GETTING STARTED GUIDE

TerraSync™ software

Version 5.61
Revision A
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TerraSync Software

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TerraSync Software

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Contents

1 Introduction . . . 13

Documentation conventions . . . 14
About the TerraSync software . . . 14
TerraSync software editions . . . 15
Finding additional information . . . 15
Technical assistance . . . 16
Technical support . . . 16
Windows error reporting . . . 16

2 Software Installation and Activation . . . 17

System requirements . . . 18
Computer specifications . . . 18
Required software . . . 18
Registering the TerraSync software . . . 19
Obtaining your installation code after registration . . . 23
Installing the TerraSync software . . . 24
Installing the TerraSync software onto a handheld device . . . 24
Installing the TerraSync software onto an office computer running a Windows operating system . . . 28
Activating the TerraSync software . . . 29
Starting the TerraSync software . . . 32
Updating the TerraSync software . . . 32
Installing a translation of the TerraSync software . . . 32
Install fonts onto the mobile device . . . 33
Compatible GNSS receivers . . . 34
Connecting to a receiver . . . 34
Connecting to external real-time correction devices . . . 35

3 User Interface and Data Entry . . . 37

Using the Windows operating system . . . 38
Using the Windows Mobile or Windows Embedded Handheld operating system . . . 38
Adjusting the backlight . . . 38
Working with other applications . . . 38
Using the on-screen keyboard . . . 39
Device Lock utility . . . 39
Starting and exiting the TerraSync software . . . 40
Section structure . . . 41
The TerraSync software display . . . 42
Status bar . . . 42
Interacting with the TerraSync software . . . 47
Screens . . . 47
Graphical screens . . . 48

Forms . . . 48
Lists . . . 49
Buttons . . . 50
Keyboard shortcuts . . . 51
Data entry fields . . . 53
Auto-incrementing attributes . . . 57
Pop-up messages . . . 58
Tooltips . . . 58
Sound . . . 59
Color . . . 61

4 Software Structure . . . 63

Introduction . . . 64
Sections . . . 64
Panes . . . 66
Section structure . . . 66

5 Map Section . . . 67

Elements and controls in the Map section . . . 68
Map tools . . . 73
Map layers . . . 74
Background Files form . . . 75
Multiple background files . . . 76
Web map server . . . 76
Layer Formatting form . . . 79
Enter Coordinates form . . . 80
Using the Map section . . . 81
Selecting features, map points, and waypoints . . . 82
Panning . . . 82
Zooming . . . 83
Capturing point features using QuickPoint mode from the Map section . . . 84
Creating and ending features from the Map section . . . 84
Digitizing positions . . . 85
Measuring . . . 87
Setting and clearing the navigation start and target . . . 87
Controlling logging from the Map section . . . 89

6 Data Section . . . 91

New File screen . . . 92
Confirm Antenna Height form . . . 93
Base Station Setup wizard . . . 94
Collect Features screen . . . 97
Collect features in QuickPoint data collection mode . . . 97
Collect features in Log Now or Log Later data collection mode . . . 97
Collect Base Data form . . . 99

Base File Logging Settings form 100
Attribute entry form 101
Pausing and resuming logging 104
Offset form 104
Distance-Bearing Offset form 105
Distance-Distance Offset form 106
Triple Distance Offset form 107
Bearing-Bearing Offset form 108
Triple Bearing Offset form 109
Vertex form 110
Logging Interval form 111
Continue Feature form 112
Existing Files screen 113
Update Features screen 114
Attribute entry form for existing features 117
Update status 117
Marking a feature as updated 118
Updating positions 118
Filter By form 119
Filtering features 121
Construct Target Offset form 123
File Manager 124
Send via E-mail form 127
Receive via E-mail form 128
Read from Shape form 129
Write to Shape form 131
Extract Data form 132

7 Navigation Section 133

Navigate 134
Direction Dial 134
Close-up screen 136
Lightbar 138
Information fields 140
Message line 142
Navigation Options form 143
Waypoints 144
Waypoint Files screen 144
New Waypoint File form 145
Waypoint List screen 145
New Waypoint form 147
Edit Waypoint form 150

8 Status Section 151

Skyplot 152

Skyplot 152
SNR graph 154
Satellite geometry indicator 154
Information fields 155
Message line 155
GNSS settings area 156
Satellite Information 157
Information fields 158
Receiver 158
Real-time 161
Real-time Summary screen. 161
Setup button. 163
External Source status screen 163
External Beacon status screen. 164
Integrated Satellite status screen 166
Integrated SBAS status screen. 168
Integrated RTK Radio status screen 168
Sensor 170
Comms 170
Time 171
About 172

9 Setup Section. 173

Setup screen 174
Configuration files 176
Choose Configuration form 177
Enter Password form 178
Logging Settings form 178
Accuracy Settings form 180
Antenna Settings form 181
GNSS Settings 183
Using Smart Settings. 183
Configuring custom GNSS settings. 184
NMEA Output Settings form. 186
RTK Precision Settings form 187
Real-time Settings form 188
External Source Settings form. 192
Receiver Port Settings form 195
Serial Port Settings form 197
Select Server form 197
Integrated OmniSTAR Settings form. 199
Integrated SBAS Settings form 200
RTK Radio Settings form 201
Coordinate System 203
Units 205

External Sensors . . . 206
Sensor Properties form . . . 207

10 High-Accuracy Data Collection . . . 211

Introduction to carrier phase GNSS . . . 212
Carrier phase techniques compared . . . 213
H-Star technology . . . 213
Carrier phase postprocessing . . . 213
Real-time kinematic (RTK) . . . 214
Principles of carrier phase data collection . . . 215
Carrier lock . . . 215
Initialization . . . 215
Carrier blocks . . . 215
The relationship between time and accuracy . . . 217
H-Star technology workflow and required infrastructure . . . 218
Required infrastructure for H-Star technology . . . 218
Configuring the TerraSync software to collect H-Star data . . . 219
Collecting sufficient high-accuracy data . . . 220
Carrier phase postprocessing workflow and required infrastructure . . . 222
Required infrastructure for carrier phase data . . . 222
Collecting sufficient high-accuracy data . . . 222
Real-time kinematic workflow and required infrastructure . . . 223
Required infrastructure for RTK . . . 223
Configuring the TerraSync Centimeter edition software for RTK data collection . . . 224
Collecting sufficient high-accuracy data . . . 225
Using corrections from a VRS network . . . 226
Connecting to a VRS network using an Internet connection . . . 227
Connecting to a VRS network using a direct dial connection . . . 233

A Advanced Datalogging Options . . . 237

Data collection modes . . . 238
QuickPoint Data collection mode . . . 238
Log Now and Log Later data collection modes . . . 238
Recording between feature positions . . . 239
Continuing line and area features . . . 239
Offsets . . . 240
Complex offsets . . . 242
Recording a complex offset . . . 243
Distance-distance offset . . . 244
Bearing-bearing offset . . . 245
Triple bearing offset . . . 245
Using a laser rangefinder to record offsets . . . 246
Using an external sensor . . . 246
Repeating features . . . 247
Segmenting line features . . . 247

Recording averaged vertices 248
Enhanced support for adding image files as attributes to features. 249

B Coordinate Systems 251

Modelling the earth's surface 252
Geoids and ellipsoids 252
Coordinate systems and datums 254
Transforming and projecting collected GNSS positions 255
Transforming real-time corrected GNSS positions 255
Coordinate systems available in the TerraSync software 257
Using the Coordinate System Manager utility 257
Transferring coordinate systems 258
Transferring a coordinate system export file. 258
Transferring a single coordinate system 259
Configuring coordinate systems. 260

C Setting up a Base Station 261

Logging base data to a file 262

D Troubleshooting 263

Communications 264
Field computer 265
GNSS 266
Real-time differential correction. 268
Data files 269
Map screen 270
Coordinate system 271
Position accuracy 272

Glossary 273

CHAPTER

1

Introduction

In this chapter:

- Documentation conventions
- About the TerraSync software
- TerraSync software editions
- Finding additional information
- Technical assistance

Welcome to the *TerraSync Software Getting Started Guide*. This guide provides:

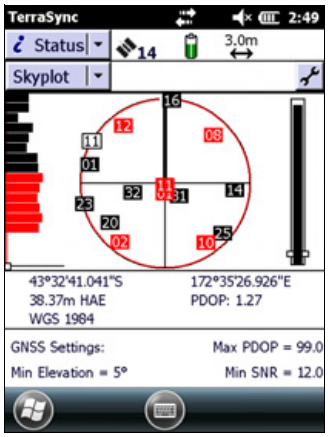
- an overview of the Trimble® TerraSync™ software
- a guide to the user interface and general operation of the TerraSync software

Even if you have used other Global Navigation Satellite System (GNSS) or Global Positioning System (GPS) products before, Trimble recommends that you spend some time reading this guide to learn about the special features of this product.

This publication assumes that you know how to use the Microsoft® Windows® operating system that you are using.

Documentation conventions

The documentation shows the TerraSync software as it appears on a portrait orientation handheld, powered by the Windows Mobile® 6.5 operating system, with a 480 × 640 pixel screen. In landscape orientation, some software items are displayed differently. However, there is no functional difference between the displays.



Portrait orientation (480 x 640)

Landscape orientation (640 x 480)

About the TerraSync software

The TerraSync software collects and updates geographical data (GIS and spatial data) on a field computer.

Use the TerraSync software to track GNSS status, log new data and update existing data, and navigate in the field.

The TerraSync software acts as the ***controlling software***. It communicates with the GNSS receiver, allowing you to set GNSS parameters in the receiver, record GNSS positions on the field computer, and update existing GIS data.

The software can be used with a wide variety of real-time differential correction sources. All supported GNSS receivers receive real-time correction messages from a real-time differential correction source, allowing integrated support for Satellite Based Augmentation Systems (SBAS) such as WAAS, EGNOS and MSAS. The SBAS corrections are used directly by the GNSS receiver.

Note – *For specific details of SBAS support for your receiver, refer to the documentation for your receiver.*

For externally-sourced corrections, you can use an external receiver, a radio link to an external data radio, or use a cellphone or the handheld's integrated modem to dial an Internet Service Provider and then download the corrections from an Internet server.

Trimble office software (the GPS Pathfinder® Office software) works with the TerraSync software. Use the office software to create data dictionaries, transfer data, import and export files, and postprocess collected GNSS data.

TerraSync software editions

The TerraSync software is available in three editions: Standard, Professional, and Centimeter. The TerraSync Professional and Centimeter editions offer several additional useful features; you can:

- update imported data files, including:
  - SSF files transferred from TerraSync Standard edition software using the Trimble Data Transfer utility.
  - data files created from Shapefiles.
  - data files received by email.
- display background images or data files in the Map section.
- use an external sensor (including laser rangefinders) when collecting data.

With the Centimeter edition you can also use a survey receiver to collect RTK data.

If you have purchased the TerraSync Standard edition software and would like to use the additional functions provided in the Professional edition, you can upgrade your software to the TerraSync Professional edition software.

If you have purchased the TerraSync Professional edition software and would like to collect RTK data, you can updgrade to the TerraSync Centimeter edition. You cannot upgrade directly from the Standard edition to the Centimeter edition. For upgrade pricing details, contact your local Trimble reseller.

This manual describes the TerraSync Centimeter edition software. If a feature or option it describes is not available in the TerraSync Standard or Professional edition software, this is indicated with a note at the beginning of the relevant section.

The TerraSync software user interface can also be customized using the TerraSync Studio in the GPS Pathfinder Office software. This means that some sections or options in the TerraSync software can be hidden from the user. If a section or option described in this manual can be hidden from the user, this is indicated with a note at the beginning of the relevant section.

Finding additional information

In addition to the *TerraSync Software Getting Started Guide* (this document), *TerraSync Software Release Notes* are also available. The *TerraSync Software Release Notes* describe new features in this version of the software and any changes to the documentation, and provide any information not included in the product documentation. The release notes are available as a download from the TerraSync software technical support page (www.trimble.com/mappingGIS/terrasync).

Technical assistance

If you have a problem and cannot find the information you need in the product documentation, contact your Trimble reseller.

Technical support

Go to the TerraSync software technical support page (www.trimble.com/mappingGIS/terrasync) for the latest support information about the software, including:

- Support notes detailing the latest support issues
- Documentation
- The latest files available for download

Windows error reporting

If a Microsoft Windows Error Reporting dialog appears, indicating that the TerraSync software has encountered a problem and needs to close, you are asked whether you wish to send an error report to Microsoft.

Trimble recommends that you click **Send** and then click any subsequent links that are used to obtain additional information.

Trimble can access the report that is sent to Microsoft and use it to improve the TerraSync software.

CHAPTER

2

Software Installation and Activation

In this chapter:

- System requirements
- Registering the TerraSync software
- Installing the TerraSync software
- Activating the TerraSync software
- Updating the TerraSync software
- Installing a translation of the TerraSync software
- Compatible GNSS receivers

This chapter describes how to install and activate the TerraSync software on a handheld device powered by the Windows Mobile or Windows Embedded Handheld operating system, or onto an office computer that is running a Windows operating system.

To install and run the TerraSync software, you must:

1. Make sure your handheld or office computer meets the minimum platform requirements for successful operation of the TerraSync software.
2. Register the Proof-of-Purchase Number (POPN) that you received when you purchased the TerraSync software, and obtain an installation code.
3. Download the software, and install it using the installation code you obtained when you registered your POPN.
4. Activate the software on the office computer, and on the handheld device depending on the operating system.

System requirements

Computer specifications

The TerraSync software runs on handheld devices powered by the Windows Mobile 6, 6.1, and 6.5 operating systems, and the Windows Embedded Handheld 6.5 operating system.

The TerraSync software runs on computers running any of the following Microsoft operating systems, including 64-bit variants:

- Window 8 and 8.1
- Windows 7 (Ultimate Edition, Professional Edition, or Home Premium Edition SP1)
- Windows Vista® (Ultimate Edition, Enterprise Edition, Business Edition, or Home Premium Edition SP2)
- Windows XP (Professional Edition, or Tablet PC Edition SP3).

Required software

To install the TerraSync software onto a device powered by the Windows Mobile or Windows Embedded Handheld operating system, and to transfer files between a desktop computer and a mobile device, you must have the appropriate Microsoft software installed on your computer or Tablet PC. The software you use to manage the connection between the device and the computer depends on the operating system the office computer is running. If the computer is running:

- Windows Vista® , Windows 7, 8, or 8.1 make sure you have downloaded and installed the Windows Mobile Device Center.
- Windows XP, make sure you have installed the appropriate version of Microsoft ActiveSync® technology.

For more information, see Step 1: Install Microsoft connection management software onto the computer, page 24.

To transfer files between a desktop computer and a field computer running the TerraSync software, you must also have one of the following installed on the desktop computer:

- the Trimble Data Transfer utility, which is available to download from www.trimble.com/datatransfer/
- the Trimble GPS Pathfinder Office software, version 5.10 or later

Registering the TerraSync software

Before you can install the TerraSync software, you must register the POPN that you received when you purchased the software. You will then receive an installation code that you enter during the installation process.

You can only register your POPN once. For information about obtaining your installation code when your POPN has previously been registered, see Obtaining your installation code after registration, page 23.

Trimble recommends that you register ***before*** beginning installation.

To register, you need:

- the Proof-of-Purchase Number (POPN) from the POPN certificate that you received by email or from your Trimble reseller when you purchased the TerraSync software
- Internet access (including a valid email address)

Note – *If you do not have Internet access, contact your local Trimble reseller for assistance.*

To register your POPN for the TerraSync software:

1. Go to the My Trimble account login page.

   To do this, open your Web browser and go to www.trimble.com/register.

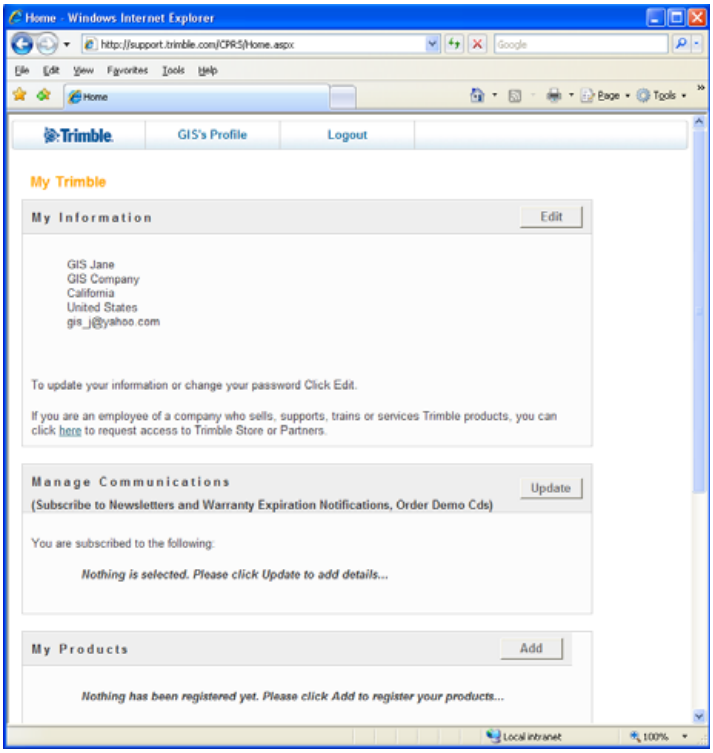
   Your default Web browser opens and displays the My Trimble account login page.

2. If you already have an account, skip this step and go to step 3 to log in.

   To create your My Trimble account, click *Create an account*. Enter your contact details and then click **Save**. Your account is created and you are returned to the My Trimble account login page.

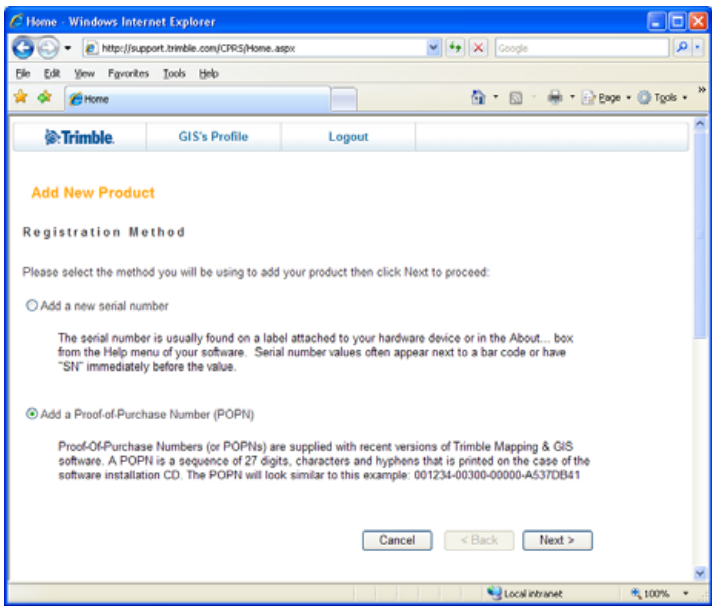
3. Enter your email address and password, and then click **Login**.

The *My Trimble* page for your account appears. It will look similar to the one shown below:



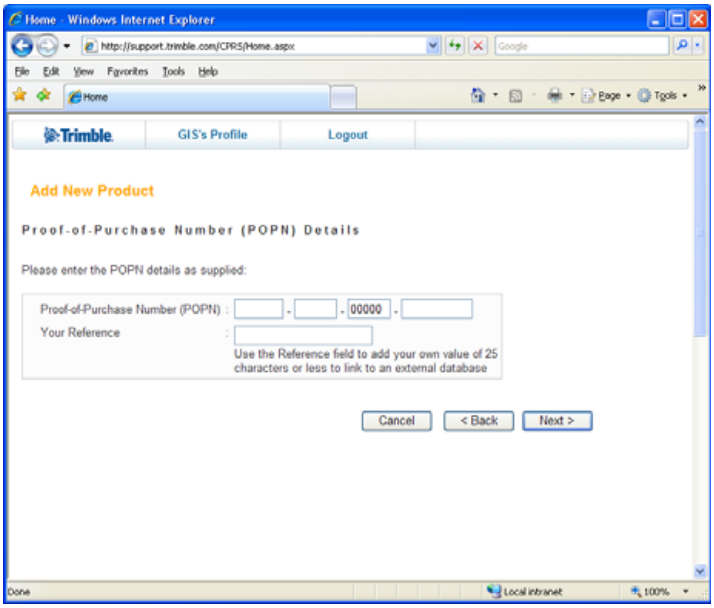
4. To register your POPN for the TerraSync software, scroll to the *My Products* section and then click **Add**.

   The *Registration Method* page appears:



5. Select the *Add a Proof-of-Purchase Number (POPN)* option and then click **Next**.

   The *Proof-of-Purchase Number (POPN) Details* page appears:



6. Enter the POPN that you received on the POPN certificate when you purchased the software.

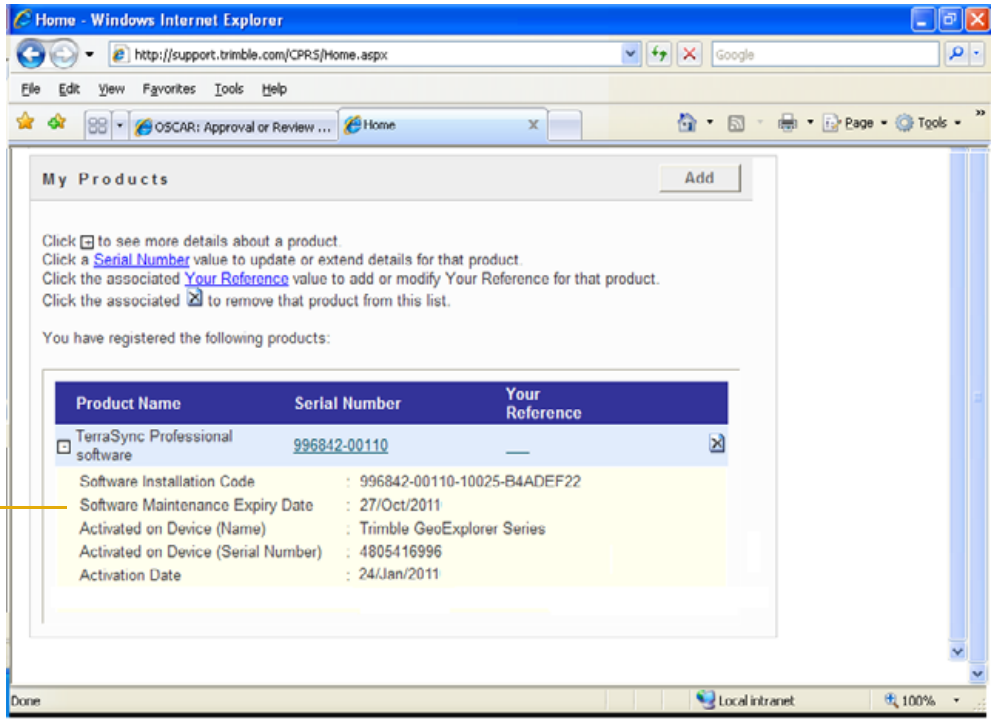
7. If you want to enter your own reference code, for example a sales order number or an asset/inventory number, enter it in the *Your Reference* field.

8. Click **Next**.

Note – *If a message warns that the POPN you entered has already been registered, click* ***Cancel*** *to cancel the registration process. Then obtain the installation code for your POPN and install the software. For more information, see* *Obtaining your installation code after registration, page 23*.

9. If this is the first time that you have registered a Trimble Mapping and GIS product, the *Mapping & GIS Industry Details* page appears. From the drop-down lists, select your organization type and most common market segment and then click **Save**.

You are returned to your My Trimble page, where the software you have just registered now appears in the My Products section:



Installation code

10. If the five lines below the TerraSync software do not appear, click the + beside the TerraSync software that you have just registered.

    The *Installation Code* field shows the installation code for the POPN you received when you purchased the TerraSync software. Make a note of this code. You must enter this code when you install or reinstall the software.

Note – *If you are entitled to an upgrade from a previous version of the TerraSync software, you can install a later version of the TerraSync software using the installation code that you obtained when you first registered the product. If you are* ***not*** *entitled to an upgrade, the installation program will not accept your installation code. Contact your local Trimble reseller to purchase a software maintenance option.*

Obtaining your installation code after registration

To reinstall the TerraSync software, for example if you performed a factory reset on the device or reinstalled the operating system, you must use the same installation code that you received when you registered the software before installing it for the first time.

If you do not know the installation code, do one of the following:

- If someone else at your company registered the POPN for the software, ask them for the installation code.

  If you cannot find out who registered the software, contact your local Trimble reseller.

- If you registered your POPN for the software yourself, you can check your installation code from the My Trimble page of the Trimble website.

To do this:

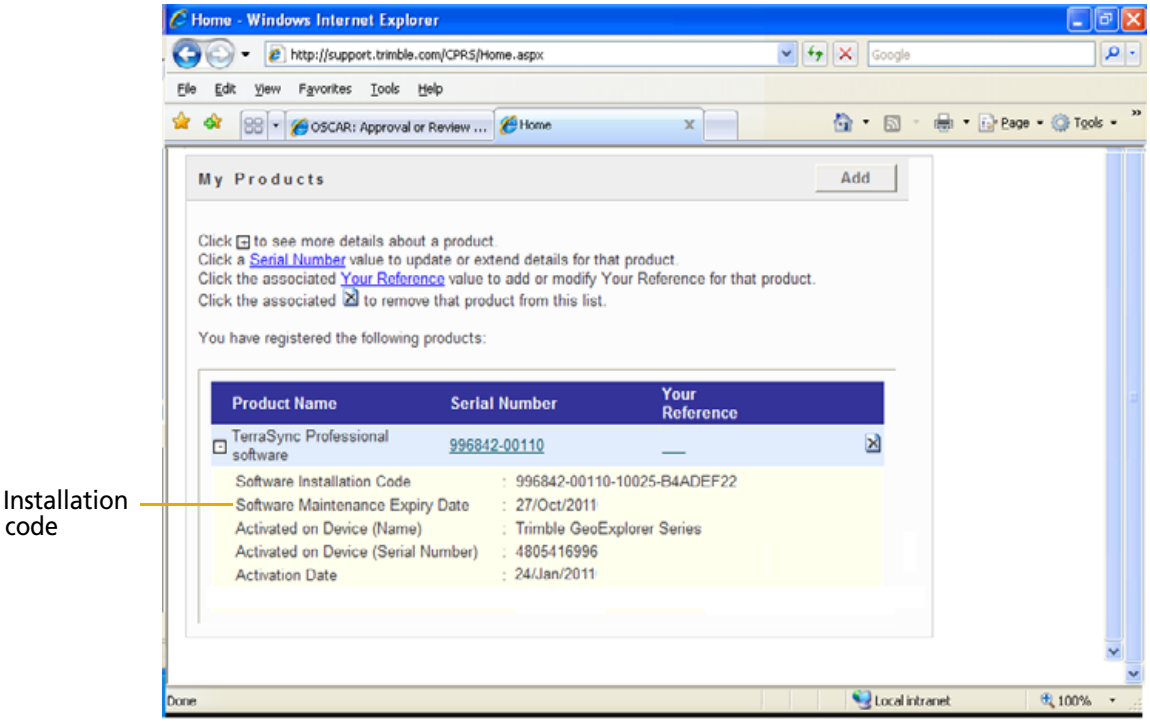
a. Open your Web browser and go to www.trimble.com/register.

   Your default Web browser opens and displays the My Trimble account login page.

b. Enter your email address and password and then click **Login**.

   The *My Trimble* page for your account appears.

c. Scroll to the My Products section, where any software that you have already registered appears:



Installation code

d. If the five lines below the TerraSync software do not appear, click the + beside the TerraSync software that you have just registered.

The *Installation Code* field shows the installation code for your POPN for the TerraSync software. Make a note of this code. You need to enter this code when you install or reinstall the software. You can also check which device the registered Installation Code has been activated on.

Installing the TerraSync software

This section describes how to install the TerraSync software onto a handheld device powered by the Windows Mobile or Windows Embedded Handheld operating system, and onto an office computer running the Windows operating system.

Installing the TerraSync software onto a handheld device

The installation procedure comprises the following steps:

1. Install Microsoft connection management software onto the office computer.
2. Connect the mobile device to the office computer.
3. Back up any TerraSync software data files.
4. Uninstall any previously installed versions of the TerraSync software.
5. Check that you have enough space on the device to install the TerraSync software.
6. Install the required version of the TerraSync software.

