represents.

Map Navigation

You can also navigate to a Target using the *Map* module. For more information, see Chapter 8, Map.

Old Navigation

When GPS position information is temporarily unavailable (for example, when one or more satellites is obscured, or due to a high PDOP), the Asset Surveyor software still displays the most recent navigation information. However, it flashes a message in the message area of the *Navigation* form to indicate that the displayed navigation information is old. The direction dial arrow and any *Info* panels affected flash. The *Road* screen freezes, but does not flash.

Heading Lock

The heading is calculated from the angle between the last two computed GPS positions. If you are stationary or moving very slowly then any positional error causes the GPS position to wander around your current location, resulting in false heading information.

To counteract this, the heading is locked below the preset *Cutoff velocity*. When this happens the message Heading locked flashes in the message area, alternating with Start moving. (If no heading has been calculated since startup then the first message is replaced with Heading unavailable). The direction dial arrow, the *Road* screen, and any *Info* panels affected freeze. These include Heading, Bearing, ETA, and Time to go. The Heading triangle on the *Map* screen also freezes. To unlock the heading, start moving (faster than the *Cutoff velocity*).

Note – The cutoff velocity is preset at the factory and cannot be configured. When you are using autonomous GPS, the cutoff velocity is 0.65 meters/second (2.34 kilometers/hour). With differential GPS the cutoff velocity is 0.35 meters/second (1.26 kilometers/hour).

Note – The heading is always locked when the Close-up screen is visible.

Text-Based Navigation

Configurable text navigation displays are also provided to help you navigate to a Target.

Distance to Go

The Distance to go is the distance remaining between the current GPS position and the Target. This is the shortest great-circle distance to the Target, computed on your local datum. Distance to go is shown at the bottom of every navigation screen, along with the name of your Target. The Distance to go is always visible. If a Target has not been selected it reads No Target instead:
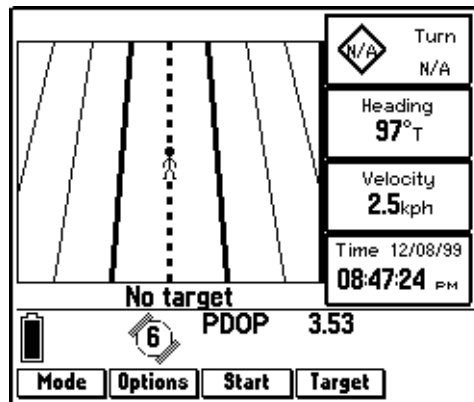
Note – The great-circle distance is the shortest distance between two points on the surface of a sphere. It does not precisely match the approximations used for compass navigations, but the difference for computed distances less than 500 km is negligible.

Info Panels

Info panels are text display panels that you can configure. They appear on all navigation screens. You can display up to four *Info* panels on each navigation screen. Pressing the ⎕Mode⎕ softkey to switch between screens changes the *Info* panels too, depending on the configuration of the screen you are switching to. You can configure up to eight *Info* panels (four for each navigation mode).

Info panels are configured from the *Navigation options* form, which you can access by pressing ⎕Options⎕ in the *Navigation* module or by selecting *Navigation options* from the *Configuration* menu.

For details on configuring *Info* panels, see Navigation Options Form, page 325.

The following *Info* panels are available:

- **Turn**: This panel shows the direction you need to turn to head towards the Target, along with the size of the turn angle. The arrow indicates whether you should veer to the left or to the right and approximately how big a turn is required. The numeric value indicates the magnitude by which your course should vary (the difference between the bearing to the Target and the current heading). As with the heading, this value is most useful if you are receiving real-time differential corrections or are traveling at a reasonable speed.

- **Bearing to Go**: This panel shows the compass bearing (angle) that you should follow in order to take the shortest path between the current GPS position and the Target. The bearing to go is useful if you are navigating in open country and can travel in a direct line to the Target. The bearing is displayed with a 'T' if it is relative to true north or an 'M' if it is relative to magnetic north. If a Target has not been selected this field is null.

- **Heading**: This panel shows your current direction of travel as a compass angle. The heading is the angle between the last two GPS positions computed, and is therefore likely to be most accurate if you are receiving differential corrections. If you are stationary or moving very slowly, the velocity lock freezes the heading display until you start moving again. The units of this field also include a 'T' or 'M' to indicate whether the heading is relative to true or magnetic north. The heading is displayed whether or not you have chosen a Start or Target.

- **Time**: This panel shows the current time and date. The value shows GPS time (atomic accuracy), with the local variation from GMT time applied from the *Time and Date* setting. This field is displayed regardless of whether a Start or Target has been selected.

- **Time to Go**: This panel displays the expected time to reach the Target (if any). The time to go takes your current heading and velocity into account. It shows a larger value if you are not heading directly toward the Target. This field is null if there is no Target selected.

- **ETA**: This panel displays the Estimated Time of Arrival (ETA) at the Target, based on your current heading and velocity. It shows a larger value if you are not heading directly toward the Target. If the arrival time is more than 24 hours in the future it displays >24 hr. This field is null if there is no Target selected.

- **Velocity**: This panel displays your two-dimensional velocity. The velocity is displayed whether or not you have chosen a Start or Target.

- **Go N/E**: This panel indicates the northerly and easterly distance components of the bearing to go to the Target. It is given as two Cartesian distances, with one value representing the north/south distance and one representing the east/west distance from the current GPS position to the Target. This panel is very useful for navigation around city blocks, or when you cannot travel in a direct line to the Target. If a Target has not been selected this field is null.

- **Cross-track**: This panel shows the direction and distance to the cross-track line (XTE). This is an imaginary straight line linking the Start and Target by the shortest route. It is useful if you need to navigate without deviating too far from the direct path to the Target. The direction of the cross-track line (left or right) is indicated by ← or → arrows. The numeric value indicates the distance you should travel in that direction to get back on line. Unless both a Start and a Target have been selected, this field is null.

- **Altitude**: This panel shows the current altitude. If you are using 2D GPS then the altitude shown is the value entered in the *2D altitude* field. The *Altitude reference* used (HAE or MSL) is also shown. The altitude is displayed whether or not you have chosen a Start or Target.

- **Go Up/Down**: This panel shows the difference in altitude between the current altitude and the altitude of the Target, and is very useful for 3D navigation. It tells you how far up or down you need to go to be at the same altitude as the Target. If you are using 2D GPS then the current altitude used is the value entered in the *2D altitude* field. This field is null if there is no Target selected.

Tip – You can change any of the above units or the style of display in the *Units and display* configuration form. For more information, see Units and Display, page 250.

Navigation and Waypoints

This section describes how to select waypoints and features for navigation purposes. For a detailed description of how to create and manage waypoints, see Waypoints, page 300.

Selecting the Start and Target

The Target is a position you want to navigate to. Once you select a Target, the Asset Surveyor software can provide navigation information such as the distance to the Target and the direction you need to travel in.

Using a Start lets you plot and measure a direct path from one location to another. When you select a Start you can monitor the cross-track error (XTE) in the Cross-track *Info* panel, or in the *Road* screen, to ensure you stay on the shortest path from your starting location to the Target. To navigate to a Target you can either navigate from your current position, or navigate from a Start. You do not have to select a Start for navigation.

Select the Target for navigation by pressing `Target` and the Start by pressing `Start`. When you press either `Target` or `Start`, the Asset Surveyor software opens the menu of current waypoints on the TSC1 datalogger, along with all features in the currently open data file. You can select any feature or waypoint from the menu, or you can clear the Start or Target by selecting 'None'.

When you first use the Asset Surveyor software to navigate, no Start and Target are selected. Once you have selected a Start and/or a Target, these remain selected for subsequent navigation sessions, until you change them. If your Start or Target is a feature, its position will still be remembered if you close the file, but if you open another data file, it will be reset to 'None'. A Start or Target that is a waypoint is not affected by file operations. Once a Start or Target has been set it applies to the whole system, including the *Map* module and *Review data* list.

If you select a line feature as the Target, the *Which position?* menu appears, as follows:
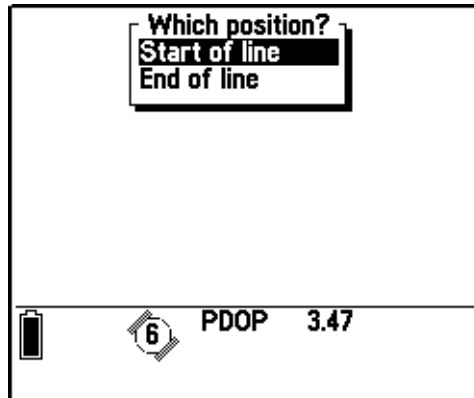
Using this menu you can choose whether you want to navigate to the beginning or end position of the line. If the line is a new feature and is still being collected, then the end point is the most recent GPS position that was logged. This is handy for navigating back to the line after leaving it to nest a point feature, for example.

If the Target is an area then the *Which position?* menu contains the following options:
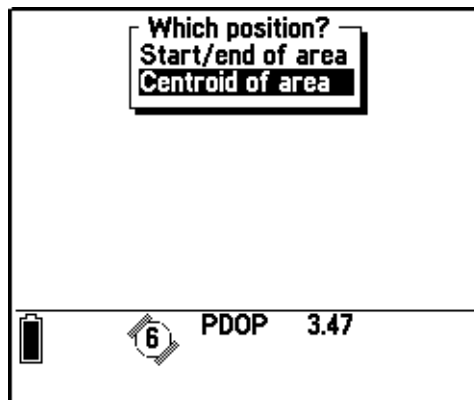
Using this you can choose whether to navigate to the start/end point on the perimeter of the feature, or the centroid, which is the calculated center of the area. If the area is a new feature and it is still being collected, then it is treated as a line for navigation purposes, and the *Which position?* menu appears as for a line feature.

Note – The Start and Target can also be set from the Map module, and the Target can be set from the Review data list.

Navigating to a Target From Your Current Position

If you have neither a Start nor a Target (that is, both are set to 'None'), all navigation screens display the message No target:
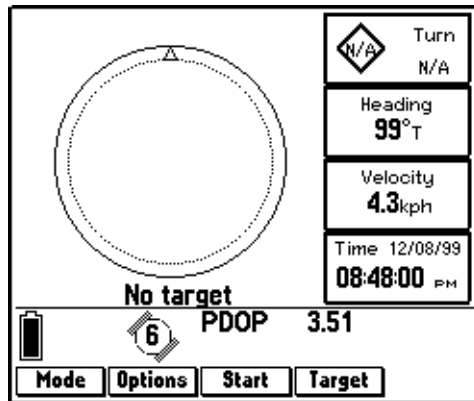
If you want to navigate to a feature or waypoint from wherever you happen to be at the time, press ⎡Target⎤. A menu of available Targets, including waypoints and all features in the currently open file, appears, similar to the following:
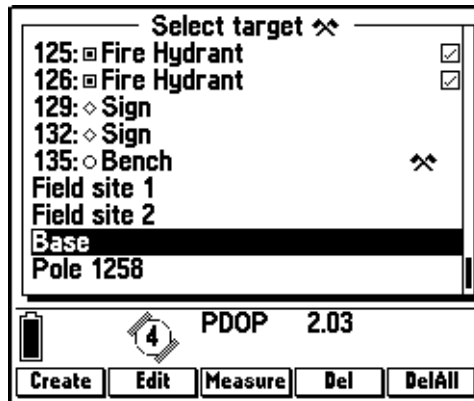
Select a feature or waypoint from the menu. The name of the Target now appears on the screen, along with the distance to it from your current location (if you have GPS):
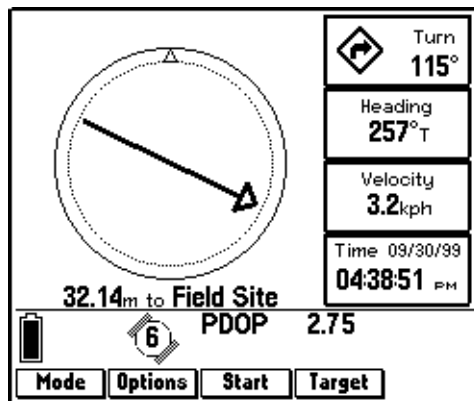
Using a Target only is the most common method of navigation. You can also set a Start if cross-track error calculations are important to you.

Figure 7.3 illustrates navigating from your current position.
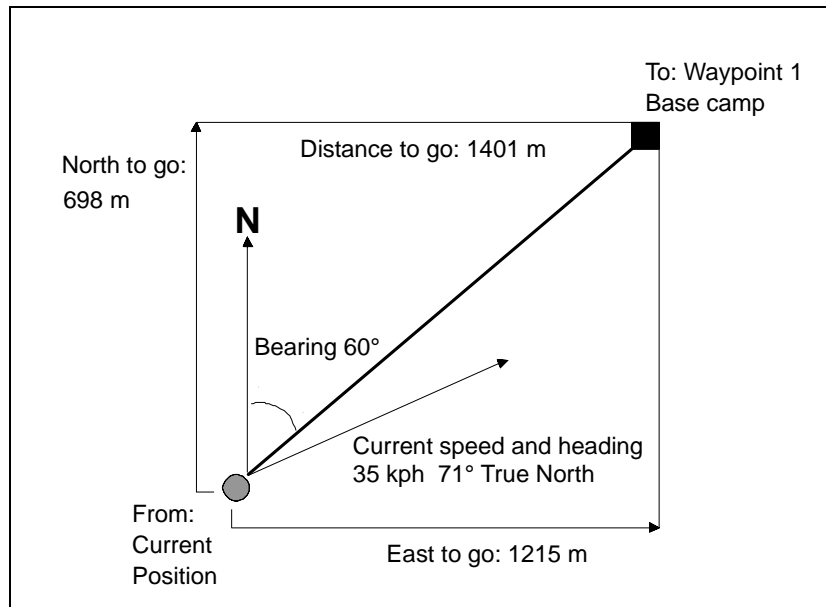
Figure 7.3   Navigating from your current position

Navigating from a Start to a Target

If you want to navigate from one feature or waypoint to another, select both a Start and a Target (press ⌐Start⌐ and ⌐Target⌐).

Navigation from a Start to a Target lets you take advantage of the cross-track error indication provided by the *Road* screen and Cross-track *Info* panel.

Figure 7.4 illustrates navigating from waypoint to waypoint.
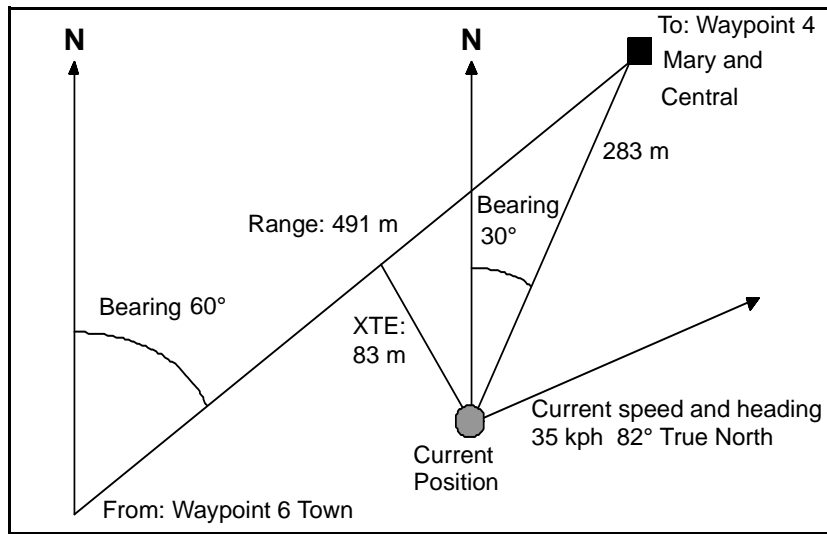
Figure 7.4   Navigation from waypoint to waypoint

Waypoint Operations

To create, edit, measure, or delete waypoints, highlight the waypoint you want to modify from the *Select target* or *Select start* menu and press the `Create` , `Edit` , `Measure` , `Del` , or `DelAll` softkeys. The `Create` softkey works without needing a waypoint highlighted, but if you have a feature highlighted, then the `Edit` , `Measure` , `Del` , and `DelAll` softkeys do not appear.

Creating new waypoints

Press `Create` to create a new waypoint. The *Create waypoint* form appears. If the GPS cursor is currently active on the *Map* screen, then the coordinates of the GPS position are automatically entered as the coordinates for the new waypoint. To reflect this, the default name for the new waypoint would be 'GPS' followed by a sequential number, for example, GPS001:

```
            Create waypoint 1
Name:                        GPS001
Latitude:           37°24'41.03555"N
Longitude:         121°59'54.32697"W
Altitude (MSL):                1.47m
Datum:                     WGS 1984
Zone:                            N/A



██ PC      ⟨7⟩    PDOP    2.45
```

If the Map cursor is active on the Map screen the coordinates of the Map cursor location are automatically entered as the coordinates for the new waypoint. To reflect this, the default name for the new waypoint would have been 'Cursor' followed by a sequential number, e.g. Cursor001:

```
┌─────────────────────────────────────┐
│         Create waypoint             │
│ Name:                    │Cursor001│ │
│ Latitude:         37°24'45.37403"N   │
│ Longitude:       121°59'51.26660"W   │
│ Altitude (HAE):            0.00m     │
│ Datum:                 WGS 1984      │
│ Zone:                     N/A        │
│                                      │
│                                      │
│ ┌──┐   ╱8╲   PDOP   1.73             │
│ │  │   ╲─╱                           │
│ └──┘                                 │
│ ┌──────┐                             │
│ │ Here │                             │
│ └──────┘                             │
└─────────────────────────────────────┘
```

Note – Default waypoint names are numbered sequentially starting from 001. The first GPS waypoint is named GPS001, then GPS002, and so on. Cursor waypoint names are assigned separately, in the same manner. The numbering of cursor waypoints and the numbering of GPS waypoints have no effect on each other. You can change waypoint names if you want. To change an existing waypoint, press `Edit`.

Note – You can give two or more waypoints the same name. You can distinguish identically named waypoints by their GPS position or their position in the list of waypoints, because waypoints are listed in the order that they were created.

You can edit the name and position information (*Latitude*, *Longitude* and *Altitude*) for the new waypoint, as desired. Press `Here` to replace the coordinates with the current GPS position.

Tip – To change the *Datum* and *Zone*, go to *Configuration: Coordinate system*.

Press ⏎ to save the new waypoint. This takes you back to the *Select target* menu. The name of the newly created waypoint is now highlighted in the list.

If you want to set the new waypoint as the Target, press ⏎; otherwise press ⎋. Pressing ⎋ exits the *Select target* form without selecting a new Target. However, the new waypoint has still been created in the system.

For more information, see Chapter 6, Utilities.

Edit

To edit the name, coordinates, or altitude details of an existing waypoint, highlight the waypoint on the *Select start* or *Select target* menu and press ⎡Edit⎤. For more information, see Chapter 6, Utilities.

Note – The ⎡Edit⎤ softkey does not appear if the highlighted item on the menu is a feature.

Measure

To calculate the distance between any two waypoints, highlight the first waypoint on the *Select start* or *Select target* menu and press ⎡Measure⎤. In the *Measure* form, choose the other waypoint to measure to. The measuring function calculates the distance between the waypoints based on their coordinates, so does not require GPS.

For more information, see Chapter 6, Utilities.

Note – The ⎡Measure⎤ softkey does not appear if the highlighted item on the menu is a feature.

Delete

To delete an existing waypoint, highlight the waypoint on the *Select start* or *Select target* menu and press ⌐Del⌐. For more information, see Chapter 6, Utilities.

Note – The ⌐Del⌐ *softkey does not appear if the highlighted item on the menu is a feature.*

Delete All

To delete all existing waypoints, highlight a waypoint on the *Select start* or *Select target* menu and press ⌐DelAll⌐. For more information, see Chapter 6, Utilities.

Note – The ⌐DelAll⌐ *softkey does not appear if the highlighted item on the menu is a feature.*

Map

In this chapter:

Introduction

The *Map* screen in the Asset Surveyor software is accessed from the *Map* option in the *Main menu*. The *Map* screen is useful for displaying features and waypoints, selecting features for update, and for navigating to a Target. The *Map* screen can also be customized to suit your data collection requirements, and the settings are stored to be used again next time you enter the *Map* screen.

Map Display

The appearance of the *Map* screen varies, depending on the number and type of features contained within the currently open data file, and what display options have been configured. When you first open the *Map* screen it appears similar to the following:
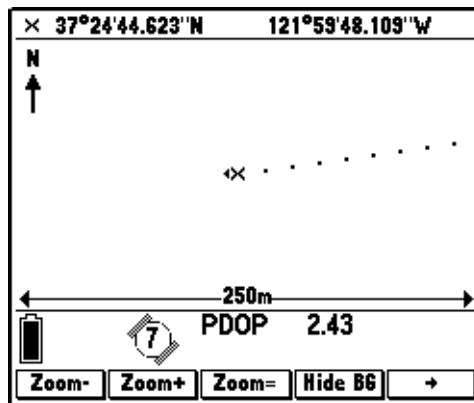
The top of the *Map* screen always points north.

The current GPS position is indicated by the cross symbol. The trail of dots behind the GPS position is referred to as the GPS trail, and shows your recently traveled route. Unless you have activated the map cursor, the map automatically pans to follow the GPS position. For more information on enabling or disabling display of the GPS trail, see Map Display Options, page 351.

Map   **8**

When GPS position information is temporarily unavailable (for example when there are too few available satellites, or the PDOP is high), the Asset Surveyor software will display the most recent GPS position on the map, and the GPS cursor will flash to show that it is displaying an old position. If there is no old position then the GPS cursor will not appear at all.

Also shown on the *Map* screen is the scale. You can use the `Zoom+` and `Zoom-` softkeys to zoom in and out, and the `Zoom=` softkey to zoom to the map extents. For further details on using the zoom keys, see Zoom Operations, page 350.

If a data file is currently open, then the features in that file are displayed on the *Map* screen:
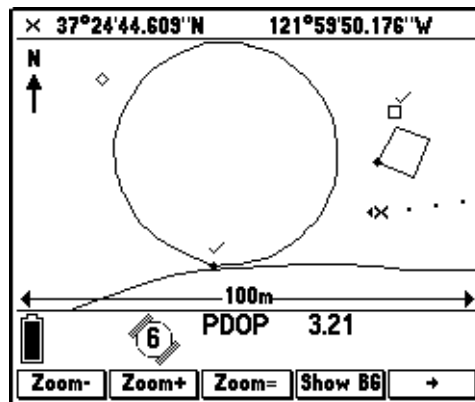
Note – When the Map module is calculating, for example, when you open the Map screen for the first time, the hourglass ⧖ appears. When the hourglass disappears, the calculation is complete.

Along with features, the *Map* screen also displays a number of symbols to assist in your interpretation of the data. Table 8.1 shows a list of map symbols and what they represent.

Table 8.1   Map symbols

Symbol	Map item
□ ◇	Point features
✖	Point feature in background file
⌒	Line features
⟁	Area features
. . . .	GPS trail
ˣ ˣ ˣ ˣ	Not in feature positions
✖	Waypoints
✖	Target waypoint
▶	Start waypoint
◀	Heading arrow
⇧	Bearing to go arrow
✕	GPS position
⋅⋅+⋅⋅	Map cursor position
◆	Area start/end positions
╱	Line start/end positions

Note –   Point feature types in the currently open file can be displayed using a number of different types of symbol. For more information, see Map Display Options, page 351.

Map   **8**

The Map Cursor

As shown previously, the *Map* screen provides a GPS cursor to show your current GPS position on the map. The Asset Surveyor software also provides a map cursor to help with panning around the *Map* screen, and to help you identify and select features for data update or navigation.

Changing from GPS Cursor to Map Cursor

By default the cursor will display the GPS position, indicated by the cross symbol. To activate the map cursor, press one of the arrow (⊙, ⊙, ◑, or ◐) keys. The map cursor appears as the plus symbol, and dotted crosshairs are shown to assist in movement of the map cursor:
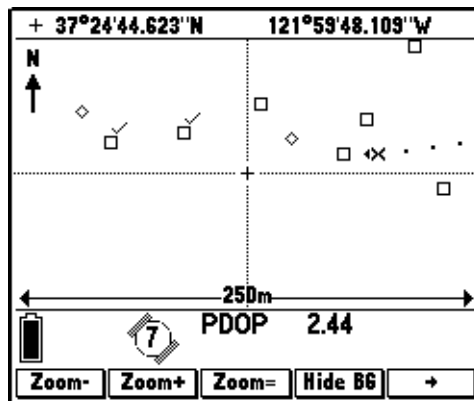
Tip – When the map cursor is enabled, the coordinate display shows the coordinates of the current map cursor location. You can use this to view the coordinates for any location on the *Map* screen.

The position at which the map cursor appears depends on what is visible on the current *Map* screen. If a Target has been specified, and that Target is visible on the current screen, the map cursor will appear over the Target. If the Target is not visible, but the currently highlighted feature in the *Review data* list is visible, then the map cursor will appear over that feature. If neither the Target nor the current highlighted feature is visible on the *Map* screen, then the cursor will appear at the last displayed GPS position if that position is within the current *Map* screen. Finally, if none of the above applies, the map cursor will appear in the center of the currently displayed *Map* screen.

Tip – If you want the map cursor to jump to an item of interest (the Target or the currently highlighted feature) not shown on the current *Map* screen, zoom to extents before you activate the map cursor. The map cursor does not jump to an item of interest when activated unless it is currently visible on the screen. Alternatively, activate the map cursor before highlighting the feature on the *Review data* list. If the map cursor is already activated when a feature is selected it jumps to the selected feature even if it is currently off the current *Map* screen view.

To move the map cursor around the *Map* screen, use the ⊙, ⊙, ◊, and ◊ directions on the multi-arrow key. Press the diagonal directions on the multi-arrow key to pan the map diagonally. If the cursor is moved to the edge of the map it automatically pans the *Map* screen so that the cursor is repositioned in the center of the screen, with the cursor remaining in the same geographic location.

Press the ⌫Esc key to deactivate the map cursor and display the GPS cursor. If the last GPS position is not visible on the currently displayed *Map* screen, the map automatically pans so that the GPS position is shown in the center of the screen.

Tip – You can pan the map quickly by pressing the [Fn] key followed by the appropriate arrow key; [Fn]⊙ to pan left, [Fn]⊙ to pan right, [Fn]◊ to pan up, and [Fn]◊ to pan down.

Map   **8**

Selecting Features for Update

When you first activate the map cursor, the feature highlighted in the *Review data* list is also highlighted on the *Map* screen. The *Map* module and the *Review data* list depend on each other, so any feature you highlight in one also becomes highlighted in the other.

A point feature highlighted in *Review data* is displayed with a black box surrounding it, similar to the following:
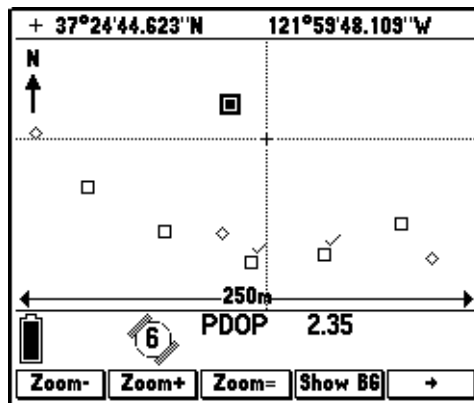
A line or area feature highlighted in *Review data* is displayed in bold (double thickness) on the *Map* screen, similar to the following:
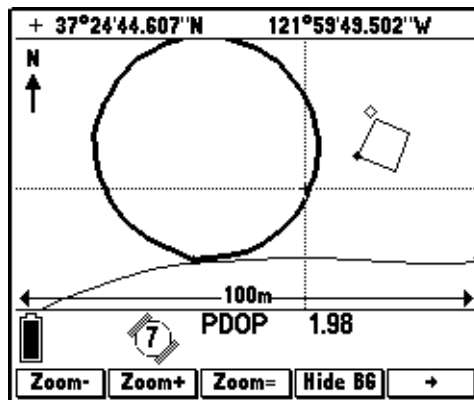
If you move the map cursor over a feature, it highlights the feature on the *Map* screen and in the *Review data* list. For more information on using the map cursor, see The Map Cursor, page 345.

If you position the map cursor over a feature and release the arrow key, the feature is not only highlighted, but also becomes *selected*. You can perform data review and update, or navigate to selected features:
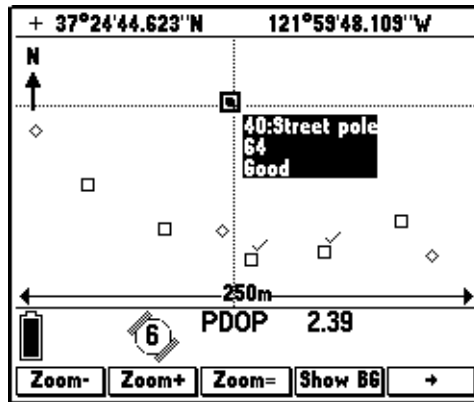
The following information appears next to the selected feature:

- Feature ID
- Feature name
- Up to two labels

You can select up to two attributes from each feature type as labels. When a feature is selected in the *Map* screen and in the *Review data* list, the values of the label attributes appear to help you distinguish the feature.

Note – For more information on allocating labels in the Asset Surveyor software, see Map Display Options, page 239.

Map   **8**

On either the *Map* screen or the *Review data* list, you can press the
Enter key to open the currently selected feature for review or data
update. The attribute form for the selected feature opens, allowing you
to review and/or update attribute or position information for that
feature. For more information, see Data Review and Update, page 80.

When you move the map cursor off a feature, that feature remains
highlighted, until you move the cursor over a new feature or you select
a new feature from the *Review data* list. To be able to open a feature
for update, the map cursor must remain positioned over that feature, so
that it is both highlighted and selected.

*Note – You cannot open a feature for data update if it is only
highlighted; it must be selected with the map cursor first. However
you can set either a highlighted or selected feature as the Start or
Target for navigation by pressing the* Start *or* Target *softkey.*

Tip – Filtering hides or shows certain types of information on the *Map*
screen. You can use this to show only the features you are interested in,
based on the filtering parameters. Sorting will change the order of the
feature list. It will also change the order of the feature ID numbers,
because each ID number is linked to only one feature until the file is
transferred to the GPS Pathfinder Office software. You can use this to list
the features in the order that you want to visit them, based on the sort
parameters. For more information, see Data Review and Update,
page 80.

Zoom Operations

In the Asset Surveyor software, three softkeys control the scale at which the *Map* screen is drawn. The scale is shown at the bottom of the *Map* screen. Zoom scales range from 25 cm to 2000 km.

- Use the `Zoom+` softkey to zoom in to a smaller scale.

- Use the `Zoom-` softkey to zoom out to a larger scale.

- Press the `Zoom=` softkey to Zoom to the *map extents*. Map extents is the scale at which all visible items, including waypoints and features in foreground and background files, can be displayed on the current *Map* screen.
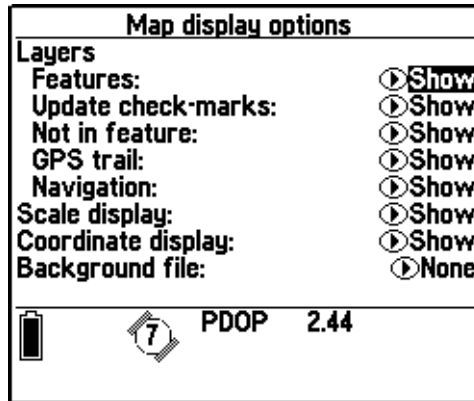
By default the *Map* screen is displayed at a scale of 250 m with the screen centered on the GPS cursor, or at the extents of the open data file if GPS is not available.

When there is no open data file, or other foreground data such as waypoints, the *Map* screen defaults to a scale of 250 m, centered on the *Initial position*.

Map   **8**

Map Display Options

The *Map display options* form lets you customize and configure different aspects of the *Map* module. To access it, press ⌷Options⌷ from the *Map* screen.

The *Map display options* form appears:

```
         Map display options
Layers
  Features:              ⊙Show
  Update check-marks:    ⊙Show
  Not in feature:        ⊙Show
  GPS trail:             ⊙Show
  Navigation:            ⊙Show
Scale display:           ⊙Show
Coordinate display:      ⊙Show
Background file:         ⊙None

 ▮      ⟨7⟩   PDOP   2.44
```

For more information on configuring the *Map display options* form, see Map Display Options, page 239.

Background File Display

The Asset Surveyor software provides the capability to display data files as a background file in the *Map* screen. When a file is specified as the background file its features are visible but they are read-only and cannot be selected, updated, or deleted.

Any file specified as the background file is displayed on the *Map* screen by default. The background file can be temporarily hidden by pressing the ⌐Hide BG⌐ softkey which turns the background display off. When display of the background file is disabled, the ⌐Hide BG⌐ softkey is replaced by ⌐Show BG⌐. Pressing the ⌐Show BG⌐ softkey shows the background display again, so you can switch the display of the background file on and off with a single keypress. Any rover or background file type can be opened in the background.

Note – Because you cannot select features in the background file, they cannot be used as the Start or Target for navigation, you cannot view attributes or file statistics for them, and they cannot be updated. Open the file as a foreground file if you want to do any of these.

Tip – If you know you will not need to edit or update a data file, but still want to view it in the *Map* screen, transfer it to the TSC1 datalogger as a background file so that you cannot accidentally open the file as a rover file and update it.

For more information on how to select a background file, see Map Display Options, page 239.

Features in the open data file are shown in the foreground, which is independent of the background layer. To hide features in the foreground, filter the file or set the *Features* layer to 'Hide'.

Tip – It may take the Asset Surveyor software some time to open a large background file. the Asset Surveyor software also takes longer to open a file on a PC card than a file in the internal memory of the TSC1 datalogger.

Map   **8**

Text Mode

The ⌑Mode⌑ softkey provides access to the *GPS position* form, where the current position is shown in text form:

```
          GPS position
Latitude:        37°24'44.08279"N
Longitude:      121°59'37.58651"W
Altitude (HAE):              5.91m
Datum:                   WGS 1984
Zone:                         N/A




 ▐PC  ⟨7⟩  PDOP   2.11

 Mode                       WayPt
```

When the Asset Surveyor software is unable to obtain a current GPS position from the GPS receiver (for example, due to a high PDOP value, or insufficient satellites), the title of this form changes to *OLD position*, which flashes on and off.

If you have selected a local coordinate system, the *GPS position* form might look more like the following:

```
          GPS position
North:            5177432.38m
East:              628574.48m
Altitude (MSL):       26.58m
Datum:              WGS 1984
Zone:            UTM Zone 59




 Mode                       WayPt
```

If you are using Over and Up mode, the *GPS position* form displays paper units, and might look like:

```
            GPS position
Left:                       5.24cm
Up:                         9.32cm
Altitude (MSL):             26.40m
Datum:                   WGS 1984
Zone:               Over and Up




  _____

  Mode                        WayPt
```

When current GPS positions are available, the Asset Surveyor software updates the contents of the *GPS position* form every 1–2 seconds. This is independent of the interval at which GPS positions are logged to a data file.

> **Tip –** You cannot edit any of the fields in the *GPS position* form; it is for viewing only. If you want to change your coordinate system, select *Coordinate system* from the *Configuration* menu. If you want to change your altitude reference from mean sea level (MSL) to height above ellipsoid (HAE), or vice versa, select *Coordinate system* from the *Configuration* menu.
> The order of the *Latitude/Longitude* or *North/East* fields can also be configured under *Units and display*, as can the units in which *North/East* coordinates are displayed (see Units, page 250).

Press $\boxed{\text{WayPt}}$ to save the current GPS position (or an old position, if no current one is available) as a waypoint. For details on creating a new waypoint, see Waypoints, page 300.

Map **8**

Note – The GPS position form takes the currently configured antenna details into account, and subtracts the height of the GPS antenna from the GPS positions supplied by your receiver before displaying them. The displayed positions apply therefore to the point on the ground beneath the antenna, rather than to the Antenna Phase Center itself.

To return to the *Map* screen, press the ⌑Mode⌑ softkey again.

Filtering

Filtering lets you show or hide certain features on the Map display, depending on certain parameters which you select. Features can be filtered based on their feature type, attributes, update status, deletion status, or the time they were collected.

You could use filtering to show only specific types of features you are interested in (for example, all features that still need to be updated) or to hide features that you don't need to see so that the *Map* screen and the *Review data* list are less cluttered.

To access *Filtering options* press the ⌑Filters⌑ softkey on the *Map display options* form or the *Review data* list. This softkey is only available if a data file is open. This opens the *Filters* menu for the current file. The same menu is opened from both locations, and any changes to filtering made in one place affect the whole system.

For more information, see Filtering, page 102.

Note – Specified filters are associated with the open data file only. If you open a new data file, the filtering options are returned to their default settings. Any changes you make to the filter settings for a data file are not stored when you close and re-open it again. If you want to turn off the filtering options for a file, uncheck the fields on the Filters menu, or press the ⌑None⌑ softkey. Closing and then reopening a file will also turn off any filters.

Navigation in the Map Screen

You can use the *Map* screen to help you navigate to features and waypoints. You can see your current location, where you have been, and where you are navigating to, the direction you are heading in, and the direction you need to go to get to the specified Target. Using the *Map* screen you can navigate and see yourself moving in relation to all the features and waypoints displayed on the map.

Selecting a Target

To select a Target for navigation, press the ⌷Target⌷ softkey. The *Select target* menu appears, displaying list of all the features in the currently open data file and all waypoints stored on the TSC1 datalogger. If a Target or Start is already set, the appropriate icon is displayed next to it in the menu. The *Select target* menu looks similar to the following:
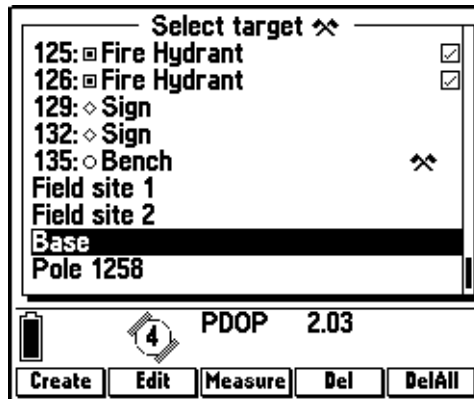
If you already have a selected Target, it is the highlighted item in the list and is also marked with the Target icon ✖. If there is no Target selected yet, the feature that is highlighted in the map is highlighted in the list.