More information about each step is provided below.

Step 1: Install Microsoft connection management software onto the computer

Note – *You must install the Windows Mobile Device Center or ActiveSync technology onto the computer* ***before*** *you connect the device.*

To install software onto a mobile device, you must connect the device to the office computer. If the computer is running:

- the Windows Vista, Windows 7, 8, or 8.1 operating system, use the Windows Mobile Device Center to manage the connection.
- the Windows XP operating system, use Microsoft ActiveSync technology to manage the connection.

Installing the Windows Mobile Device Center

The Windows Vista, Windows 7, 8, and 8.1 operating systems include a basic connectivity driver for Windows Mobile and Windows Embedded Handheld powered devices. This driver allows you to transfer files from the device to your computer.

To install software onto a mobile device, or to use the more advanced desktop synchronization features with your device, you must install Windows Mobile Device Center 6 onto your office computer.

You can download the Windows Mobile Device Center from http://support.microsoft.com/kb/931937.

Installing ActiveSync technology

ActiveSync technology may be supplied on a CD with the mobile device, or you can download it from http://www.microsoft.com/en-us/download/details.aspx?id=15 .

Tip – If you are installing a translation of the TerraSync software and you want all installation screens to appear in the translated language, install the corresponding translation of the ActiveSync technology. You can download translated versions of the ActiveSync technology from the Microsoft website.

Step 2: Connect the device to an office computer

1. Make sure that the device and the computer are turned on.
2. Connect the device to the office computer using either a USB cable connection or Bluetooth® wireless technology. For more information on connecting the device to a computer, refer to the documentation for the mobile device.

   When the device is connected, a window appears on the office computer that enables you to manage the connection.
3. If the office computer is running:

- the Windows Vista, Windows 7, 8, or 8.1 operating system:

  a. If the *Autoplay* window appears, close the window.

  b. The *Windows Mobile Device Center* window displays the message Connected.

  c. Click *Connect without setting up your device*.

  d. Use the Windows Mobile Device Center to back up data files and uninstall any previous versions of the software (see Step 3, page 26 and Step 4, page 26).

     For more information, refer to the *Windows Mobile Device Center Help*.
- the Windows XP operating system:

  a. If the *Synchronization Setup Wizard* appears, click **Cancel** to close the wizard.

  b. The *Microsoft ActiveSync* window displays the message Connected.

c. Use ActiveSync technology to back up data files and uninstall any previous versions of the software (see Step 3 and Step 4 below).

For more information, refer to the *ActiveSync Help*.

Step 3: Back up any TerraSync software data files

Before installing a new version of the TerraSync software, Trimble recommends that you transfer any existing TerraSync software data files to the office computer.

To transfer files using...	do the following...
the Windows Mobile Device Center	click *File Management* and use the Windows Explorer-type window to copy files.
ActiveSync technology	click **Explore** and use the Windows Explorer-type window to copy files.

Step 4: Uninstall any previous versions of TerraSync software

Before installing a new version of the TerraSync software, Trimble recommends that you uninstall any previously installed versions of the TerraSync software from the mobile device and the office computer.

To remove programs...	do the following:
from the device using the Windows Mobile Device Center	click *Programs and Services* and then click *Add/Remove Programs*. **Tip –** If the *Add/Remove Programs* option is not displayed below *Programs and Services*, click *More*. The *Add/Remove Programs* option appears.
from the device using ActiveSync technology	select *Add/Remove Programs* from the *Tools* menu.
from the office computer	use the *Add or Remove Programs* tool in the Control Panel.

Step 5: Check that you have enough space on the device

Before you install the TerraSync software, make sure that you have enough free space on the device. The TerraSync software requires at least 18 MB of free space. If you are installing it to a secondary internal storage location, the TerraSync software requires at least 18 MB of free space in that location, plus 5 MB of RAM.

Note – *The installation program cannot determine how much memory is available in the non-volatile storage location. You must ensure that 18 MB is free* ***before*** *you begin the installation.*

If there is not enough memory space on the device, a message appears during installation, indicating the amount of memory left on the device.

Click **Cancel**, remove any unwanted programs or data files from the device, and/or increase storage memory. Then start the installation again.

If memory space in the secondary internal storage location is insufficient, the installation may appear to complete successfully, but error messages may appear when you try to run the TerraSync software. If this happens, make more space available in the secondary storage location and then install the software again.

Step 6: Install the TerraSync software onto the device

1. Before you begin, make sure that:
   - you have registered the POPN that you received when you purchased the software, and have made a note of the installation code that you must enter during installation. For more information, see Registering the TerraSync software, page 19.
   - the TerraSync software is not running on the device.
   - you have closed all applications on the device.
2. Go to www.trimble.com/mappingGIS/TerraSync.aspx. Click *Technical Support / Downloads* and then click the required version of the software.

   The InstallShield Wizard launches.

   On the *Welcome* screen, click **Next.**
3. Read the software license agreement, select *I accept the terms of the license agreement* and then click **Next**.
4. The *Register your Software* page appears. Do one of the following:
   - If you have registered the software and obtained your installation code for the software, select the *I have already registered* option and then click **Next**.
   - If you have not yet registered the software and do not have an installation code for the software, select the *I do not have an installation code. I want to register my POPN over the Internet now* option and then click **Next**.

     The Register page opens in your default Web browser, displaying the My Trimble account log in. For more information, see Registering the TerraSync software, page 19.

   The *Enter your Installation Code* page appears.
5. Enter the installation code that you received when you registered the POPN for the TerraSync software and then click **Next**.
6. The *Start Copying Files* page appears. Click **Next**.
7. If prompted, Install “Trimble TerraSync” using the default application install directory?, click **Yes**.

Note – *If an SD (Secure Digital) memory card is inserted in the handheld, the card appears as an installation location option. Trimble recommends that you install software to the handheld's internal storage,* ***not*** *to an SD memory card. If you install software to a card and then remove the card from the handheld, the software will not be available for use.*

8. If you clicked **No** in Step 7, the *Select Destination Media* dialog appears. Click **OK** to proceed with the installation.

   On some mobile devices, such as the Trimble Recon® handheld, the message Adding information for "Remove Programs" may remain on the screen for several minutes. ***Do not*** cancel the installation or reset the device while this message is displayed.

9. Check your mobile device screen to see if any additional steps are necessary to complete the installation

10. On the *InstallShield Wizard Complete* screen, click **Finish**.

Installing the TerraSync software onto an office computer running a Windows operating system

This section describes how to install the TerraSync software onto an office computer, such as a laptop or a Tablet PC, that is running a Windows operating system.

The installation procedure comprises the following steps:

1. Back up any TerraSync software data files.
2. Uninstall any previously installed versions of the TerraSync software.
3. Install the TerraSync software.

More information about each step is provided below.

Step 1: Back up any TerraSync software data files

Before installing a new version of the TerraSync software, Trimble recommends that you transfer any TerraSync software data files to a safe storage location.

Step 2: Uninstall any previous versions of TerraSync software

Before installing a new version of the TerraSync software, Trimble recommends that you uninstall any previously installed versions of the TerraSync software.

Step 3: Install the TerraSync software onto the computer

1. Before you begin, make sure that:
   - you have registered the POPN that you received when you purchased the software, and have made a note of the installation code that you must enter during installation. For more information, see Registering the TerraSync software, page 19.

- the TerraSync software is not running on the computer.
- you have closed all open windows programs on the office computer.

2. Go to www.trimble.com/mappingGIS/TerraSync.aspx. Click *Technical Support / Downloads* and then click the version you want to install.

   The InstallShield Wizard launches. On the Welcome screen, click **Next**.

3. Read the software license agreement, select *I accept the terms of the license agreement* and then click **Next**.

   The *Register your Software* page appears.

4. Do one of the following:
   - If you have registered the software and obtained your installation code for the software, select the *I have already registered* option and then click **Next**.
   - If you have not yet registered the software and do not have an installation code for the software, select the *I do not have an installation code. I want to register my copy over the Internet now* option and then click **Next**.

     The Register page opens in your default Web browser, displaying the My Trimble account log in. For more information, see Registering the TerraSync software, page 19.

   The *Enter your Installation Code* page appears.

5. Enter the installation code that you received when you registered the POPN for the TerraSync software and then click **Next**.

6. In the *Choose Desktop Software Location* page, select the folder where the setup will install the program files and then click **Next**.

7. The *Start Copying Files* page appears. Click **Next**.

8. The final page of the installation wizard shows *InstallShield Wizard Complete*. Click **Finish**.

Activating the TerraSync software

The TerraSync software must be activated once it is installed.

1. If not already started by the installation process, start the Activation Wizard. Click *Start / All Programs / Trimble / TerraSync x.x WM / Trimble TerraSync Activator*. The Activation Wizard was installed on your office computer during the TerraSync software installation.

Note – *The Activation Wizard is a .NET framework application. If your office computer is running the Windows XP or Windows Vista operating system, you must also have the latest Service Packs installed.*

2. Select your preferred language.

The Activation Wizard connects to the field computer through the Microsoft ActiveSync technology or the Windows Mobile Device Center.

3. Select an activation method.

Select this method	If...	See...
I wish to activate the Trimble TerraSync software over the Internet	Your office computer is connected to the Internet. Trimble recommends this method.	page 30
I already have a Trimble TerraSync software Activation Key for this device	If your Trimble Reseller has provided you with an Activation Key, or you have previously activated this Installation Code on the same field computer and kept a record of the Activation Key.	page 30
I do not have an Internet connection	You do not have an Internet connection.	page 30

Product information

The Wizard will now extract information about the connected device that will help you identify it at a later stage.

You will be able to edit the Device Name to customize it to your environment.

Depending on the connected device type, you may also be required to enter the device serial number.

Online activation

The Wizard communicates directly with the Trimble Activation server and activates the TerraSync software on your field computer.

Activation using an existing Activation Key

The Activation Wizard prompts you for the folder where the Activation Key is stored. This could be on a local or network drive, or an external memory card, such as a USB memory stick or SD card.

Use the **Browse** button to navigate to the required folder.

If the Activation Wizard cannot find an Activation Key for the connected device in the selected folder, it will continue to prompt for a different folder.

Activation succeeds only if the Activation Key matches the connected field computer.

Offline activation

1. Print out or write down the information that appears.
2. Send the information to your Trimble reseller.

   Your Trimble reseller will return the Activation Key on an electronic media (diskette, CD, SD card, or USB memory stick).

3. Insert the media into the office computer that is connected to the field computer.
4. Follow the steps as described above for Activation using an existing Activation Key.

Activation troubleshooting

One of the following issues may occur:

- No valid Installation Code:

- The Installation Code is assigned to another device:

In these circumstances, enter a valid or previously unused Installation Code. If in doubt, contact your Trimble reseller.

Starting the TerraSync software

The TerraSync software will run only when you have successfully activated the software. If a valid Activation Key is not found, the following error message appears:

Tap **ok** to exit and then run the Activation Wizard to activate the software, see page 29.

Updating the TerraSync software

The TerraSync support page www.trimble.com/mappingGIS/terrasync on the Trimble website has the latest software and language updates.

Installing a translation of the TerraSync software

Trimble recommends that you install a translation of the TerraSync software only on a mobile device that has the corresponding language version of the operating system installed. For example, install the Japanese TerraSync software on a device that has been provisioned as a Japanese Windows operating system.

Note – *The Regional Options applet in the Control Panel changes only the display of date, time, units, and currency information. It does not change the language of the operating system running on the device or field computer.*

System commands (such as the **Done** / **OK** and **Cancel** buttons) are generated by the operating system, so they appear in the language of the operating system on the field computer. If you use the TerraSync software on a field computer that does not have the corresponding translation of the operating system installed, system commands are not translated. Also, some characters may not be interpreted or displayed correctly.

For best results, make sure that the languages used by the TerraSync software and the operating system match.

The TerraSync software is available in several languages.

To install a translation of the TerraSync software:

1. On the TerraSync support page www.trimble.com/mappingGIS/TerraSync.aspx, go to *Technical Support* / *Downloads* and click the required version of the software.
2. Select *TerraSync Software Language Files*.
3. Select the required operating system option (for installation on a mobile device or an office computer)
4. Select the required language file, and save it to your office computer.
5. Run the file to complete the installation.

Install fonts onto the mobile device

When you install a translation of the TerraSync software on a mobile device, you must also install a TerraSync language font if both of the following are true:

- You have installed the TerraSync software in one of the following languages:
  - Chinese
  - Japanese
  - Korean
- The language version of the operating system does not match the language of the TerraSync software (for example, if you have installed the Japanese TerraSync software onto an English mobile device)

CAUTION – *Do not* install the Japanese font onto a mobile device with the Japanese version of the operating system installed. This can cause software errors on the device.

Tip – If you see squares or unusual characters instead of characters from the appropriate language, you need to install a font.

Chinese, Japanese, Korean, or Russian TerraSync software on an ***English*** (or other foreign) mobile device does not recognize Asian or Cyrillic characters entered using a keyboard. This is because the English device cannot convert the Unicode characters to multi-byte characters. However, Japanese TerraSync software running on a Japanese mobile device recognizes Japanese characters correctly.

Cyrillic characters, from data dictionaries created in the GPS Pathfinder Office software using Russian Windows, are not displayed correctly in Russian TerraSync software. However, this text displays correctly when transferred back to the GPS Pathfinder Office software. Data dictionaries created in the GPS Pathfinder Office software using Chinese, Japanese, or Korean Windows are displayed properly.

Tip – The Trimble GPS Pathfinder font is installed automatically when you install the TerraSync software. This font includes symbols that you can use to represent point features on the map. If you want to use other symbol fonts for point features, install the additional fonts manually.

To install a TerraSync language font onto a mobile device:

1. Uninstall any previous versions of the font.

CAUTION – On some mobile devices, you cannot delete Asian language fonts in the usual way. To remove such fonts, you may need to perform a hard reset of the device. A hard reset removes ***all*** software that is not pre-installed on the device by the manufacturer.

2. Make sure that you have enough free memory to install the font. TerraSync language fonts require 9 to 10 MB of free memory.
3. Go to www.trimble.com/mappingGIS/TerraSync.aspx. Click *Technical Support / Downloads* and then click the required version of the software.
4. Select *TerraSync Software Language Files*, then select *TerraSync Asian Font File*.
5. Select the option for the language that you require.
6. Follow the instructions on the screen to install the font.

Note – *TerraSync fonts should always be installed to RAM (main memory). Do not install fonts to a secondary internal storage location or to a removable storage device.*

7. When the installation is complete, perform a ***soft*** reset of the device.

For information how to perform a soft reset, refer to the documentation for the device.

Compatible GNSS receivers

The TerraSync software will connect to all supported receivers as listed in the Product Compatibility Matrix.

Connecting to a receiver

You can connect the receiver to a port on the field computer using one of the options described below.

Port	Connection method
Bluetooth port	Use the Bluetooth management software provided with your field computer and the receiver to configure and then establish the Bluetooth wireless connection.
Standard RS-232 serial (COM) port	Use the null modem cable provided with your Trimble GNSS receiver to connect to the 9-pin serial port on your field computer.

Note – *To use GNSS positions from the integrated receiver when the TerraSync software is installed on a GeoExplorer series handheld, a Geo 5 handheld, or a Juno series handheld, configure the TerraSync software to connect to GNSS on the COM port specified for the device; refer to the User Guide for the device for details.*

Note – *The TerraSync software does not connect to the NMEA port.*

Connecting to external real-time correction devices

To connect to a receiver and an external real-time correction device such as a Trimble GeoBeacon™ receiver, use one of the following options:

- If you are using a serial cable connection to both receivers, use a splitter cable.
- If the field computer has two Bluetooth ports, you can connect to both the receiver and the real-time correction device using Bluetooth connections.
- If the field computer has only one Bluetooth port, use Bluetooth wireless technology to connect the real-time correction device to the receiver and then use Bluetooth wireless technology to connect the receiver to the field computer. Alternatively you can use a combination of Bluetooth wireless technology and cabling.

For more information, refer to the documentation provided with the receiver and the real-time correction device.

CHAPTER

3

User Interface and Data Entry

In this chapter:

- Using the Windows operating system
- Using the Windows Mobile or Windows Embedded Handheld operating system
- Starting and exiting the TerraSync software
- Section structure
- The TerraSync software display
- Interacting with the TerraSync software

This chapter contains detailed information about the TerraSync software user interface and data entry methods.

Using the Windows operating system

You can install the TerraSync software on an office computer (desktop, laptop, or Tablet PC), instead of on a mobile device.

This manual describes the TerraSync software as it appears on a portrait orientation handheld, powered by the Windows Mobile 6.5 operating system, with a 480 × 640 pixel screen (see Documentation conventions, page 14). On an office computer, some software items appear differently. The main difference is that on a larger screen the TerraSync software display is arranged in panes, so you can view up to three sections at the same time (see Panes, page 66).

Except where specified, any information in this manual that relates to the operation of the TerraSync software on a mobile device also applies to its operation on an office computer.

Using the Windows Mobile or Windows Embedded Handheld operating system

This manual assumes that you are reasonably familiar with the Microsoft Windows Mobile or Windows Embedded Handheld operating system that you are using.

For information about some operating system features that are useful when using the TerraSync software, see:

- Adjusting the backlight, page 38
- Working with other applications, page 38
- Using the on-screen keyboard, page 39
- Device Lock utility, page 39

Adjusting the backlight

You can change the backlight brightness on a mobile device to adjust to indoor or outdoor operation. For information on changing device settings, refer to the documentation for the device.

Working with other applications

The Windows Mobile or Windows Embedded Handheld operating system is similar to a desktop Windows operating system. You can use the same methods on the device as you would on a Windows computer to start, exit, or switch between programs. For example, to switch from the active application to another application, tap the program icon in the taskbar. Alternatively, if the device has a keyboard, you can use the Alt + Tab key combination.

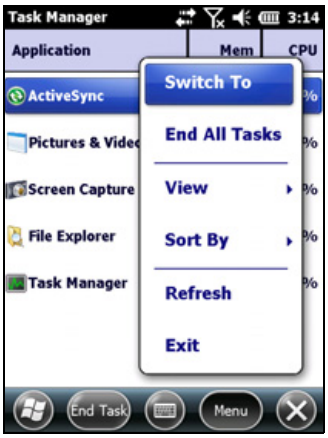
Some programs on a mobile device do not have a close button or a menu command for exiting the program. Instead, you must use system software to shut down a particular program. If the device does not have a keyboard, you must also use system software to switch from the active application to another application.

To shut down or switch to a task that is running on a mobile device:

1. Tap / *Task Manager*.
2. Do one of the following:

- To end a task, select the the task you want to end and then tap **End Task**.
- To switch to another task, select the task you want to switch to and then tap **Menu** / **Switch To.**

3. Tap to close the *Task Manager* dialog.



When the TerraSync software is already running on a device, tapping / *Programs / TerraSync* does not start the software a second time. Instead, the TerraSync software becomes the active program. Use this method to switch back to the TerraSync software from another application.

Tip – Some devices have hardware buttons that start specific applications. You may be able to change the program that is assigned to a particular button, or you can delete the existing program assignment so that pressing the button has no effect. Removing or changing hardware button assignments can be helpful if you frequently activate hardware buttons by accident.

Using the on-screen keyboard

For devices that do not have a physical keyboard, enter text using the ***on-screen keyboard***. To activate the on-screen keyboard, tap the keyboard button in the taskbar. The on-screen keyboard pops up and partially covers any screen that is open. When you have finished entering text in a field, tap **Enter** to accept the text you have entered and move to the next field. To hide the on-screen keyboard, tap the keyboard button on the taskbar again.

The on-screen keyboard consists of rows of alphabetic or alphanumeric keys, laid out like a real keyboard. As you tap each key, the corresponding character is added to the current text or numeric field in the current program.

Device Lock utility

The Device Lock lets you lock the device so that accidentally pressing the screen, keys, or hardware buttons has no effect. Locking the device lets you safely clean the screen or exterior of the device, transport it, or carry it.

Tap the *Device Lock* icon on the *Start* screen to lock the screen and keypad while the handheld remains turned on.

Once the handheld is locked, the screen and most of the keys do not respond until the handheld is unlocked. The exceptions are the **Power** key and the **Reset** button, which always respond when pressed.

Communication with external devices such as a GNSS receiver, or external sensors used by the TerraSync software, is not interrupted by locking the device. This means that you can keep using the TerraSync software when the device is locked. For example, you could lock the device so that you can safely transport it in your pocket between features, but keep the TerraSync software connected to the GNSS receiver so that you can collect a continuous block of carrier phase data.

When the device is locked, the lock screen shows, providing multiple unlock sliders for different applications (for example, if a new email has arrived, an email unlock slider takes you straight to the email.) To unlock the device and continue using the TerraSync software, slide the *Unlock* icon for the software.

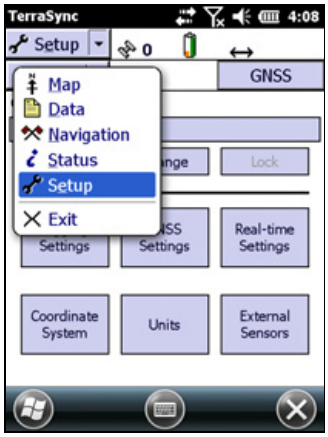
Starting and exiting the TerraSync software

To start the TerraSync software on a mobile device, tap / *TerraSync*.

Note – *Some Trimble devices have customized Home screens with application launchers that can be used to quickly start the TerraSync software.*

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

To exit and close the TerraSync software, tap the drop-down arrow on the Section menu, and then select *Exit*. Tap **Yes** to confirm.



To minimise the TerraSync software and keep it running, tap on any TerraSync screen.

To switch to the TerraSync software when it is already running, do one of the following:

- Use any of the methods described above for starting the TerraSync software.
- On a Windows office computer, click the TerraSync button on the taskbar.

Section structure

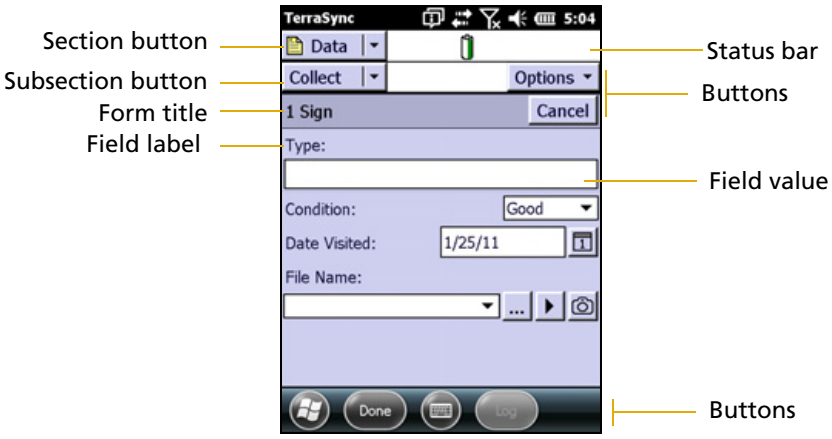
The TerraSync software is arranged in five ***sections***:

Note – *Some sections or options in the TerraSync software may have been hidden using the TerraSync Studio utility in the GPS Pathfinder Office software.*

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

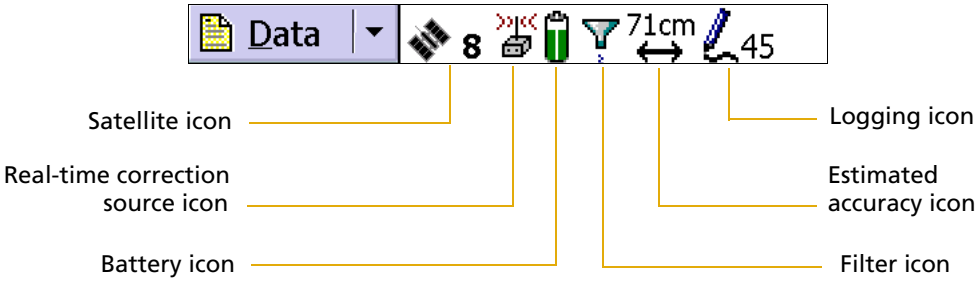
The TerraSync software display

The screen below shows elements that are common to all screens in the TerraSync software:



Status bar

The status bar appears at the top of the TerraSync software screen and provides basic status information about the connected GNSS receiver. For information about how to connect to a receiver, see Connecting to a receiver, page 34.



The status bar is always visible, but the icons displayed depend on the current status of the system. Table 3.1 shows the icons that can appear.

Table 3.1 Status bar: Icons

Icon	Name	Description
8	Satellite icon	Shows whether the geometry of the satellites is good or bad, as configured in the GNSS settings area of the software. The satellite icon flashes when the geometry of the satellites (their PDOP or HDOP) is poor. The number next to the icon indicates how many satellites are being used to compute GNSS positions. The number flashes when not enough satellites are available. You need at least four satellites to compute GNSS positions.
	Connect icon	When the TerraSync software is trying to connect to a receiver, the connect icon appears instead of the satellite icon. If the TerraSync software cannot connect to the GNSS receiver, the connect icon flashes.

Table 3.1 Status bar: Icons (continued)

Icon	Name	Description
	Antenna icon	If the TerraSync software connects to the receiver but cannot find a GNSS antenna, the antenna icon appears instead of the satellite icon. This icon flashes to warn you that there is a problem. If no icon appears in this position, no GNSS receiver is connected.
	Real-time external icon	Shows that the TerraSync software is receiving real-time corrections from an external source, such as a radio.
	Integrated RTK radio icon	Shows that the TerraSync Centimeter edition software is receiving RTK corrections through the GNSS receiver's integrated radio.
	External RTK icon	Shows that the TerraSync Centimeter edition software is receiving RTK corrections through an external radio.
	Real-time external beacon icon	Shows that the TerraSync software is receiving real-time corrections from an external beacon receiver such as a GeoBeacon receiver.
	Real-time satellite icon	Shows that the TerraSync software is receiving real-time corrections from a satellite differential service.
	Real-time SBAS icon	Shows that the TerraSync software is receiving real-time corrections from an SBAS satellite.
Note – *If the real-time signal is lost, the current real-time icon flashes. If the icon is flashing and the number of satellites being used is greater than 0, the TerraSync software is using autonomous (uncorrected) GNSS to calculate its position. If no icon is visible, the TerraSync software has not been configured to use a real-time correction source.*		
	Battery icon	The left half of this icon indicates the charge level of the GNSS receiver battery, if one is connected. If the connected receiver does not provide battery status information to TerraSync, the left half of the battery icon is empty. The right half indicates the charge level of the field computer battery. When the battery of the GNSS receiver or field computer is fully charged, the corresponding half of the battery icon appears green. The level of green drops as the corresponding battery charge level drops. When the power level is low, the corresponding half of the battery is yellow. When the power level is critical, the corresponding half of the icon is red and the icon flashes. If the GNSS receiver is powered by the field computer or is integrated with the field computer (for example a GeoExplorer series handheld), both halves of the battery icon show the same level and indicate the battery status of the field computer.
	Filter icon	Indicates that a filter has been applied to the open data file. When this icon is not displayed, no filter has been set up. See page 119.