Map   **8**

The [Create], [Edit], [Measure], [Del], and [DelAll] softkeys are also made available, allowing you to create new waypoints and edit or delete existing waypoints. For more information, see Waypoint Operations, page 337.

Press the [Enter] key to select the highlighted item in the list. On the *Map* screen, the crossed flag Target symbol appears over the point feature or waypoint you selected. If the Target is a line or area feature the Target symbol appears at the selected position of that feature: its start, end, or centroid.

You can also select the Target from the *Review data* list and the *Navigation* module. For more information, see Target Selection from Review Data List, page 94, or Selecting the Start and Target, page 331.

Tip – To select a Target from the *Map* screen, first move the map cursor over the feature or waypoint to select it. Then press the [Target] softkey. The selected feature automatically becomes the highlighted option in the *Select target* menu.

Tip – You can create a Target at any location by moving the map cursor to the location, pressing [Start] or [Target] to open the *Select start* or *Select target* menu, and pressing [Create]. A waypoint is created at the map cursor position.

Note – You cannot select Not-in-feature positions, GPS trail positions, or features in the background file to be the Target or Start. Use the map cursor to create a waypoint at the desired location instead.

Selecting a Start

To select a Start waypoint or feature from the *Map* screen, press the ⎍Start⎍ softkey. The *Select start* menu appears, displaying the same list of features and waypoints as shown in the *Select target* menu. If a Target or Start is already selected, the appropriate icon is displayed next to it in the list. Highlight the feature or waypoint you want as the Start, and press the ⎍Enter⎍ key. On the *Map* screen, the Start symbol ▶ appears over the feature or waypoint you selected. The Start symbol appears at the selected position of that feature (its start, end, or centroid).

Note – Selecting a Start for navigation is optional, but the cross-track line only appears if both a Start and a Target are selected.

Navigating to the Target

As shown previously, the specified Target is shown on the *Map* screen by a large crossed flag waypoint symbol:
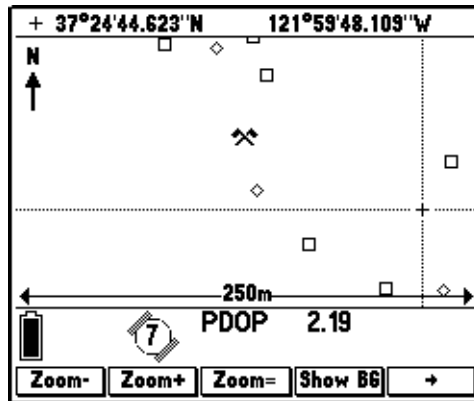
Note – The Target map symbol looks similar to the map symbol for ordinary waypoints, but is much larger.

Map   **8**

A Heading triangle is displayed above the GPS cursor to show the direction you are currently heading in. To navigate to the Target, turn so that the Heading arrow is pointing in the direction of the Target and walk towards it. The GPS trail shows where you have recently been.

If the Target is not visible on the screen then the Bearing arrow ⬈ appears to show the direction to take to get to it:
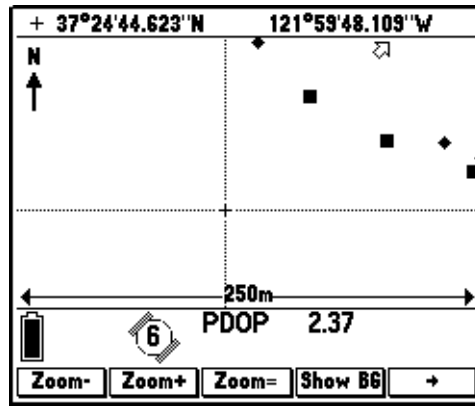
To navigate to the Target, line up the Heading triangle so that it points toward the Bearing arrow and walk towards the Target.

If you have selected both a Start and a Target, then the cross-track line is shown on the map as a dotted line linking the Start and Target via the shortest path. The cross-track line is useful if you want to navigate along a direct line to the Target, similar to the following:
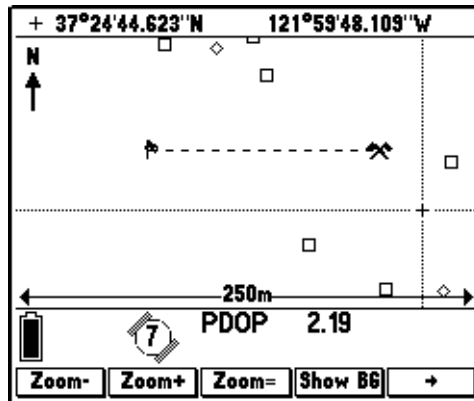
Note – You can also navigate to a Target using the Navigation module. For more information, see Navigating to a Target From Your Current Position, page 333.

Waypoint Operations

To create, edit, measure, or delete waypoints, highlight the waypoint you want to modify from the *Select target* or *Select start* menu. The `Create`, `Edit`, `Measure`, `Del`, or `DelAll` softkeys appear. The `Create` softkey works without needing a waypoint highlighted, but if you have a feature highlighted then the `Edit`, `Measure`, `Del`, and `DelAll` softkeys will not appear. For more information, see Waypoint Operations, page 337.

Receiver Status

In this chapter:

- ■ Introduction
- ■ Receiver status form
- ■ DGPS status
- ■ Detailed status information

Introduction

This chapter describes the fields and softkeys in the *Receiver status* module.

Receiver Status Form

When you select the *Receiver status* entry from the *Main menu*, the Asset Surveyor software displays information regarding the status of the connected GPS receiver:

```
              Receiver status
 Mode:                      Manual 3D
 SVs:               2,4,14,7,9,16,24,5
 HDOP:                            1.0
 VDOP:                            1.8
 Status:                   Doing fixes
 Carrier time:                    N/A
 Battery:                         88%
 Receiver type:                Pro XR
 Navigation version:             1.03
 Signal processor version:       0.09


 ┌──────┐
 │ DGPS │
 └──────┘
```

The example above shows the status for a Pro XR receiver. The fields in the *Receiver status* form are described in the following sections.

Mode

The *Mode* field shows the receiver's current position mode. This remains constant if you have selected Manual 2D, Manual 3D, or Overdetermined 3D. It may vary if you have configured your GPS receiver to use the Auto 2D/3D position mode, depending on the number of available satellites. When the mode value ends in '2D' the GPS receiver computes two-dimensional positions. When it ends in '3D' the GPS receiver computes three-dimensional positions.

SVs

The *SVs* field lists the satellites that are currently being used to compute positions. The abbreviation 'SV' refers to ***space vehicles***, the official term for the physical GPS satellites. The numbers listed are the PRNs (Pseudo-Random Numbers) of the satellites. Satellite PRNs are described in the *Mapping Systems General Reference*.

Note – The number of satellite PRNs in this list is the number that appears in the satellite icon on the left-hand side of the GPS status line.

HDOP and VDOP

These two dilution of precision (DOP) values are shown on the next two lines of the *Receiver status* form.

The VDOP (Vertical Dilution of Precision) value is a measure of vertical accuracy; HDOP (Horizontal Dilution of Precision) is a measure of horizontal accuracy. The PDOP, which is displayed in the status line, is a combination of VDOP and HDOP.

For a detailed discussion of DOP values and their significance, refer to the *Mapping Systems General Reference*.

Status

The *Status* field shows the current status of the GPS receiver. This field can take one of the following values:

- 'No GPS time': The GPS receiver has not yet acquired a signal from one GPS satellite, and has therefore not acquired accurate GPS time.

- 'PDOP too high': The current PDOP value is in excess of the PDOP mask, and consequently the GPS receiver does not compute GPS positions.

- 'No usable satellites': The GPS receiver is unable to find any usable (both visible and healthy) satellites, or has lost signals from all satellites (perhaps due to an obstruction).

- 'Too few SVs': The GPS receiver has acquired satellites, but too few to compute a position in the current position mode (that is, less than three satellites in a 2D mode, less than four satellites in Manual 3D mode, or less than five satellites in Overdetermined 3D mode).

- 'Satellite unusable': The GPS receiver has just rejected a particular satellite, probably because it has become unhealthy.

- 'Doing fixes': The receiver is computing GPS position fixes. The current satellite constellation is therefore acceptable.

Carrier Time

The *Carrier time* field shows the time elapsed since the carrier lock was lost. For further details on this field, see Chapter 7, Carrier Phase Data Collection, of the *TSC1 Asset Surveyor Operation Manual*.

Battery

The *Battery* field shows the current level of charge in the GPS receiver's battery, if available. This value appears as a percentage.

Receiver Type

The *Receiver type* field shows the name of the GPS receiver, for example 4000SE, Pro XL, or Pro XR. The Asset Surveyor software shows the receiver's internal name which may not precisely match the name that you use when referring to the receiver.

Navigation Version

The *Navigation version* field shows the GPS receiver's navigation firmware version number. If you call Trimble for assistance, you may be asked for the navigation firmware version of your GPS receiver, as this can assist Trimble support staff to diagnose and fix a problem.

Signal Processor Version

The *Signal processor version* field shows the GPS receiver's signal processor firmware version number.

Landstar ID

This field shows the LandStar activation code. You need this code when contacting your LandStar provider for activation.

Omnistar ID

This field shows the OmniSTAR activation code. You need this code when contacting your OmniSTAR provider for activation.

Note – The Landstar ID and Omnistar ID fields appear only when connected to a Pro XRS receiver.

For further details on activating the satellite DGPS component of your Pro XRS receiver, refer to the *Pro XR/XRS Receiver Manual*.

DGPS Status

Press the [DGPS] softkey on the *Receiver status* form to open the *DGPS status summary* form:

The *DGPS status summary* form shows all the real-time correction sources you have configured, with selected status information for each source. Each source appears as a separate heading, with its status fields indented below it.

Note – If no real-time sources have been configured, the message No DGPS source set up *appears. No other information is shown.*

The source that is currently in use is indicated by an icon beside its name. This icon matches the icon displayed in the status line. For more information, see Status Line Display, page 14.

If you have configured the Asset Surveyor software to use a real-time source, but no real-time source is available, no icon appears. If real-time corrections have been lost, the real-time icon in the status line disappears and the message DGPS link down appears on the status line.

Detailed Status Information

You can view detailed status information on any source, not just the one that the Asset Surveyor software is currently using. This is useful if, for example, the Asset Surveyor software is using your second or third choice for corrections and you want to check the status details for your first choice to find out why it is not available.

To view detailed information on a particular correction source, press ⎡Mode⎤ in the *DGPS status summary* form. The *DGPS status details Choice 1* form appears, showing status information for your first choice. Press ⎡Mode⎤ repeatedly to cycle through the detail forms for your configured choices until the choice you want is displayed. When the form for your last choice is displayed, press ⎡Mode⎤ again to return to the *DGPS status summary* form.

Note – A DGPS status details form is only available for the real-time sources you have configured in the Real-time input form.

You can press ⎡Esc⎤ at any time to exit the *DGPS status* form and return to the *Receiver status* form. You can press ⎡Esc⎤ at any time to exit the *Receiver status* form, or you can press ⎡Next⎤ to display the next form in the stack of open windows, or ⎡Menu⎤ to display the *Main menu*.

Press ⎡Setup⎤ to access the *Real-time input options* form, where you can specify the priority of correction sources to use, and configure any of them. For more information on configuring a real-time source, see

The fields in the form depend on which source of real-time corrections is being used. For example, the screen below shows the *DGPS status details* form when the source of real-time corrections is a beacon:

```
┌─────────────────────────────────────────┐
│   DGPS status details · Choice 1         │
│ Integrated  Beacon              In use   │
│ Frequency:                   314.0kHz    │
│ State:                           Lock    │
│ SNR:                           18.1dB    │
│ Correction Age:                    2s    │
│ Diagnostic information                   │
│  Error rate:                    0.000    │
│  Input level:                    31.0    │
│  Data rate:                    200b/s    │
│  Health:                      Healthy    │
│  ▯ ))((  ⟨7⟩   PDOP   2.5                │
│  ■ ⌂⌐                                    │
│ ┌───────┐┌──────┐                        │
│ │ Setup ││ Mode │                        │
│ └───────┘└──────┘                        │
└─────────────────────────────────────────┘
```

Service Provider

The *Service provider* field displays the name of the DGPS service provider that is currently being used to supply real-time DGPS corrections to the Pro XRS receiver. The possible values for this field are 'LandStar' or 'OmniSTAR'. This field appears only when using the integrated satellite DGPS component of the DGPS receiver.

Frequency

This field displays the current beacon or satellite frequency being tracked/locked onto. The range of possible frequencies are between 283.5 kHz and 325 kHz for a beacon, and between 1525.000 MHz and 1559.000 MHz for a satellite.

State

The *State* field shows the current operating DGPS status of the receiver. The possible values for this field are:

- 'Search': The DGPS component of the GPS receiver is searching the frequency range for a usable DGPS signal.

- 'Track': The DGPS component of the GPS receiver has detected a usable DGPS signal, but has not yet locked onto the signal.

- 'Lock': The DGPS component of the GPS receiver has locked onto a usable DGPS signal.

SNR

This field shows the signal-to-noise ratio (SNR), measured in decibels (dB), at the beacon or satellite DGPS frequency. For the beacon DGPS component, an SNR above 6.0 dB indicates that the signal is usable. For the satellite DGPS component, an SNR above 3.0 dB indicates that the signal is usable.

Correction Age

This field indicates the time, in tenths of a second, since the last real-time correction message was received.

DGPS Service Information

The fields under the *DGPS service information* subheading provide information on the DGPS subscription currently in use.

User Access

The *User access* field shows whether the LandStar or OmniSTAR DGPS satellite correction service has been enabled for the Pro XRS receiver. If the receiver has not been activated for DGPS satellite corrections, this field displays 'Unknown'. If the user access becomes 'Disabled' you should contact your service provider to renew your DGPS subscription. This field appears only when using the integrated satellite DGPS component of the DGPS receiver.

Decoder State

The *Decoder state* field appears only when using the integrated satellite DGPS component of the DGPS receiver. This field displays the current status of the LandStar or OmniSTAR DGPS activation for the Pro XRS receiver, as shown in Table 9.1.

Table 9.1   Decoder state values

Value	Meaning
Initializing(0-4)	The DGPS decoder is initializing.
Initializing(5)	The DGPS decoder is initialized, but DGPS data has not yet been received.
Initializing(6)	User access has been confirmed, but DGPS data has not yet been received.
Receiving corrections	The DGPS decoder is providing DGPS corrections to the Pro XRS receiver.
No recent data	DGPS data has not been received from the DGPS decoder in the last 10 seconds.
Decoder unavailable	The DGPS decoder is not available or is not operating correctly.
Decoder reset	A reset has been detected in the decoder.
Invalid link	The DGPS decoder is using a satellite link that is not valid for the subscription.
Invalid region	The DGPS decoder is being used in a region that is not covered by the current DGPS subscription.

Table 9.1   **Decoder state values (Continued)**

Value	Meaning
Update required	The DGPS decoder requires an update from the DGPS master station before corrections can be provided.
No offshore	The DGPS decoder is being used in a marine area and offshore operation is not provided for in the current subscription.

Expiration

The *Expiration* field displays the end date or elapsed time remaining for the current DGPS activation on the Pro XRS receiver, depending on the type of subscription you have been given.

'End date' subscriptions display the date (in the configured *Date format*) that your subscription is active until (when it will expire).

'Elapsed time' activations display the time in use (in hours and minutes) remaining for your DGPS subscription. As corrections are used by your Pro XRS receiver, the time remaining will count down every five minutes.

Diagnostic Information

The fields under the *Diagnostic information* subheading provide diagnostic information relating to the DGPS source currently in use. The information provided is not important for day-to-day use. It has been included to assist with troubleshooting any problems that may arise in the DGPS link.

Quality figure

The *Quality figure* field displays a number representing the percentage of error-free data received in the last satellite DGPS data block. Values lower than about 90% indicate excessive noise on the signal (possibly due to L-band jamming) and reduce the chance that the receiver is able to compute a real-time position using the incoming DGPS corrections. This field appears only when using the integrated satellite DGPS component of a Pro XRS receiver.

Tracking errors

When 'LandStar' is the displayed *Service provider,* the *DGPS status* form displays the *Tracking errors* field. The *Tracking errors* field only appears when using the integrated satellite DGPS component of a Pro XRS receiver. This field displays a ratio representing the number of times the DGPS decoder has lost synchronization with the incoming control blocks in the last 1000 block interval. The ratio displayed is usually '0', indicating that no tracking errors occurred.

Decoding errors

When 'LandStar' is the displayed *Service provider,* the *DGPS status* form displays the *Decoding errors* field. The *Decoding errors* field displays a ratio representing the number of incorrectly decoded data blocks in the last 1000 block interval. The ratio displayed is usually '0', indicating that no decoding errors occurred. This field only appears when using the integrated satellite DGPS component of a Pro XRS receiver.

Age of Sync

The *Age of sync* field appears only when using the integrated satellite DGPS component of a Pro XRS receiver. This field indicates whether or not the satellite DGPS component that your Pro XRS receiver is currently tracking is a valid differential signal. The value displayed represents the number of seconds since the receiver decoded a satellite differential data stream block which occurs about every 3.0 seconds under normal operation. If the time since last sync is greater than 3.0 seconds, there may be a problem with the differential data on the signal.

Station ID

The *Station ID* field displays the ID number of the network reference station that is being used to compute the current DGPS corrections. This field appears only when you are using the integrated satellite DGPS component of a Pro XRS receiver.

Decoder Version

The *Decoder version* field appears only when you are using the satellite DGPS component of a Pro XRS receiver. This field displays the version number of the OmniSTAR or LandStar decoder in the connected Pro XRS receiver, depending on the *Service provider* currently in use.

Error Rate

The *Error rate* field appears only when you are using the beacon DGPS component of a Pro XR or Pro XRS receiver. This field shows the RTCM Word Error Rate, or the number of RTCM words with parity errors, expressed as a decimal fraction. An error rate below 0.1 is acceptable.

Input Level

The *Input level* field appears only when using the beacon DGPS component of a Pro XR or Pro XRS receiver. This field displays the intensity level of the electro-magnetic field, measured in decibels above one microvolt per meter (dBµV/M). An input level between 10 dBµV/M and 100 dBµV/M is acceptable.

Data Rate

The *Data rate* field identifies the data modulation rates from the beacon DGPS component of the Pro XR or Pro XRS receiver. This field only appears when using the beacon DGPS component of a Pro XR or Pro XRS receiver.

Health

The *Health* field appears only when using the beacon DGPS component of a Pro XR or Pro XRS receiver. This field shows whether the signal received from the beacon DGPS component is 'Healthy', 'Unhealthy', or 'Unmonitored'. The Asset Surveyor software will not use 'Unhealthy' beacon corrections to correct GPS positions in real-time.

Note – The Health field only appears when connected to a Pro XRS receiver, or a Pro XR receiver with a firmware version of 1.05 or later.

Satellite Information

In this chapter:

- ■ Introduction
- ■ Text mode
- ■ Graphical modes

Introduction

If you select the *Satellite information* entry from the *Main menu*, the Asset Surveyor software displays information for each satellite in the GPS receiver's tracking set.

There are three modes of displaying the satellite information. They are the *Text* mode, the *Skyplot* graphical mode, and the *SNR levels* graphical mode. Use the ⌷Mode⌷ softkey to cycle through these modes.

Whenever you enter the *Satellite information* screen, the Asset Surveyor software displays the mode you last used. The first time you open the *Satellite information* screen the default screen that appears is the *Skyplot* graphical mode.

You can exit the *Satellite information* screen by pressing ⌷Esc⌷ any time.

Text Mode

Pressing the ⌑Mode⌑ softkey provides access to the *Text* mode screen, which may look similar to the following:

```
┌──── Satellite information ────┐
│ PRN    SNR    Elev    Br(T)  URA │
│ √01   10.2   53°↓    113°    32 │
│  14    4.8   25°↓    229°    32 │
│ √15    8.0   39°↑    277°   4.0 │
│  21    4.8   25°↑     42°    32 │
│ √25   10.8   72°↓    341°    32 │
│ √29    6.4   45°↑    254°    32 │
│ √30    7.4   29°↓    108°    32 │
│                                │
│ ───────────────────────────── │
│                                │
│ ┌──────┐                       │
│ │ Mode │                       │
│ └──────┘                       │
└────────────────────────────────┘
```

This form displays five columns of information, and spans as many pages as required to display information for all satellites in the receiver's current tracking set. The columns are:

- *PRN*: Each satellite's PRN is listed to identify that satellite uniquely. If the satellite is currently being used by the GPS receiver to compute positions, then a check mark (✓) appears to the left of the PRN. In the example above, satellites 1, 15, 25, 29 and 30 are being used to compute positions.

- *SNR*: The current signal-to-noise ratio of each satellite is indicated in the *SNR* column. A given satellite may not be used for a number of reasons, including:

  – The satellite's SNR is beneath the configured *SNR mask*.

  – Using this satellite to compute positions would increase the PDOP value, possibly to the point where it would exceed the PDOP mask.

  – The satellite's elevation is beneath the configured *Elevation mask*.

If a satellite is marked as 'unhealthy' by the GPS Control Segment, the characters 'U/H' appear in the *SNR* column for that satellite. The GPS receiver does not use unhealthy satellites to compute positions.

• *Elev*: This column shows the current elevation of each satellite above the horizon. Typically, satellites which are far below the configured elevation mask are dropped from the receiver's tracking set, so that the receiver can concentrate on satellites which are currently visible.

Beside each satellite's elevation is an arrow indicating whether the satellite is moving from a lower elevation to a higher elevation (rising, indicated by ⬆) or moving from a higher elevation to a lower elevation (setting, indicated by ⬇).

• *Br(T)* or *Br(M)*: This column shows the current bearing to each satellite in the tracking set. This bearing is shown relative to either true north *(T)* or magnetic north *(M)*, as determined by the currently configured *North reference*.

Tip – You can change the value of the *North reference* field in the *Units and display* configuration form, under the *Configuration* menu.

• *URA*: This column shows the *User Range Accuracy* value for each satellite in the tracking set. URA is an estimate of the accuracy of the pseudo-range measurement to each satellite. It is based on a number of factors, including the age of the data, the type of clock in the satellite, the satellite orbit and clock behavior, and whether Selective Availability (S/A) is activated for the satellite.

User range accuracies are listed in Table 10.1.

Table 10.1   User range accuracy

URA value	Interpretation
Below 6	Accuracy is good
6 to 15	Accuracy may be poor
16 to 30	SA may be activated
31 to 64	SA is activated
Above 64	SA is activated to an abnormal extent, or a problem exists with this satellite. (Satellite problems usually cause a satellite to be set 'unhealthy').

The *Satellite information* form is updated every eight seconds.

Graphical Modes

The graphical mode screens provide a graphical interpretation of information already shown in the *Text* mode of the *Satellite information* screen, but in a manner which is more easily comprehended than in the written form.

Skyplot Graphical Screen

When you first enter the *Satellite information* screen, a *Skyplot* similar to the following appears:
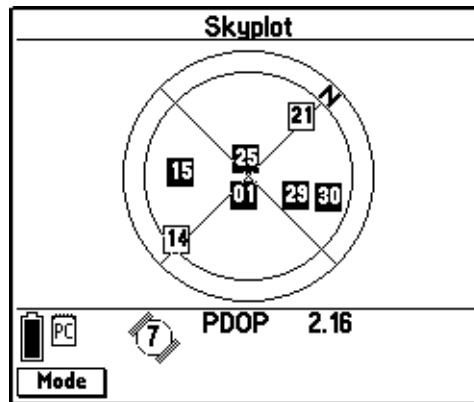
The skyplot provides a graphical representation of the position of satellites currently being tracked by the receiver. The outer circle marks the horizon (at 0°), while the inner circle shows the configured *Elevation mask* (15°). The skyplot rotates so that the top of the screen always represents your current heading (direction of travel), and the 'N' represents the direction of north relative to your heading.

Satellites (numbered boxes) near the center of the circle are overhead, while those towards the edge are lower on the horizon. The location of any one satellite can be determined by noting its direction (N, S, E, W) and approximate elevation from the skyplot. For example, in the skyplot shown above, SV 15 is about 40° from the horizon to the southwest.

The SVs shown as black boxes are those that are currently being used by the receiver to compute GPS positions. SVs with clear boxes are those that are being tracked by the receiver, but are not being used to compute positions because their elevation or SNR are below the configured masks.

Because the skyplot's rotation is relative to your heading, the skyplot stops rotating when your velocity is too slow to calculate an accurate heading, and the message Heading locked appears in the status line. For more information, see Heading Lock, page 326.

SNR Levels Screen

Pressing the [Mode] softkey provides access to the *SNR levels* screen, which may look similar to the following:
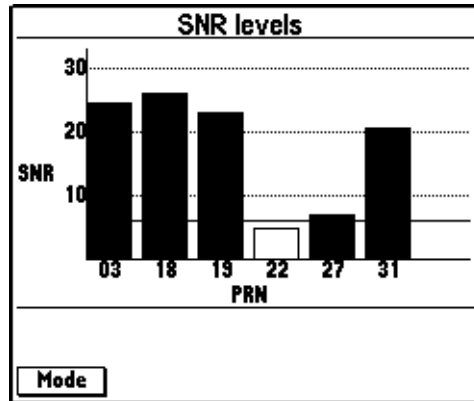
The *SNR levels* screen shows a histogram of the signal strength (SNR) of the satellites (PRN) currently being tracked by the GPS receiver. Black bars represent satellites with a Signal-to-Noise-Ratio above the *SNR mask*, which is indicated by a solid black line across the histogram. Empty bars represent satellites that are not being used, either because they have an SNR level which is below the *SNR mask*, or for other reasons such as satellite health and height above the horizon.

In the above example, five of the six satellites currently being tracked by the receiver have SNR levels above the *SNR Mask* (6.0), subsequently they are being used by the receiver to compute GPS positions. Only PRN 22, with an SNR of 5.0, is not being used by the receiver.

Help

In this chapter:

- ■ Introduction
- ■ Getting help
- ■ Getting help in different languages
- ■ Exiting the help

Introduction

To get more information about a topic, press the [HELP] key at any time. The menu of main help topics appears:
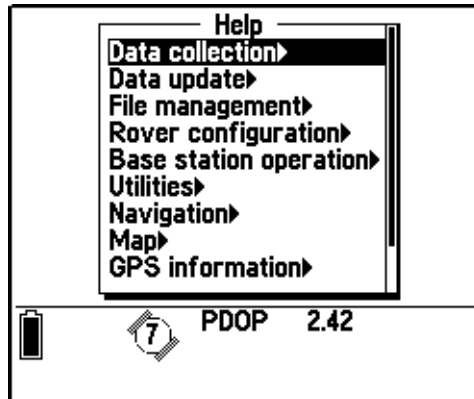
Getting Help

Use the ⊘ and ⊘ keys to select a topic and press [Enter] to access the information.

The *Help* list of topics is structured essentially the same way as the Asset Surveyor menu structure. This means that you can locate help on a particular part of the Asset Surveyor software by selecting the main help topic that relates to that part of the software.

For example, if you want help on starting a feature, you can select the *Data collection* option from the *Help* menu and press ⏎. The following menu appears:

```
┌─ Help/Data collection ─┐
│ Creating a data file    █
│ Reopening a rover file  █
│ Starting a new feature  █
│ Ending a feature        │
│ Recording an offset     │
│ Recording a quickmark   │
│ Nesting a point         │
│ Segmenting a line       │
│ Repeating a feature     █
└─────────────────────────┘
    🔋    ⟨7⟩   PDOP   2.46
```
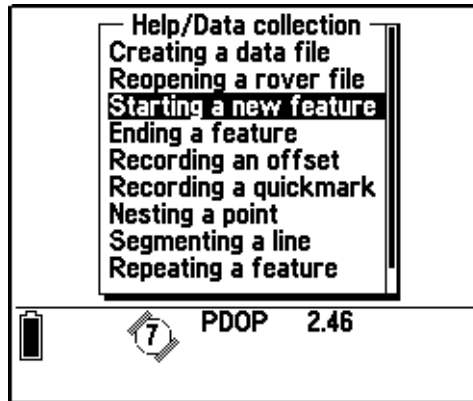
The entry *Starting a new feature* is clearly the topic that provides the help assistance you require. If you select this topic and press ⏎, the following help page appears:

```
    Help/Starting a new feature    ▼
If you open an existing file the 'Review
data' list appears, showing existing
features. If you create a new file then
the 'Start feature' menu appears. You
can switch between these at any time
using the 'New' and 'Review' softkeys.

To start a new feature:
 • If necessary, press the 'New'
   softkey to go to the 'Start feature'
   🔋    ⟨7⟩  PDOP   2.46
```
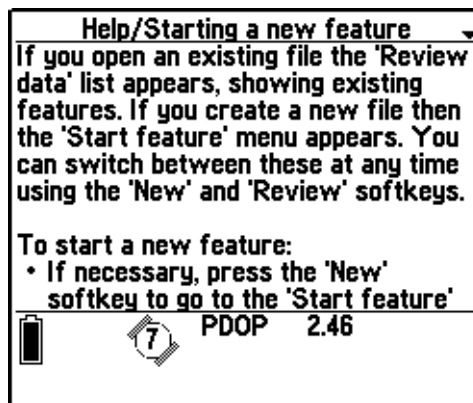
This topic has more than one screen of information. This is indicated by a small arrow in the top right hand corner of the screen. Press the ⊙ or ⓥ key to see the next screen. Press 〈Esc〉 to return to the *Help* list of topics.

Getting Help in Different Languages

Only English help is loaded onto the TSC1 datalogger by default. Translated help files are available for French, German, Portuguese, Russian, and Spanish. For details on transferring help files onto the TSC1 datalogger, see Transferring Data Files to and from the PC, page 154. Contact your local Trimble dealer for information on the availability of help files for other languages.

Exiting the Help

To exit the online help system, return to the *Help* screen and press ⟨Esc⟩. You can also use the ⟨Menu⟩ and ⟨Next⟩ keys to access the Asset Surveyor software while leaving the *Help* system open.

Installing the Asset Surveyor Software

In this chapter:

- Introduction
- Equipment required for installation
- Installing the Asset Surveyor version 5.20 software on your TSC1 datalogger
- Loading options onto the TSC1 datalogger

Introduction

If you received this document with a new TSC1 datalogger then the Asset Surveyor version 5.20 software is already installed on the datalogger. If that is the case, you may disregard this chapter.

If you want to install the Asset Surveyor version 5.20 software onto an existing TSC1 datalogger (with an earlier version of the Asset Surveyor software or with the Trimble Survey Controller software already installed), then you should read this chapter carefully and follow the instructions it contains. You can install the Asset Surveyor version 5.20 software onto the TSC1 datalogger using the installation CD provided.

Equipment Required for Installation

In order to install the Asset Surveyor version 5.20 software onto the TSC1 datalogger, you require the following equipment:

- An IBM-compatible personal computer running Microsoft Windows 95, Windows 98, or Windows NT, with at least one available serial RS232 port, at least 8 MB of free hard disk space, and a CD-ROM drive.

- Your TSC1 datalogger.

- The Asset Surveyor version 5.20 CD-ROM (P/N 34186-20).

- Optionally, a 9-pin to 25-pin converter. This is required if your personal computer has a 25-pin serial port connector on its COM1 or COM2 port.

- Optionally, a Trimble Support Module (TSM™) battery charger. A TSM can be used to provide an external source of power for the installation, rather than using the TSC1 datalogger's internal battery. An adapter cable is required to connect the TSM to your TSC1 datalogger. The cable required depends on the TSM model you are using.

Note – Although the Asset Surveyor software installation can be accomplished by using power from the TSC1 datalogger's internal lithium battery, it is recommended that you use the TSM as an external source of power. This prevents accidental termination of the installation process while running off a discharged battery.

Installing the Asset Surveyor Version 5.20 Software on Your TSC1 Datalogger

Before commencing the installation of the Asset Surveyor version 5.20 software it may be necessary to perform an option upgrade if:

- the TSC1 datalogger is currently running the Trimble Survey Controller software, and does not have a valid license for the Asset Surveyor software; or

- the current Asset Surveyor support warranty has expired.

For instructions on performing the option upgrade, see Loading Options onto the TSC1 Datalogger, page 398. When you have completed the option upgrade, you can proceed with the Asset Surveyor software installation. The following instructions enable you to install version 5.20 of the Asset Surveyor software onto a TSC1 datalogger.

⚠ **Warning –** The Asset Surveyor software completely erases the contents of the TSC1 datalogger's memory when the software is installed onto the TSC1. The installation does not commence until you have transferred and deleted all data files from the TSC1 datalogger.

To install the Asset Surveyor software onto your TSC1 datalogger using a TSM as an external source of power, connect the equipment listed on page A-388, as shown in Figure 1.1.

1 TSM extension cable (P/N 14284)

2 Null modem cable (P/N 18532)

3 TSC1 data cable (P/N 32287-00)
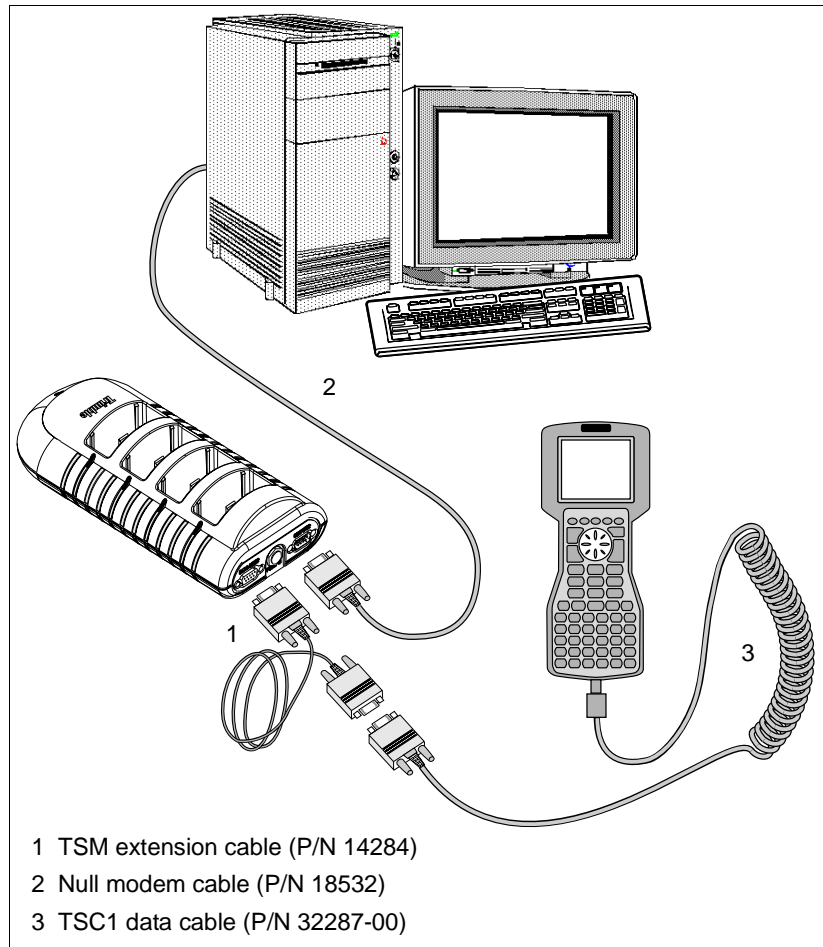
Figure 1.1 Cabling for connection to PC using a TSM power supply

To connect the TSC1 datalogger to your PC using the TSM:

1. Plug the TSM into the wall current (mains).

2. Connect one end of the TSM extension cable (P/N 14284) to the DATALOGGER port on the TSM.

3. Connect the other end of the TSM extension cable to the TSC1 data cable (P/N 32287-00). This cable connects to either the top or bottom port of the TSC1 datalogger.

4. Connect the COMPUTER port on the TSM to the personal computer's COM1 or COM2 serial port, using the null modem cable (P/N 18532).

5. Turn on the TSC1 datalogger, TSM, and personal computer, if they are not already on.

To install the Asset Surveyor software onto your TSC1 datalogger using the TSC1's internal lithium battery as the power source, connect the equipment listed on page A-388, as shown in Figure 1.2.

1 TSC1 data cable (P/N 32287-00)

2 Null modem cable (P/N 18532)
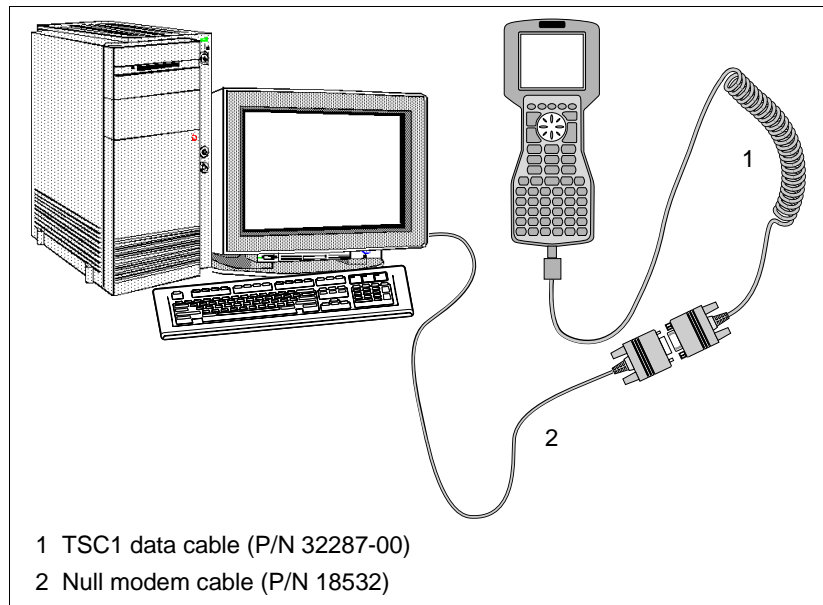
Figure 1.2   Cabling for direct connection to PC using the TSC1 internal battery

To connect the TSC1 datalogger directly to your PC:

1. Connect the TSC1 data cable (P/N 32287-00) to the top or bottom port on the TSC1 datalogger.

2. Connect the other end of the TSC1 data cable to the null modem cable (P/N 18532).

3. Connect the other end of the null modem cable to the personal computer's COM1 or COM2 serial port.

4. Turn on the TSC1 datalogger and personal computer, if they are not already on.

Note – The Asset Surveyor software cannot be installed using the TSC1 datalogger's internal lithium battery if the battery level is below 50%.