Table 3.1 Status bar: Icons (continued)

Icon	Name	Description
71cm ↔	Estimated Accuracy icon	Shows the estimated accuracy of the current GNSS position. The type of estimated accuracy value shown depends on the settings in the *Accuracy Settings* form. The estimated accuracy value may be the estimated accuracy in the field, or it may be the predicted accuracy after postprocessing. To show the predicted postprocessed accuracy, there must be a data file open and the software must be logging GNSS positions. By default, this icon shows the estimated accuracy in the field. For more information about the predicted postprocessed accuracy value, see predicted postprocessed accuracy, page 280. The direction of the arrow indicates whether the estimated accuracy shown is for the horizontal or the vertical accuracy of the current GNSS position. ***Note –*** *The value shown depends on several factors, including satellite geometry and the type of GNSS receiver that is connected.* The estimated accuracy value flashes if the required accuracy set in the *Accuracy Settings* form is not met. An arrow with no estimated accuracy value indicates that the software is unable to calculate the estimated accuracy. Tap the icon for more information.
8	Logging icon	Shows that the TerraSync software is logging a feature with code accuracy. The number at the bottom of the icon indicates the number of positions logged. The number above the icon indicates the predicted postprocessed accuracy in the configured distance unit. The width of the pen indicates code or carrier logging.
1	Logging static icon	Shows that the TerraSync Centimeter edition software is logging a point feature or vertex in ***static mode***, which is available only when the TerraSync software is receiving RTK corrections. In static mode, only the GNSS position with the best precision estimate is logged. All other positions are discarded. The number to the right of the icon indicates whether a position has been logged. If the required precision has not been achieved, the number is 0 and no position is logged. If a position with the required precision has been logged, the number is 1. If a position with a better precision is received, it replaces the previously logged position.
4	Logging vertex icon	Shows that the TerraSync software is logging GNSS position information for an averaged vertex (including point features). The number to the right of the icon indicates the number of positions logged for this vertex or point feature.
	Base logging icon	Shows that the TerraSync software is logging positions to a base data file, or that is generating correction messages.
3	Digitizing icon	Shows that the TerraSync software is in Digitize mode and GNSS logging is paused, so tapping the map will result in a digitized position being recorded for the open feature. The number to the right of the icon indicates the number of digitized positions logged for this feature.
❚❚	Pause icon	When logging is paused, the pause icon flashes.
MB	Memory icon	When storage space is low, the memory icon appears. If memory gets low while you are logging positions, the memory icon flashes alternately with the logging icon. If you are not logging, the memory icon appears alone and flashes. ***Note –*** *When no icon appears in this position, memory space is sufficient, and the TerraSync software is not logging position data.*

Table 3.2 shows the status bar icons and the tooltips that describe them.

Table 3.2 Status bar: Tooltips

Icon	Behavior	Tooltip
8	Solid	GNSS is calculating positions
	Flashing	Poor satellite geometry (PDOP) ***or*** Poor satellite geometry (HDOP).
	Note – *The message that appears depends on whether a maximum PDOP or HDOP value is configured.*	
	Flashing satellite count	Too few satellites.
71cm ↔	Solid	Estimated accuracy in the field and estimated accuracy after postprocessing.
	Flashing	The estimated accuracy value flashes if the required accuracy set in the *Accuracy Settings* form is not met.
	Animated	Attempting to connect to GNSS receiver.
	Flashing	No GNSS detected. Check cables and batteries.
	Flashing	Antenna is not connected to GNSS receiver.
	Solid	Applying real-time corrections from external source.
	Flashing	Waiting for real-time corrections.
	Solid	Applying real-time corrections from VRS™.
	Flashing	Waiting for real-time corrections.
	Solid	Applying RTK corrections from an external RTK source.
	Flashing	Waiting for RTK corrections.
	Solid	Applying RTK corrections from a VRS.
	Flashing	Waiting for RTK corrections.
	Solid	Applying real-time corrections from the external beacon receiver.
	Flashing	Waiting for real-time corrections.
	Solid	Applying real-time corrections from the receiver's integrated OmniSTAR receiver.
	Flashing	Waiting for real-time corrections.
	Solid	Applying real-time corrections from the receiver's integrated SBAS differential receiver.
	Flashing	Waiting for real-time corrections.
	Solid	Applying RTK corrections from the receiver's integrated RTK radio.
	Flashing	Waiting for RTK corrections.

Table 3.2 Status bar: Tooltips (continued)

Icon	Behavior	Tooltip
	Solid	GNSS receiver battery is good (75%). Field computer battery is good (75%).
	Solid	GNSS receiver battery is low (25%). Field computer battery is low (25%).
	Flashing	GNSS receiver battery is critical (10%). Field computer battery is critical (10%).
Note – *The battery icons and tooltips in this table show both batteries at the same level of charge. However, each half of the battery icon can appear in green, yellow, or red, independently of the color and level of the other half.*		
	Solid	Filter is applied.
8	Animated pen, and number increments	Positions are being logged.
	Flashing pen	GNSS is not available.
4	Animated circle decreases in size	Vertex/point feature capture in progress.
3	Solid	Ready to digitize.
	Flashing	Position logging is paused.
	Flashing	Memory is full.

Tip – A tooltip also appears when you tap a graphical item in the *Skyplot* screen.

Interacting with the TerraSync software

You can interact with the TerraSync software in a variety of ways.

The following topics describe the different types of displays:

- Screens, page 47
- Graphical screens, page 48
- Forms, page 48

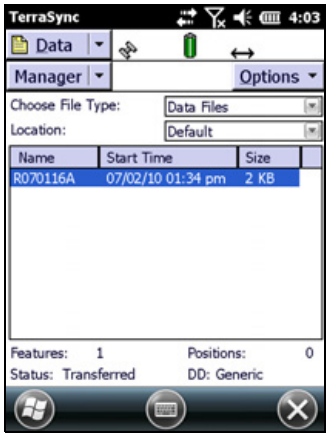
The TerraSync software screens also have the following features:

- Lists, page 49
- Buttons, page 50
- Data entry fields, page 53
- Auto-incrementing attributes, page 57
- Pop-up messages, page 58
- Sound, page 59
- Color, page 61

For more ways to interact with the software if the field computer has a keyboard, see Keyboard shortcuts, page 51.

Screens

Use screens to view information in a list or table, or to make selections that provide access to other areas in the software. A screen usually displays information that you cannot edit directly.



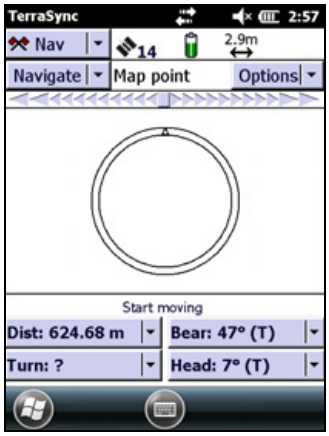
Most screens contain buttons, lists, or labels. When a screen contains a field, a default value is supplied in the field.

Examples of screens are:

- The top level screen for each subsection in the Data section, such as the *New File* screen and the *File Manager* screen
- The main screen of the Setup section

Graphical screens

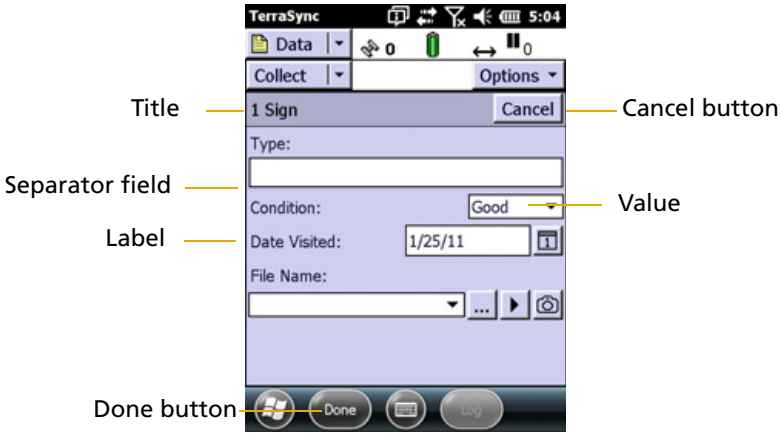
Use graphical screens to view information graphically. You cannot enter data in a graphical screen, and you cannot edit the information displayed.



Examples of graphical screens are:

- The *Skyplot* screen and *Satellite Information* screen in the Status section
- The *Direction Dial* and *Close-up* screens in the Navigation section
- The map display in the Map section

Forms



To enter data in the TerraSync software, you use a form. Like a paper form, a software form has a title and a sequence of lines or fields.

Each field on a form generally has two parts: a label (or name) and a value. A label is followed by a colon (:), which separates it from the value. Some fields are separator fields, which have no value and serve simply to divide a form into sections. If there is a dark rectangle around a field and its label, it is the current field on the form. Any editing operations apply to the current field.

To edit a field, select it. There are several ways to enter data into a form, depending on the keyboard options the field computer has, and the type of data stored in the field. See also Data entry fields, page 53.

To move to the next field on a form, do one of the following:

- Tap the field you want to move to.
- Tap **Enter** on the on-screen keyboard. Tap **Enter** repeatedly to move through all fields on the form.

- Press **Tab** on the physical keyboard. Press **Tab** repeatedly to move through all fields on the form.

To move up or down the form, drag the vertical scroll bar.

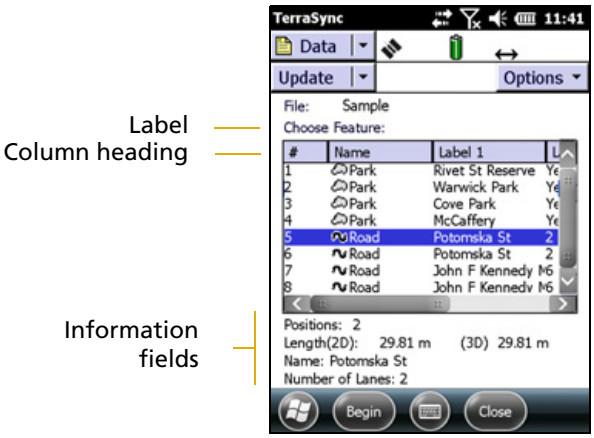
When you finish browsing through the form, or finish editing fields in the form, tap **OK** to accept the changes you made and to return to the previous screen.

Lists

Some forms in the TerraSync software include ***lists*** from which you select data files or features. A list contains the information that is currently stored.

Each row of the list represents one file or feature. Each column shows information about that item. A list also has a label that describes its contents.

This figure shows the *Choose Feature* list, which displays all feature types in the open data file.



Often, information fields are displayed at the bottom of the screen, below the list. They provide useful information about the item currently selected in the list.

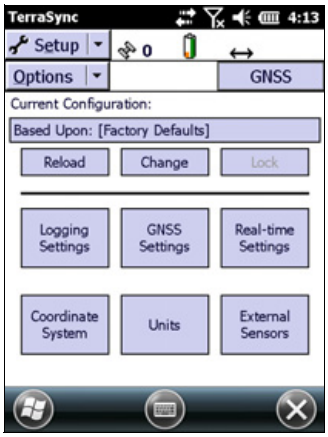
To choose an item from a list, select the item. If the item you want is not visible, drag the vertical scroll bar up or down until it is visible.

Tap a column heading to sort items by that column. For example, to sort the *Choose Feature* list by feature name, tap the *Name* column heading.

Tip – If the list is already sorted by the column you tapped, tapping the column heading reverses the sort order.

Buttons

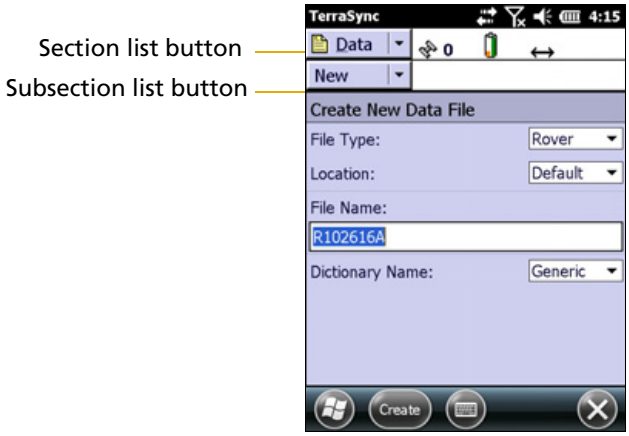
Many forms and screens in the TerraSync software contain buttons. When you tap a button, the TerraSync software carries out the appropriate command or opens a new screen. For example, if you tap **GNSS Settings** in the *Setup* screen, the *GNSS Settings* form appears.



List buttons and menu buttons are special buttons. They can be identified by the drop-down arrow at the right end of the button. When you tap one of these buttons, a drop-down list of commands appears. See also List buttons, page 50, and Menu buttons, page 51.

List buttons

List buttons are buttons that have a vertical line and a drop-down arrow at the right end of the button.



Use list buttons to move to a different section or subsection of the software, or to change the mode in the current section.

When you tap a list button, a drop-down list appears. Select an option on the list to access the command it describes. The label of the list button changes to match the option you selected.

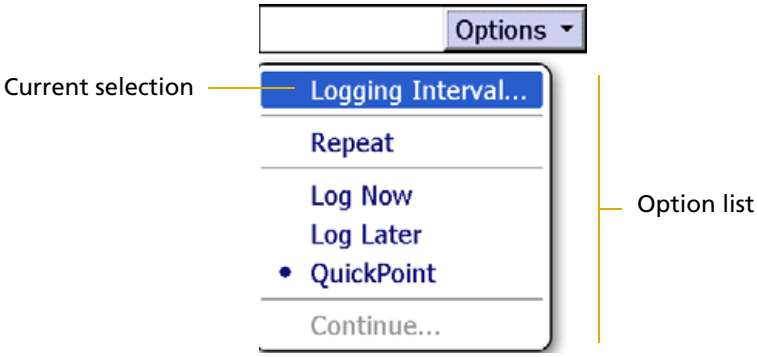
The following list buttons appear in the TerraSync software:

- Section button
- Subsection button
- Map Tools button in the Map section
- Status Mode button in the Status section

Note – *List buttons differ from* ***menu*** *buttons (such as Options buttons) in their appearance, behavior, and function. See also* *Menu buttons, page 51*.

Menu buttons

Menu buttons are buttons that have a drop-down arrow at the right end of the button.



Use menu buttons to access additional functionality and commands. When you tap a menu button, a drop-down list appears. Select an option on the list to select the command it describes.

The label on a menu button does not change when you select a command from the list. (The label on a list button does.)

The following menu buttons appear in the TerraSync software:

- Any **Options** button
- The **Layers** button in the Map section

Note – *Menu buttons differ from* ***list*** *buttons (such as the Section list button) in their appearance, behavior, and function. See also* *List buttons, page 50*.

Keyboard shortcuts

If you are using a field computer that has a keyboard, such as a notebook computer, you can use keyboard shortcuts instead of the touch screen.

To use a keyboard shortcut, hold down the Alt key on the keyboard and press the letter assigned to the shortcut. For example, the shortcut letter for switching to the Map section is M, so press Alt+M to switch to the Map section.

There are two types of shortcuts in the TerraSync software: global and local shortcuts.

Global shortcuts apply wherever you are in the software. They let you perform important actions such as switching quickly between the sections of the software. If you use the shortcut for the current section or subsection, the corresponding list drops down. For example, if you press Alt+M when the Map section is already open, the Section list drops down.

You can also use global shortcuts to close the current file, exit the software, or control data logging from any section or screen of the software.

Local shortcuts apply only within the current form or screen. They open lists such as the *Options* list or subsection list, or run commands on the open list.

The same local shortcut letter may be used in different screens to perform different tasks. For example, if you press D when the Option list is open in the Setup section, the TerraSync software disconnects from the GNSS receiver. However, if you press D in the *Options* list of the File Manager subsection, the TerraSync software deletes the selected file.

If the TerraSync software is installed on a desktop or laptop computer, the screen is arranged in panes. Local shortcuts work only for the primary pane (the pane in the top left of the screen).

This table lists the ***global*** shortcuts in the TerraSync software:

Action	Keyboard shortcut
Open Map section	Alt+M
Open Data section	Alt+D
Open Navigation section	Alt+N
Open Status section	Alt+S
Open Setup section	Alt+E
Open Skyplot screen	Alt+K
Open New File subsection	Alt+T
Open Collect Features subsection	Alt+T
Open Update Features subsection	Alt+U
Start, pause, or resume logging GNSS	Alt+L
Close current data file	Alt+C
Exit TerraSync	Alt+Q

This table lists the ***local*** shortcuts in the TerraSync software:

Action	Section	Keyboard shortcut
Select a command on an open list	All sections	Underlined letter
Open the Options list for the current screen	All sections	Alt+O
Open the Layers list	Map	Alt+A
Zoom in	Map	Alt+Z
Zoom out	Map	Alt+Y
Zoom extents	Map	Alt+X
Move up	Map	Alt+up arrow key; Alt+8
Move down	Map	Alt+down arrow key; Alt+2
Move left	Map	Alt+left arrow key; Alt+4

Action	Section	Keyboard shortcut
Move right	Map	Alt+right arrow key; Alt+6
Open Existing File subsection	Data	Alt+X
Open File Manager subsection	Data	Alt+G
Open Satellite Info subsection	Status	Alt+F
Open Receiver subsection	Status	Alt+V
Open Real-time subsection	Status	Alt+A
Open Plan subsection	Status	Alt+P
Open Sensor subsection	Status	Alt+R
Open Comms subsection	Status	Alt+O
Open Time subsection	Status	Alt+I
Open About subsection	Status	Alt+B

Data entry fields

The method you use to enter data in a field on a form depends on the type of field you are entering data into, and on the availability of keyboards.

The following field types can appear:

- Text (see page 54)
- Numeric (see page 54)
- Menu (see page 54)
- Time (see page 55)
- Date (see page 55)
- Filename (see page 55)

If the field computer has a physical keyboard, use it to enter text or numbers, just as you would in any Windows program. If you do not have a keyboard, use the on-screen keyboards for data entry. An on-screen keyboard is a small dialog that pops up from the taskbar when you select a field that allows data entry. You can also manually activate an on-screen keyboard at any time.

Tap the keys on the on-screen keyboard to specify the text or number you want to enter. As you enter characters, they appear in the selected field.

If you use an on-screen keyboard to enter values, the TerraSync software automatically moves the focus to the next field on the form. To move through the fields on a form, repeatedly tap **Enter** on the on-screen keyboard. If the field computer has a physical keyboard, press the **Tab** key to move through the fields. When you reach the end of the form, the focus moves to the first field on the form. See Using the on-screen keyboard, page 39.

Text

To enter a value in a text field, use the on-screen keyboard or the physical keyboard. If you are using a field computer with an on-screen keyboard, the keyboard pops up automatically when you select a text field. See Using the on-screen keyboard, page 39.

Numeric

To enter a value in a numeric field, use the physical keyboard or tap 123 on the on-screen keyboard to switch from the alphabetic keyboard to the alphanumeric keyboard.

Tip – Any text or numeric field can be defined as an auto-incrementing attribute. See also Auto-incrementing attributes, page 57.

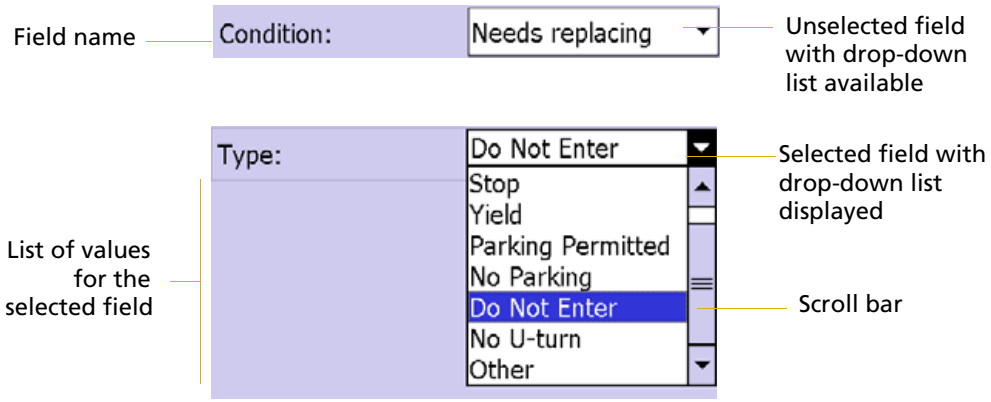
Menu

A menu field has a predefined set of values associated with it. A menu can appear as one of the following:

- A checkbox, if the set of values has only two items. One of the items is set as the default.
- Radio buttons, if the set of values has at most seven items.
- A list, which can contain two or more values. The values can also be linked to images.

Note – *The type of menu that appears in the TerraSync software is determined by the configuration settings in the Data Dictionary Editor in the GPS Pathfinder Office software.*

To change the selected value in a list, tap the drop-down arrow at the right of the field and select an option from the list.



The current value in a drop-down list is selected. To choose a different value, select the value from the list. If a drop-down list has more options than fit on one screen, a scroll bar appears on the right. Drag the scroll bar or tap the arrow buttons to scroll up and down the list.

To select a value using the images linked to the values, tap the Browse button ... to the right of the menu field name.

Some menu fields can store either a value you enter or a value you select from a list. For example, in the *Data* form in the Setup section, the *Interval* field can accept either an integer 1 through 999, or Off. Enter a value manually using the on-screen or physical keyboard, or select a value from the drop-down list.

Time

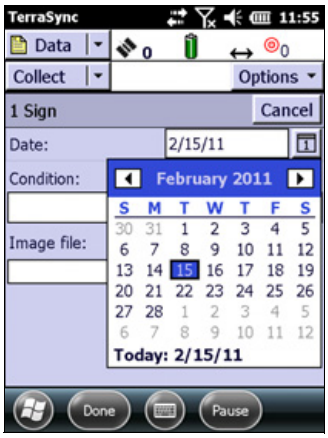
Enter time values manually using the on-screen or physical keyboard, or select the current time from a drop-down list.

To enter the current time, tap the arrow at the right of the field and select Now from the drop-down list.

A time attribute may have been configured to automatically set to the current time when the feature is created, when the feature is updated, or both. This is done using the Data Dictionary Editor in the GPS Pathfinder Office software.

Date

Enter a date value manually using the physical keyboard, or select it from the drop-down calendar.



To enter a date manually, type it in from the keyboard. To select it from the calendar, tap the drop-down arrow at the right of the date field and select the date required from the calendar.

A date attribute may have been configured to automatically set to the current date when the feature is created, when the feature is updated, or both. This is done using the Data Dictionary Editor in the GPS Pathfinder Office software.

Filename

A filename field is primarily used for attaching image files, but can also be used to attach other files to a feature. If your field computer does not have an integrated camera, use a digital camera to create and save images. When the TerraSync software is running on a handheld which has an integrated camera, you can switch to the camera live preview window. Tap on the Camera icon next to the Filename field to switch to Camera mode.

Note – *The Camera button is only displayed if the handheld device has an integrated camera.*

Enter a filename

Enter a filename manually using the physical keyboard, or select the filename from the drop-down list for the filename field. The drop-down list shows files in the current working folder. The default location is the My Pictures folder. To change the working folder, tap the Browse button ... to the right of the filename field. In the pop-up window that appears, navigate to the folder you need.

For image files, the Browse button ... will take you to the thumbnail view for any stored images.

Tip – If you set the working folder to the folder where the files to be attached are stored, you can simply select the appropriate file for each feature from the drop-down list, without having to check or change the working folder each time.

View a file

To view the currently selected file, tap the Preview button ▶ beside the attribute field, or tap on the thumbnail for an image file. The file is opened in the default program associated with its file type. Image files will be displayed full screen in the Pictures & Videos application.

Once you attach a file to a filename attribute in a feature and save the feature, the selected file is moved to the TerraSync software data folder and assigned a unique name. If you open the feature for review later, the actual filename is not displayed, because the file has been renamed. Instead, a message similar to "Attached JPG File" appears in the attribute field.

When you transfer the data file to the office computer using the Trimble Data Transfer utility, any attached files are transferred with the data file, and are stored with the transferred data file. This link is also maintained when you export the data file to a GIS. For more information, refer to the *Data Transfer Utility Help*.

Tip – Sometimes, to save space or to create better quality files, recording software on a mobile device (such as sound recording software that creates .wav files) uses a default file format that is unreadable on a desktop computer. Before going out into the field, test that you can transfer and read files created by the software that you want to use. If necessary, change the settings of the recording software to use a format that is compatible with the desktop computer.

EXIF (Exchangeable image file format) support

When a jpg image file is attached to a feature in TerraSync, and there is a current GNSS position, the EXIF header of the image file is populated with the following fields:

- GPS Time (UTC)
- GPS Date (YYYY:MM:DD)
- GPS Longitude (DD_MM_SS.SS)

- GPS Latitude (DD_MM_SS.SS)
- GPS Altitude (Height Above Ellipsoid) (xxxxx.xx)
- GPS Datum
- Feature name
- Labels 1 and 2 as defined in the Data Dictionary.

When a feature is updated and the GNSS position is replaced, the GPS Time and GPS Date fields in the EXIF information are updated.

The EXIF fields for Original Date/Time—that is, when the photo was originally taken—are not updated unless the attached photo is replaced.

Auto-incrementing attributes

Any numeric or text attribute can be defined as an auto-incrementing attribute. When you create a new feature, the TerraSync software automatically fills in each auto-incrementing attribute with a default value. This value is the next value in the auto-incrementing sequence, and is based on the step value you specified in the data dictionary and the last value entered in the field. The sequence can increase or decrease, and may advance in any increment (step) value, provided this value is within the acceptable range for the attribute.

Although you can define a text attribute as an auto-incrementing attribute, only numeric values within the text are incremented or decremented. For example, if the last value you entered was 47A, and the step value is 1, the next value generated by the TerraSync software is 48A. However, if the last value was AAA, the next is still AAA, as there is no numeric component to increment.

When the text consists of more than one number interspersed with alphabetic characters, only the last number is incremented. For example, if the step value is 1, and the last value was A100-K9, the next value is A100-K10.

The auto-incremented value is only a default value, so you can edit it if you want. If you do, the next value in the sequence is calculated using the new value you entered, not the original value generated by the TerraSync software.

If the TerraSync software cannot generate the next value in the sequence, it creates the attribute without a value. This occurs if:

- the feature is the first of its type to be created in this file and no default value is specified
- the last value for the attribute was blank
- the last value was the maximum value in the range and the sequence is incrementing
- the last value was the minimum value in the range and the sequence is decrementing

To make an attribute auto-incrementing, you must set an increment value in the data dictionary. You can do this in the Data Dictionary Editor utility in the GPS Pathfinder Office software. For more information on making an attribute auto-incrementing, refer to the *Data Dictionary Editor Help*.

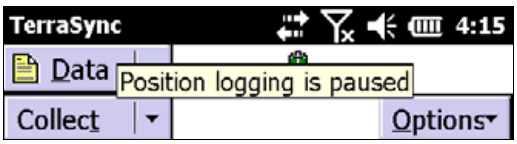
Pop-up messages

When the TerraSync software asks a question, it displays a pop-up message. You must answer the question before you can continue working with TerraSync. To answer the question, tap one of the buttons in the message. The pop-up message disappears.

Error messages are examples of pop-up messages. Warning and Error messages should be noted, because they contain important information about the task you are trying to perform.

Tooltips

A tooltip is a yellow message that contains information about an item on the screen, or about the current system status.



Tooltips appear:

- when you tap on an icon in the status bar
- as transient messages in the status bar
- when you tap on an item on the map
- when you measure distances and areas on the map

To close a tooltip, tap it, or tap anywhere else on the screen.

If you tap an icon in the status bar (see page 42), a tooltip appears over it. The tooltip contains information about the current state of the system function the icon represents. For example, if you tap the Filter icon (see page 43) when a filter is in use, a tooltip appears, showing the message Filter is applied.

A transient message shows information that is only important for a few seconds, such as notification that you have successfully recorded an offset with a laser rangefinder, or that the feature has been stored. A tooltip that contains a transient message appears over the status bar for three seconds, or until you tap the tooltip. Other functions in the software are not affected by transient messages.

In the Map section, tap any item to display its Position information in a tooltip. When you use the Measure tool in the map, measurement information appears in a tooltip in the top left corner of the map display.

Sound

The TerraSync software uses sound to indicate special conditions or events. Often these conditions are accompanied by a change in a status icon. For example, when the battery on the GNSS receiver gets low, the battery icon in the status bar (see page 42) flashes, and the Low GNSS battery (see page 60) sound is played.

The events and conditions that can occur fall into three categories:

Category	Description
Success	An operation has been successfully completed, or a warning condition has been resolved. By default, a success event uses a sound with rising tones.
System	A message, containing a question or information about an error that has occurred, has appeared. Before you can continue working with the TerraSync software, you must tap a button in the message to acknowledge the message.
Warning	A condition exists that could cause loss of data, or could prevent you from collecting data successfully. By default, a warning is indicated by a sound with falling tones.

The following table lists events and conditions in the TerraSync software, and the sounds that are used for them:

Event	Sound category	Description
Feature stored	Success	The feature has been successfully stored.
QuickPoint captured	Success	A quick point has been successfully captured.
GNSS connected	Success	The TerraSync software has successfully connected to the GNSS receiver and is receiving position information.
GNSS OK	Success	The GNSS quality has increased to the levels you have specified, and the TerraSync software is logging positions again.
Minimum positions stored	Success	The TerraSync software has logged the minimum number of positions for the current feature. You can now safely close this feature and begin logging another feature.
Navigation proximity alarm	Success	The navigation target is within the close-up range you have specified, and the *Direction Dial* screen changes to the *Close-up* screen.
Position logged	Success	The TerraSync software has successfully logged a GNSS position.
Position snapped	Success	The digitized position has been snapped to a nearby existing position.