Note – Although the Asset Surveyor software installation can be accomplished using power from the TSC1 datalogger's internal lithium battery, it is recommended that you use the TSM as an external source of power. This prevents accidental termination of the installation process while running off a discharged battery.

You are now ready to proceed with the installation of the Asset Surveyor software.

To install the Asset Surveyor software:

1. Turn to your personal computer.

    For the software installation to proceed, the WinFLASH program must be installed on your personal computer. If WinFLASH program is not installed, insert the Asset Surveyor installation CD in your CD-ROM drive and double-click on setup.exe. Follow the instructions to install WinFLASH.

2. Start the WinFLASH program by selecting *Programs / WinFLASH / WinFLASH* from the Windows *Start* menu.

The WinFLASH program starts and the *Device Configuration* dialog appears:

3.   Select *TSC1 Data Collector* as the device type and specify the serial port on your PC that your TSC1 datalogger is connected to.

4.   Click **Next**.

The *Operation Selection* dialog appears:
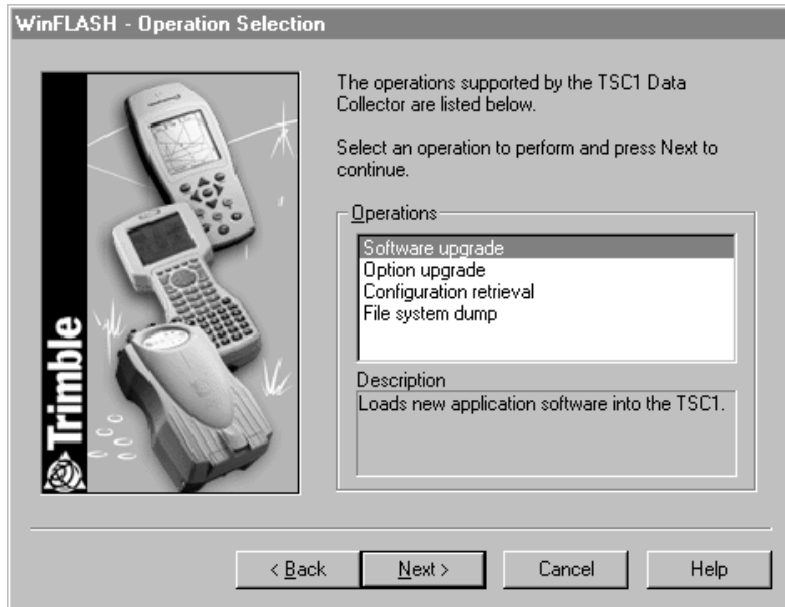
5.   Select the *Software upgrade* option and click **Next**.

The *Software Selection* dialog appears:
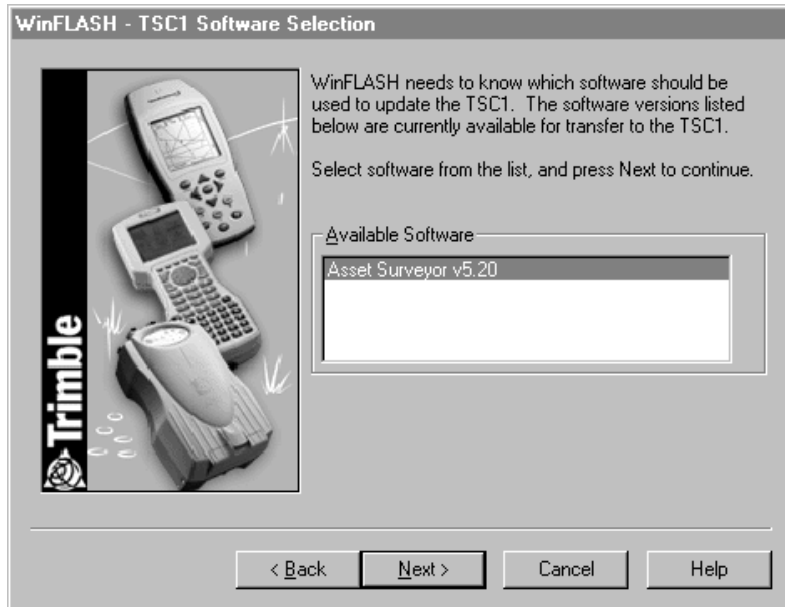
6. Select *Asset Surveyor 5.20* as the software version you want to install onto your TSC1 datalogger and click **Next**.

The *Settings Review* dialog appears similar to the following:
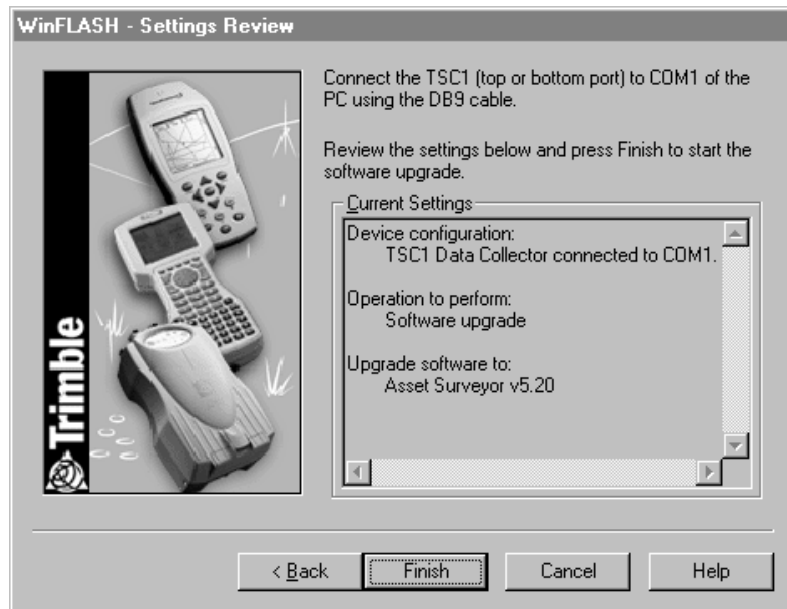
7.   Review the current settings and click **Finish**.

8.   The program initiates communication with the TSC1 datalogger.

Note – The Asset Surveyor software cannot be installed if any of the following is true: (a) the TSC1 datalogger is in file transfer mode; (b) a GPS receiver is connected to the TSC1; (c) there are data files on the TSC1; (d) you are installing using the TSC1's internal lithium battery when the battery level is below 50%.

A dialog similar to the following appears, indicating the progress status of the software installation:

```
┌─ Software Upgrade ──────────────────────────── × ┐
│ ┌─ Status ───────────────────────────────────┐ │
│ │ Establishing communication with the TSC1. Please wait... │ │
│ │                                            │ │
│ │                                            │ │
│ │                                            │ │
│ │                                            │ │
│ └────────────────────────────────────────────┘ │
│                    52%                          │
│ ███████████████████                             │
│                                                 │
│             [    Cancel    ]                    │
└─────────────────────────────────────────────────┘
```
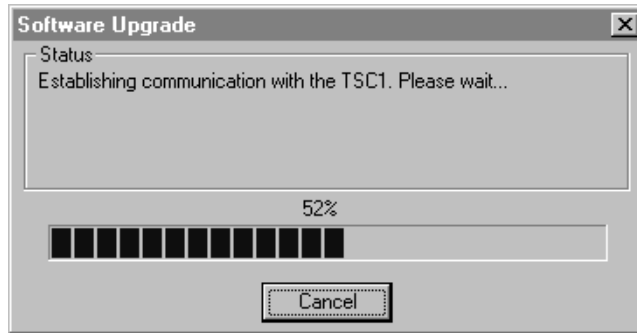
The installation takes about five minutes. Typically, the transfer of the Asset Surveyor software to the TSC1 datalogger proceeds automatically.

When the installation has completed, the following dialog appears on your personal computer:

```
┌─ Software Upgrade ──────────────────────────── × ┐
│ ┌─ Status ───────────────────────────────────┐ │
│ │ The software upgrade was completed successfully. │ │
│ │                                            │ │
│ │ Press 'Menu' to select another operation, or 'Exit' to quit WinFLASH. │ │
│ │                                            │ │
│ └────────────────────────────────────────────┘ │
│                    100%                         │
│ ███████████████████████████████████████████     │
│      [  Menu...  ]   [  Retry  ]   [  Exit  ]   │
└─────────────────────────────────────────────────┘
```
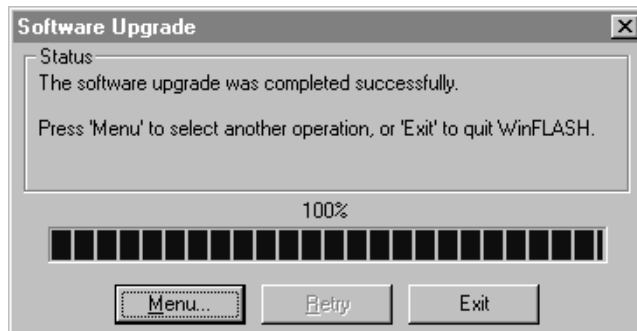
9.   Click **Exit** to close the WinFLASH program.

10. Your TSC1 datalogger now performs a cold boot and automatically starts up the newly installed software.

    The Trimble logo screen appears just after rebooting identifying the new Asset Surveyor software and also showing the software version number (5.20).

11. If you have just installed version 5.20 of the Asset Surveyor software onto your TSC1 datalogger, you must now reload any data dictionaries, coordinate system sites, and waypoints, as these are erased when the software on the TSC1 datalogger is installed.

Loading Options onto the TSC1 Datalogger

It may be necessary to perform an options upgrade on the TSC1 datalogger before installing the Asset Surveyor software if:

- the TSC1 datalogger is currently running the Survey Controller software, and does not have a valid license for the Asset Surveyor software

- the current Asset Surveyor support warranty has expired.

The following steps provide instructions for upgrading the software option on the TSC1 datalogger. Note that you must have a password provided by Trimble in order to perform an upgrade.

Note – The option upgrade program does not install the Asset Surveyor 5.20 software on your TSC1 datalogger. Once the option upgrade program has been successfully completed, you must install the Asset Surveyor version 5.20 software, as described in Installing the Asset Surveyor Version 5.20 Software on Your TSC1 Datalogger, page 389.

For the option installation using a TSM as an external source of power, connect the equipment as shown in Figure 1.1 on page 390.

For the option installation using the TSC1 datalogger's internal lithium battery as the power source, connect the equipment as shown in Figure 1.2 on page 391.

Note – The Asset Surveyor software cannot be installed using the TSC1 datalogger's internal lithium battery if the battery level is below 50%.

Note – Although the TSC1 option installation can be accomplished using power from the TSC1 datalogger's internal lithium battery, it is recommended that the TSC1 datalogger uses the TSM as an external source of power. This prevents accidental termination of the installation process while running off a discharged battery.

Before you can install options, the WinFLASH program, which is used to install the Asset Surveyor software onto your TSC1 datalogger, must be installed onto your personal computer. The WinFLASH program can be downloaded from the Trimble web site at:

- http://www.trimble.com/support/files/assets1.htm

Download the file as520web.exe from the above address. This file includes the latest version of the Asset Surveyor software. Once you have downloaded the file, double-click it to begin installing the WinFLASH software, and follow the instructions on the screen.

You are now ready to proceed with the option installation.

To install the option upgrade:

1. Start the WinFLASH program by selecting *Programs* /
    WinFLASH / *WinFLASH* from the Windows *Start* menu.

    A dialog similar to the following appears:

2. Select *TSC1 Data Collector* as the device type and specify the
    serial port on your PC that your TSC1 datalogger is connected
    to.

3. Click **Next**.

The *Operation Selection* dialog appears:
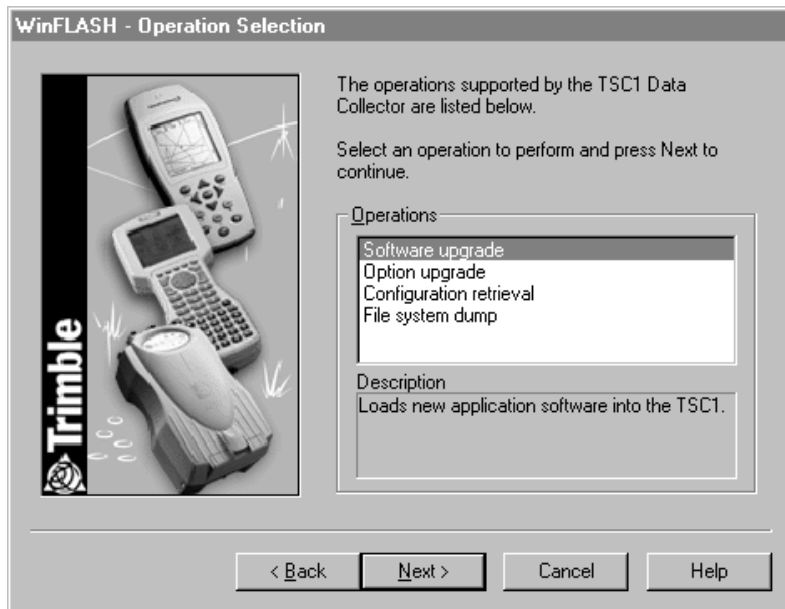
4. Select *Option upgrade* and click **Next**.

5. At this point, the WinFLASH software asks you to enter your option password. Enter the password exactly (including matching case) as provided by Trimble and click **Next**.

   The program initiates communication with the TSC1 datalogger and the option installation completes automatically.

Troubleshooting

Introduction

This section lists potential problems and describes how to solve them.

Troubleshooting

The following table lists symptoms, the problems they indicate, and how to solve them.

Symptom	Possible cause	Fix
The message No GPS detected. Check cabling, batteries etc. Do you wish to retry GPS now? appears on the TSC1 datalogger.	The cable connecting the TSC1 datalogger to the GPS receiver has not been connected, or has been connected incorrectly, or is faulty.	Check that the cable is connected correctly. If it appears to be correct and all other equipment appears to be correct, the cable may require servicing.
	The GPS receiver's battery is dead, or has not been connected correctly.	Check that the battery is correctly connected and is charged, or connect to an external power source.
	The GPS receiver has not been turned on.	The Series 4000 and Site Surveyor 4400 receivers must be manually turned on before the Asset Surveyor software can communicate with them.
The receiver has not acquired a satellite within three minutes of the TSC1 datalogger being turned on.	The receiver is still looking for satellites.	Check the *Satellite information* screen to see how many satellites are being tracked by the receiver.
	The expected satellites are being obstructed.	The obstruction may be a building, tree, large vehicle, for example. Identify the obstruction and move away from it. ***GPS does not work indoors.***
	Your GPS receiver's external antenna (or antenna cable) has not been connected, has been connected incorrectly, or is faulty.	Check that the external antenna is connected correctly. If your receiver still fails to acquire signals from a satellite then your antenna and/or antenna cable may require servicing.

Symptom	Possible cause	Fix
	Your GPS receiver requires an almanac to be loaded from the TSC1 datalogger, but the Asset Surveyor software has not yet recorded an almanac and stored it on the TSC1 datalogger.	Wait (for up to 15 minutes) until the GPS receiver records an almanac and makes it available to the Asset Surveyor software. The Asset Surveyor software records the almanac and stores it on the TSC1 datalogger. It is reloaded into your GPS receiver when you next turn the TSC1 datalogger on.
	You have traveled a large distance (more than 1000 km) since using the GPS receiver, and you have not reconfigured the *Initial position*.	Reconfigure the *Initial position* under *Configuration* / *GPS Rover options*, then turn the TSC1 datalogger off and on again to reinitialize communications with the GPS receiver.
	The receiver has not been used for a very long time, and an extreme change in the GPS constellation has outdated the almanac stored in the receiver and/or the TSC1 datalogger.	Wait (for up to 15 minutes) until a new almanac has been recorded. Subsequent restarts should then be rapid.
The receiver is not able to compute a GPS position within one minute of you turning the TSC1 datalogger on.	There are not enough satellites available. 3 SVs are required in 2D mode, 4 SVs in 3D mode, and 5 SVs in Overdet 3D mode.	Use mission planning to check that there are sufficient satellites visible at this time.
		Under *Position filters*, check that the *Elevation mask* is not too high.
		Under *Position filters*, check that the *SNR mask* is not too high.
		Under *Position filters*, check that the *Position mode* is correct.
	The current PDOP value is too high.	Use mission planning to check that the current PDOP value is below your configured mask.
		Under *Position filters*, check that the configured *PDOP mask* and *PDOP switch* are not too low.

Symptom	Possible cause	Fix
The TSC1 datalogger does not turn on, or turns off immediately after being turned on.	The main TSC1 batteries are dead.	Replace or recharge the main TSC1 batteries, or power the TSC1 datalogger externally.
	The Asset Surveyor software has locked up.	Perform a warm reboot of the TSC1 datalogger, as described in Chapter 2. If the problem recurs, contact your local Trimble dealer.
The display on the TSC1 datalogger is dim, or washed out.	The TSC1 datalogger's LCD contrast needs adjusting.	Adjust the LCD contrast as described in Chapter 2.
	The main TSC1 batteries are low.	Check the level of the main TSC1 batteries in the *Hardware (TSC1)* configuration form. If the battery level is low, replace or recharge the batteries.
The TSC1 screen goes black.	The TSC1 datalogger has been sitting in direct sunlight.	Remove from direct sunlight and wait until the screen returns to normal.
The accuracy of recorded GPS positions is not as good as you expect.	You did not record sufficient positions to achieve the required accuracy (for a point feature).	For some GPS receivers, Trimble specifies that a certain minimum number of GPS positions be logged, differentially corrected and averaged to achieve a required level of accuracy for point features. Configure the *Minimum positions* option (under *GPS rover options* / *Logging options*) to make sure that the Asset Surveyor software records enough positions to meet your accuracy requirements.
	You may be operating in an area of high multipath.	Move to a better area of GPS coverage and use offsets.
	Your *PDOP mask* was too high.	If you record positions when the PDOP is high (that is, the geometry of the GPS satellite constellation is poor), this has a detrimental effect on the accuracy of these positions. You should lower your *PDOP mask* (under *GPS rover options* / *Position filters*) to make sure that the Asset Surveyor software only logs accurate positions.

Symptom	Possible cause	Fix
	Your *SNR mask* or *Elevation mask* was too low.	If you let the receiver use satellites with a low SNR or elevation, this may have a detrimental effect on the accuracy of positions calculated by the receiver. You should raise your *SNR mask* and/or *Elevation mask* (under *GPS rover options* / *Position filters*) to make sure that the receiver uses satellites with a strong signal.
	You used a 2D mode and failed to specify an accurate 2D altitude.	The accuracy of 2D GPS positions is critically dependent on the quality of the 2D altitude you supply. You must specify your altitude precisely in order to use a 2D mode and still obtain accurate GPS positions. You must also specify the 2D altitude relative to the correct reference level (that is, mean sea level or the current ellipsoid).
Your real-time differential correction link does not appear to work.	Your telemetry link has been incorrectly installed, powered, cabled, or configured.	Install the telemetry link as specified by the supplier. Consult the supplier if necessary.
	You have configured the real-time serial parameters incorrectly.	Under *Configuration* / *Rover options*, select the *Real-time input options* entry and check that the RTCM serial parameters match the telemetry link and the transmitted RTCM data stream.
	You have set the station ID incorrectly.	Under *Configuration* / *Rover options*, select the *Real-time input options* entry and set the *Station* field correctly.
	You have set *Apply real-time* to 'Off'.	Under *Position filters*, set *Apply real-time* to either 'Auto' (which allows real-time or autonomous positions), or 'Yes' (which requires real-time corrections to always be applied).