Event	Sound category	Description
Real time OK	Success	The connection to the specified source of real-time differential correction has been regained.
General error	System	An error has occurred. An error is indicated by the sound the field computer uses for the Critical Stop event.
Question	System	The TerraSync software requires some information or a decision from you. The question appears in a message and is indicated by the sound the field computer uses for the Question event.
Unable to log QuickPoint	Warning	The quick point was not captured due to too few satellites, poor geometry, or an unintelligible message from a laser rangefinder.
Dead GNSS battery	Warning	The battery in use by the GNNS receiver is dead. The TerraSync software continues to operate but no position information is received until the battery is replaced.
Low GNSS battery	Warning	This sound plays repeatedly and the battery icon in the status bar flashes when the battery in use by the GNNS receiver is running low and needs to be replaced.
Poor geometry	Warning	GNSS position quality has dropped below the level you have specified because the visible satellites are too close together in the sky. The TerraSync software has paused logging until geometry improves.
Real time lost	Warning	The connection to the specified source of real-time differential correction has been lost.
Too few satellites	Warning	GNSS position quality has dropped below the level you have specified because there are not enough visible satellites. The TerraSync software has paused logging until more satellites become visible.
Required accuracy lost	Warning	The required accuracy (specified in the *Accuracy Settings* form) has been lost.

Customizing sounds

The TerraSync software is supplied with default sounds for all warning and success events. However, you can customize these sounds or disable any or all of the sounds played by the software.

To enable or disable all sounds as a group:

1. Tap / *Settings* / *Sounds and Notifications*.
2. On the *Sounds* tab, select or clear the *Events* check box to enable or disable sounds for questions and error messages in the TerraSync software.
3. Select or clear the *Programs* and / or *Notifications* check boxes to enable or disable warning and success sounds.
4. Select or clear the *Screen taps* and *Hardware buttons* check boxes to enable or disable warning and success sounds. If selected, you can also choose to set these to *Soft* or *Loud*.

Tip – All the sounds used in the TerraSync software are wave (.wav) files. A default .wav file is supplied for each warning or success event that occurs in the software. To change any of the sounds used, replace the appropriate .wav file in the Windows folder on the field computer. To disable a sound, delete or rename its .wav file.

The events and their corresponding sound (.wav) files are as follows:

Event	Sound file
Feature stored	FeatureStored.wav
Dead GNSS battery	GNSSBatteryIsDead.wav
QuickPoint captured	PositionLogged.wav
Unable to log QuickPoint	LockLost.wav
Low GNSS battery	GNSSBatteryIsLow.wav
GNS connected	GNSSIsConnected.wav
GNSS OK	GNSSIsOK.wav
Poor geometry	PoorGeometry.wav
Position logged	PositionLogged.wav
Position snapped	PositionSnapped.wav
Real time lost	RealTimeIsLost.wav
Real time OK	RealTimeIsOK.wav
Required accuracy lost	RequiredAccuracyNotAchieved.wav
Minimum positions stored	StoredMoreThanMinimumPositions.wav
Navigation proximity alarm	CloseUpChange.wav
Too Few Satellites	TooFewSatellites.wav
Question	The file that the field computer uses for the Question event. By default, this is Question.wav. Use the Volume and Sounds system setting to replace the sound for this event.
General error	The file that the field computer uses for the Critical Stop event. By default, this is Critical.wav. Use the Volume and Sounds system setting to replace the sound for this event.

Color

The TerraSync software uses color to make it easier for you to distinguish important information, and to distinguish between similar items. Color is often used in conjunction with at least one other feature such as a sound, icon, or bold text.

The following features of the TerraSync software use color to provide extra information or to clarify the display:

- Battery icon (see page 43)
- Map layer colors
- Skyplot, which shows each GNSS constellation as a different color

Map layer colors

The information displayed in the Map section is arranged in five layers. To make the map display clearer, you can select a different color for each of these Map layers. If a layer contains features, you can either use the feature colors assigned in the data dictionary, or set a single color for all features in the layer.

To select layer colors, tap **Layers** in the Map graphical screen and select *Layer Formatting*. The *Layer Formatting* form appears. You can set each layer to display in a different color. You can also set two or more layers to the same color.

Note – *The TerraSync software may have been customized so that the Layer option is hidden.*

CHAPTER

4

Software Structure

In this chapter:

- Introduction
- Sections
- Section structure

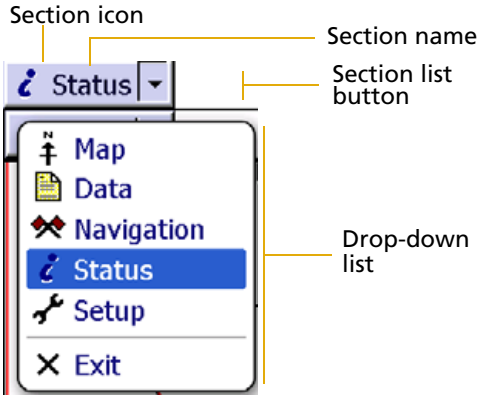
This chapter describes the main sections of the TerraSync software.

For full details of the main sections, see the following five chapters.

Introduction

The TerraSync software is arranged in the following five sections:

- Map
- Data
- Navigation
- Status
- Setup



Note – *The TerraSync software may have been customized so that the Navigation and / or Setup sections are hidden.*

One of these sections is always active and visible. The Section list button shows the section that is currently active. You can move between sections at any time without closing any open forms or screens. To switch to a different section, tap the Section list button and then select the section you want from the drop-down list.

For example, to switch from the Map section to the Data section, tap the Section list button and then select *Data*. The button now shows *Data*, and the Data section is active. When you return to the Map section, the screen or form that was open when you left the Map section appears again.

Tip – You can also use shortcuts to move between sections. See Keyboard shortcuts, page 51.

Sections

The main functions of each section in the TerraSync software are described below. The sections are covered in detail in the following chapters.

The sections and their main functions are:

- ***Map***

  The Map section shows you all the features in the open data file. Raster or vector map files can be displayed in the background for reference.

  Use the Map section with the screens in the Navigation section to navigate to specific locations.

Note – *The TerraSync software may have been customized so that some options in the Map section are hidden. The Navigation section and all navigation options may also be hidden.*

- ***Data***

  The Data section provides forms for entering information about features.

Use the Data section to update data from an existing GIS, CAD, or spatial database. You can:

- review, edit, and update the positions and attributes for features
- filter data to identify the features required for data maintenance
- accurately and efficiently collect the attributes and GNSS position of geographic points, lines, and areas
- switch to Camera mode, if your device has an integrated camera, to capture images

This information is stored in one or more data files that you can transfer to the Trimble postprocessing software. Data can then be exported into a wide range of GIS-compatible formats.

Note – *The TerraSync software may have been customized so that some options in the Data section are hidden.*

- ***Navigation***

  The Navigation section provides forms for collecting and editing waypoints, and screens for navigation.

  Use the screens in the Navigation section with the Map section to navigate to specific locations. You can use real-time differential GNSS to optimize navigation and provide differential accuracy when in the field.

Note – *The TerraSync software may have been customized so that the Navigation section and all navigation options are hidden. Some options in the Map section may also be hidden.*

- ***Status***

  The Status section contains information screens.

  Use the Status section to view summary or detailed information about the software, the GNSS receiver, any real-time source you have configured, and the location and health of the satellites the receiver is tracking.

Note – *The TerraSync software may have been customized so that some options in the Status section are hidden.*

- ***Setup***

  The Setup section provides forms for configuring the TerraSync software.

  Use the Setup section to control how the TerraSync software interacts with the GNSS receiver and with any real-time correction sources you have configured, and to configure data collection and display settings.

Note – *The TerraSync software may have been customized so that the Setup section and all setup options are hidden.*

Panes

If you use the TerraSync software on a desktop or laptop computer, the screen is arranged in panes. Each pane displays a section of the software.

Depending on the screen resolution, up to three panes can be displayed. By default, when the TerraSync software opens, the Map, Data, and Status sections are displayed.

To change the size of a pane, drag the resize bar between it and the next pane. Each pane has a minimum size, so if resizing would make a pane smaller than its minimum dimensions, it is automatically hidden. You can use this feature to create three-pane, two-pane, or single-pane layouts.

The Section list button determines which section appears in the ***primary*** pane. The primary pane is the left pane, or the top pane if only two panes are visible.

To change the section that is displayed in the primary pane, tap the Section list button and select a section from the list. If the section is already displayed in a secondary pane, the two sections switch position.

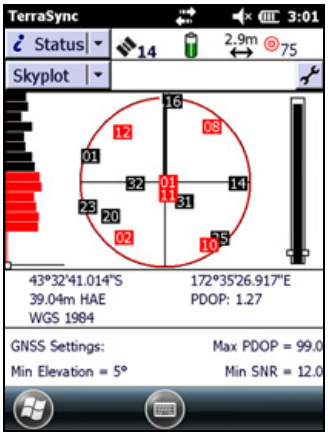
To change the section that is displayed in a secondary pane, tap the Section list button that appears in the top left corner of the pane. Then select a section from the list.

To move a section to a different pane, tap and hold the Section list button. The icon for the section appears. Drag the icon into the pane where you want the section to be displayed. When you drop the icon, the two sections switch position.

Section structure

Some sections have a number of ***subsections***. If the current section has subsections, the Subsection list button is visible. You can switch to a different subsection of the current section at any time. To do this, tap the Subsection list button and select the subsection you want from the drop-down list.

Subsection list button



For example, if you are in the Skyplot subsection of the Status section, the Subsection list button displays *Skyplot*. To switch to the Satellite Information subsection, tap the Subsection list button and select *Satellite Information*.

Some subsections are not always available. For example, in the Data section, you cannot open the Collect Features subsection until you open or create a data file.

Note – *The TerraSync software may also have been customized so that some subsection options are hidden.*

Some screens also contain buttons and menu buttons that let you open other screens or forms.

CHAPTER

5

Map Section

In this chapter:

- Elements and controls in the Map section
- Map tools
- Map layers
- Using the Map section

Use the Map section to view a graphical display of the features in the open data file. You can also view a background image, GNSS information, and navigation information in the Map section.

To display the Map section, tap the arrow on the Section button next to the status bar and from the drop-down list select *Map*.

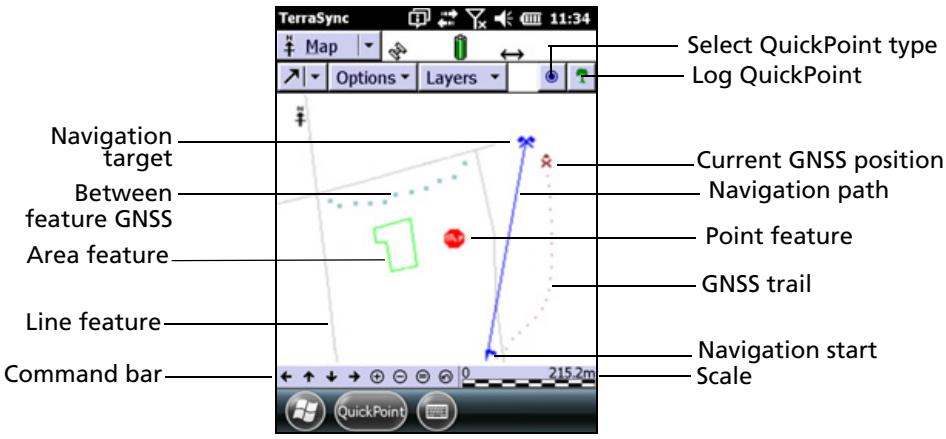
The color of an item on the map depends on which of the map layers the item belongs to.

Use the map tools to change the map scale and position, and to perform special functions such as digitizing positions and measuring between points.

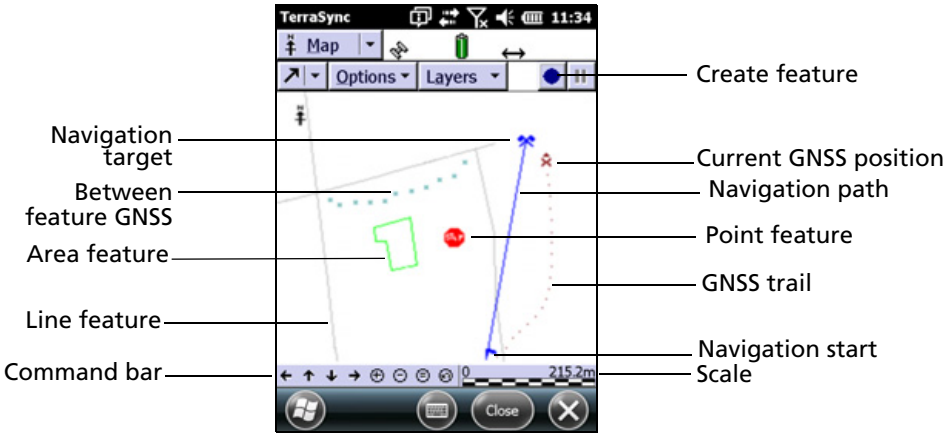
Elements and controls in the Map section

To open the Map section, tap the Section list button and then select Map. A map displaying the features in the open data file appears.

In QuickPoint data collection mode, the *Map* screen shows the QuickPoint options:



In Log Now or Log Later data collection mode, the *Map* screen shows the Create Feature option:



Note – *The TerraSync Standard edition software does not display background images or imported data files.*

The map section includes the following elements:

- Buttons (see below)
- Icons (see page 69)
- Options (see page 72)
- Tools (see page 73)

- Layers (see page 74)

Table 5.1 Map section: Buttons

Button		Function
	Map Tools	Opens the map tool list. See Map tools, page 73.
Options	Options	Opens the option list for the map. See page 72.
Layers	Layers	Opens the layer option list for the map. See Map layers, page 74. ***Note –*** *The TerraSync software can be customized; the Layers option may have been disabled and will not be visible.*
	Create Feature	Starts a new feature without returning to the Data section. See Creating and ending features from the Map section, page 84. ***Note –*** *The Create Feature button is only visible when the software is in Log Now or Log Later data collection mode.*
	QuickPoint Selection	Shows the features types and enables you to select a feature type to collect in QuickPoint mode. ***Note –*** *The QuickPoint selection button is only visible when the software is in QuickPoint data collection mode.*
	End Feature	Closes the open feature without returning to the Data section. See Creating and ending features from the Map section, page 84.
	Undo	Deletes the last digitized position recorded for the current feature. See Digitizing positions, page 85.
	Log/Resume	Starts GNSS position logging for the current feature, or resumes logging if logging is paused. See Controlling logging from the Map section, page 89.
	QuickPoint Feature Capture	Captures a QuickPoint of the selected feature type.
	Pause	Pauses GNSS position logging for the current feature. See Controlling logging from the Map section, page 89.
	End Measurement	Ends the current measurement. See Measuring, page 87.
QuickPoint	QuickPoint Feature Capture	Captures a QuickPoint of the selected feature type. ***Note –*** *The QuickPoint button is only visible when the software is in QuickPoint data collection mode.*

Table 5.2 Map section: Icons

Item	Name	Description
	Lightbar	The lightbar uses colored icons to simulate the colored LEDs of a physical lightbar. The lightbar graphically guides you along the **cross-track line**, which is the shortest path between the navigation start and target. See Lightbar, page 138.
N	North arrow	An arrow indicating the direction of north relative to the map display. The map is always oriented so that north is at the top of the screen.

Table 5.2 Map section: Icons

Item	Name	Description
	GNSS trail	A trail of dots that shows the path you have taken recently. The GNSS trail shows the last 60 GNSS positions calculated by the receiver.
	Current position	The current GNSS position, marked by the GNSS cursor, and your heading, shown by the heading arrow. If you are traveling too slowly or are stationary, only the GNSS cursor is displayed.
	Reference position	The reference position for the base data file that is being collected. This icon only appears if a base data file is open.
	Map point	A point that you have selected from the map which is not part of a feature. Tap a map point to display a tooltip showing information about the position. See Position information, page 71.
	Waypoint	A geographical point that, unlike a feature, holds no attribute information beyond a name and location. Typically, waypoints are used to denote objects whose locations are of primary interest, such as a survey mark. Waypoints are most often used for navigation. Tap a waypoint to display a tooltip showing information about the position. See Position information, page 71. When you tap and hold the stylus on a waypoint, a menu displays allowing it to be deleted or set as a navigation target. ***Note –*** *The TerraSync software can be customized; the Navigation features may have been disabled and will not be visible.*
	Navigation start	An icon indicating the feature or point that is currently selected as the start for navigation. When a start and a target are selected, they are joined by a line to show the most direct path from start to target. Use either the Map section or the Navigation section to navigate from the start to the navigation target. ***Note –*** *The TerraSync software can be customized; the Navigation features may have been disabled and will not be visible.*
	Navigation target	An icon indicating the feature or point that is currently selected as the target for navigation. When a target is selected, use either the Map section or the Navigation section to navigate to its location. ***Note –*** *The TerraSync software can be customized; the Navigation features may have been disabled and will not be visible.*
	Bearing to go arrow	An outlined arrow on the edge of the map, showing the approximate direction to the navigation target when it is not in the visible part of the map.
	Geo 7 series - Sensor interference	When using a Geo 7 series handheld with the rangefinder module, this icon appears with a magnet if the orientation sensors are reporting conditions that may be affecting sensor accuracy. When there is a very high level of interference, a message appears recommending that you recalibrate the sensors. See the Geo 7X Handheld User Guide for more information.

Table 5.2 Map section: Icons

Item	Name	Description
	Features	Features that have been logged in the current data file. Each feature type appears using the point feature symbol or line thickness defined in the data dictionary. The color of a feature is determined either in the data dictionary or by the color of the layer it appears in. When a feature is selected on the map, it is highlighted and its position information appears. A selected point feature is outlined, and a selected line or area feature is displayed with a bold line. When you tap and hold the stylus on a feature on the map, a menu displays with options depending on the selected feature: • Point feature - Update (shows the Attribute entry form), Delete, Set Target. • Line feature - Update (shows the Attribute entry form), Delete, Set Target - Vertex, Set Target - Start, Set Target - Middle, Set Target - End. • Area feature - Update (shows the Attribute entry form), Delete, Set Target - Vertex, Set Target - Start/End, Set Target - Centroid. ***Note –*** *The TerraSync software can be customized; the Navigation features may have been disabled and will not be visible.*
	Between feature GNSS	A trail of small crosses that show all GNSS positions logged but not associated with a feature.
29 Road Sign 10/12/00 Speed Limit 41°37'18.37 N 70°56'42.14 W -30.08m	Position information	A tooltip showing the coordinates of the current map cursor location. If the selected location is a waypoint, the waypoint name and number also appear. If the selected location is a feature, the feature name and number also appear, as well the two attribute values from the feature that have been specified in the data dictionary as labels.
	Digitized position	The last point that you digitized for the open feature. ***Note –*** *The TerraSync software can be customized; the Digitize option may have been disabled and will not be visible.*
	Measured point	The last point that you measured.
1.368 km 238°20'41"T 60,536.72 km²	Measurement information	A tooltip showing the total length of the current measurement, the bearing from the start of the measurement to the last measured point, and the area enclosed by the measurement, if the measurement has been ended.
	Command bar	A toolbar containing zooming and panning controls: Pan half the map width to the left Pan half the map height upwards Pan half the map height downwards Pan half the map width to the right Zoom in Zoom out Zoom to extents to show all positions in all visible layers Zoom to extents to show all positions in all visible layers
0 215.2m	Scale	The scale at which the map is drawn. As you zoom in or out, the scale changes accordingly.

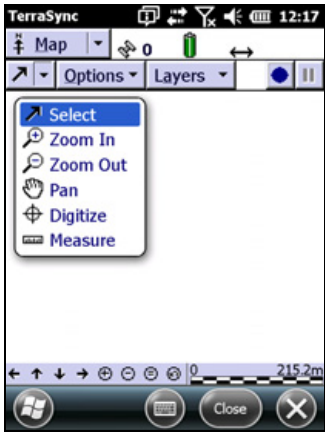
Table 5.3 Map section: Options

Option	Description
Zoom Extents	Changes the scale so that all selected layers are visible in the Map section. The Zoom extents option varies. What it shows depends on what layers are selected and whether the features are filtered. If nothing is displayed on the Map, the Zoom extents option does not affect the map scale.
High Resolution Mode	High Resolution Mode reduces the minimum discernible real world distance between points shown on the map. In other words, if two points are very close to each other, when High Resolution Mode is turned off they will be shown as one entity on the screen; High Resolution Mode must be turned on in this case to show both points on the screen. If the map extents exceed 1000 km, it may not be possible to show all of the features even at the maximum zoom out; turning off High Resolution Mode is recommended in this situation.
Auto Pan to GNSS Position	Makes sure that the current GNSS position is always visible. When this option is selected, and the GNSS position is outside the displayed area on the map or is close to the edge of the map, the TerraSync software automatically pans to bring the GNSS position to the center of the map. When the Auto Pan to GNSS Position option is active, a bullet appears beside it. ***Note –*** *You can select either Auto Pan to GNSS Position or Auto Pan to Selection, but not both. To clear Auto Pan to GNSS Position, select it again, or select Auto Pan to Selection.*
Auto Pan to Selection	Makes sure that the currently selected feature is always visible. When this option is selected, and the currently selected feature is outside the displayed area on the map or is close to the edge of the map, the TerraSync software automatically pans to bring the selected feature to the center of the map. When the Auto Pan to Selection option is active, a bullet appears beside it. ***Note –*** *You can select either Auto Pan to Selection or Auto Pan to GNSS Position, but not both. To clear Auto Pan to Selection, select it again, or select Auto Pan to GNSS Position.*
Filter	Opens the *Filter By* form in the Data section, where you can set or change filtering criteria (see page 119).
Update Selected Feature	Opens the Data section and displays the *Attribute Entry* form for the currently selected feature, where you can update the attributes or position of the feature (see page 101). When you save the changes to the feature and close the attribute entry form, you are returned to the Map section. ***Note –*** *You can also open a feature for update by double-tapping it on the map.*
Delete Selected Feature	Deletes the currently selected feature. This is the same as the *Delete* option in the *Update Features* screen in the Data section (see page 114). ***Note –*** *Deleted features are never displayed in the map. Once a feature is deleted, it is hidden on the map. To undo a deleted feature, use the Update Features screen (see page 114).*
Set Nav Start	Defines the position of the navigation start. See Setting and clearing the navigation start and target, page 87. ***Note –*** *The TerraSync software can be customized; the Navigations features may have been disabled and will not be visible.*
Set Nav Target	Defines the position of the navigation target. See Setting and clearing the navigation start and target, page 87. ***Note –*** *The TerraSync software can be customized; the Navigations features may have been disabled and will not be visible.*

Table 5.3 Map section: Options

Option	Description
Clear Nav Targets	Clears the current navigation start and target. You do not have to select either the start or target before clearing them. ***Note –*** *The TerraSync software can be customized; the Navigations features may have been disabled and will not be visible.*
Cross-Track Light Bar	Hides or displays the navigation lightbar at the top of the Map screen. By default, the lightbar is hidden. See Lightbar, page 138.
Enter Coordinates	Opens the *Enter Coordinates* form, where you can record a position for the open feature by entering its coordinates manually. See Creating manual positions, page 86. ***Note –*** *To enter coordinates manually, you must be in Digitize mode with a feature open.*
Refresh	Clears the map display and then redraws it.

Map tools



The Map section has six map tools. Only one map tool is active at a time. To change to a different map tool, tap the Map Tools button and from the drop-down list select the tool you want to use.

When you tap a point on the Map screen, the effect depends on the currently selected map tool. For example, if you tap a point on the map when the Zoom In tool is active, the map zooms in to the next largest scale, centered on that point.

Tip – Use the Command bar to pan or zoom at any time without changing the map tool (see page 71). When you use the command bar to zoom or pan, the operation is centered on the middle of the map, as if you had selected the appropriate map tool, then tapped the center of the map.

Tool	Name	Description
	Select	When the Select tool is selected, tap a point on the map to highlight a position or a feature. Double-tap a feature to open it for update. See Selecting features, map points, and waypoints, page 82.
	Zoom In	When the Zoom In tool is selected, tap a point on the map or drag a rectangle to reduce the map scale and magnify the map display. The map zooms in on that point. See Zooming, page 83.
	Zoom Out	When the Zoom Out tool is selected, tap a point on the map to enlarge the map scale and show a greater area on the map. The map zooms out from that point. See Zooming, page 83.
	Pan	When the Pan tool is selected, tap a point on the map to pan the display so that the point is in the center of the screen. See Panning, page 82.

Tool	Name	Description
	Digitize	When the Digitize tool is selected, tap a point on the map to create a position for a feature. See Digitizing positions, page 85. ***Note –*** *The TerraSync software can be customized; the Digitize option may have been disabled and will not be visible.*
	Measure	When the Measure tool is selected, tap a series of points on the map to measure the distance between the points and the area that they enclose. See Measuring, page 87.

Map layers

To view the list of layers that you can display on the map and to access commands for formatting layers, tap **Layers**.

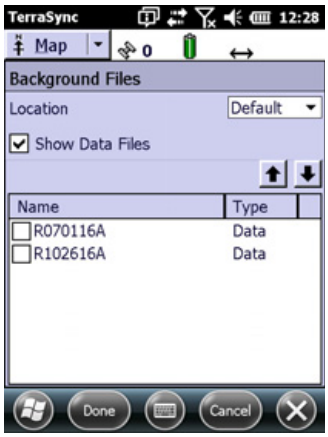
Note – *The TerraSync software can be customized; the Layers option may have been disabled and will not be visible. All background files will be visible.*

Option	Description
Filtered Features	Hides or displays filtered features on the map and in the Data section. When this option has a check mark(✓) beside it, filtered features are visible. Select this option to clear the check mark and hide filtered features from view. ***Note –*** *You can set or clear filters in the Map section or in the Data section (see page 121).*
Unfiltered Features	Hides or displays unfiltered features on the map and in the Data section. When this option has a check mark (✓) beside it, features that have not been filtered are visible. Select this option to clear the check mark and hide unfiltered features from view. ***Note –*** *When you hide or show filtered features or unfiltered features in the Data section, they are also shown or hidden in the Map section. When you hide or show filtered or unfiltered features in the Map section, they are also hidden or shown in the Data section.*
Waypoints	Hides or displays waypoints on the map (see page 70).
Background	Hides or displays the background file if one is selected. When this option has a check mark(✓) beside it, features in the background file are visible. Select this option to clear the check mark and hide background features from view. This option is not available in the TerraSync Standard edition software. You can only open background files using the TerraSync Professional edition or Centimeter edition software.
Between Feature GNSS	Hides or displays Between feature GNSS positions on the map (see page 71).
GNSS Trail	Hides or displays the GNSS trail (see page 70).

Option	Description
Background Files	Opens the *Background Files* form where you can select a data or background file to be used as the map background, or clear the currently selected background (see page 75). This option is not available in the TerraSync Standard edition software. You can only open background files using the TerraSync Professional edition or Centimeter edition software.
Layer Formatting	Opens the *Layer Formatting* form, where you can change the colors and line thicknesses used for the layers in the map (see page 79).

Background Files form

Note – *This form is not available in the TerraSync Standard edition software.*



Use the *Background Files* form to select a file to be displayed in the background of the map, or to clear the current background selection.

To open the *Background Files* form, in the Map section tap **Layers** and then select *Background file*.

Two types of file can be displayed in the background:

- Data files
- Background files containing **vector** information or **raster** information

Any data file in the TerraSync software can be selected as the background (.bkg) file, provided it is not already open in the Data section. When you open a data file in the background, its features are visible but cannot be selected, edited, or deleted.

Tip – If you want to use a data file (.cor, .ssf, or .imp) in the background, but will not be opening it as a data file, you can transfer the file to the TerraSync software as a ***background file.*** This uses less storage space, because the attribute information is removed. You cannot open a background (.bkg) file for data collection or update, and features in a background file cannot be selected, updated, or deleted.

The vector formats that the TerraSync software supports are the TerraSync software data file format (.cor, .ssf, or .imp) and ArcView Shapefiles (.shp).