Symptom	Possible cause	Fix
Your integrated beacon component does not appear to work (Pro XR and Pro XRS only).	You have set the DGPS *Source* incorrectly.	Under *Configuration* / *Rover options* / *Real-time input*, set the *Choice 1* field to 'Beacon'.
	You have set the *Mode* incorrectly.	Under *Integrated beacon* / *Setup*, set the *Mode* field to 'Auto range', 'Auto power' or 'Manual'.
	You have set the *Frequency* incorrectly.	Set the frequency to the correct number, or configure the *Mode* field to 'Auto range' or 'Auto power' to let the receiver select the beacon.
Your integrated satellite component does not appear to work (Pro XRS only).	You have set the DGPS *Source* incorrectly.	Under *Configuration* / *Rover options* / *Real-time input*, set the *Choice 1* field to 'Satellite'.
	You have not enabled your integrated satellite component.	Refer to the *Pro XR/XRS Receiver Manual* for further details of how to enable your integrated satellite component.
	You have entered the incorrect provider, satellite, and/or frequency.	Under *Integrated satellite* / *Setup*, choose the correct service provider and enter the correct frequency.
You are unable to differentially correct your rover GPS positions (either in real-time or postprocessing).	The GPS rover used satellites which were not visible to the GPS base station.	Make sure that the *Elevation mask* on the GPS rover is set sufficiently high that the rover only uses satellites which are also visible to the GPS base station.
		Try correcting your data using another base station file.
		If real-time positions were collected, make sure the PPRT option in the Asset Surveyor software is set to 'Yes' and that the GPS Pathfinder Office software has the PPRT option set to 'Yes'.

Symptom	Possible cause	Fix
The coordinates displayed by the Asset Surveyor software appear to be incorrect.	You are using the Latitude/Longitude coordinate system and have selected the wrong datum.	Under the *Coordinate system* configuration menu, select *Latitude/Longitude* and specify the correct datum.
	You are using the *UTM* coordinate system and have selected the wrong UTM zone or datum.	Under the *Coordinate system* configuration menu, select *UTM* and specify the correct zone and datum. ***The traditional UTM datum for the U.S.A is NAD-27.***
	You have selected the wrong coordinate system or zone.	Under the *Coordinate system* configuration menu, select the correct coordinate system and zone.
	You have selected the wrong coordinate units.	Select the specified coordinate system (under *Coordinate system* configuration), and select the correct *Coordinate* units.
	You have defined a custom coordinate system, datum, and/or zone incorrectly in the Coordinate System Manager utility in the GPS Pathfinder Office software.	Check the definition of the coordinate system, datum, and/or zone carefully. Make sure that values such as the scale factor have been specified correctly (as a parts-per-million value), that rotations have been specified in the correct sense (a positive rotation is counter-clockwise), and that latitudes and longitudes have been specified in the correct hemisphere (North/South or East/West, respectively).
Automatically-generated time attributes are incorrect.	The TSC1 datalogger's internal clock has been set incorrectly.	Reset the TSC1 datalogger's internal clock (under the *Time and date* configuration menu entry). Check that the *24-hour clock* field is set correctly.

Symptom	Possible cause	Fix
The Asset Surveyor software does not communicate with an external sensor.	The sensor has not been connected, or has been connected to the wrong serial port, or the cabling is faulty.	Connect the sensor correctly. Check that the cabling is appropriately wired.
	The configured external sensor has the wrong RS232 settings.	Check the configuration of the RS232 settings for that sensor (press `Comms` in that sensor's configuration form).
	The configured sensor has the wrong *Data request* string, the wrong *Data received* settings, or the *Interval* fields are set to 'None'.	Check that the configuration matches the requirements and specifications of the sensor in question.
Offsets recorded with a laser rangefinder seem inaccurate.	You have not made allowance for the local magnetic declination.	In the *Units and display* form, enter the correct local magnetic declination into the *Magnetic declination* field.
	Your laser is attempting to apply its own magnetic declination, in addition to the Asset Surveyor software's.	Configure the laser to output uncorrected magnetic bearings only.
	The environment in which you are working is magnetically 'hostile', and is affecting the laser's compass.	Move away from all ferrous metal objects (for example, vehicles, buildings, bridges, overhead cables, and so on). Calibrate the compass of your laser rangefinder, if possible.
The Asset Surveyor software fails to communicate with a laser rangefinder.	Your cabling is faulty and/or incorrectly connected.	Check the cabling.
	Your laser is configured incorrectly for operation with the Asset Surveyor software.	Configure the laser, if possible, as outlined in Chapter 5, Configuring the Asset Surveyor Software.
	The Asset Surveyor software has not been configured to work with your laser.	Select *External sensors* from the *Configuration* menu. Highlight the *Laser* entry and press `Setup`. Select from the list of supported laser rangefinders.

Symptom	Possible cause	Fix
Some or all features are missing from the *Review data* list or the *Map* screen.	There is no data file open.	Select *Data collection* from the *Main menu* and open a rover file.
	There are no features in the file to display.	Open the *Start feature* form and collect some features.
	The *Features* layer on the *Map* screen has been turned off.	Press `Options` on the *Map* screen and set *Features* to 'Show'.
	The background file in the *Map* screen is turned off or has not been selected.	If the data you want to see is in a background file, ensure that the *Map* screen is set to display this file (in the *Map display options* form) and press `Show BG` in the *Map* screen to display it.
	Your zoom scale is incorrect.	Check that you are not zoomed in too close or out too far to see your data. If you have distant items to display, the zoom extents of the *Map* screen will be at a more distant scale.
	You are viewing the wrong area in the *Map* screen.	Pan to the appropriate area. You can make the *Map* screen jump to a feature by activating the map cursor then highlighting the feature on the *Review data* list.
	The features have been filtered out.	Check the title of the *Review data* list to see if any filters are active. If the title ends in *(Filtered)*, press `Filters` to display the *Filters* menu where you can disable or change the criteria for filters.
	The features have been deleted.	Deleted features are never shown in the *Map* screen. Use `Undel` in the *Review data* list to restore deleted features.

Asset Surveyor Messages

In this chapter:

- Introduction
- Messages

Introduction

This appendix lists, in alphabetical order, the various error, warning and information messages which are displayed by the Asset Surveyor software. Possible causes of each message are described, and suggestions of how to proceed are supplied where relevant.

If the Asset Surveyor software displays an error message that is not listed here, write down the exact text of the message and contact your local Trimble dealer for assistance.

Note – Error messages (which have the word Error! as their title) remain on the TSC1 datalogger's screen until you press $\boxed{\text{Esc}}$. *Warning messages usually time out after four seconds and disappear, but can also be dismissed by pressing* $\boxed{\text{Esc}}$.

Messages

The following messages appear in the Asset Surveyor software.

\XX escape sequence is invalid

You have entered an invalid hexadecimal code into a field in the *External sensor* configuration form. Each escape sequence must consist of a backslash (\) character followed by two hexadecimal digits. To enter the backslash character into a field, type the following escape code: '\5C'.

4000 battery is low

The battery currently being used by the connected Series 4000 GPS receiver is low. A Series 4000 receiver can be connected to several batteries at once and the Asset Surveyor software emits the 4000 battery is low message even if one (or more) batteries remain fully or partially charged. If the receiver is currently using its last battery, you should change or recharge the receiver's batteries as soon as possible after seeing this message.

4000 Nav. firmware needs updating

This message is displayed if the navigation firmware in the connected Series 4000 GPS receiver is older than version 5.64. This is the earliest version of the Series 4000 receiver firmware which works with the Asset Surveyor software.

Contact your local Trimble dealer to obtain an upgrade to the firmware in your Series 4000 GPS receiver.

A file with this name exists. Do you wish to append to it?

This message appears in *Base station* mode, when you attempt to create a new base station file with the same name as a previous data file. Press `Yes` if you want to append base station data to the end of the existing data file or press `No` if you want to create a new base station file with a different name.

A feature is being updated and must be closed before a new feature can be collected.

This message appears when you select a feature from the *Start feature* menu. You cannot record GPS position information for a new feature while an existing feature's GPS position is being updated.

A feature is open elsewhere for GPS data collection, and must be closed before you can log GPS to any other feature.

This message appears in the feature review form when you press `Log` to update its GPS position. You can open a feature from the *Review data* list and one from the *Map* screen at the same time, and can edit the attributes or offset of both features at the same time. However, you can only log GPS positions to one feature at a time. If you are already logging GPS for a feature, you must close it before you can start logging GPS positions for another feature.

Abandon changes?

This message warns you that changes you have made to a form will be lost if you continue. It is displayed if you press [Esc] on a form after changing the value of one or more fields. If you want to save changes to the form, press [No], followed by [Enter], otherwise press [Yes] to abandon the changes.

Abandon feature?

This message appears if you press [Esc] on the attribute entry form for a new feature in *Data collection*. Press [Yes] if you want to abandon the feature. If you want to save the feature, press [No] followed by [Enter].

If you abandon a feature, its attributes, GPS positions, and any associated external sensor data are discarded by the Asset Surveyor software, and cannot be recovered.

Abandon update?

This message appears if you press [Esc] on the attribute entry form for an existing feature in *Data collection*. Press [Yes] if you want to abandon the changes to the feature. If you want to save the feature, press [No] followed by [Enter].

If you abandon a feature update, any changes to its attributes, GPS positions and any associated external sensor data are discarded by the Asset Surveyor software, and cannot be recovered.

Aborted

You have used the [Esc] key to successfully cancel a long operation.

Activation complete

This message appears when the DGPS satellite has confirmed that your Pro XRS receiver has the appropriate activation to receive RTCM corrections using the integrated DGPS satellite component of the receiver.

Almanac sent

The Asset Surveyor software displays this message to inform you that a GPS almanac has been sent to the PC.

Are you sure you want to disconnect from GPS?

This message is displayed when you select the *Disconnect* entry from the *Utilities* menu. Press ☐ Yes ☐ if you want the Asset Surveyor software to cease communicating with the currently connected GPS receiver, or press ☐ No ☐ if you want to continue using the GPS receiver.

When a GPS receiver is disconnected, the Asset Surveyor software turns the receiver off if it is able to do so. If not, you should manually turn off the receiver to avoid draining its batteries. If the connected GPS receiver is a Series 4000 or Site Surveyor 4400 receiver, remember to turn the receiver back on before attempting to re-establish communications with the Asset Surveyor software.

Battery is low

The level of the internal lithium-ion battery is very low. You should recharge or replace this battery immediately. Data may become corrupted if the battery is allowed to run completely dead while the TSC1 datalogger is in use.

Battery level is low. Data may become corrupted if battery is allowed to run dead

The level of the internal lithium-ion battery is very low. You should recharge or replace this battery immediately. Data may become corrupted if the battery is allowed to run completely dead while the TSC1 datalogger is in use.

Best results are obtained by using a receiver with 12 channels

If you start a base station file with an 8-channel Pro XL or Pro XR receiver connected, the Asset Surveyor software warns you that you obtain better results using a 12-channel receiver. If you want to upgrade an 8-channel Pro XL or Pro XR to 12 channels, contact your local Trimble dealer for up-to-date pricing details.

Building list . . . .

The Asset Surveyor software displays this message when a new feature has been opened and a list of attributes is being built for that feature.

Cannot delete current Start/Target

You cannot delete a waypoint while it is selected as the Start or Target. Select a different waypoint or feature as the Start or Target.

Cannot open more than two features simultaneously.

You have tried to open a new feature and an existing feature from the data file as well as a feature from the *Map* screen. Only two features can be open for editing at the same time.

Cannot perform this operation because the file is already open in the Map.

This message appears when you try to open, move, or delete a file which is in use as the background file in the *Map* module. Exit the *Map* module or change the background file.

Cannot perform this operation because the file is not a rover file

This message appears when you try to open a file for data collection which is not a rover file.

Cannot perform this operation because the file is open for data collection.

This message appears when you try to open, move, or delete a file which is open. Close the file first.

Cannot quickmark when logging is paused

This message is displayed if you press Quick to record a quickmark when logging is paused. The quickmark is not recorded. You must return to the position of the feature you tried to quickmark and re-record the feature after resuming logging of GPS positions.

If you want to record a point feature which lies off a line feature or off the perimeter of an area feature, you cannot record the feature as a quickmark (without inserting a spike in the line or area feature), unless you use an offset. It is usually easiest to use the Nest softkey to record point features lying off a line or area feature.

Cannot segment the line when logging is paused

This message is displayed if you press Seg to segment a line when logging is paused. To segment a line, the Asset Surveyor software must record a GPS position. Press Resume to resume logging, then press Seg .

Cannot specify units in a unitless domain

This message is displayed if you type any non-numeric characters (apart from sign characters) into a numeric field which does not permit units to be specified.

Carrier lost hh:mm

This message appears on the status line when the receiver has lost lock on the minimum number of satellites required for carrier phase data collection. The time displayed shows the amount of carrier data that had been logged since the previous loss of carrier information.

Carrier mode is off

This message appears on the GPS status line when you start a file and carrier phase mode is disabled.

Carrier mode is on

This message appears on the GPS status line when you start a file and carrier phase mode is enabled.

Carrier mode should be left on if further features will require carrier precision. Are you sure you want to turn Carrier mode off?

The Asset Surveyor software displays this message to remind you that Carrier mode should be left set to 'On' if further features require carrier precision.

Carrier phase data collection works best when in Overdetermined 3D mode.

This message is displayed by the Asset Surveyor software when a file has been opened with carrier phase enabled and the *Position mode* in *Position filters* is set to anything other than 'Overdetermined. 3D'. Trimble recommends that *Position mode* be set to 'Overdetermined. 3D' for best results when using carrier phase.

Carrier started

This message appears on the GPS status line when a complete carrier phase message is received after the carrier time has been reset.

hh:mm Carrier time

This message displays whenever carrier data is logged and informs you of the amount of carrier data that has been logged since the last time this counter was reset due to a loss on satellite lock.

Check antenna/cable

The Asset Surveyor software displays this message in the status bar whenever the GPS receiver detects that the antenna cable is disconnected or faulty. Connect the antenna cable or replace it if it is faulty.

Check "Real-time input options" for other serial parameters.

This message is displayed to remind you to check the serial parameter settings (*Baud rate*, *Data bits*, *Stop bits* and *Parity*) in the *Real-time input options* form. These settings should match those that you have set in the *NMEA/TSIP output options* form, for configuration to take effect.

Checking activation

This message appears on the status line when you have configured the Pro XRS receiver to receive RTCM corrections using the DGPS satellite component of the receiver. It may take up to ten minutes for the DGPS satellite component to receive confirmation from the satellite that your receiver is activated to receive these corrections.

Checking initialization

The Asset Surveyor software displays this message in the status bar when the receiver is checking the validity of the RTK (Real-Time Kinematic) solution that has been computed.

Clear waypoints file, deleting all current waypoints?

The ⎡DelAll⎤ softkey on the *Review waypoint* menu deletes all waypoints stored on the TSC1 datalogger. This message is displayed when you press ⎡DelAll⎤ to avoid the accidental deletion of all waypoints. Press ⎡Yes⎤ to actually delete the waypoints or ⎡No⎤ to return to the menu of waypoints.

Code accepted!

You have entered a valid DGPS activation code. The DGPS service is now activated.

Code less than <X> digits. Please try again.

The DGPS activation code you have entered does not contain enough digits. Enter the code again.

Communications error

This error message indicates a break-down in communications between the Asset Surveyor software and an external sensor. This may be caused by incorrect or damaged wiring in the cable between the Asset Surveyor software and the sensor, or the sensor operating in an incorrect mode. Check that the communications parameters (under the $\boxed{\text{Comms}}$ softkey, from the external sensor configuration form) are set correctly.

This message may also appear if an external sensor emits data at such a rate that the TSC1 datalogger cannot process the incoming data fast enough to avoid a serial buffer overrun. In this situation, part or all of an incoming data record may be lost. If it is critical that the datalogger be able to log every record emitted by the sensor, it may be necessary to run the sensor at a slower rate.

Configuration file has been reset to factory default settings

All settings in the Asset Surveyor software have been returned to their default settings. When you clear this message the Asset Surveyor software restarts.

Confirm deletion

Whenever you attempt to delete a data file, data dictionary, waypoint, coordinate system, datum, zone or language file, the Asset Surveyor software asks you to confirm that it really is your intention to delete the indicated item. Press <kbd>Yes</kbd> to delete the item or <kbd>No</kbd> to indicate that you either selected the delete operation by mistake, or have decided not to delete the item.

Connect antenna/cable

This message appears on the GPS status line if the Asset Surveyor software detects that the receiver's antenna and/or cable is disconnected, improperly connected, or faulty.

Connect cable to PC

This message is displayed when you select *File transfer* from the Asset Surveyor software's *File manager menu*. It serves as a reminder to connect the TSC1 datalogger to the PC before attempting to transfer files between the two using the GPS Pathfinder Office software.

Connecting to GPS

The Asset Surveyor software displays this message on the status line to indicate that it is attempting to communicate with a GPS receiver. You can press <kbd>Esc</kbd> to cancel an attempt at connection, or wait for the connection attempt to conclude.

Constant offset(s) are active

Whenever you create a new rover file or reopen an existing file, the Asset Surveyor software checks to see if you had previously configured one or more constant offsets. If you had, the Asset Surveyor software warns you by displaying the Constant offset(s) are active message. If you do not want to apply constant offsets to features which you record, select *Constant offset* from the *Configuration* menu and <kbd>Reset</kbd> all of the configured offsets to zero.

Copy failed

This message is displayed when an attempt to copy file(s) from the TSC1 datalogger to the PC card (or vice versa) has failed. In most cases this happens because there is insufficient memory in the PC card or datalogger.

Data dictionary cannot be deleted until files using it are deleted first

When you press ⌐ Del ⌐ on the menu of data dictionaries, the Asset Surveyor software checks that there are no data files on the TSC1 datalogger that are associated with this data dictionary. If one or more data files require(s) this data dictionary, the above message appears and you cannot delete this dictionary. You must transfer the data files concerned to the GPS Pathfinder Office software and then delete these data files from the TSC1 datalogger before you are permitted to delete this data dictionary. The *Open existing file* screen shows which data dictionary is used by the selected data file.

Data dictionary read OK

This message is displayed on the *File transfer* status form when a data dictionary has been transferred from the GPS Pathfinder Office software to the TSC1 datalogger, and the Asset Surveyor software has verified that the data dictionary was transferred correctly and successfully stored on the TSC1 datalogger.

Deleted file

The Asset Surveyor software displays this message after it has successfully deleted a file.

Directory sent

This message appears on the *File transfer* status form, and indicates that the Asset Surveyor software has transmitted a directory of data files to Pathfinder Office.

Disconnect GPS before selecting this option

This message is displayed if you select the *File transfer* entry when the GPS receiver is still connected to (and communicating with) the Asset Surveyor software. You must disconnect the GPS receiver before attempting to perform this operation, as the Asset Surveyor software does not allow file transfer and data collection to be performed simultaneously. Select *Disconnect GPS* from the *Utilities* menu, or simply unplug the GPS receiver and wait until the Asset Surveyor software detects that the receiver is no longer present.

Do you have a <X>-digit activation code to enter?

This message appears when you try to configure certain DGPS services.

Do you want to copy all data files to the datalogger?

The Asset Surveyor software displays this message when you have pressed the ⎕ All ⎕ softkey on the *PC card:Copy file(s)* menu, indicating that you want to copy all of the files on the PC card to the TSC1 datalogger. Press ⎕ Yes ⎕ to confirm this, or press ⎕ No ⎕ to abandon the operation.

Do you want to copy all data files to the PC card?

The Asset Surveyor software displays this message when you have pressed the ⎕ All ⎕ softkey on the *TSC1:Copy file(s)* menu, indicating that you want to copy all of the files on the TSC1 datalogger to the PC card. Press ⎕ Yes ⎕ to confirm this, or press ⎕ No ⎕ to abandon the operation.

Do you want to move all data files to the datalogger?

The Asset Surveyor software displays this message when you have pressed the ⎕ All ⎕ softkey on the *PC card:Move file(s)* menu, indicating that you want to move all of the files on the PC card to the TSC1 datalogger. Press ⎕ Yes ⎕ to confirm this, or press ⎕ No ⎕ to abandon the operation.

Do you want to move all data files to the PC card?

The Asset Surveyor software displays this message when you have pressed the ⌐All⌐ softkey on the *TSC1:Move file(s)* menu, indicating that you want to move all of the files on the TSC1 datalogger to the PC card. Press ⌐Yes⌐ to confirm this, or press ⌐No⌐ to abandon the operation.

Do you want to delete ALL files?

When you press ⌐DelAll⌐ on the *Delete file* menu, the Asset Surveyor software asks you to confirm that you want to delete all of the files displayed. You are asked to reconfirm deletion for any file(s) which have not yet been transferred to the PC.

Do you want to store this feature now?

The minimum number of GPS positions for this feature have not been recorded. The Asset Surveyor software asks you to confirm that you want to stop logging and store the feature. Press ⌐Yes⌐ to store the feature or ⌐No⌐ to continue logging.

Doing fixes

This message appears in the *Status* field of the *Receiver status* form when connected to a GPS receiver which is currently computing GPS positions (that is, is tracking sufficient satellites, with a PDOP lower than the configured mask).

Downloading file

This message is displayed during the first stage of the *upgrade* procedure, when upgrading the TSC1 datalogger to a new version of the Asset Surveyor software.

Duplicate data dictionary name not allowed

The Asset Surveyor software has just received a new data dictionary from the GPS Pathfinder Office software. However, the data dictionary name is identical to the name of an existing data dictionary on the TSC1 datalogger. Delete the old data dictionary from the TSC1 datalogger, then transfer the new data dictionary.

Duplicate filename. Do you wish to overwrite?

You have attempted to move or copy a file to the PC card or the TSC1 datalogger and a file with the same name already resides there. Press ⬜ Yes if you want to overwrite the existing file, or press ⬜ No to abandon the operation.

Duplicate file names are not allowed

The Asset Surveyor software insists that all data files have unique names. This message is displayed if you attempt to create a new rover data file with the same name as an existing data file. The case (upper or lower) of a letter in a file's name is ignored when comparing two names for equivalence.

Entry required

If, when you create a data dictionary in the GPS Pathfinder Office software, you specify *Entry required* for an attribute of a feature, the Asset Surveyor software does not let you save a feature of that type without entering a value for that attribute. If you press ⬜Enter on an attribute entry form when one or more attributes with the *Entry required* flag still have the null value, the Asset Surveyor software displays this error message and directs you to the first attribute requiring an entry.

Error!

An error has occurred. Specific details will follow.

Error opening data dictionary

The Asset Surveyor software is unable to open a data dictionary for use in association with a particular data file. Try deleting that dictionary and transferring it from the GPS Pathfinder Office software to the TSC1 datalogger again.

It is also possible that there is too little data storage space remaining on the TSC1 datalogger to open and cache the data dictionary. In this case, try deleting one or more unwanted data files. If the problem persists, contact your local Trimble dealer for assistance.

Existing offset reset

The offset stored for the current feature has been reset to the default value because you have started to log new GPS data for the feature.

Exit Data collection?

This message is displayed whenever you press ⎡Esc⎦ to exit the rover or base file currently open. Press ⎡Yes⎦ to exit, or press ⎡No⎦ to cancel exiting.

Exit data file and disconnect GPS before selecting File transfer

You must close any open data file and disconnect from the GPS receiver before transferring files to or from your PC.

Exit data file before selecting File transfer

You must close any open rover, background, or data dictionary file before transferring files to or from your PC.

External battery is low

The external (GPS receiver) battery is low. You should complete your current operation as quickly as is practical, and then change the GPS receiver's batteries before reconnecting to GPS.

External sensor data cannot be recorded with more than one feature open.

The software has received external sensor input while two features are open, and is unable to determine which feature to apply this data to. Close the feature for which you do not want to record external sensor input, then send the external sensor data again.

Failed to load coordinate system

Error message that is displayed when a coordinate system fails to load, usually because there is insufficient memory available for the coordinate system in question.

File cannot be closed while this feature is open.

You cannot close a data file while a feature is open for editing or GPS update. Close the feature before closing the file.

File error

An error has occurred while the Asset Surveyor software was performing a file-related operation (reading, writing, or creating a file, for example).

This message may occur when the Asset Surveyor software attempts to write to a data file and the TSC1 datalogger's data storage memory is full. In this case, you should press any key to restart the Asset Surveyor software and then transfer and delete sufficient data files before continuing to collect data.

File is not available for background map display

The file you have selected as the background file in the *Map* module could not be found. The selected background file is set to 'None' instead.

File received

The Asset Surveyor software displays this message when a file has been successfully received from the PC.

File sent

The Asset Surveyor software displays this message when it has successfully transferred a file to the PC.

Floating point number too large

A numeric value which you have entered into a field is too large to be stored or displayed by the Asset Surveyor software.

The Asset Surveyor software can store and display large numeric values, so when this message is displayed, it usually means that you have just typed a value incorrectly, or possibly that you have entered a coordinate using an inappropriate coordinate system (which cannot mathematically represent the point entered).

GPS in 2D mode

This message is displayed when a GPS receiver is connected and operating in the '*Auto 2D/3D' Position mode*, and the receiver switches from computing 3D GPS positions to computing 2D GPS positions.

GPS Update has been prohibited

The *Allow GPS update* field in *Configuration / GPS rover options / Logging options* has been set to 'Never' to prevent GPS update. Set it to 'Always' or 'Warn first'.

Heading locked

This message flashes in the status line in the Navigation screen when your velocity is too low for the Asset Surveyor software to compute a heading. Start moving, or move faster, to unlock the heading.

Heading unavailable

This message flashes in the status line in the Navigation module when the Asset Surveyor software cannot compute a heading. Start moving to acquire a heading.

High RMS

The Asset Surveyor software displays this message in the status line when initializing an RTK solution. RMS is an indicator of the quality of the GPS phase measurements. High RMS indicates that there is high multipath or the initialization may be bad, lost, or not yet gained.

ID sent

The Asset Surveyor software displays this message when it has successfully sent its unique ID to the GPS Pathfinder Office software.

Inappropriate location for map projection

You have entered a coordinate (North/East) which is outside the bounds of the currently selected coordinate system zone. Check that you have selected the appropriate coordinate system and zone. Check that you have entered the coordinate correctly (paying particular attention to signed values). If you are using a custom coordinate system and/or zone, check that you have defined the coordinate system, datum and/or zone correctly.

Initialize in hh:mm

This message is displayed in the status bar to indicate the expected time to go until the receiver initializes for an RTK (Real-time Kinematic) solution.

Initialized

This message is displayed in the status bar to indicate that the receiver has initialized a valid RTK (Real-time Kinematic) solution.

Initializing, please wait

This message is displayed in the status bar to inform you that the receiver is attempting to initialize an RTK solution.

Insufficient carrier data; do you want to close this file now?

This question appears if you attempt to close a data file (which is logging carrier phase data), and the last feature(s) have been collected in a carrier data block which has not surpassed the configured *Minimum time*. Press [Yes] to close the file, or press [No] and wait until the Asset Surveyor software has recorded enough carrier-phase data before attempting to close the file again.

Insufficient GPS positions: do you want to store this feature now?

You have pressed [Enter] to store the details for the current point feature before the Asset Surveyor software has had time to record the required (*Minimum positions*) number of GPS positions. Press [Yes] to store the point feature, or press [No] and wait until the Asset Surveyor software has recorded enough positions before pressing [Enter] again.

Insufficient space to rebuild coordinate system index

The coordinate system index has failed to rebuild due to insufficient memory. You should transfer any data files on the TSC1 datalogger to a PC card or back to your office PC to free up memory so that the index can be rebuilt.

Insufficient SVs

The receiver is not tracking enough satellites to compute a GPS position.

Internal battery is dead

The internal battery in the TSC1 datalogger is dead. Replace the lithium-ion battery or attach the TSC1 datalogger to a charger. You can continue to use the TSC1 if you are connected to a GPS receiver that can power the TSC1 datalogger.

Internal battery is low

The internal battery in the TSC1 datalogger is low. Replace the lithium-ion battery or attach the datalogger to a charger. You can continue to use the TSC1 datalogger if you are connected to a GPS receiver that can power the TSC1.

Invalid activation code. Please try again or contact your service provider

This error message is displayed if you have entered an invalid activation code for your chosen DGPS service. Try again, and if the problem persists, contact your service provider.

Invalid date

The date you have entered is invalid. Check that you have entered the date in the correct format (subject to the *Date format* field in the *Time and date* configuration form).

Invalid file or version

A file on your TSC1 datalogger has an invalid version number. Be careful not to mix files from different versions of the Asset Surveyor software. If the problem persists, contact your local Trimble dealer for assistance.

Invalid time

The time you have entered is invalid. Remember to enter the time as up to three values separated by a space or a colon. You can enter times in either the 12- or 24-hour clock format. If you are entering times using the 12-hour clock, remember to specify 'pm' if the time is after midday. You can configure the way in which times are displayed in the *Time and date* configuration form.

Invalid units

> The unit you have entered is not permitted in the context of the field into which it was typed. Specify the correct units (by pressing the ⬛Units⬛ softkey if necessary).
>
> If you type an alphabetic character into a numeric field by mistake, the Asset Surveyor software mistakes it for a units designator. Edit the field and remove the spurious alphabetic character.

(filename) is open in Data collection and cannot be copied

> The file you have attempted to copy to the TSC1 datalogger or PC card is currently open in *Data collection* and cannot be copied. Press the ⬛Next⬛ key to cycle to *Data collection* and press ⬛Esc⬛ to exit the file. You may then proceed with the copy operation.

(filename) is open in Data collection and cannot be deleted

> The file you have attempted to delete is currently open in *Data collection* and cannot be deleted. Press the ⬛Next⬛ key to cycle to *Data collection* and press ⬛Esc⬛ to exit the file. You may then proceed with the delete operation.

(filename) is open in Data collection and cannot be moved

> The file you have attempted to move to the TSC1 datalogger or PC card is currently open in *Data collection* and cannot be moved. Press the ⬛Next⬛ key to cycle to *Data collection* and press ⬛Esc⬛ to exit the file. You may then proceed with the move operation.

(filename) is open in Data collection and cannot be renamed

> The file you have attempted to rename is currently open in *Data collection* and cannot be renamed. Press the ⬛Next⬛ key to cycle to *Data collection* and press ⬛Esc⬛ to exit the file. You may then proceed with the rename operation.

Laser offsets can only be recorded for features

You attempted to record a laser offset when you were not logging a feature. The Asset Surveyor software only associates offsets with features, so you must start a feature before recording a laser offset.

Less than 5 L2 SVs

The Asset Surveyor software displays this message when attempting to initialize an RTK (Real-time Kinematic) solution. This message indicates that the receiver is tracking an insufficient number (less than five) L2 signal satellites. There may be a large obstruction in the line of sight or more satellites may be low on the horizon.

Logging paused

When you press the ⟨Pause⟩ softkey while logging GPS positions for a point, line, or area feature, the Asset Surveyor software displays this message on the GPS status line. The message continues to flash on the status line until you resume logging by pressing the ⟨Resume⟩ softkey.

Maximum bytes includes the length of the prefix and suffix

The *Max bytes* record length you have specified while configuring an external sensor is less than the combined length of the prefix and suffix strings. Remember that the maximum record length *includes* the length of the prefix and suffix strings.

Memory nearly full

This warning message is displayed once a minute whenever there is less than 20 kb of data storage space left. If you are currently logging data, free up some space by deleting old data files. You can select a file in the *Open existing file* form to determine how much space a data file is using.

Minimum time achieved!

This message is displayed on the status line when the *Minimum time* for carrier phase data has been exceeded.

Move failed

This message is displayed when an attempt to move file(s) from the TSC1 datalogger to the PC card (or vice versa) has failed. In most cases this happens because there is insufficient memory in the datalogger of PC card.

Navigation firmware needs updating

The firmware on your Series 4000 receiver is too old to work with this version of the Asset Surveyor software.

No almanac file available

This message is displayed on the TSC1 datalogger if you try to transfer an almanac file from the datalogger to the GPS Pathfinder Office software, and no almanac file exists on the TSC1 datalogger. The Asset Surveyor software records an almanac from any Pathfinder GPS receiver which has an up-to-date almanac. If you have a Series 4000, Site Surveyor 4400, or GPS Total Station 4800 receiver, the Asset Surveyor software does not record an almanac from the receiver, but you can record an almanac by logging data to the receiver's internal memory and then extracting it as described in the *GIS Surveyor Operation Manual*.

No features found

If you log data to a file whose associated data dictionary contains no features at all, this message is displayed. You can still log GPS positions and external sensor data from external sensors without any associated feature or attribute information.

This message is also displayed if you attempt to review a file which does not contain any features (for example, a base station file).

No files

This message is displayed in place of the menu of available data files when the TSC1 datalogger does not contain any data files.

No GPS

This message appears on the status line in the *Navigation* module when you are not connected to the GPS receiver.

No GPS detected. Check cabling, batteries etc. Do you wish to retry GPS now?

You have either just turned the TSC1 datalogger on, or have selected a GPS-related entry from the *Main menu* (such as *Satellite information*, or *Receiver status*), and have not connected, powered or turned on your GPS receiver. If you do not want to use GPS, press [No]. If you want to use GPS, check that the receiver is connected to the TSC1 datalogger, that the receiver is connected to its batteries (which must be charged) and that the receiver is turned on (if it has an external power button) before pressing [Yes] to retry the GPS connection.

If the Asset Surveyor software again fails to communicate with the GPS receiver, you may have a faulty cable, battery pack or receiver. Contact your local Trimble dealer to have your GPS equipment serviced.

No GPS positions for feature

This message is displayed when you press the [Pos] softkey in *Review file* and the currently highlighted feature has no recorded GPS positions.

No GPS positions recorded. Do you want to store this feature now?

You have pressed [Enter] on an attribute entry form while connected to a GPS receiver, but no GPS positions have been logged for the current feature. The GPS receiver only logs positions if there are sufficient satellites and the PDOP is low enough. You should press [No] and return to the attribute entry form before letting the GPS receiver record GPS positions for that feature. If you press [Yes], the Asset Surveyor software saves the attributes you have entered for the feature, but the GPS Pathfinder Office software ignores the feature entirely (unless you can process the resulting data in such a way as to assign a position to that feature).

No GPS time

The GPS receiver has not yet obtained GPS time from a GPS satellite.

No more files permitted

You have reached the maximum limit on the number of data files, data dictionaries, and language files permitted on the TSC1 datalogger. Transfer your data files to the PC and delete from the TSC1 datalogger any that are not needed.

No Target

This message is displayed whenever you are in a navigation form and have not selected a Target to navigate to. To select a Target press `Target` and choose from the menu of defined waypoints.

No usable SVs

This message appears in the *Status* field of the *Receiver status* form when connected to a GPS receiver and the receiver is tracking no GPS satellites. In this situation, the receiver is unable to compute a GPS position. The GPS receiver may have an old, inaccurate or missing almanac, or the receiver's antenna may be obscured.

Not found

The Asset Surveyor software displays this message when an item search in file review has failed to find the specified item.

Offset received

The Asset Surveyor software has received and decoded an offset measurement from a laser rangefinder.

OLD Navigation

The title of the *Navigation* form displays *OLD Navigation* whenever a current GPS position is unavailable (for example, when there are too few satellites, the PDOP is too high, or the radio link is down).

OLD Position

The title of the *GPS Position* form changes to *OLD Position* whenever a current GPS position is unavailable (for example,. when there are too few satellites, the PDOP is too high, or the radio link is down).

Other windows must be closed before resetting to factory defaults

The Asset Surveyor software displays this message to advise you that any open windows must be closed before you can reset the TSC1 datalogger to factory defaults. Use the ⌜Next⌝ key to cycle to the next open window and press the ⌜Esc⌝ key to close that window. Repeat until all windows are closed and proceed with the factory defaults reset.

Out of range

The value you have entered is outside the permitted range of values allowed for this field. Most numeric fields have tight bounds on the range of values that may be entered. The bounds on numeric attribute values are specified when a data dictionary is created using the GPS Pathfinder Office software.

PC card error

Message advising you that an error has occurred with the inserted PC card. Transfer any files on the PC card to your PC and reformat the card.

PC card hardware error

This message is displayed when the Asset Surveyor software detects a problem with the inserted PC card. Try reinserting the card. If the problem persists the card may need reformatted or replaced.

PC card memory nearly full

This warning message indicates that the memory on the inserted PC card is nearly full. You should transfer the data on the PC card to the GPS Pathfinder Office software before attempting to log further data to the card.

PC card stuck, please wait or reinsert

This message is displayed when the Asset Surveyor software is not communicating properly with the inserted PC card. Wait for it to establish communications or reinsert the PC card.

PDOP is too high

The current PDOP is higher than the configured *PDOP mask*, and the GPS receiver is no longer computing GPS positions. For a discussion of the effect of satellite geometry on the accuracy of GPS positions, refer to the *Mapping Systems General Reference* manual.

Please charge the internal battery before upgrading

The Asset Surveyor software displays this message if you attempt to upgrade the software using the TSC1 datalogger's internal lithium-ion battery, and the battery level is below 50%. Recharge the battery before proceeding with the upgrade.

Please configure the current time and date

The Asset Surveyor software displays this message every five minutes if the TSC1 datalogger's internal clock is set to a time or date which is known to be incorrect because it is set prior to the release date of the Asset Surveyor software. You can reset the TSC1 datalogger's internal time and date in the *Time and date* configuration form.

Please delete all files before upgrading

You have attempted to upgrade the TSC1 datalogger and there are files still on the datalogger that must be transferred and/or deleted before the upgrade can commence.