You can also transfer raster files such as aerial photographs to the TerraSync software as background (.bkg) files. The supported formats are bitmap (.bmp), ECW (.ecw), JPEG (.jpg), JPEG2000 (.jp2, .j2c), MrSID (.sid), and TIFF (.tif). If the image file is any format except an .ecw or an .sid file, the image file ***must*** be transferred with the following files:

- A World (.wld) file that tells the TerraSync software how the pixels in the file relate to real-world coordinates. You can create the World file in your GIS.
- A coordinate system file that includes the coordinate system that the image file uses. You can create the coordinate system file in the GPS Pathfinder Office software or in the Trimble Data Transfer utility at the time of transfer.

Including these files is optional if you are using an .ecw or an .sid image file.

Multiple background files

If you are using the TerraSync Professional edition or Centimeter edition software, you can display more than one file as background layers for your current map.

Note – *You can only display multiple files if each file is located in the same folder and uses the configured coordinate system.*

When displaying multiple background files, the layers are not transparent; files layered beneath other layers are obscured by the layers above. If the uppermost layer contains a white background, the layer directly underneath shows through, except when hidden by features on the uppermost layer.

Background files are layered in the following order:

- Raster image layers are displayed first.
- Shapefile layers are displayed over raster image layers.
- Trimble data file and background (.bkg) layers are displayed over Shapefile layers.

Web map server

In addition to background files that you have transferred to the field computer, you can connect to a Web map server (also known as an Internet map server, or IMS) and download raster background images.

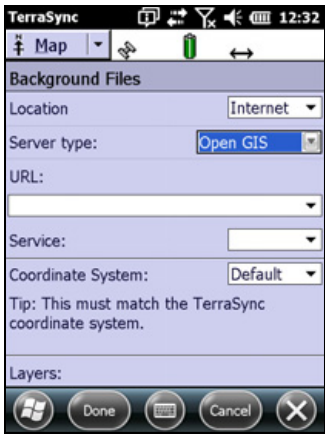
To download background files from a Web map server:

1. Use Panning or Zooming to make sure that the area for which you want a background image is displayed on the map.

   If the map server covers the area you are in, it will provide a background image that matches the current map extents.

2. Connect to the Internet using your normal connection method.

Note – *You cannot connect to the Internet from within the TerraSync software.*



3. Once you have established an Internet connection, open the *Background File* form.
4. Select Internet in the *Location* field, then use the fields that appear to specify a Web map server, a service, and the layers from that service that you want to download.
5. Tap **OK** to close the *Background File* form and download the selected background map.

   This may take some time. When a download is in progress, an animated icon appears in the top left corner of the map. Once the background file is downloaded, the hourglass icon appears until the downloaded image is rendered and becomes visible.

If you pan or zoom beyond the extents of the downloaded image, new images are downloaded automatically and displayed in the background of the map. To stop automatic downloading, either clear the address of the map server from the *URL* field, or set the *Location* field to Device and from the list of files select None.

Tip – Background settings are saved when you exit the TerraSync software, so when you restart the software, any Web map server session that you have configured automatically starts again.

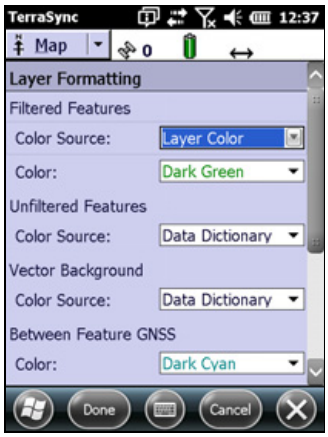
Table 5.4 Background File form: Fields

Field	Default	Description
Location	Default	The location of the files to be listed in the *Files* field. This field contains an entry for each storage location on the device. There is also an option called Default, which represents the TerraSync documents folder, and an option called Internet, which allows you to download background images from a Web map server.
Show Data Files	None	Select the check box to show Trimble data files (.ssf, .cor, or .imp files) in the list of background files.

Table 5.4 Background File form: Fields (continued)

Field	Default	Description
Files	None	A list of the files that can be displayed in the background. The *Format* column shows the format of each file in the list. The options are: • Data — A Trimble data file (a .ssf, .cor, or .imp file) ***Note –*** *Data files appear only if you have selected the Show Data Files check box.* • Background — A Trimble data file transferred as a background (.bkg) file • Shapefile — ArcView Shapefiles (.shp) • BMP — A bitmap (.bmp) file • ECW — An .ecw file • JPEG — A .jpg file • JPEG2000 — A .jp2 or a .j2c file • MrSID — An .sid file • TIFF — A .tif file To display a background file, select the check box next to the file name.
Server type	Open GIS	The type of Web map server to connect to. The options are: • ArcIMS — A map server that uses the ArcIMS protocol • Open GIS — A map server that conforms to the Open GIS standard
URL	None	The Internet address of the map server. Select a URL from the drop-down list, or enter the URL of the server you want to connect to. Once you successfully connect to a server, the server is added to the drop-down list. This field only appears if Internet is selected in the *Location* field.
Service	None	The map service that you want to use from the selected ArcIMS Web map server. If you want to connect to an Open GIS server, leave this field blank. Open GIS servers do not provide services. This field only appears if Internet is selected in the *Location* field.
Coordinate system	None	This field only appears if Internet is selected in the *Location* field. The coordinate system that maps will be downloaded in. The selected option must match the coordinate system configured in the *Coordinate System* form in the Setup section (see page 203). Some servers do not let you select a coordinate system for the images you download. If this field is not available, set the coordinate system in the TerraSync software to match the coordinate system of the image. To do this, go to the website for the map server to determine the coordinate system required, and then select the same system in the Setup section.
Layers	None	This field only appears if Internet is selected in the *Location* field. The layers that you want to download. Under this heading, a check box appears for each layer in the selected service. ***Note –*** *The TerraSync software can be customized; the Digitize option may have been disabled and will not be visible.*

Layer Formatting form



Use the *Layer Formatting* form to change the colors assigned to items in the five Map layers (see page 74).

Note – *The TerraSync software can be customized; the Layers option may have been disabled and will not be visible.*

To open the *Layer Formatting* form, in the Map section tap **Layers** and then select *Layer Formatting*.

Features in the open data file are displayed according to the following rules:

- Feature symbols, symbol sizes, and line thicknesses are derived from the data dictionary.
- All items in a layer appear in the color assigned to that layer.
- The color assigned to a layer depends on the selected option in the *Color Source* field:
  - Select the *Layer Color* option to use the color that is selected in the corresponding *Color* field.
  - Select the *Data Dictionary* option to use the color assigned in the data dictionary.

Table 5.5 Layer Formatting form: Fields

Field	Default	Description
Filtered Features	(none)	Sets the display options for the *Filtered Features* layer (see page 74).
Color Source	Layer color	Specifies whether to display filtered features using the layer color or the color specified in the data dictionary.
Color	Dark Green	The color for filtered features in the data file. This field only appears if the *Color Source* field is set to Layer Color (see page 79).
Unfiltered Features	(none)	Sets the display options for the *Unfiltered Features* layer (see page 74).
Color Source	Data dictionary	Specifies whether to display unfiltered features using the layer color or the color specified in the data dictionary.
Color	Black	The color for unfiltered features in the data file. This field only appears if the *Color Source* field is set to Layer Color (see page 79).
Waypoints	(none)	Sets the display options for the *Waypoints* layer (see page 74).
Color	Black	The color for waypoints (see page 70).
Vector Background	(none)	Sets the display options for the Background layer (see page 74). ***Note –*** *This field is not available in the TerraSync Standard edition software.*

Table 5.5 Layer Formatting form: Fields (continued)

Field	Default	Description
Color Source	Data dictionary	Specifies whether to display features from a file that is open in the background using the layer color or the color specified in the data dictionary.
Color	Dark Magenta	The color for background features if the background file contains feature information. This field only appears if the *Color Source* field is set to Layer Color (see page 79). ***Note –*** *This field is not available in the TerraSync Standard edition software.*
Between Feature GNSS	(none)	Sets the display options for the Between Feature GNSS layer (see page 74).
Color	Dark Cyan	The color for Between feature GNSS positions (see page 71).
GNSS trail	(none)	Sets the display options for the GNSS Trail layer (see page 74). ***Note –*** *In addition to the GNSS trail, the following items appear in the color assigned to the GNSS Trail layer:* • *Current position (see page 70)* • *Map point (see page 70)* • *Bearing to go arrow (see page 70)* • *Line segments between digitized positions for the current feature* • *Line segments between measured points* *However, when the GNSS Trail layer is hidden, these map items remain visible.*
Color	Dark Red	The color for the GNSS trail (see page 70).
Navigation	(none)	Sets display options for the Navigation layer.
Color	Blue	The color for the Navigation start and Navigation target (see page 70).

Enter Coordinates form

Use the *Enter Coordinates* form to record a manual position for the open feature by entering its coordinates.

To open the *Enter Coordinates* form, in the Map section tap **Options** and then select *Enter Coordinates*.

This option is only available if there is an open feature and the Map section is in Digitize mode (see page 74). A point feature can contain only one position, but a line or area feature can contain any number and combination of manual, digitized, and GNSS positions. See Creating manual positions, page 86.

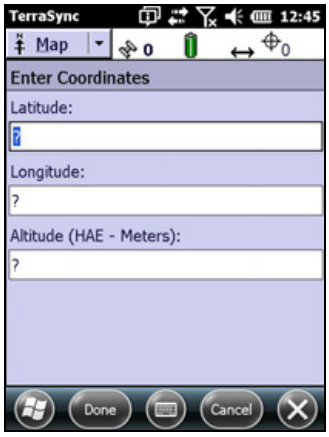


Table 5.6 Enter Coordinates form: Fields

Field	Description
Latitude	This field only appears if the current coordinate system is Lat/Long. The latitude of the manual position. The value in this field is displayed in the units specified in the *Coordinate System* form (see page 203). ***Note –*** *To indicate a Southern hemisphere latitude or Western hemisphere longitude, you must include the hemisphere letter (S or W) or a minus sign (–). The hemisphere letter or plus sign is optional for Northern or Eastern hemisphere positions.* ***Note –*** *The symbols for degrees (°), minutes ('), and seconds (") can be omitted or replaced with a space, but you must include the decimal point (.).*
Longitude	This field only appears if the current coordinate system is Lat/Long. The longitude of the manual position. The value in this field is displayed in the units specified in the *Coordinate System* form (see page 203).
North	This field only appears if the current coordinate system uses North/East. The northing of the manual position, in the coordinate units specified in the *Coordinate System* form (see page 203).
East	This field only appears if the current coordinate system uses North/East. The easting of the manual position, in the coordinate units specified in the *Coordinate System* form (see page 203).
USNG	This field only appears if you have enabled USNG display in the *Coordinate System* form (see page 203). The northing and easting of the manual position, in USNG format.
Altitude	This field only appears if you have enabled USNG display in the *Coordinate System* form (see page 203). The altitude of the manual position. The altitude is expressed as a **Height Above Ellipsoid** or **Mean Sea Level**, depending on the option configured in the *Coordinate System* form (see page 203), and is in the altitude units specified in this form.

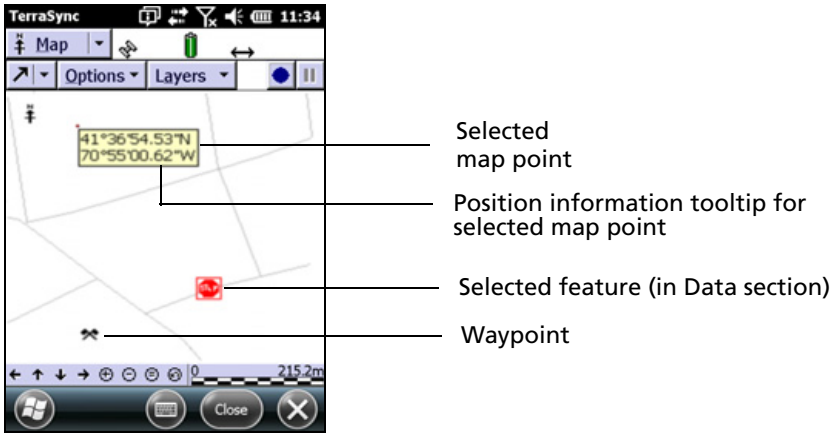
Using the Map section

You can move around the map, hide or display different parts of the map, and select features or points of interest.

Note – *Imported files cannot be opened in the TerraSync Standard edition software.*

Selecting features, map points, and waypoints

When a feature is selected in the Data section (see page 91), it becomes the selected feature in the map.



When you select a feature from the map and there is no open feature in the Data section, the feature selected on the map is highlighted in the *Choose Feature* list in the *Update Features* screen (see page 114) in the Data section.

To select a feature on the map, make sure that the Select tool is active and then tap the feature. The feature is highlighted and a position information tooltip, including the coordinates, feature number, and name, is displayed.

The position information tooltip remains visible until you tap the tooltip, another feature, a different map point, a waypoint, or anywhere else on the screen. The feature remains selected (highlighted) until you tap another feature.

Waypoints are displayed on the map with the symbol .

When you select a map point that is not a feature (see page 70), the last feature that you selected on the map remains highlighted.

To delete or update a feature from the map, tap and hold the required feature:

- Tap *Delete* to delete the feature.
- Tap *Update* to change the feature's attributes. The *Update Features* screen appears. See Update Features screen, page 114.

Tip – This is particularly useful when capturing QuickPoints (see Capturing point features using QuickPoint mode from the Map section, page 84) from a LaserAce 1000 rangefinder and the laser has returned the wrong distance or bearing. For more information on using a rangefinder, see External Sensors, page 206.

Panning

When you pan, you change the area that is visible in the Map screen by sliding the map left, right, up, or down. Panning does not change the scale at which you are viewing the map.

- To pan to any location, select the Pan tool (see page 73) and then tap the location. The selected location is placed in the center of the display.
- To pan half a screen width or height in any direction without changing the currently selected map tool, tap the appropriate panning button on the Command bar (see page 71) at the bottom of the Map section.

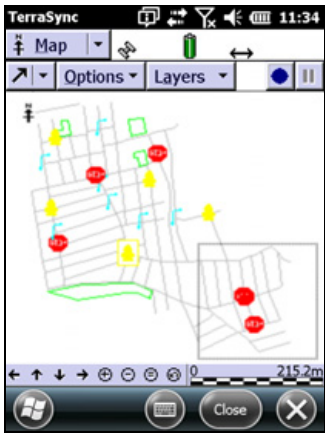
Auto Pan options

The two Auto Pan options let you control the map automatically. You can set either option, or clear both to retain full manual control over the map display.

- When you select the *Auto Pan to GNSS Position* option (see page 72), the TerraSync software ensures that the map shows the current GNSS position. Whenever the GNSS position moves to or beyond the edge of the display, the map automatically pans until the GNSS position is in the center of the screen.
- When you select the *Auto Pan to Selection* option (see page 72), the TerraSync software ensures that the currently selected position is always visible by automatically panning whenever the selected feature is at the edge of the display, or beyond it. When you tap close to the edge of the map, the map automatically pans (half a screen width or height) in the direction of the movement. The selected point remains at the same geographic position. In these circumstances, the current GNSS position may not be visible.

Zooming

When you zoom, you change the map scale to display a larger or smaller area. You can zoom in to view a few features that are close together, or zoom out for an overview of the features you have collected so far.



Zooming in

To zoom in, select the Zoom In tool (see page 73) and then tap the location on the map you want to zoom in on. Alternatively, tap the Zoom In button on the Command bar (see page 71) to zoom in to the center of the map.

You can also zoom in by dragging across the map when the Zoom In tool is active. As you drag, a rectangle appears. The diagonal of the rectangle is the line between the point where you started dragging and the last point you dragged to. When you stop dragging, the map zooms in on the rectangle.

Note – *If the rectangle you draw is very small, the map does not zoom.*

Zooming out

To zoom out, select the Zoom Out tool (see page 73) and then tap the location you want to zoom out from. Alternatively, tap the **Zoom Out** button on the command bar to zoom out from the center of the map.

Note – *You cannot zoom out by dragging a rectangle. This method is for zooming in only.*

Zoom Extents

To view all the features in all visible layers, tap the **Zoom Extents** button on the command bar, or select *Zoom Extents* from the Options list (see page 72). The map scale increases until all points in all the visible layers appear. The map layers that you can display include features in the data file and background file, the current GNSS position, and past GNSS positions (see page 74).

Capturing point features using QuickPoint mode from the Map section

You can use the **QuickPoint** button and the **QuickPoint Feature Capture** button (for example,) to capture QuickPoints from the Map screen. The TerraSync software must be in QuickPoint data collection mode. See Collect Features screen, page 97.

When you tap the **QuickPoint** button, a drop-down list appears, showing each point feature type that is defined in the data dictionary of the open file. Select a point feature type from this list to enable you to quickly log features of this type. To log each feature, tap the **QuickPoint Feature Capture** button.

Creating and ending features from the Map section

You can use the **Create Feature** button and the **End Feature** button to open a new feature, or to close a feature that is already open in the Data section. When you tap the **Create Feature** button, a drop-down list appears, showing each feature type that is defined in the data dictionary of the open file. Select a feature type from this list to open its attribute entry form.

Whenever a feature is open, and irrespective of whether it was opened from the Map section or from the Data section, you can close it by tapping the **End Feature** button. If you have done one of the following, you will be asked to confirm that you want to close this feature:

- collected insufficient positions
- have not entered all the attribute values for the feature
- have set the *Confirm End Feature* field in the *Logging Settings* form to Yes (see page 178)

When you close a feature using the **End Feature** button, you are returned to the section that you opened the feature from. If you used the **Create Feature** button, you are returned to the Map section. Otherwise, you are returned to the Data section.

Tip – To create digitized positions from the map, you need an open feature. Use the Create Feature button to open a new feature without switching to the Data section. See Digitizing positions, page 85.

Note – *Waypoints cannot be created from the map. To create waypoints, use the Waypoints subsection of the Navigation section (see page 144).*

Digitizing positions

Digitizing is the process of creating positions for a feature by selecting points on the map, instead of using GNSS positions. A line or area feature can contain both GNSS and digitized positions, but you must pause GNSS logging before you can digitize positions.

Note – *The TerraSync software can be customized; the Digitize option may have been disabled and will not be visible.*

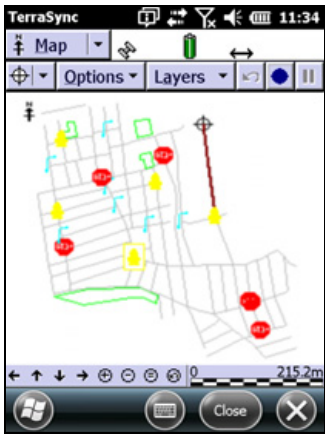
To record digitized positions:

1. Make sure that the new or existing feature that you want to add positions to is open in the Data section. If no feature is open, tap the **Create Feature** button in the Map section to quickly open a new feature. See Creating and ending features from the Map section, page 84.
2. Make sure that GNSS logging is paused.

Tip – Use the Log Later option to prevent GNSS logging from starting automatically when you start a new feature (see page 99).

3. Select the Digitize tool (see page 74). The Digitize icon appears in the Status bar.
4. Tap the location on the map where you want to create a position. If the location you tap is close to an existing position, the new position will "snap" to the same location. This is a useful feature when you want to create line or area features with shared boundaries.

Tip – Whether or not a digitized position snaps to an existing one depends on how close the two positions are when shown in the map display. It does not depend on the distance between their actual coordinates. To record a digitized position without snapping to a nearby position, zoom in to increase the distance between the two positions on the screen.



To record a digitized area or line feature, tap the location where you want each vertex.

The number beside the Digitize icon increments to show the number of digitized positions in the current feature. A line appears on the map, joining all the vertices recorded so far.

A digitized point feature can contain only one position, so if you tap again while a point feature is open, an error message appears.

Any offset you have configured for the feature is applied to each digitized position. The map location that you tap is the position that the offset is measured from.

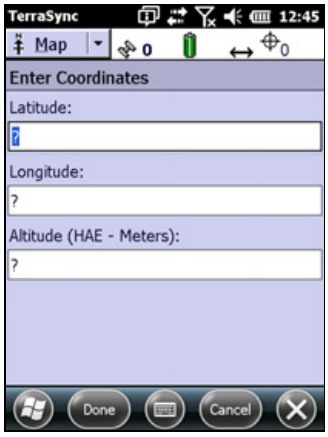
If you tap the wrong location, use the Undo button to remove the incorrect position. You can undo any number of positions recorded for the current feature, in reverse order, up to the last GNSS position recorded.

For example, if you have recorded four digitized positions, you can undo the fourth, then the third, and then the second position, by tapping the Undo button three times. Once you have undone all the positions in a feature, the Undo button becomes unavailable.

Note – *You cannot undo a GNSS position. Once you have undone all digitized positions in the feature up to the last GNSS position, the Undo button becomes unavailable, even if there are other digitized positions in the feature that you recorded before the GNSS position.*

To record GNSS positions, simply tap the **Resume** button to resume logging GNSS. When you are logging GNSS positions, you cannot record digitized positions. However, you do not leave Digitize mode until you select one of the other map tools (see page 73), so you can quickly switch between GNSS and digitized positions using the **Pause** and **Resume** buttons.

Creating manual positions



A manual position is a position that you create by entering its coordinates manually. A line or area feature can contain a mixture of GNSS, manual, and digitized positions, but a point feature can contain only GNSS positions or a single manual or digitized position.

You can record manual positions only when all of the following are true:

- A feature is open.
- GNSS logging is paused.
- The Digitize tool (see page 74) is active.

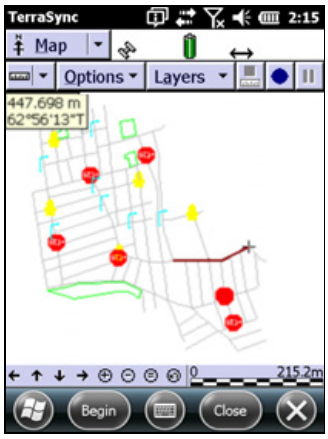
For more information, see Digitizing positions, page 85.

To record a manual position:

1. Tap **Options** in the Map section.
2. From the drop-down list, select *Enter Coordinates*. The *Enter Coordinates* form appears. The fields that appear (*Latitude*, *Longitude*, and *Altitude*, or *North*, *East*, and *Altitude*) depend on the current coordinate system (see page 80).
3. Enter the coordinates of the position.
4. Tap **Done** to close the form and store the position.

Measuring

Use the Measure tool to measure the distance between points, or the area enclosed by a set of points. To measure a distance or area:



1. Select the Measure tool (see page 74). A tooltip appears in the top left corner of the map.
2. Tap on the map where you want to start measuring.
3. Tap each point that you want to measure to. The last position that you tapped is marked with a cross +, and the measured points are connected by a line. As you add points to the measurement, the distance and bearing are updated in the tooltip. The distance shown is the total line length, while the bearing is the bearing of the last line segment that you measured

Tip – If the location you tap is close to the GNSS cursor or to a point on an existing feature, the point will "snap" to that position. This is a useful feature when you want to measure the length or area of a feature.

To end the measurement, do one of the following:

- Double-tap the last point.
- Tap the **End Measurement** button .

The area enclosed by the measured points is displayed in the tooltip. You do not have to join the first and last points; the TerraSync software assumes that these points are joined when it calculates the area.

Setting and clearing the navigation start and target

To navigate to a location using the Navigation section, you must set a navigation target. If you want to use the lightbar to navigate (see page 138), you must also set a navigation start position. You can set both the navigation start and target in the Map graphical screen or in the Data section.

Note – *The TerraSync software can be customized; the Navigation features may have been disabled and will not be visible.*

Setting the navigation start

The navigation start can be any of the following items:

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

To set the navigation start in the Map section:

1. To navigate from a point on the map, a waypoint, or from a feature, select the map point, waypoint, or feature.
2. Tap **Options** and then select *Set Nav Start*.
3. Select the start option required. Do one of the following:
   - To set the start to the current GNSS position, select *GNSS*.
   - To set the start to the selected map point, select *Map Point*.
   - To set the start to the selected waypoint, select the waypoint. The waypoint is identified by the waypoint number (for example, **18 Waypoint**).
   - To set the start to a location on the selected feature, select one of the feature options. The feature options are identified by the feature number and feature type (for example, **173 Road - Start** is the feature option for the start point of the Road feature that has ID number 173).

   The start icon appears over the selected map point, waypoint, feature, or position.

Tip – A start icon also appears beside the selected feature in the *Update Features* screen (see page 114).

Note – *If you have specified a navigation start and target, but the start is farther from your position than the configured Range (see Close-up range, page 138), you must navigate to the start before you can navigate to the target. Until you are within the close-up range of the navigation start, the Navigation section guides you to the navigation start.*

Setting the navigation target

The navigation target can be any of the following items:

- the selected map point
- the selected waypoint

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

To set the navigation target in the Map section:

1. To navigate to a point on the map, a waypoint, or to a feature, select the map point, waypoint, or feature.
2. Tap **Options** and then select *Set Nav Target*.
3. Select the target option required. Do one of the following:
   - To set the target to the selected map point, select *Map Point*.
   - To set the target to the selected waypoint, select the waypoint. The waypoint is identified by the waypoint number (for example, **18 Waypoint**).
   - To set the target to a location on the selected feature, select one of the feature options. The feature options are identified by the feature number and feature type (for example, **3 Park - Centroid** is the feature option for the center of the Park feature that has ID number 3).
   - To enter a target position manually, select *Construct*. The *Construct Target Offset* form appears (see page 123). Enter the bearing and distance from the start to the target and then tap **OK**.

Note – *The Construct option is only available if you have set the navigation start.*

The target icon appears over the selected map point, waypoint, feature, or position. If a navigation start is also defined, the start and target are joined by a line that shows the most direct navigation path.

Tip – A target icon also appears beside the selected feature in the the *Update Features* screen (see page 114).

Clearing the navigation start and target

To clear the navigation start and target, tap **Options** and select *Clear Nav Targets*. The start and target icons disappear from the Map section and from the *Update Features* screen in the Data section. In the Navigation section, the lightbar is grayed out and the message Set your nav target in the Map or Data section appears. You cannot navigate until you have set a new target.

Controlling logging from the Map section

In *Log Now* or *Log Later* data collection modes, when the attribute entry form for a feature is open in the Data section, you can use the **Log** button and **Pause** button in the Map section to start, pause, or resume logging, just as you would tap **Log**, **Pause**, or **Resume** in the Data section.

The two buttons perform the same function, so they are synchronized. For example, if you tap **Pause** in the Data section, its label changes from Pause to Resume, and logging is suspended. At the same time, the **Log** button in the Map section is replaced by the **Pause** button. Use either the **Log** button in the Map section or **Resume** in the Data section to start logging again. See Pausing and resuming logging, page 104.

CHAPTER

6

Data Section

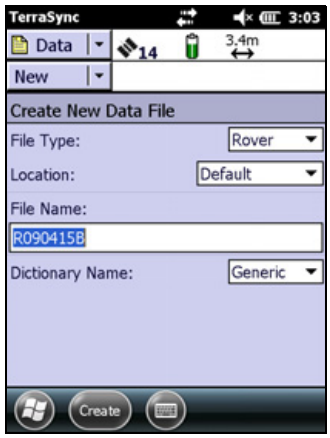
In this chapter:

- New File screen
- Collect Features screen
- Existing Files screen
- Update Features screen
- File Manager

Use the Data section to open data files, collect new data, update existing data, and manage files in the field.

To display the Data section, tap the arrow on the Section button next to the status bar and from the drop-down list select *Data*.

New File screen



Use the *New File* screen to create a new data file for logging features and GNSS positions.

To display the *New File* screen, tap the arrow on the Subsection button below the Section button and then select *New*. The *New File* screen appears.

Select a file type, filename, and (for rover files only) a data dictionary, and then tap **Create** to create a new file. If the new file is:

- a rover file, the *Collect Features* screen appears (see page 97)
- a base file, the Base Station Setup wizard appears (see page 94)

Tip – Once you have logged features to the new file, you can switch to the *Update Features* screen (see page 114) to edit the features you have collected so far.

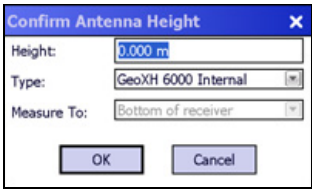
Table 6.1 New File screen: Fields

Field	Description
File Type	The type of data that will be stored in the new file. The options are: • Rover — The new file will contain feature, attribute, and position information. • Base — The new file will contain base GNSS data recorded at a stationary location, or will allow you to set up the connected GNSS receiver as an unattended base station, broadcasting correction messages. If the connected receiver is a Trimble survey receiver, you cannot log base data to file; you can only generate corrections for broadcast. If any other receiver that supports carrier phase logging is connected, you can log data to a base file, and depending on the receiver you may be able to broadcast corrections as well.
Location	The TerraSync software enables you to write data files directly to internal or removable secondary storage locations. This field contains an entry for each storage location on the device. There is also an option called Default, which represents the TerraSync documents folder.
File Name	The name of the new file. When you open this section, the TerraSync software automatically generates a filename for the new data file, using the date and time from the field computer's clock. It uses the formula RMMDDHHX for rover files, and BaseMMDDHHX for base files, where: • **R** or **Base** is the Filename Prefix. • **MM** is the current month, • **DD** is the current day of the month, • **HH** is the current hour of the day, • **X** increments within this hour, starting at *A* for the first file in that hour, then *B* for the second file, and so on. ***Note –*** *You can change the prefix character for rover files in the Logging Settings form in the Setup section (see page 178).* The auto-generated filename is only a suggestion. You can edit it, or replace it with an entirely different name. Filenames must follow the naming rules for Windows.

Table 6.1 New File screen: Fields (continued)

Field	Description
Dictionary Name	The data dictionary that will be associated with the new file. This field lists all the data dictionaries currently loaded in the TerraSync software. The default data dictionary is the last dictionary used. The Generic data dictionary is always available. It lets you record point, line, and area features, each with a simple descriptive attribute. ***Note –*** *When you create a data file, a copy of the data dictionary selected is permanently associated with that file. This embedded data dictionary determines what types of features can be recorded to the file, and what attributes the features have.* This field only appears when Rover is selected in the *File Type* field (see page 92).

Confirm Antenna Height form



Use the *Confirm Antenna Height* form to specify the antenna height and measurement position, so that you can accurately record altitude data.

If the *Confirm* field in the *Antenna Settings* form (see page 181) is set to Per File, the *Confirm Antenna Height* form appears whenever you tap **Create** in the *New File* screen (see above), or tap **Open** in the *Existing File* screen (see page 113).

If the *Confirm* field in the *Antenna Settings* form is set to Per Feature, the *Confirm Antenna Height* form appears whenever you create a new feature or update position information for an existing feature.

The values shown in the *Confirm Antenna Height* form default to the values shown in the *Antenna Settings* form (see page 181). If you change either value, it is also changed in the *Logging Settings* form.

Table 6.2 Confirm Antenna Height form: Fields

Field	Default	Description
Height	The current value set in the Height field of the *Antenna Settings* form.	The height of the GNSS antenna that is connected to the GNSS receiver. This is used as a vertical offset on each position.
Measure To	The current value set in the Measure To field of the *Antenna Settings* form.	The point on the antenna that the height is measured to. If the selected antenna type does not allow alternative measurement locations (for example, if you are using the internal antenna in a GeoExplorer series handheld), this field defaults to Bottom of antenna mount.

Base Station Setup wizard

You can use the TerraSync software to configure a GNSS receiver as a base station. You can set up the GeoExplorer 6000 series handheld as a base station to log base data to a file (see below), which can be used to postprocess rover data in Trimble postprocessing software.

The Base Station Setup wizard guides you through the process of setting up a GNSS receiver to broadcast real-time corrections or log base data to file.

To start the Base Station Setup wizard, select Base in the *File Type* field on the *New File* screen (see page 92) and then tap **Create**.

The following sections describe each step of the Base Station Setup wizard:

- Antenna Settings step, page 94
- Logging and GNSS Settings step, page 95
- Reference Position Step, page 95

Antenna Settings step

Use the Antenna Settings step of the Base Station Setup wizard to specify the antenna type that you are using, and its height.

When you have made your changes, tap **Next**.

Click **Cancel** to close the wizard and return to the *New File* screen.

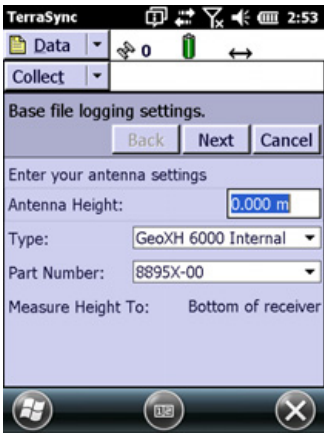


Table 6.3 Antenna Settings step: Fields

Field	Default	Description
Height	0.00 m	The height of the GNSS antenna that is connected to the GNSS receiver. This is used as a vertical offset on each position.
Type	Unknown External	The type of antenna that is connected to the GNSS receiver. See Antenna Settings form, page 181.
Part Number	n/a	The part number of the antenna that is connected to the GNSS receiver. See Antenna Settings form, page 181.
Measure Height To	(none)	The point on the antenna that you have measured to. The TerraSync software automatically adjusts the antenna height by the distance between the measurement location and the Antenna Phase Center (APC). See Antenna Settings form, page 181.

Logging and GNSS Settings step

Use the Logging and GNSS Settings step of the Base Station Setup wizard to specify the logging interval and GNSS settings for the base station.

When you have made your changes, tap **Next**.

Click **Cancel** to close the wizard and return to the *New File* screen.

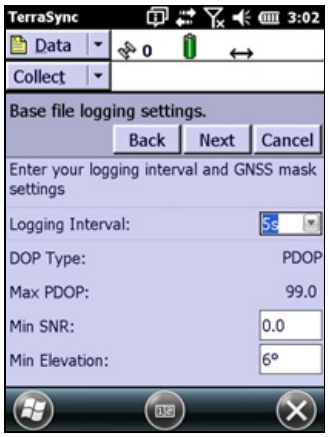


Table 6.4 Logging and GNSS Settings step: Fields

Field	Default	Description
Logging interval	5s	The logging interval, in seconds, for the base station data. Select an option from the drop-down list.
DOP Type	PDOP	The type of DOP value to use. This field is read-only.
Max PDOP	99.0	The maximum **PDOP** value. This field is read-only.
Min SNR	0.0	The minimum SNR value. The SNR is a measure of the quality of the signal from a satellite. When the SNR of a satellite falls below the minimum value, the TerraSync software stops using that satellite to calculate the GNSS position of the base station. If the GNSS receiver is a survey receiver, this field shows N/A.
Min Elevation	0°	The minimum elevation. Signals from satellites that have a low elevation from the horizon can be of poor quality. The TerraSync software does not use any satellite that is below the minimum value to calculate the GNSS position of the base station.

Reference Position Step

Use the Reference Position step of the Base Station Setup wizard to to specify the location of the base receiver (its reference position).

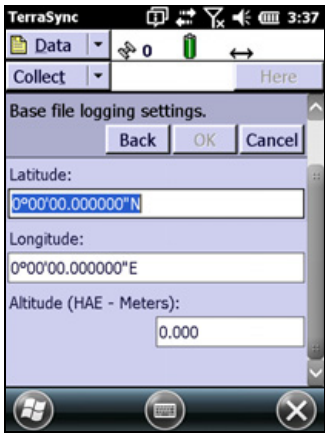


Table 6.5 Reference Position step: Buttons

Button	Description
Here	Sets the reference position to the current GNSS position. ***Note –*** *Because the current GNSS position is autonomous, using the* **Here** *button will result in an inaccurate reference position. Trimble recommends that the base station is set up over a known, surveyed point, and that you enter the exact reference position. If you do use the* **Here** *button, Trimble recommends that you apply a coordinate transformation in the Trimble postprocessing software to calibrate the base data.* **Tip –** You can use this button to speed up data entry. Press **Here** to quickly fill in an approximate position, and then replace only the digits that are incorrect.
Back	Returns to the Logging and GNSS Settings Step (see page 95) .
OK	Closes the Base Station Setup wizard and begins logging base data. The *Collect Base Data* screen appears (see page 99).
Cancel	Cancels the Base Station Setup wizard and returns to the *New File* screen (see page 92).

Table 6.6 Reference Position step: Fields

Field	Description
Latitude	The latitude of the reference position. Select an option from the drop-down list. This field only appears if the current coordinate system is Lat/Long. The value entered is displayed in the units specified in the *Coordinate System* form (see Appendix B, Coordinate Systems). ***Note –*** *To indicate a Southern hemisphere latitude or Western hemisphere longitude, you must include the hemisphere letter (S or W) or a minus sign (–). The hemisphere letter or plus sign is optional for Northern or Eastern hemisphere positions.* **Tip –** The symbols for degrees (°), minutes ('), and seconds (") can be omitted or replaced with a space, but you must include the decimal point (.).
Longitude	This field only appears if the current coordinate system is Lat/Long. The longitude of the reference position. The formats you can use are as for the *Latitude* field.
North	This field only appears if the current coordinate system uses North/East. The northing of the reference position, in the coordinate units specified in the *Coordinate System* form (see Appendix B, Coordinate Systems).
East	This field only appears if the current coordinate system uses North/East. The easting of the reference position, in the coordinate units specified in the *Coordinate System* form (see Appendix B, Coordinate Systems).
Altitude	The altitude of the reference position. The altitude is expressed as a **Height Above Ellipsoid** or **Mean Sea Level**, depending on the option configured in the *Coordinate System* form (see Appendix B, Coordinate Systems), and is in the altitude units specified in this form.

Collect Features screen

Note – *The Collect Features screen is only available when a data file is open. Use the New File screen to open a new data file (see page 92), or the Existing File screen to open an existing data file (see page 113).*

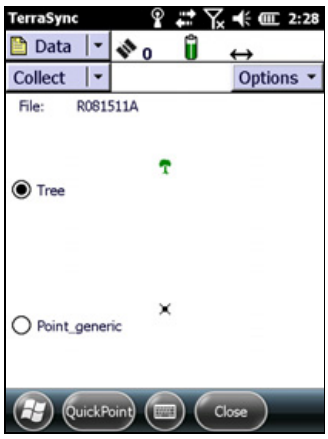
Use the *Collect Features* screen to select a feature type to add.

To open the *Collect Features* screen, tap the arrow on the Subsection button below the Section button and then select *Collect*. The *Collect Features* screen appears.

Collect features in QuickPoint data collection mode

If the TerraSync software is in *QuickPoint* data collection mode, the *Collect Features* screen shows only point features.

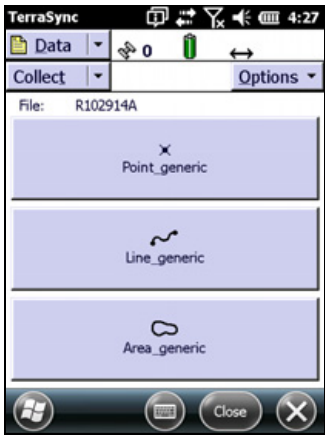
To log a QuickPoint, select the required point feature, and then tap *QuickPoint*.



Tip – The Map screen also has a QuickPoint button (see Map Section, page 67).

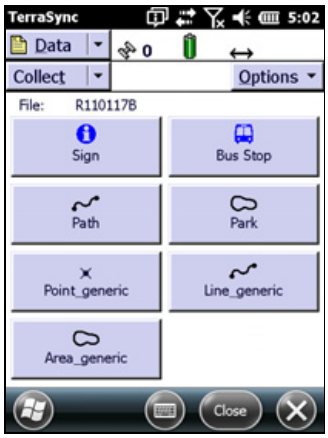
Collect features in Log Now or Log Later data collection mode

If the TerraSync software is in *Log Now* or *Log Later* data collection mode, and if a customised data dictionary is not used, the *Collect Features* screen shows the generic data dictionary.



If the TerraSync software is in *Log Now* or *Log Later* data collection mode, and if a customised data dictionary is used, the *Collect Features* screen shows one of two screens, depending on the number of features in the data dictionary:

- If the data dictionary has eight features or less, a button panel displays. Tap the required button to add a feature of the selected type.



- If the data dictionary has more than eight features, select it from the *Choose Feature* list and then tap **Create**.

An attribute entry form appears.

Tip – The Map screen also has a Create Feature button (see Map Section, page 67).

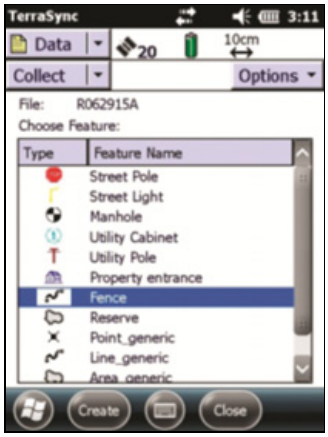


Table 6.7 Collect Features screen form: Fields

Field	Description
File	The filename of the open file. This field is read-only.
Choose Feature list	If the data dictionary has more than eight features, the Feature Lists displays the feature types from the data dictionary. Select the type of feature you want to create. The list contains the following columns: • Type — The type of feature, indicated by the line or area icon, or the point symbol configured in the data dictionary. • Name — The name of the feature.
Button panel	If the data dictionary has eight features or less, a button panel displays the feature types from the data dictionary. Tap the required button to create a feature of that type.

Table 6.8 Collect Features screen form: Options

Note – *The TerraSync software can be customized; the data collection Options button may have been disabled and will not be visible.*

Option	Description
Logging interval	Opens the *Logging Interval* form where you can configure the logging interval for all features of the selected type in the open data file (see page 111).
Repeat	Sets the default attribute values for each new feature to the same values entered for the last feature of that type. This overrides any default values set in the data dictionary. The *Repeat* option lets you record a series of similar features quickly and efficiently. You can change any of the attributes of the current feature or simply accept the repeated values. When Repeat is selected, a check mark (✓) appears beside it in the option list. When Repeat is not selected, attributes for new features use the default values set in the data dictionary, if any. See Repeating features, page 247.
Log Now	Configures the software to log positions for a new feature as soon as you begin the feature. You can pause and resume logging at any time. When Log Now is selected, a bullet (•) appears beside it in the option list.
Log Later	Pauses logging of positions for a new feature until you tap **Log** in the attribute entry form. The pause icon flashes in the Status bar when logging is paused. When Log Later is selected, a bullet (•) appears beside it in the option list.
QuickPoint	Enables you to capture a point feature with a single key press, or laser rangefinder trigger. When QuickPoint is selected, a bullet (•) appears beside it in the option list.
Trigger <sensor name>	Sends a data request to the sensor. If the sensor is configured to fill in an attribute value, the value of the specified attribute is updated with the sensor message. ***Note –*** *This option only appears if the sensor is configured to provide data when requested. To do this, open the Sensor Properties form (see page 207) and set the Receive Mode field to Requested, and set the Request Intervals field for the feature type to Trigger.* ***Note –*** *This option does not appear in the TerraSync Standard edition software.*
Continue	Resumes logging a line or area feature that you logged previously. You can stop logging a line or area feature, record other features on or near it, and then use Continue to return to logging the line or area feature without beginning a new feature. Select the Continue option to open the *Continue feature* form. Use this form to select a feature to continue. When you select a feature, the attribute entry form for the last line or area feature you logged opens, and logging resumes from the last position. In the line or area feature, the last position logged and the new positions are joined up automatically. See Continuing line and area features, page 239.

Collect Base Data form

Note – *This screen is only available when a base file is open. Use the New File screen to open a new base file (see page 92).*

Use the *Collect Base Data* form to monitor the status of the open base file, or to change the base station logging settings

To open the *Collect Base Data* screen, tap the arrow on the Subsection button below the Section button and then select *Collect*. The *Collect Base Data* screen appears.

Table 6.9 Collect Base Data screen: Button

Button	Description
Options	Opens the option list for this form. See the Options table below.
Close	Closes the current base file and returns to the *New File* screen (see page 92).

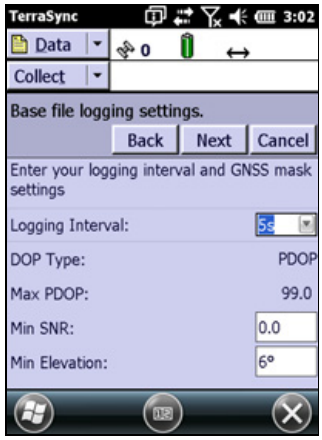
Table 6.10 Collect Base Data form screen: Fields

Field	Description
File	The filename of the open file.
Start	The time and date when the base file was opened.
Duration	The duration, in hours, minutes, and seconds, of the current base data logging session.
	Note – *If the receiver is a survey receiver, the Start and Duration fields show N/A. These receivers can be used only to generate corrections, not to log a base file.*

Table 6.11 Collect Base Data form screen: Options

Option	Description
Base Settings	Opens the *Base File Logging Settings* form where you can configure the logging interval and GNSS settings for the open base file (see page 100).

Base File Logging Settings form



Use the *Base File Logging Settings* form to change the logging interval and GNSS settings for the base data file that you are logging.

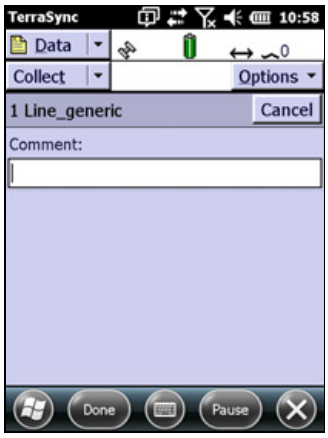
To open the *Base File Logging Settings* form, in the *Collect Base Data* form, tap **Options**, and then select the *Base Settings* option (see page 99).

Alternatively, tap the Setup button in the Skyplot section (see page 152) or the Satellite Information section (see page 157).

Note – *If this form is already open, the* ***Logging Settings*** *and* ***GNSS Settings*** *buttons in the Setup section are unavailable (see page 173).*

The fields on this form are the same fields that appear in the Logging and GNSS Settings step of the Base Station Setup wizard (see page 95).

Attribute entry form



Use the attribute entry form to enter attribute values for a new feature.

To add a new feature, on the Collect Features screen select the feature type from the button panel, or select the feature type from the *Choose Feature* list and then tap **Create** (see page 97).

To enter a value for an attribute, select the attribute field. The method of data entry you use will depend on the availability of physical or virtual keyboards, and on the type of field selected. When you have finished entering data in a field, select another field. Alternatively, use the **Enter** key on the physical or virtual keyboard to move to the next field. For more information on data entry techniques, see Interacting with the TerraSync software, page 47.

When you have finished entering attribute data and collecting positions, tap **Done**. The feature is stored and you are returned to the *Collect Features* screen.

Tip – You can also use the **End Feature** button in the Map screen to close the current feature.

To discard the new feature, tap **Cancel**. You are prompted to confirm that you want to abandon changes. If you tap **Yes**, the feature, including all its attributes and positions, is discarded.

The attribute entry form also appears when you update an existing feature. See Attribute entry form for existing features, page 117 .

Table 6.12 Attribute entry form: Buttons

Button		Description
Done	Done	Closes and saves the current feature and returns to the *Collect Features* screen (see page 97).
Cancel	Cancel	Returns to the *Collect Features* screen (see page 97) without saving the current feature.
Log	Log	Starts logging GNSS positions.
Pause	Pause	Suspends logging of GNSS positions. See Pausing and resuming logging, page 104.
Resume	Resume	Starts logging GNSS positions again after you have paused logging, when you are appending to an existing feature. See Pausing and resuming logging, page 104.
Options	Options	Opens the option list for this form. For a detailed list of the available options, see the table below.

Table 6.13 Attribute entry form: Fields

Field	Description
Mark as updated	Select this check box to indicate that you have visited a feature and checked its position and attributes, without making any changes to the values stored. This field only appears if you are updating an existing feature that has been imported from the Trimble postprocessing software. It is not available if you are creating or updating a new feature.
Attribute fields	The attribute entry form includes a field for each attribute defined in the data dictionary for this feature type.
Image File	This Filename field displays when collecting or updating a feature, if the data dictionary has features which have a File Name attribute. On devices which have an integrated camera, a Camera icon displays next to the Filename field. This allows pictures to be taken and stored for the feature. To take a picture, tap the Camera icon. The Pictures & Videos screen displays. Press the hard key associated with the camera shutter. Once the picture has been taken, it is displayed in the Pictures & Videos Review screen, where you can edit and rename it. Tap Menu, Edit, and Menu again to access the Save As option to rename the file. If you don't want to rename the file, tap OK. To close the Review screen, tap OK or Back. The Camera button retains focus, allowing you to take another picture (press the Enter key). Once images are stored and named, they will appear in the Image file drop-down selection list. When an image is selected in the list, a thumbnail of the images displays below the Image file field. To view an image full-screen, either tap the thumbnail of the image or highlight it in the list and tap Play. The Browse icon to the right of the Image file field shows thumbnails of any stored images in Pictures & Videos. It will default to the My Pictures folder, but will remember the last folder you accessed. To exit Pictures & Videos without taking a picture, tap OK or tap Cancel.

Table 6.14 Attribute entry form: Options

Option	Description
Offset	If a line or area feature is open, this option opens the *Offset* form where you can enter or edit the offset for the selected feature (see page 104). If a point feature is open, select the type of offset for the point feature from the pullout menu. The *Offset* form for the selected option opens. For more information see: • Distance-Bearing Offset form, page 105 • Distance-Distance Offset form, page 106 • Triple Distance Offset form, page 107 • Bearing-Bearing Offset form, page 108 • Triple Bearing Offset form, page 109 ***Note –*** *The TerraSync software can be customized; the Offset option may have been disabled and will not be visible.*
New Vertex	Opens the *Vertex* form where you can record an averaged vertex for the selected line or area feature (see page 110).
Logging Interval	Opens the *Logging Interval* form where you can change the logging interval for the selected feature type (see page 111).
Nest	Nests a point feature in the current line or area feature. This is a shortcut for the end and continue feature method (page 112. ***Note –*** *The TerraSync software can be customized; the Nest option may have been disabled and will not be visible.*
Segment Line	Segments the current line feature. This ends the current line feature and immediately starts a new feature of the same type. The first position of the new feature and the last position of the old feature are at the same location, which is a position recorded when you select the *Segment Line* option. See Segmenting line features, page 247.
Trigger <sensor name>	Sends a data request to the sensor. If the sensor is configured to fill in an attribute value, the value of the specified attribute is updated with the sensor message. Otherwise, an uninterpreted sensor data record is added to the data file. ***Note –*** *This field only appears if the sensor is configured to provide data when requested. To do this, in the Sensor Properties form (see page 207), set the Receive Mode field to Requested, and set the Request Intervals field for the feature type to Trigger.* ***Note –*** *This field does not appear in the TerraSync software Standard Edition.*
Log	Starts logging GNSS positions.
Pause	Suspends logging of GNSS positions.
Resume	Starts logging GNSS positions again after you have paused logging.

Pausing and resuming logging

When the TerraSync software is logging GNSS positions, the logging icon appears in the status bar. To pause logging, tap **Pause**. While paused, the TerraSync software stops logging GNSS positions and the pause icon flashes over the logging icon in the status bar.

When GNSS logging is paused, the TerraSync software does not record GNSS positions. However, if carrier logging is enabled, background logging of carrier data does continue.

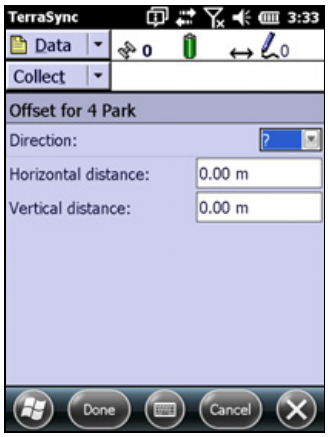
Use the pause function if you want to stop logging briefly. For example, you could pause logging if you are collecting a line feature and you want to stop and enter attribute values, or you have to travel around an obstacle before returning to the line.

To resume logging GNSS when collecting a new feature, tap **Log**. The pause icon stops flashing and the logging icon appears again. Each time you resume logging while collecting a line or area feature, the TerraSync software immediately logs a GNSS position (regardless of the logging interval set for line/area features).

Tip – You can also start, pause, and resume logging from the Map section (see page 67).

Offset form

When you select the *Offset* option in the attribute entry form for a line or area feature, the *Offset* form appears.



Note – *The TerraSync software can be customized; the Offset option may have been disabled and will not be visible.*

Recording an offset lets you log accurate position information for a feature without traveling over it. For example, to record a road centerline, it is safest to walk beside the road at a constant distance from the centerline.

Tip – You can use a laser rangefinder to record offsets. See Using a laser rangefinder to record offsets, page 246.

Note – *You can only enter one offset for each feature you collect.*

Table 6.15 Offset form: Fields

Field	Default	Description
Direction	(none)	The direction the feature lies in, relative to your path of travel. The options are left or right. For example, if you travel clockwise around a building, the feature you are logging is to the right of the path you are traveling, so select Right.
Horizontal distance	0.00 m	The two-dimensional distance to the feature. The horizontal distance ignores any difference in height between your position and the feature. This field only appears if the *Offset Format* field in the *Units* form is set to Horizontal/Vertical (see page 205).
Vertical distance	0.00 m	The vertical distance between your position and the feature. This field only appears if the *Offset Format* field in the *Units* form is set to Horizontal/Vertical (see page 205).
Slope distance	0.00 m	The distance from your position to the feature, including any difference in height. This field only appears if the *Offset Format* field in the *Units* form is set to Slope distance (see page 205).
Inclination	0.00°	The angle of inclination between your position and the feature. This field only appears if the *Offset Format* field in the *Units* form is set to Slope distance (see page 205).

Distance-Bearing Offset form

Use the *Distance-Bearing Offset* form to specify a distance-bearing offset for a point feature.

To display the *Distance-Bearing Offset* form, from the attribute entry form for the point feature, select the *Distance-Bearing* option (see page 101).

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

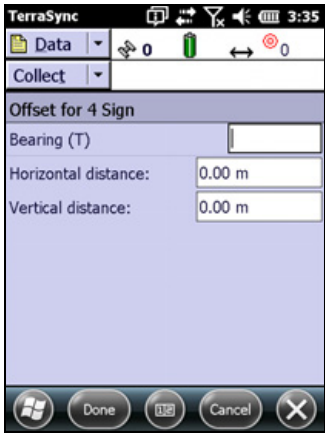
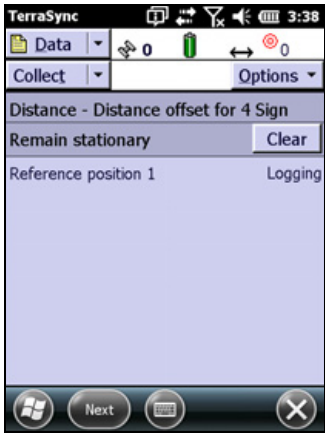


Table 6.16 Distance-Bearing Offset form: Fields

Field	Default	Description
Bearing	0.00°	The bearing, in the selected angle units, from the reference position to the point feature you are logging. For example, if you are facing North and the feature is directly to your right (East), enter 90°. The angle you enter is relative to the configured north reference, which is indicated by a T (true north) or M (magnetic north) after the field name. To configure the north reference, use the *Units* form (see page 205).
Horizontal distance	0.00 m	The two-dimensional distance to the feature, ignoring any difference in height between your position and the feature. This field only appears if the *Offset Format* field in the *Units* form is set to Horizontal/Vertical (see page 205).
Vertical distance	0.00 m	The vertical distance between your position and the feature. This field only appears if the *Offset Format* field in the *Units* form is set to Horizontal/Vertical (see page 205).
Slope distance	0.00 m	The distance from your position to the feature, including any difference in height. This field only appears if the *Offset Format* field in the *Units* form is set to Slope/Inclination (see page 205).
Inclination	0.00°	The angle of inclination between your position and the feature. This field only appears if the *Offset Format* field in the *Units* form is set to Slope/Inclination (see page 205).

Distance-Distance Offset form



Use the *Distance-Distance Offset* form to specify a distance-bearing offset for a point feature.

To display the *Distance-Distance Offset* form, from the attribute entry form for the point feature, select the *Distance-Distance* option (see page 101).

When you set a distance-distance offset, you record two reference positions, and the distance from each of these positions to the feature. See Distance-distance offset, page 244.

To increase accuracy, you can record each reference position as if it were an averaged vertex. If you log a number of positions at each reference point, the TerraSync software averages these positions to give a more accurate reference position.