Please exit Data collection before resetting receiver

This message appears when you attempt to reset the GPS receiver while *Data collection* is open. Exit *Data collection* before selecting the *Reset GPS receiver* entry in *Utilities*.

Please exit data file and disconnect GPS before commencing upgrade

This message appears when you attempt to upgrade the software on the TSC1 datalogger and the TSC1 is connected to GPS with a data file open. Exit the data file and disconnect from GPS (use the *Disconnect GPS* entry in *Utilities*) before attempting to upgrade the TSC1 datalogger.

Please wait . . . Processing

The Asset Surveyor software displays this message whenever it is busy performing a long operation.

Poor ratio

The Asset Surveyor software displays this message in the status line when it is attempting to initialize a fixed RTK (Real-time Kinematic) solution. During initialization, an RTK-capable receiver determines the integer number of wavelengths for each satellite and for any particular set of integers it calculates a ratio, or probability, that it is the correct set, by comparing it to the next best integer set. A high ratio gives the user confidence that the integer set used to provide an RTK solution is much better than any other set. The Poor ratio message indicates that the integer solution currently being computed is not good enough to provide a fixed RTK solution.

Port is currently in use. Check all communication settings

This message is displayed when you attempt to use a serial port on the TSC1 datalogger that is already in use elsewhere in the Asset Surveyor software. Check all communication settings.

Position is out of the current coordinate systems boundaries

This message is displayed when you receive a position from the GPS receiver that is outside the boundaries of the currently selected coordinate system. Check that the selected coordinate system in *Configuration* / *Coordinate system* is appropriate for your current location.

Press OFFSET before using the laser

You attempted to record a laser offset while logging a line or area feature. The Asset Surveyor software requires you to be viewing the offset form for this feature are the time you record the laser offset (so that it can be sure that you remember to enter a value into the *Direction* field). The offset form is accessible by pressing ⌷Offset⌷ .

Processing

This message appears when the Asset Surveyor software is performing a processing operation which may take some time. Press ⌷Esc⌷ to cancel.

Quickmark: <feature>

This message appears in the status line when a quickmarked feature is stored. It indicates the feature type you have quickmarked.

Quickmark position outside five second limit

When you press ⌷Pos⌷ to review the position of a quickmark feature, the Asset Surveyor software displays the above message if the GPS positions which bracket the quickmark feature are not within 5 seconds of the quickmark. This occurs because GPS positions were unavailable just after the quickmark was recorded (for example, due to insufficient satellites, high PDOP or radio link loss).

Radio link down

Real-time (RTCM or RTK) corrections are not being received by the GPS receiver, or have not been received for a period in excess of the configured real-time *Age limit*. Check that the telemetry link is still attached to the GPS receiver, is turned on, and is still being powered. It is possible that the telemetry link has been obstructed (for example, by a hill, a building or other physical obstructions), that the base GPS receiver or transmitter have ceased operating, or that your roving GPS receiver is using one or more satellites which are not visible to the base receiver.

Recording almanac

The Asset Surveyor software is currently recording an up-to-date almanac from the connected Pathfinder GPS receiver. The almanac contains satellite orbital information which can be sent to the receiver at a later date to make sure rapid acquisition of satellites, and can also be transferred to the PC for use in mission planning.

Recording ephemeris

The Asset Surveyor software is recording the most up to date satellite information for a particular satellite (which has either just been acquired by the receiver, or has just transmitted updated ephemeris information). The Asset Surveyor software briefly stops recording GPS positions while it receives and logs the up-to-date ephemeris information. This information is crucial to high-accuracy differential correction.

When you start logging data to a file, the Asset Surveyor software records ephemeris information for all visible satellites. This takes a few seconds, after which GPS positions can be logged.

Reset GPS receiver?

The Asset Surveyor software displays this message when you select the *Reset receiver* entry from the *Utilities* menu. Press ⌐Yes⌐ to reset the GPS receiver to its default settings.

Reset to factory defaults

The Asset Surveyor software displays this message when you select the *Factory defaults* entry from the *Utilities* menu. Press ⌐Yes⌐ to reset the Asset Surveyor software to the default configuration it was shipped with.

RTK=Fixed

A fixed RTK solution has been computed.

RTK=Float

A float RTK solution has been computed.

Search aborted

You have interrupted a search in the *Review data* list by pressing ⌨Esc.

Searching...

The Asset Surveyor software is searching through a data file for a particular feature or attribute value.

Sending almanac

This message appears on the status line when the Asset Surveyor software loads a pre-recorded almanac into a GPS receiver, to make sure that the receiver acquires satellites quickly.

Sensor data can only be recorded while viewing an open feature

You have activated an external sensor while there is no open feature. Sensor data must be stored into an attribute field of an open feature.

Sorry, GPS time required before creating a data file

Before the Asset Surveyor software lets you create a data file for the first time (since installation or since you last reset the memory of your datalogger), it must align the datalogger's clock with GPS time. You should connect your GPS receiver and let the Asset Surveyor software record a GPS time before again attempting to create a new data file.

Sorting

This message appears while the Asset Surveyor software sorts a data file.

Start moving

This message appears at the top of the current *Navigation* module screen when your velocity is too low for an accurate GPS heading to be computed. Start moving, or move faster. The minimum velocity with autonomous GPS is 0.6 meters/second. With DGPS it is 0.2 meters/second.

Storing data

The Asset Surveyor software is busy storing data for the feature which is being saved.

The external battery is dead

When the battery voltage being supplied to your GPS receiver drops below a specified level, it may begin to operate unreliably or to suffer internal damage. To avoid such problems, the Asset Surveyor software ceases communicating with the connected GPS receiver and powers the receiver off, if possible.

Table 3.1 lists applicable GPS receivers and their threshold voltages. Other receivers have built-in protection from low voltages.

Table 3.1   GPS Receivers and their voltages

GPS receiver	Threshold voltage
GPS Pathfinder Pro XL	10.5 V
GPS Pathfinder Pro XR	10.0 V
GPS Pathfinder Pro XRS	10.0 V

The external battery is low

The external (GPS receiver) battery is low. You should complete your current operation as quickly as is practical, and then change the GPS receiver's batteries before reconnecting to GPS.

The file cannot be filtered by attribute and feature type at the same time.

You have attempted to enable both the attribute and feature filter. Either the attribute filter or the feature filter can be active, but not both at the same time.

The geoid model you have selected may not give the accuracies that you require

This message is displayed to remind you that the selected geoid model may not provide the required accuracy.

The internal battery is low

This warning message is displayed every minute when the power in the TSC1 battery is getting low. The battery should be replaced or recharged as soon as possible so that the Asset Surveyor software may continue to be used.

The Minimum time has not yet been achieved. Are you sure you want to turn Carrier mode off?

This message is displayed to remind you that the configured Minimum time has not yet been achieved and that features collected since the last loss of carrier lock may not meet your desired accuracy requirements if the logging of carrier is discontinued.

The start time is later than the end time

You have selected a start time for your time filter that is later than the end time. The start time cannot be later.

This feature has not yet been collected

This message is displayed when you try to repeat a feature in *Data collection* and a feature of that type has not yet been recorded to the current data file.

This feature is already open elsewhere.

This message is displayed when you try to open a feature from the *Map* screen or the *Review data* list, and the feature is already open in the other module.

This file has not been transmitted to the PC

When you select a file from the *Delete file(s)* menu, the Asset Surveyor software checks that the file has been output to the GPS Pathfinder Office software. If not, it displays the above message. Press ⌈ Yes ⌋ to delete the file if you really do not want to output it to the PC.

This PC card is not supported

This error message is displayed when the Asset Surveyor software has failed to recognize the inserted PC card as a supported card. Try re-inserting the card, or replace the card with one that is supported by the Asset Surveyor software.

This PC card needs formatting

This error message is displayed when the Asset Surveyor software has detected a PC card which must be formatted before it is readable.

This receiver can not output the configured RTK record type

This message is displayed when real-time output has not been enabled for the connected GPS receiver. The receiver is unable to output RTK messages until real-time output is enabled.

This receiver does not connect. It is not supported by Asset Surveyor

This message appears when you try to connect to a receiver that is not supported by the Asset Surveyor software.

This unit is not licensed for Asset Surveyor. Entering monitor mode.

You have attempted to run an unlicensed copy of the Asset Surveyor software.

Timed out

Communications with an external sensor or GPS receiver has timed out unexpectedly. This occurs when the Asset Surveyor software receives only part of a data record from the sensor or receiver. Check that the cabling is still connected and that the sensor or receiver is still powered and turned on.

Too few SVs

There are insufficient satellites (SVs) to compute a GPS position. At least four satellites are required for a 3D position, and three for a 2D position. If you have configured the Asset Surveyor software to use the Overdetermined 3D position mode, where only overdetermined positions are logged, then at least five satellites are required to compute a position.

Transfer aborted

This message is displayed on the *File transfer* status form if you cancel the transfer of a file in the GPS Pathfinder Office software.

Unable to append to a file over one week old

This error message is displayed if you attempt to log data to a file which was created over one week ago. You must create a new data file (possibly using the same data dictionary as is associated with the older data file) and use it to collect data.

Unable to connect

The Asset Surveyor software was unable to connect to the indicated external sensor. Another sensor or a GPS receiver may already be connected on that serial port.

Unable to delete. This coordinate system is currently in use.

You are trying to delete a coordinate system that is being used by an open data file. Close the data file before deleting the coordinate system.

Unable to open top (bottom) serial port. This port may already be in use

This message indicates that the Asset Surveyor software was unable to connect to the chosen sensor or GPS receiver, probably because that serial port is already in use by another external sensor or GPS receiver. Reconfigure the external sensor to use another TSC1 serial port.

Unable to quickmark

The Asset Surveyor software displays this message on the GPS status line if you press the ⌧Quick⌧ softkey at a time when there is no current GPS position available (for example, due to a high PDOP). In these conditions, the Asset Surveyor software cannot record a quickmark.

You should return to the location of the feature in question and re-record it, either as a normal or nested point feature, or (if you have altered your masks or you believe that the GPS satellite visibility has improved) by trying to quickmark the feature again.

Update GPS data for this feature?

If you have the *Allow GPS update* option set to 'Warn first', this message appears when you press ⌧Log⌧. Press ⌧Yes⌧ to update the feature's GPS position, or ⌧No⌧ to cancel the update.

Use "Connect GPS" in the "Utilities" menu to reconnect the GPS

This message appears whenever you disconnect the GPS receiver, as a reminder that you can select the *Connect GPS* entry in *Utilities* to prompt the Asset Surveyor software to establish communications with the GPS receiver once again.

User access currently disabled. Please contact your DGPS service provider

This message is displayed when the receiver has established that your DGPS user access is currently disabled. Contact your service provider to have your activation enabled.

Validating

The Asset Surveyor software is busy validating the attribute values that you have entered prior to saving the feature into the data file. While most validation occurs while you are entering attributes, some checks are only possible once all the data has been entered. These checks are performed at this stage.

This message also appears when you have altered fields in a configuration form and then pressed ⏎Enter to save the changes.

Value invalid for DD.MMSSss format when entering angles

You have entered an invalid value into an angle or latitude/longitude field, and the current configured *Angles* setting is 'DD.MMSSss'. This format for angles requires you to specify each of the components of the angle in sequence, remembering to precede values less than 10 with a 0. For example, the value 23°6'8.56" would be entered as 23.060856.

The 'DD.MMSSss' format for entry of angles should not be confused with the entry of angles as decimal degrees ('DD.ddd') or as degrees and decimal minutes ('DD MM.mmm').

Value with no associated unit

You have entered too many values, separated by spaces, into a numeric field with associated units. For example, entering '1 2 3 4' into a field that expects values as degrees, minutes and seconds produces this error message; the Asset Surveyor software does not know what units to assign to the fourth value.

Wait until a range has been recorded before releasing the laser trigger

When using a ProSurvey 1000 laser rangefinder, it is necessary to press and hold the trigger for 1–2 seconds to let the laser take a measurement to the target. If you press and release the trigger too quickly, the Asset Surveyor software warns you with the above message.

Waiting for base

This message is displayed in the status bar when the receiver is attempting to initialize for RTK (Real-time Kinematic) operation but it has yet to receive the coordinates for the RTK base station.

Waiting for satellites

This message is displayed in the status bar when the receiver is attempting to initialize for RTK (Real-time Kinematic) operation but there are insufficient satellites being tracked for a solution to be derived.

Waypoint received

This message is displayed on the *File transfer* status form when a waypoint is transferred from the GPS Pathfinder Office software to the TSC1 datalogger.

Waypoint sent

This message is displayed on the *File transfer* status form when a waypoint is transferred from the TSC1 datalogger to the GPS Pathfinder Office software.

You cannot append to this base file while Real-time output mode is set to On

This error message appears if you try to append to a base file when *Real-time output mode* is configured to 'On'.

You have edited an offset. Do you need to update the feature's GPS before moving away?

If you update the offset for a feature without updating its GPS, you must be very careful to return to the exact location where the feature position was recorded. It is often easier to update the GPS position as well as any offset.

You must enable real-time output to operate a base station with this receiver

This message is displayed by the Asset Surveyor software when you are connected to a receiver which only supports real-time base station operation. Set the *Real-time output mode* field in the *Real-time output options* form to 'On' before attempting to open a base file.

You must exit Antenna options first

This message advises you that you must exit the *Antenna options* form before attempting the selected operation. Use the [Next] key to cycle to the *Antenna options* form and press [Esc] to exit the form, before attempting the selected operation.

You must exit File transfer first

This message advises you that you must exit *File transfer* before attempting the selected operation. Use the [Next] key to cycle to the *File transfer* screen and press [Esc] to exit the form, before attempting the selected operation.

You must exit Reference position first

This message advises you that you must exit the *Reference position* form before attempting the selected operation. Use the [Next] key to cycle to the *Reference position* form and press [Esc] to exit the form, before attempting the selected operation.

You must exit Review before starting Data collection

This message advises you that you must exit *File review* before you can open a file for data collection. Use the [Next] key to cycle to the *Review file* screen and press [Esc] to exit the form, before attempting to open a file for data collection.

You must exit the Coordinate system file menu first

This message advises you that you must exit the coordinate system setup form before attempting the selected operation. Use the [Next] key to cycle to the coordinate system screen and press [Esc] to exit the form, before attempting the selected operation.

You must exit the Coordinate system menu first

This message advises you that you must exit the *Coordinate system* menu before attempting the selected operation. Use the [Next] key to cycle to the *Coordinate system* screen and press [Esc] to exit the form, before attempting the selected operation.

You must exit the filters configuration form before closing the file

This message advises you that the configuration menu or form for filters is still open and must be closed before you can exit data collection. Use the [Next] key to cycle to the *Filters* menu or the *filtering* form and press [Esc] to close it, before attempting to close the file again.

You must exit the Note form before exiting data collection

This message advises you that the *Enter note* form in the *Utilities* module is still open and must be closed before you can exit data collection. Use the [Next] key to cycle to the *Enter note* form and press [Esc] to exit the form before attempting the selected operation.

You must exit the symbols configuration form before closing the file

This message advises you that the configuration menu or form for point symbols is still open and must be closed before you can exit data collection. Use the [Next] key to cycle to the *Symbols* menu or *Point feature symbols* form and press [Esc] to close it, before attempting to close the file again.

You must restart base file for the real-time output changes to have effect

This error message appears when you configure the *Real-time output mode* to '*On*' while a base station file is already open. You must exit and restart the base file for changes to real-time output to take effect.

Your DGPS activation will expire after the following time in use: <X>. Contact your service provider to renew your subscription.

This message appears each time you connect to the receiver to remind you how much time is remaining before your activation expires.

Your DGPS activation will expire in the following number of days: <X>. Contact your service provider to renew your subscription.

This message appears each time you connect to the receiver to remind you of the date that your activation expires.

Asset Surveyor Limits

In this chapter:

- ■ Introduction
- ■ Limits

Introduction

While the Asset Surveyor system is extremely flexible, it does operate within certain limits, imposed either by the computer on which it runs, or by its internal architecture. Most of these limits do not normally restrict your operation of the system. Even if your application stretches the Asset Surveyor software's capabilities to the limit, you can generally configure your Asset Surveyor system or your Data Dictionaries in such a way that you can avoid any operational restrictions.

Limits

The following limits apply to the Asset Surveyor software.

Maximum Features per Data Dictionary

Each data dictionary can define up to 254 types of geographic feature.

Maximum Attributes per Feature

Each feature can have up to 254 attributes.

Maximum Values per Menu Attribute

Each menu attribute can theoretically have up to 65,535 values, not counting the optional null value.

Maximum Features for Map Cursor Operation

The map cursor can only be used to select features if the currently open data file contains 5,000 or fewer features.

Numeric Attribute Values

The magnitude of numbers which can be entered as attribute values can not exceed ±999,999,999,999,999. All numeric attributes actually impose a range of permitted values which may be more restrictive than this maximum range.

Character String Attribute Values

The maximum length of a character string attribute value is 100 characters. All character string attributes actually impose a limit on the length of that attribute value which may be shorter than the maximum length.

Length of Notes

A note entered in the Asset Surveyor software can be at most 250 characters long.

Data Storage Space

The TSC1 datalogger comes with 2 MB of total memory, providing approximately 1,730 KB for storage of data files.

Note – When the TSC1 datalogger's memory becomes completely full, the Asset Surveyor software displays the message File error *and waits for you to press a key. It then reboots the TSC1 to make sure that the Asset Surveyor software restarts cleanly. You should transfer your data file(s) to your office PC and delete them from your TSC1 datalogger before using the Asset Surveyor software for further data collection.*

Maximum Data Files

As well as the restriction imposed by the data storage capacity of the TSC1 datalogger, the Asset Surveyor software permits a maximum of 120 data files.

Maximum Waypoints

The Asset Surveyor software permits a theoretical maximum of 32,767 waypoints to be defined at any time. In practice, the Asset Surveyor software begins to operate more slowly as you add more waypoints to its list. Operation of the software with up to 1000 waypoints is typically quite acceptable. You should generally try to delete unused waypoints to keep the list to a manageable size.

Maximum External Sensors

When using a TSC1 datalogger with a Pro XL, Pro XR, Pro XRS, 4600LS, GPS Total Station 4800, Series 4000, or 4400 GPS receiver, you can connect only one external sensor at any given time.

Maximum Coordinate Systems

There can be at most 65,535 coordinate systems defined, including the built-in *Latitude/Longitude* coordinate system.

Maximum Zones per Coordinate System

There can be at most 65,535 zones for each coordinate system.

Maximum Datums

There can be at most 65,535 datums defined.

Maximum Language Files

The theoretical maximum number of languages that the Asset Surveyor software could support at one time is 254.

Maximum Age for a Data File

You can log data to a file for up to seven days after the file was created. After seven days, the Asset Surveyor software does not let you log further data to the file (although you are allowed to review and edit it). This restriction is due to a technical limitation related to the way in which GPS times are stored. In order to maintain full accuracy of storage, it is necessary to limit the time-span of a data file to seven days. If the Asset Surveyor software displays the message Sorry. Unable to append to a file over one week old, you should create a new data file and log data to that file, or transfer the file to the GPS Pathfinder Office software and then transfer it back to the Asset Surveyor software, to change its status to Imported.

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