To record the offset, you need to perform a number of steps in a particular sequence. To ensure that the correct steps are followed, the form displays instructions and hides some fields until you have performed the preceding steps. See Offsets, page 240.

Table 6.17 Distance-Distance offset form: Buttons

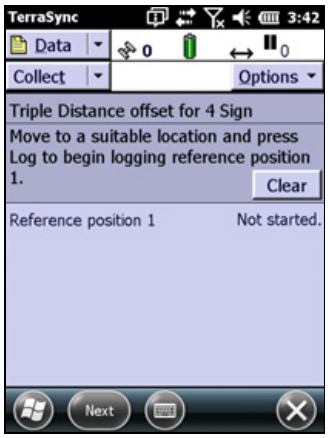
Button	Description
Next	Moves to the next step in the sequence. When you have completed all steps, this button is replaced with the **Done** button.
Clear	Deletes all the offset and position data that you have recorded for this feature.

Table 6.18 Distance-Distance offset form: Fields

Field	Default	Description
Reference position	(none)	The status of the reference position. This field is read-only, and is repeated for each reference position. The options are: • Not started — You have not yet collected any positions, because logging was paused when you opened the form. • Logging — The TerraSync software is logging positions for this reference position. • Paused — Logging of positions is paused. • Collected — The position has been collected.
Distance	(none)	The distance from the reference position to the feature. Depending on the current *Offset Format* set in the *Units* form (see page 205), the fields below this heading are either *Horizontal distance* and *Vertical distance* (see page 105), or *Slope distance* and *Inclination* (see page 105). The fields are repeated for each reference position.
Direction	(none)	The direction of the feature relative to the path between the reference positions. The options are left and right.

Triple Distance Offset form

Use the *Triple Distance Offset* form to specify a triple-distance offset for a point feature.



To display the *Triple Distance Offset* form, from the attribute entry form for the point feature, select the *Triple Distance* option (see page 101).

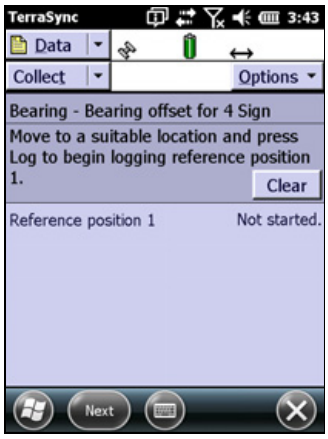
When you set a triple distance offset, you record three reference positions (A, B, and C), and the distance from each of these positions to the feature. A triple distance offset is similar to a distance-distance offset, but a third measurement provides some mathematical redundancy so that the direction can be calculated automatically. See Triple distance offset, page 244.

To increase accuracy, you can record each reference position as if it were an averaged vertex. If you log a number of positions at each reference point, the TerraSync software averages these positions to give a more accurate reference position.

To record the offset, you need to perform a number of steps in a particular sequence. To ensure that the correct steps are followed, the form displays instructions and hides some fields until you have performed the preceding steps. See Offsets, page 240.

The *Triple Distance Offset* form contains the same controls as the *Distance-Distance Offset* form (see page 106), except that the repeated fields appear three times (for the three reference positions A, B, and C), and the *Direction* field is usually read-only because the software calculates it automatically.

Bearing-Bearing Offset form



Use the *Bearing-Bearing Offset* form to specify a bearing-bearing offset for a point feature.

To display the *Bearing-Bearing Offset* form, from the attribute entry form for the point feature, select the *Bearing-Bearing* option (see page 101).

When you set a bearing-bearing offset, you record two reference positions (A and B), and the bearing from north from each of these positions to the feature. See Bearing-bearing offset, page 245.

To increase accuracy, you can record each reference position as if it were an averaged vertex. If you log a number of positions at each reference point, the TerraSync software averages these positions to give a more accurate reference position.

To record the offset you need to perform a number of steps in a particular sequence. To ensure that the correct steps are followed, the form displays instructions and hides some fields until you have performed the preceding steps. See Offsets, page 240.

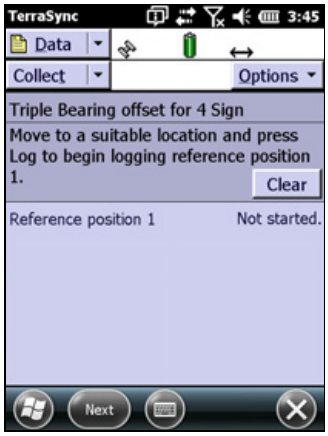
Table 6.19 Bearing-Bearing Offset form: Buttons

Button	Description
Next	Moves to the next step in the sequence. When you have completed all steps, this button is replaced with the **Done** button.
Clear	Deletes all the offset and position data recorded for this feature.

Table 6.20 Bearing-Bearing Offset form: Fields

Field	Default	Description
Reference position	(none)	The status of the reference position. This field is read-only, and is repeated for each reference position. The options are as for the *Reference position* field on the *Distance-Distance Offset* form (see page 106).
Bearing	0.00°	The bearing, in the selected angle units, from the reference position to the feature. This field is repeated for each reference position. For example, if you are facing north and the feature is directly to your right (east), enter 90°. The angle you enter is relative to the configured north reference, which is indicated by a T (true north) or M (magnetic north) after the field name. To configure the north reference, use the *Units* form (see page 205).

Triple Bearing Offset form



Use the *Triple Bearing Offset* form to specify a triple-bearing offsetfor a point feature.

To display the *Triple Bearing Offset* form, from the attribute entry form for the point feature, select the *Triple Bearing* option (see page 101).

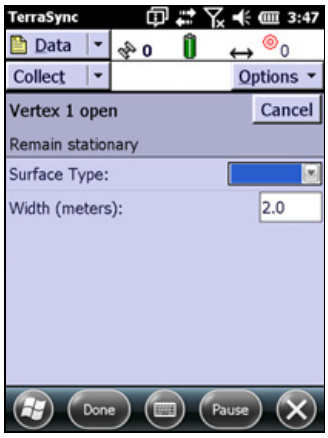
When you set a triple bearing offset, you record three reference positions (A, B, and C), and the bearing from north from each of these positions to the feature. A triple bearing offset is similar to a bearing-bearing offset, but a third measurement provides some mathematical redundancy that can improve accuracy. See Triple bearing offset, page 245.

To increase accuracy, you can record each reference position as if it were an averaged vertex. If you log a number of positions at each reference point, the TerraSync software averages these positions to give a more accurate reference position.

To record the offset you need to perform a number of steps in a particular sequence. To ensure that the correct steps are followed, the form displays instructions and hides some fields until you have performed the preceding steps. See Offsets, page 240.

The *Triple Bearing Offset* form contains the same buttons and fields as the *Bearing-Bearing Offset* form (see page 108), except that the repeated fields appear three times (for the three reference positions A, B, and C).

Vertex form



Use the *Vertex* form to log an averaged vertex for a line or area feature.

To display the *Vertex* form, from the attribute entry form select the *New Vertex* option (see page 101).

The *Vertex* form looks exactly like the attribute entry form, except that the messages Vertex # open (where # represents the vertex number within the current feature) and Remain stationary appear in the form title.

When you log an averaged vertex for a line or area feature in ***autonomous*** or ***DGNSS*** mode, the TerraSync software records several positions at each vertex, then averages these positions to calculate the vertex position. The averaged position is more accurate than a single position. When you log a vertex in ***RTK*** mode, the TerraSync Centimeter edition software records only the RTK-corrected position with the best precision. All other positions are discarded. See Recording averaged vertices, page 248.

Tip – If you want a line or area feature to contain only vertices, use the Log Later function to pause logging before opening the feature (see page 99). When you open the *Vertex* form, logging resumes automatically. When you close the vertex, logging returns to the paused state. This ensures that you do not record any positions that are not associated with a vertex.

To record a vertex:

1. Open the attribute entry form.
2. Tap **Options**.
3. Select *New Vertex*. The logging icon in the status bar changes to show that you are logging a vertex. In autonomous or DGNSS mode, the logging icon changes to an animated circle zooming in 4, and the number beside it shows the number of positions logged for this vertex.
   - In RTK mode, the logging icon changes to an animated circle zooming in over a triangle 1. The number beside the icon is 1 if a position has been logged, or 0 if no positions with the required precision have been received yet.
4. Remain stationary at your current location, and enter or edit attribute values if necessary.
5. When you have recorded enough positions for this vertex, tap **Done**. The *Vertex* form closes, and you are returned to the attribute entry form.

Tip – In RTK mode, you can finish logging the vertex at any time, provided the number beside the logging icon is 1.

Logging Interval form

Use the *Logging Interval* form to change the interval for all features of the selected type. A default logging interval for each type of feature is set in the data dictionary.

Note – *The TerraSync software can be customized; the Logging interval option may have been disabled and will not be visible.*

Note – *Any changes made in this form are applied to* ***all*** *features of the selected type that you collect or update in the open data file.*

Tip – The logging interval is only for the highlighted or open feature type. To configure logging intervals for all feature types in the open data file, use the Logging Settings form in the Setup section (see page 178).

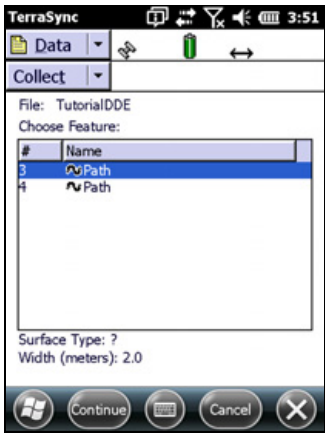
To open the *Logging interval* form, tap **Options** in one of the following screens and then select *Logging interval*:

- Collect Features screen (see page 97)
- Attribute entry form for a new feature (see page 101)
- Update Features screen (see page 114)
- Attribute entry form for an existing feature (see page 117)

Table 6.21 Logging Interval form: Fields

Field	Default	Description
Logging style	Time	The unit of measurement for the logging interval. The options are: • Time — Log a new position when a certain time since logging the last position for this feature has elapsed. • Distance — Log a new position when you have moved a certain distance from the last position logged for this feature. This field is only available for line and area features. If the selected feature is a point, this field displays Time and the logging style cannot be edited.
Logging interval	5 s	The time or distance between recording GNSS positions. Enter the interval in the units specified in the *Logging style* field. ***Note –*** *When the logging interval is small, the TerraSync software records more positions for the feature. More storage space is required.* If you do not want to log positions, select Off. No GNSS data is recorded for this feature.

Continue Feature form



Use the *Continue Feature* form to resume logging of a feature that you have paused.

To display the *Continue Feature* form, from the *Collect Features* screen tap **Options** and select *Continue* (see page 97).

The Continue Feature form displays a list of line and area features that are paused but can be resumed.

To continue a feature, select it from the list and tap **Continue**. The attribute entry form for the selected feature appears (see page 101), and logging of GNSS positions to this feature resumes. See Continuing line and area features, page 239.

Table 6.22 Continue Feature form: Buttons

Button	Description
Cancel	Cancels the continuation of the feature and returns to the *Collect Features* screen (see page 97)
Continue	Opens the attribute entry form for the selected feature. Use this form to continue logging positions to the selected feature.

Table 6.23 Continue Feature form: Fields

Field	Description
File	The filename of the open file. This field is read-only.
Choose Feature list	The list of features that you can review or update. The list contains the following columns: • # — The feature identification number. Each feature is given a unique number in the file. • Name — The name of the feature and its type, shown by the line or area icon to the left of the feature name.
Labels	The name and value of two attributes from the selected feature. The data dictionary defines which attributes from each feature type are selected as labels. Use the labels to verify that the correct feature is selected from the list.

Existing Files screen

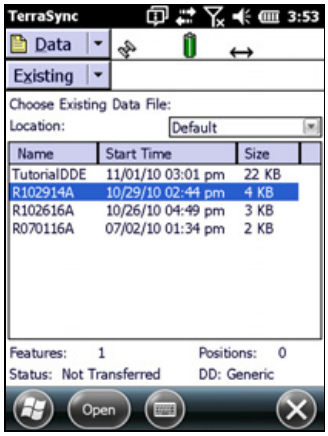
Use the *Existing Files* screen to open an existing data file.

Note – *You cannot open imported files using the TerraSync Standard edition software. Imported files do not appear in the Existing File screen.*

To open the *Existing File* screen, tap the arrow on the Subsection button below the Section button and then select *Existing*.

Note – *This screen is not available if a file is already open. To access this section, close the open data file.*

Select an existing data file from the list of files and then tap **Open** to open this file and begin reviewing existing features in the *Update Features* screen (see page 114).



Tip – You can also switch to the *Collect Features* screen to add new features to the file (see page 97). However, because of the way in which GNSS times are stored, you cannot log new features to a file that is more than a week old. To maintain accurate storage, it is necessary to limit the time-span of a data file to seven days.

Table 6.24 Existing Files screen screen: Fields

Field	Description
Location	The TerraSync software enables you to write data files directly to internal or removable secondary storage locations. This field contains an entry for each storage location on the device. There is also an option called Default, which represents the TerraSync documents folder.
List of files	A list of all the data files that are available for update. The list contains the following columns: • Name — The name of the data file. • Time — The date and time when the file was created or was last updated. • Size — The size of the file. You can drag each column heading to resize the column, or tap a column heading to sort by that column. If the list is already sorted by the column you tap, the sort order reverses. To open a file, highlight it in this list and then tap **Open**. The *Update Features* screen appears (see page 114).
Features	The number of features in the selected file.
Positions	The number of position records in the selected file.

Table 6.24 Existing Files screen screen: Fields (continued)

Field	Description
Status	The update status of the selected file. The options are: • Transferred — The file has been created or updated in the TerraSync software, and then copied to the office computer, and it has not been updated in the TerraSync software since. • Not Transferred — The file has not been copied to the office computer since it was created or last updated. • Imported — The file has been transferred from the office computer, imported from Shapefiles, or received by e-mail, but it has not yet been updated in the TerraSync software. ***Note –*** *If you are using the TerraSync Standard edition software, files with the status Imported do not appear in this list, because they cannot be opened.*
DD	The data dictionary that the selected file was associated with when you created it. ***Note –*** *Once you have created a file, you cannot change which data dictionary it uses.*

Update Features screen

Use the *Update Features* screen to review and maintain features and attributes that have already been collected. You can update attributes, offsets, and GNSS positions, or delete features.

To open the *Update Features* screen, tap the arrow on the Subsection button below the Section button and then select *Update*.

Note – *This subsection is only available when a file is open. Use the Existing File screen to open an existing data file (see page 113), or the New File screen to open a new data file (see page 92).*

Note – *You cannot open imported files using the TerraSync Standard edition software.*

The *Update Features* screen lists all the features in the open data file.

To update a feature, highlight it in the *Choose Feature* list and tap **Begin**. An attribute entry form appears.

Table 6.25 Update Features screen: Buttons

Button	Description
Begin	Opens the selected feature on the list for update. Tap **Begin** to open the attribute entry form for the selected feature.

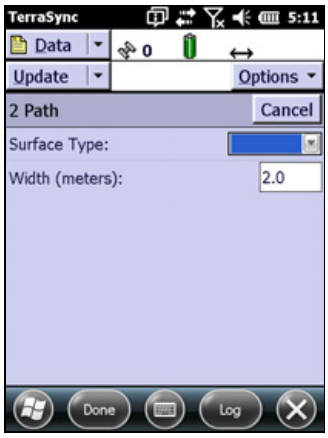
Table 6.26 Update Features screen: Fields

Field	Description
File	The filename of the open file. This field is read-only.
Choose Feature list	The list of features for review or update. The following columns are available: ***Note –*** *To show or hide any columns, tap and hold on the column title bar and then select or deselect the required columns from the list.* **#** — The feature identification number. Each feature is given a unique number in the file. **Name** — The name of the feature and its type, shown by the point, line, or area icon to the left of the feature name **Update** — The update status (see page 117) of the feature: • blank — The feature is new. • ○ — The feature has been imported from the postprocessing software. • ⊘ — The feature has been updated. **Filter** — The filter status of the feature: • (blank) — The feature does not meet the criteria of the filter, or no filter has been set. • Y — The feature meets the filter criteria. **Distance** — The distance from the feature to the GNSS position.
Positions	The number of GNSS and digitized positions recorded for the selected feature in the list.
Carrier coverage	The carrier phase status of the selected feature. This field only appears if the selected feature has carrier phase data collection enabled. Possible values are: • <carrier time> — Enough carrier data has been collected for this feature. This field shows the length of the block, in mm:ss format. • Continuing — The carrier block that this feature belongs to is still being collected, and may provide enough carrier data to process this feature. • Insufficient — Not enough carrier data has been collected for this feature.
Length (2D)	The two-dimensional length of the selected feature. This field only appears if the selected feature is a line or area feature. The two-dimensional length is calculated by adding together the horizontal distances between positions logged for the feature, ignoring height information.
(3D)	The three-dimensional length of the selected feature. This field only appears if the selected feature is a line feature. The three-dimensional length takes the height of each position in the feature into account when it calculates distances between positions.
Area	The (two-dimensional) area of the feature. This field only appears if the selected feature is an area feature.
Labels	The name and value of two attributes from the selected feature. The data dictionary defines which attributes from each feature type are selected as labels. Use the labels to check that the correct feature is selected from the list.

Table 6.27 Update Features screen: Options

Option	Description
Show Filtered Features	Displays filtered features in the *Choose Feature* list and on the map. Filtered features are indicated by the filter icon in the *Filter* column. When filtered features are displayed, this option has a check mark (✓) beside it.
Show Unfiltered Features	Displays unfiltered features in the *Choose Feature* list and on the map. Unfiltered features are indicated by a blank in the Filter column. When unfiltered features are displayed, this option has a check mark (✓) beside it.
Filter	Opens the *Filter By* form where you can set or clear filtering conditions (see page 119). ***Note –*** *The TerraSync software can be customized; the Filter option may have been disabled and will not be visible.*
Delete	Deletes the selected feature from the *Choose Feature* list. A deleted feature is indicated by a horizontal line through it. Deleted features can be undeleted in the TerraSync software or in the postprocessing software. ***Note –*** *The TerraSync software can be customized; the Delete option may have been disabled and will not be visible.*
Undelete	Undeletes the selected feature. The line through the feature is removed. This option is only available if the selected feature is deleted.
Set Nav Start	Sets the currently selected feature or GNSS position as the navigation start point. When you set the start, the point , line , or area icon beside the selected feature is replaced by the start icon . If there was already a navigation start selected, the icon of that feature changes from the start icon back to its usual point, line, or area icon. ***Note –*** *The TerraSync software can be customized; the Navigation options may have been disabled and will not be visible.*
Set Nav Target	Sets the currently selected feature as the navigation target. When you set the target, the point , line , or area icon beside the selected feature is replaced by the target icon . If there was already a navigation target selected, the icon of that feature changes from the target icon back to its usual point, line, or area icon. ***Note –*** *The TerraSync software can be customized; the Navigation options may have been disabled and will not be visible.* ***Note –*** *You can also set the navigation start and target in the Map section.*
Clear Nav Targets	Clears the navigation start and the navigation target. You can use this option even when the selected feature in the list is not the navigation start or target. When you select this option, the start and target icons beside the existing navigation start and target are replaced by the usual point, line, or area icons for those features. ***Note –*** *The TerraSync software can be customized; the Navigation options may have been disabled and will not be visible.*
Logging interval	Opens the Logging Interval form, where you can configure the logging interval for all features of the selected type in the open data file (see page 111). ***Note –*** *The TerraSync software can be customized; the Logging interval option may have been disabled and will not be visible.*
Continue	Resumes logging a line or area feature that you logged previously. See Continuing line and area features, page 239.
View	Enables you to select or deselect the columns which are available on the *Choose Feature* list. ***Note –*** *You can also tap and hold on the column title bar and then select or deselect the required columns from the list.*

Attribute entry form for existing features



Use this form to update the attributes or position data of an existing feature. To update a feature, highlight the feature in the *Choose Feature* list in the *Existing File* screen and tap **Begin** (see page 113). Alternatively, double-tap the feature (or tap and hold the feature and then select *Update*) in the Map section.

For information about the controls on this form, see Attribute entry form, page 101.

When you have finished editing the attribute data, or have marked the feature as updated, tap **Done**. The updated information is stored and the *Update Features* screen reappears (see page 114). A check mark appears next to the feature name in the *Choose Feature* list. This indicates that the feature has been updated.

To abandon changes to a feature, tap **Cancel**. You are prompted to confirm this cancellation.

Use **Log**, **Pause**, and **Resume** to start, pause, or resume logging of GNSS positions. By default, when you update an existing feature, new GNSS positions are not logged, so logging is paused when you first open the feature for update. When updating an existing feature, tap **Log**, select *Update feature (Replace)* or *Continue feature (Append)* and then tap **OK**. Tap **Pause** to stop logging briefly when required. **Log,**and then tap **Resume**. The pause icon stops flashing and the logging icon appears again. Each time you resume logging while collecting a line or area feature, the TerraSync software immediately logs a GNSS position (regardless of the logging interval set for line/area features).

Tip – You can also start, pause, and resume logging from the Map section (see page 67).

Update status

Each feature in a data file has an update status. Use the update status to sort or filter features in the field, so you can tell which features are new, which you have visited for data maintenance, and which you have not visited yet. In the postprocessing software, you can use the update status to select features to export to the GIS.

The *Update* column of the *Choose Feature* list in the *Update Features* screen (see page 114) shows the status of each feature:

Table 6.28 Data section: Update status

Icon	Update status	Description
(blank)	New	The feature has been created since the file was transferred from the postprocessing software, or the feature is in a new file that has never been transferred to the postprocessing software.
	Imported	The feature has been transferred from the postprocessing software but has not been updated yet.
	Updated	The feature has been transferred from the postprocessing software and has been updated since the transfer.

When you change an Imported feature in any way, its update status changes to Updated. Any of the following actions automatically changes that status of a feature to Updated:

- Updating positions using the **Log** button (see page 118)
- Digitizing positions (see page 85)
- Adding or changing offsets in an offset form (see Offsets, page 240)

Note – *When you edit a New feature, its status does not change to Updated. The update status indicates the status of the feature with respect to the postprocessing software and the GIS.*

Marking a feature as updated

When you change the attribute values, offset data, or GNSS position of an existing feature, its Update status changes to Updated. When you are visiting features for data maintenance, you can use the update status to identify the features you have not visited yet.

If the feature has a date attribute that is set in the data dictionary to Auto Generate on Update, the value of the data attribute automatically changes to the current date. No other changes to the feature information occur.

Tip – After you have marked a feature as updated, you can still change its attributes or position information. However, once you change attribute values or position information, you cannot unmark the feature.

Updating positions

1. Select the feature from the Choose Feature list (see page 98) and tap **Begin**. The attribute entry form appears.
2. Tap **Log**.

3. If the *Allow Position Update* field on the *Logging Settings* form (see page 178) is configured to require confirmation, or the feature is a line or area, a message box appears, asking you to select a logging option:

Table 6.29 Update Features screen screen: Logging options

Option	Description
Update feature (Replace)	Records new positions for this feature, replacing all positions.
Continue feature (Append)	Continues the feature, appending the new positions to the existing positions. See Continuing line and area features, page 239. This option is not available for point features.

If you tap **OK** in this message box, the TerraSync software starts logging GNSS data. This data either replaces or is appended to existing positions, depending on the option you selected. If you tap **Cancel**, the message box closes and no GNSS data is logged.

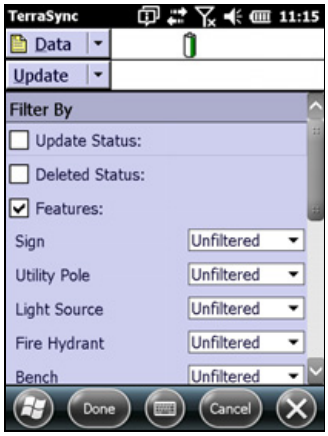
4. When you have finished collecting positions for a feature, tap **OK**. The updated information is stored and the *Update Features* screen reappears (see page 114). The updated icon ( ) appears next to the feature in the *Choose Feature* list to indicate that it is updated.

Note – *If you log new or additional position information for a feature while that feature is selected as the navigation target, you must reselect the feature as the navigation target before you can navigate to its new position.*

Tip – You can also digitize positions (see page 85) to update the positions of a feature.

Filter By form

Use the *Filter By* form to set filters that divide features into two groups: ***filtered*** and ***unfiltered***. Once you have applied a filter, you can hide or show either group in the Data section or in the Map section. You can also sort features by their filter status. See Filtering features, page 121.



Note – *The TerraSync software can be customized; the Filter option may have been disabled and will not be visible.*

Note – *Any filter that you apply in the Data section applies throughout the TerraSync software while the current data file remains open.*

To open the *Filter By* form, select the *Filter* option in the *Update Features* screen (see page 114).

Table 6.30 Filter By form: Fields

Field	Description
Update Status	Select this check box to filter by update status. If this check box is selected, the following fields appear below it: • New • Imported • Updated For each field, choose one of the following options: • Unfiltered • Filtered If this check box is cleared, the *New*, *Imported*, and *Updated* fields do not appear, and the filter does not consider update status.
Deleted Status	Select this check box to filter by deletion status. If this check box is selected, the following fields appear below it: • Deleted • Undeleted For each field, choose one of the following options: • Unfiltered • Filtered If this check box is cleared, the *Deleted* and *Undeleted* fields do not appear, and the filter does not consider deletion status.
Features	Select this check box to filter by feature types or their attributes. If this check box is selected, a field for each type of feature in the data dictionary appears below it. Use these fields to specify feature filtering conditions. Each feature type field provides the following options: • Unfiltered — Do not filter by this feature type. • All Filtered — Filter all features of this type. • Filter By — Select features of this type to filter by, using attribute values. When you select this option, the *Attribute*, *Test*, and *Value* fields appear below it. Use these three fields to select the attribute values for this feature to filter by.
Attribute	This field only appears if the Filter By option is selected in the *Features* field. The attribute from the feature to filter by. Each attribute of the feature is listed here.

Table 6.30 Filter By form: Fields (continued)

Field	Description
Test	This field only appears if the Filter By option is selected in the *Features* field. The comparison to perform on the attribute selected above. The options listed depend on the attribute type: • Menu — Equal To, Not Equal To • Text or filename — Containing, Not Containing • Date, time, or numeric — Equal To, Not Equal To, Less Than, Greater Than
Value	This field only appears if the Filter By option is selected in the *Features* field. The attribute value to filter by. If there is a list of options, select an attribute value from the list. Otherwise, enter the value to filter by.

Filtering features

Note – *The TerraSync software can be customized; the Filter option may have been disabled and will not be visible.*

The TerraSync software lets you filter each feature by one attribute value. However, a filter can include conditions for each feature type, as well as the deletion status or update status of each feature. You can set complex filtering conditions with a single filter, or you can select just one condition to filter.

When you apply a filter, all features are divided into two groups: filtered and unfiltered. The software does not automatically hide or show either group; it is up to you to decide which group you want to view and which, if any, you want to hide.

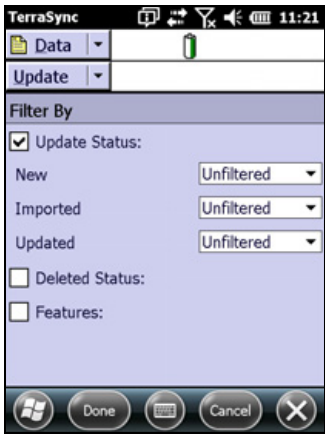
To define a filter, in the *Update Features* screen (see page 114) or in the Map section (see Chapter 5, Map Section) tap **Options** and select *Filter*. The *Filter By* form (see page 119) appears.

The *Filter By* form lets you define conditions on the update status, deletion status, and feature type of each feature. You can set any or all of these filters. By default, no filtering is applied.

The filter functions like a sieve. All features that satisfy the conditions specified are moved to the filtered group. The others remain in the unfiltered group. If you want to separate a small group of features from the rest, set them to be filtered.

You can set any or all of these filters at the same time. When you set more than one filtering condition, ***all*** conditions must be met for a feature to be filtered. For example if you have chosen to filter deleted features that have been updated, a feature must be ***both*** updated ***and*** deleted to be included in the filtered group. If it does not meet all the conditions set, it remains in the unfiltered group.

Filtering features by status



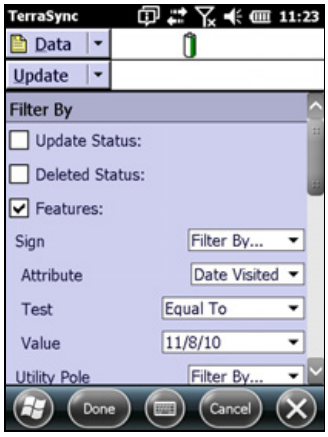
To set a filter on the update status of each feature, select the *Update Status* check box. The *New*, *Imported*, and *Updated* fields appear below the check box. Select the appropriate value in each field. For example, to filter new and updated features, select Filtered in the *New* field and selected Filtered in the *Updated* field.

To set a filter on the deletion status of each feature, select the *Deleted Status* check box. The *Deleted* and *Undeleted* fields appear below the check box. Select the appropriate value in each field to specify filtering conditions.

Filtering by feature properties

To set a filter on feature properties, select the *Features* check box. A field for each feature type in the data dictionary appears in the *Filter By* form. By default, each of these fields is set to the Unfiltered option, so no features are selected.

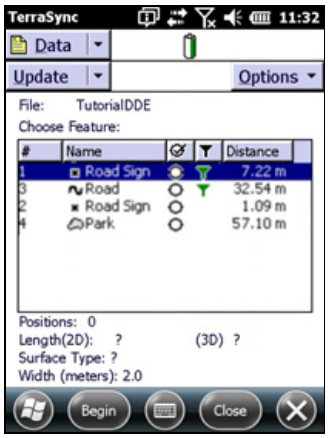
If you select All Filtered from a feature type field, all features of that type are included in the filter. If you select Unfiltered, no features of this type are included. If you select Filter By, you can filter this feature type according to its attribute values.



When you select Filter By in a feature type field, the *Attribute*, *Test*, and *Value* fields appear below it. To filter by attribute, select the attribute name in the *Attribute* field, select a comparison operation in the *Test* field, and enter or select a value in the *Value* field.

When you apply the filter, a feature of this type is filtered if the value in the selected attribute matches the value and comparison in the filter. For example, if you specify that the Date Visited attribute must be less than 1 January 2010, any feature visited on or before 31 December 2009 is filtered. Features visited on or after 1 January 2010 remain in the unfiltered group.

You can apply different levels of filtering to different feature types. For example you could select All Filtered for the Road and Park feature types, but specify an attribute condition for the Road Sign feature type. When you apply the filter, all of the Road and Park features, and some of the Road Sign features, are filtered. The remaining Road Sign features are unfiltered.



To apply a filter, simply tap **OK** in the *Filter By* form. The form closes and the filter icon appears in the Status bar. Each feature in the *Update Features* screen (see page 114) that is filtered has a filter icon beside it. Unfiltered features have no icon.

Note – *Any filter used applies as long as the current data file remains open, and is cleared when you close the file.*

Once a filter is active, tap the *Filter* column heading to sort the list by filter status. Filtered features are grouped first, followed by unfiltered features. Tap the column heading again to reverse the sort order, listing unfiltered features first.

Use the *Show Filtered Features* and the *Show Unfiltered Features* options in the *Update Features* screen (see page 116) to hide or show the two groups of features. When you hide or show a group of features in the Data section, the corresponding map layer is hidden or shown. Similarly, when you hide or show features in the Map section, they are hidden or shown in the Data section. See Map layers, page 74.

Note – *Deleted features are never displayed on the map.*

Construct Target Offset form

use the *Construct Target Offset* form to set a navigation target by specifying an offset from the current navigation start point.

Note – *The TerraSync software can be customized; the Offset option may have been disabled and will not be visible.*

To open the *Construct Target Offset* form, in the *Update Features* screen (see page 114), tap **Options** and then select *Set Nav Target / Construct*. The *Construct Target Offset* form appears.

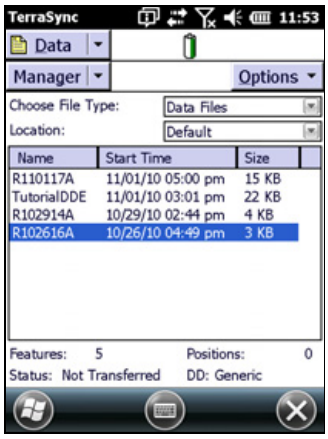
Table 6.31 Construct Target Offset form: Fields

Field	Description
Bearing	The bearing, in the selected angle units, from the navigation start to the target position. Enter the angle relative to the configured north reference, which is indicated by a T (true north) or M (magnetic north) after the field name. To configure the north reference, use the *Units* form (see page 205).
Horizontal distance	The two-dimensional distance from the navigation start to the target position. The horizontal distance ignores any difference in height between the start and target. This field only appears if the *Offset Format* field in the *Units* form is set to Horizontal/Vertical (see page 205).
Vertical distance	The vertical distance from the navigation start to the target position. This field only appears if the *Offset Format* field in the *Units* form is set to Horizontal/Vertical (see page 205).
Slope distance	The distance from the navigation start to the target position, including any difference in height. This field only appears if the *Offset Format* field in the *Units* form is set to Slope/Inclination (see page 205).
Inclination	The angle of inclination between the navigation start and the target position. This field only appears if the *Offset Format* field in the *Units* form is set to Slope/Inclination (see page 205).

File Manager

Use the File Manager subsection to:

- copy or move files between the main memory and storage cards, or between disk drives
- delete or rename files
- e-mail files
- convert files to or from Shapefile format



To open the File Manager subsection, tap the Subsection list button and select *File Manager*.

Note – *The TerraSync software can be customized; the File Manager option may have been disabled and will not be visible.*

Highlight a file and then tap **Options** to access a list of available options for the file (see page 126) .

Note – *The options that are available depend on the selected file type, the TerraSync software edition (Centimeter, Professional,or Standard) that is installed, and the storage locations that are available on the field computer.*

Table 6.32 File Manager screen: Fields

Field	Default	Description
Choose File Type	Data files	Select the type of file to display. The options are: • Data files — **SSF** files (.cor, .imp, .phs, or .ssf files) containing feature and attribute information. • Base files — **SSF** files containing reference base station data. • Dictionaries — Data dictionary (**.**ddf) files containing feature definitions. • Background files — Background image files in **vector** (.cor, .imp, .phs, .ssf) or **raster** (.bmp, .ecw, .jpg, .jp2, .j2c, .sid, .tif) format. • Geoid files — Files containing geoid definitions. • Configuration files — .tcf files containing the TerraSync software configuration information. • Waypoint files — Waypoint (.wpt) files containing name and location information for geographical points.
Location	Default	Select the storage location to display files from. This field contains an entry for each storage location on the device. There is also an option called Default, which represents the TerraSync documents folder.
List of files	(no default)	The list of files that you can move, copy, rename, delete, or export to Shapefiles. The list contains the following columns: • Name — The name of the file. • Start Time — The date and time when the file was created or last updated. • Format — The file format of the background file. This column appears instead of the Start Time column when Background files is selected in the *Choose File* field. • Size — The size of the file, in kilobytes. Drag a column heading to resize the column, or tap a column heading to sort by that column. If the list is already sorted by the selected column, the sort order is reversed.
Features	(no default)	This field does not appear unless the Data files option or the Base files option is selected in the *Choose File Type* list. If the Base files option is selected, this field shows the value Base. The number of features in the selected file.
Positions	(no default)	This field does not appear unless the Data files option is selected in the *Choose File Type* list. The number of position records in the selected file.
Waypoints	(no default)	This field does not appear unless the Waypoint files option is selected in the *Choose File Type* list. The number of waypoints in the selected file.

Table 6.32 File Manager screen: Fields (continued)

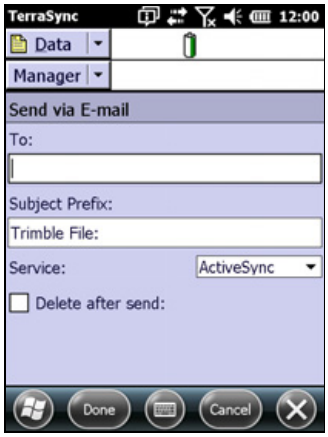
Field	Default	Description
Status	(no default)	This field does not appear unless the Data files option is selected in the *Choose File Type* list. The update status of the selected file. The status is one of the following: • Transferred — The file has been created or updated in the TerraSync software, has been copied to the office computer, and has not been updated in the TerraSync software since. • Not Transferred — The file has not been copied to the office computer since it was created or last updated. • Imported — The file has been transferred from the office computer, imported from Shapefiles, or received by e-mail, but has not yet been updated in the TerraSync software. • Not Usable — The status of the file is Imported, but you are using the TerraSync Standard edition software so you cannot update it.
DD	(no default)	This field does not appear unless the Data files option is selected in the *Choose File Type* list. The name of the data dictionary associated with the selected file.

Table 6.33 File Manager screen: Options

Option	Description
Delete	Deletes the highlighted file.
Copy to	Makes a copy of the highlighted file and stores that copy in the selected storage location. Each storage location on the field computer appears as an option on the submenu.
Rename	Enables you to change the name of the highlighted file, using the keyboard of the field device or the integrated keyboard.
Move to	Moves the highlighted file to the selected storage location. Each storage location on the field computer appears as an option on the submenu.
Send via E-mail	Opens the *Send via E-mail* form (see page 127).
Receive via E-mail	Opens the *Receive via E-mail* form (see page 128).
Read data from Shape	Opens the *Read from Shape* form (see page 129). The name of this option and the name of the form depend on the file type that is selected in the *Choose File* field.
Write data to Shape	Opens the *Write to Shape* form (see page 131).
Extract data from file	Opens the *Extract Data* form, where you can create a file that contains new and updated data (see page 132).

Send via E-mail form

Note – *This option is only available on field computers that have e-mail support.*



Use the *Send via E-mail* form to specify the recipient and the subject line for an e-mail.

To open the *Send via E-mail* form, in the File Manager screen (see page 124) tap **Options** and then select *Send via E-mail*.

When you tap **Done**, an e-mail with the selected file attached to it, is automatically generated and sent to your e-mail program's outbox. The next time you connect to your selected e-mail service, the e-mail is sent to the address you specified.

On a mobile device, you can use different e-mail services to send data files from the TerraSync software. The default service used is synchronization with a desktop computer. However, you can set up services for connection via a network, cellphone, or modem.

Note – *To successfully send and receive files from within the TerraSync software, the e-mail service that you use must specify the login details for connecting to your ISP, and must be configured to download the entire message and any attachments, not just the message header.*

For more information on adding and configuring services, refer to the help for your e-mail program.

Note – *The only file types that the TerraSync software can send by e-mail are data files and data dictionary files.*

Table 6.34 Send via E-mail form: Fields

Field	Description
To	The e-mail address you want to send the selected file to. If you have sent files from the TerraSync software before, this field defaults to the last e-mail address used.
Subject Prefix	A subject line for the e-mail. If you have sent files from the TerraSync software before, this field defaults to the last subject line used.

Table 6.34 Send via E-mail form: Fields (continued)

Field	Description
Service	This field only appears if the field computer is a Windows Mobile or Windows Embedded Handheld powered device. The e-mail service to use when sending the message. This field lists all the services that you have defined in your e-mail program. By default, the Microsoft ActiveSync® technology is selected. The ActiveSync technology service synchronizes the field computer's outbox with the desktop computer's outbox. The next time the desktop computer connects to the Internet, the e-mail program sends the e-mails in its outbox.
Delete after send	Select this check box to delete the file from the TerraSync document folder when you attach it to an e-mail message. If you select this check box, the data file is moved to the e-mail program's outbox. If you clear this check box, a copy of the data file is placed in the outbox, and the original file remains in the document folder. If space on the field computer is limited, select this check box. Only one copy of the file will be stored on the field computer. The stored file cannot be opened in the TerraSync software. When you next connect to the selected e-mail service and send the e-mail, the data file is deleted.

Receive via E-mail form

Note – *This option is only available on field computers that have e-mail support.*

Use the *Receive via E-mail* form to check your e-mail program's inbox for e-mails that have Trimble data files attached to them, and transfer the attached files to the TerraSync software.

Note – *You can only use this form to receive files sent by e-mail from the Trimble Data Transfer utility (by transferring the files to a GIS e-mail device). The TerraSync software can only receive the following file types by e-mail:*
- *data files*
- *background files*
- *configuration files*
- *waypoint files (when sent as data files)*
- *data dictionary files*

To open the *Receive via E-mail* form, in the File Manager screen (see page 124) tap **Options** and then select *Receive via E-mail*.

To receive e-mailed files, enter a subject line in the *Subject must contain* field, select the *Allow file overwrites* check box to overwrite existing files with new ones of the same name and then tap **Done**.

The TerraSync software searches the inbox of your e-mail program, selects any unread e-mails whose subject line includes the text specified, and transfers any files attached to these e-mails to the TerraSync software data folder. The *Receive via E-mail* form closes.

Tip – In the Trimble Data Transfer utility you can specify a subject line prefix for each e-mail you send. To transfer all data files successfully into the TerraSync software, make sure that the prefix specified in Data Transfer matches the text specified in this form.

If you have set up your e-mail program to leave file attachments on the mail server until requested, the software displays a message asking you to confirm that you want to download each attached file from the server.

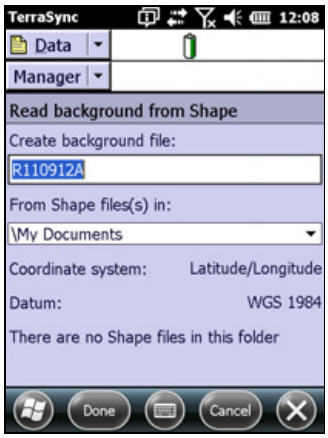
Table 6.35 Receive via E-mail form: Fields

Field	Description
Subject must contain	A subject line to search your e-mail inbox for. Only e-mails containing this text in their subject line will be recognized by the TerraSync software as having Trimble data files attached. If you have received files in the TerraSync software before, this field defaults to the last subject line used.
Allow file overwrites	This field specifies whether to allow received files to overwrite existing files of the same name.
Service	This field only appears if the field computer is a Windows Mobile or Windows Embedded Handheld device. The e-mail service that you want to use to receive the message. This field lists all the services that you have defined in your e-mail program. By default, the ActiveSync technology is selected. The ActiveSync service synchronizes the field computer's inbox with the desktop computer's inbox, so that any new e-mails in the desktop computer's inbox are copied to the field computer's inbox.

Read from Shape form

Use the *Read from Shape* form to convert Esri Shapefiles on the field computer into data or **vector** background files suitable for use in the TerraSync software. You can select which input files to use, and the name of the output file, but you cannot change any other conversion settings.

Before you open the *Read from Shape* form, make sure that the file type selected from the *Choose File Type* drop-down list on the *File Manager* screen is the file type that you want to create. For example, if you want to create a vector background file from Shapefiles, select Background files from the *Choose File* drop-down list. Also make sure that the coordinate system that you want the output file to use is selected in the *Setup* section. See Coordinate System, page 203.



To open the *Read data from Shape* form, in the *File Manager* screen (see page 124) tap **Options** and then select *Read data from Shape* or R*ead background from Shape*. The *Read from Shape* form appears.

In the *Read from Shape* form, specify an output filename in the *Create <file type> file* field, and check that the coordinate system shown is correct. Then select the folder on the field computer that contains the Shapefiles you want to convert. To select the folder, enter its full path and name in the *From Shape file(s) in* field. Alternatively, tap the drop-down arrow and, in the pop-up window that appears, navigate to the required folder.

Once you have selected an input folder, a separator field called Include appears, followed by a check box for each Shapefile in the folder. To include a Shapefile in the conversion, select its check box. To exclude a file, clear its check box.

To begin the conversion, tap **Done**. The fields on the form are replaced by a progress bar and summary information about the conversion.

When the files have been converted, the message Shape conversion complete replaces the progress bar. The same message also appears in a tooltip in the status bar.

Tap **Close** to return to the File Manager screen (see page 124). The new file appears in the List of files.

Table 6.36 Read from Shape form: Fields

Field	Description
Create <file type> file	The name of the new file. The TerraSync software automatically generates a default filename for the new data or background file, using the same naming convention as in the *File Name* field in the *New File* screen (see page 92). You can edit this default name, or enter an entirely different name. Filenames must follow the naming rules for Windows, but you should not specify an extension.
From Shape file(s) in	The folder where the source Shapefiles are stored.
In coordinate system	The current coordinate system. Use this field to check that the coordinate system to be used by the new file is correct. ***Note –*** *When you create a data or background file, the current coordinate system* ***must*** *match the coordinate system in the input Shapefiles. Use the Coordinate System form in the Setup section(see page 203) to change the coordinate system if necessary.*
Include	A list of the Shapefiles in the selected folder. To include features in a Shapefile in the converted file, select the check box beside the name of the Shapefile.

Write to Shape form

Use the *Write to Shape* form to convert a data file from the TerraSync software into Esri Shapefiles. You can select the location of the output files, but you cannot change any other conversion settings. The conversion creates a separate Shapefile for each feature type in the input data file.

To open the *Write to Shape* form, in the *File Manager* screen (see page 124) tap **Options** and then select the *Write data to Shape* option. The *Write to Shape* form appears.

The input data file in the *Convert file* field is the file that was highlighted in the list of files in the *File Manager* screen. To change the selected file, return to the *File Manager* screen and select a different file.

To convert a data file to Shapefiles, select the folder on the field computer where you want to create the Shapefiles. To select the folder, enter its full path and name in the *Write Shape file(s) to* field. Alternatively, tap the drop-down arrow and, in the pop-up window that appears, navigate to the required folder.

To begin the conversion, tap **Write**. The fields on the form are replaced by a progress bar and summary information about the conversion.

When the file has been converted, the message Shape conversion complete replaces the progress bar. Tap **Close** to return to the *File Manager* screen.

Table 6.37 Write to Shape form: Fields

Field	Description
Convert file	The name of the file to be converted. Use this field to check that you have selected the correct input data file. If this field does not show the correct filename, return to the File Manager screen, highlight the correct file in the list, and select the Write data to Shape option again.
Write Shape file(s) to	The folder where the Shapefile(s) will be stored.
Coordinate system	This field shows the current coordinate system, which is the coordinate system that will be used for the new data file. Use the Coordinate System form in the *Setup* section (see page 203) to change the coordinate system if necessary.
Zone	The currently selected coordinate system zone. This field does not appear if the selected coordinate system has no zones.
Datum	The datum that the selected coordinate system and zone are associated with. If the system can be associated with only one datum, this field does not appear.

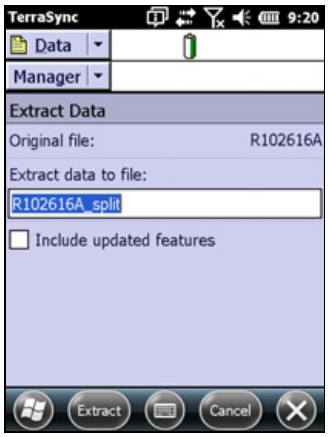
Extract Data form

Note – *This function is not available in the TerraSync Standard edition software.*

Use the *Extract Data* form to extract new and updated features from an updated data file and transfer them to a new data file. The new file can be transferred to the office computer for processing. The original file is modified so that you can append new GNSS data.

Note – *An existing feature is treated as "new" if its GNSS position has been updated.*

You can select the location of the output files, but you cannot change any other conversion settings for new and updated features. Both are extracted to the same file.



To open the *Extract Data* form, in the *File Manager* screen (see page 124) tap **Options** and then select the *Extract data from File* option. The *Extract Data* form appears.

The input data file in the *Original file* field is the file that was highlighted in the list of files in the File Manager screen. To change the selected file, return to the *File Manager* screen and select a different file.

Note – *You must close the input file before proceeding.*

To begin the process, tap **Extract**. The fields on the form are replaced by a progress bar and summary information about the conversion.

When the file has been created, the message Extraction complete replaces the progress bar. Tap **Close** to return to the File Manager screen.

Table 6.38 Extract Data form: Fields

Field	Description
Original file	The name of the original file.
Extract data to file	The name of the file that will contain the new features. A default filename is provided, but you can change or replace this name.
Include updated features	To extract features that are flagged as updated, select the check box.

CHAPTER

7

Navigation Section

In this chapter:

- Navigate
- Waypoints

Use the Navigation section to:

- make sure that you follow a direct course to a target location
- revisit features that you have previously mapped
- create and edit waypoints
- view information such as your current heading or the distance from your current position to the target

The Navigation section may be disabled; the TerraSync software can be customized to hide the entire section from TerraSync users.

Navigate

Use the Navigate subsection to navigate to selected targets. To display the Navigate subsection, tap the arrow on the Subsection button below the Section button and then select *Navigate*.

There are two navigation modes, depending on how close you are to the navigation target. Use the:

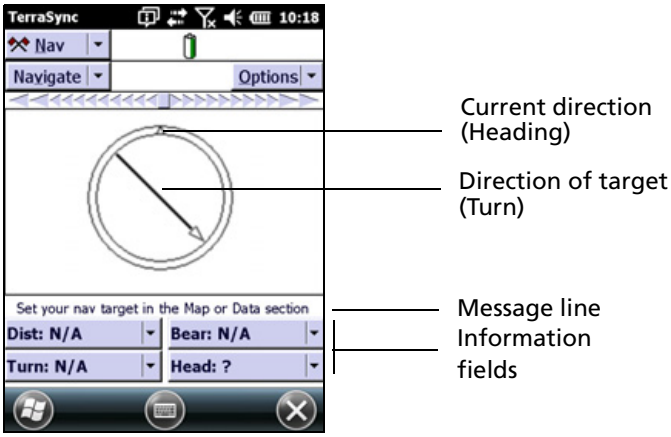
- Direction Dial to navigate to the target from a distance.
- Close-Up screen to navigate to the exact location of the target.

In either mode, you can use the lightbar at the top of the screen to guide you to the target.

Note – *With* ***real-time differential GNSS****, you can navigate to an accuracy of one meter or less, depending on factors such as the GNSS receiver and the frequency at which corrections are received. Without any form of real-time differential corrections, you are subject to errors introduced by GNSS and atmospheric conditions. These errors degrade the accuracy of navigation. Autonomous navigation (without real-time corrections) can be useful to get you close to the feature, but it may be less useful for locating a specific feature if similar features are near to each other, or if the feature is underground.*

Direction Dial

When you first open the Navigation subsection, the default screen displayed is the Direction Dial graphical screen



Note – *On most Trimble handheld devices, until GNSS is acquired and you have specified a target and started moving, the heading cannot be calculated so the turn arrow does not appear. Geo 7 series handhelds provide the current device heading even when stationary, when the orientation sensors have been calibrated.*

The Direction Dial graphical screen provides a simple dial which shows all the information you need to get to the target. It is useful for navigation in open country or where you can follow a direct route to the target.

Note – *You cannot set the navigation target in the Navigation subsection. Select a target from the Waypoints subsection (see page 145), the Data section (see page 91), or the Map section (see page 67).*

Table 7.1 Direction Dial: Fields and icons

Item	Description
Target	This field indicates the current navigation target: • If a feature is selected, the feature ID and feature type appear. • If you have selected a map point, the text **Map Point** appears. • If you have constructed a target by specifying an offset from the navigation start, the text **Constructed** appears. • If no target is selected, the text **NoTarget** appears.
Nav Start	If you have specified a navigation start and target, but the start is further away from your position than the configured Range (see page 143), you must navigate to the start before you can navigate to the target. While you are navigating to the start, the *Nav Start* field appears instead of the *Target* field. Once you have navigated within close-up range of the start, the *Nav Start* field is replaced by the *Target* field and you can start navigating to the target. Like the *Target* field, the *Nav Start* field identifies the navigation start: • If a feature is selected, the feature ID and feature type appear. • If you have selected a map point, the text **Map Point** appears.
Lightbar	The lightbar guides you along the shortest path between the navigation start and the target (see Lightbar, page 138).
Heading	The top of the dial indicates your direction of travel (heading).
Turn arrow	The turn arrow shows the direction you should travel in order to take the shortest path between the current GNSS position and the target.
Message line	The message line displays messages relating to navigation (see page 142).
Information fields	The information fields at the bottom of the screen provide navigational information (see page 140).

Using the Direction Dial

To activate navigation, use the Data section (see page 91) or the Map section (see *page 67*)) to select a navigation ***target***. When you select a target, the Direction Dial displays information that helps you to navigate to the target. The Direction Dial graphically displays your heading and the bearing to the target. The information fields at the bottom of the screen display relevant text information (see Information fields, page 140). The message line also shows relevant information for navigation.

The heading along which you are moving (your current direction of travel) is always shown at the top of the dial. The Turn arrow shows where the target is, relative to your heading.

Note – *On most Trimble handheld devices, until GNSS is acquired and you have specified a target and started moving, the heading cannot be calculated so the turn arrow does not appear.*

Note – *When using a Geo 7 series handheld, if the orientation sensors have been calibrated the current device heading is provided even when stationary. The Sensor Interference icon is also shown on the Navigation screen (see Table 5.2. Map section: Icons, page 69 for more information).*

To navigate to the target, simply line up the arrow (the direction of the target) with the triangle at the top of the dial (your current direction of travel).

The arrow on the dial rotates according to your direction of travel. 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, or are standing still, the Heading arrow freezes. See Message line, page 142.

Tip – Because the Direction Dial screen is based on your heading, it works best if you do not move backwards.

If you also select a navigation ***start***, you can use the lightbar to navigate along the shortest path from the start to the target (see page 138). This path is called the **cross-track line**. If you are not within the configured range of the navigation start (see page 143), you must first navigate to the start before you can navigate to the target.

Note – *If you log a new GNSS position for the feature that is currently selected as the navigation target, you must reselect the feature as the navigation target before you can navigate to the new location of the feature.*

Close-up screen

When you come within the specified close-up range of the target (see page 138), the navigation proximity alarm sounds, and the *Close-up* graphical screen replaces the *Direction Dial* screen.

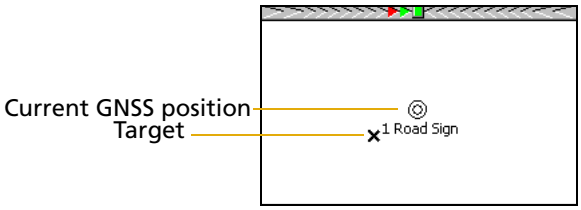


Table 7.2 Close-up screen: Fields and icons

Item	Description
Target	This field identifies the current navigation target: • If a feature is selected, the feature ID and feature type appear. • If you have selected a map point, the text **Map Point** appears. • If you have constructed a target by specifying an offset from the navigation start, the text **Constructed** appears. • If no target is selected, the text **No Target** appears.
Lightbar	The lightbar guides you along the shortest path between the navigation start and the target (see Lightbar, page 138).
Bull's-eye	The bull's-eye represents the navigation target.
Cross	The cross represents the current GNSS position.
Message line	The message line displays messages relating to navigation (see Message line, page 142).
Information fields	The information fields at the bottom of the screen provide navigational information (see Information fields, page 140).

Using the Close-up screen

For precision navigation right up to the target, move so that the GNSS position cross is in the center of the bull's-eye. Depending on the close-up style selected (see Close-up style, page 138), either the bull's-eye or the cross remains fixed in the center of the screen, while the other icon moves around it.

The top of the *Close-up* screen is relative to the direction that you were traveling in (your 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.

All information fields (see page 140) that depend on the heading are automatically locked as well. See Heading locked, page 142.

Tip – Because the *Close-up* screen does not update your heading, it works best if you maintain your original direction of travel. If necessary, move sideways or backwards rather than turning.

Tip – To quickly open the feature that is set as the target for update, double-tap the bull's-eye in the *Close-up* screen.

Close-up range

The close-up range value controls the distance from the target at which the *Direction Dial* graphical screen switches to the *Close-up* graphical screen. You can configure the close-up range value either 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 GNSS accuracy you currently have, the GNSS cross appears to leap around the screen. To minimize this effect, select a larger close-up range.

Configure the close-up range values from the *Navigation Options* form (see page 143).

Close-up style

The close-up style can be set to either target-centered or GNSS-centered. It controls which position is the fixed reference point in the center of the *Close-up* screen: your position or the position of the target.

- For the target-centered style, the bull's-eye, representing the target, is fixed in the center of the screen and the GNSS cross moves around it as your position changes.
- For the GNSS-centered style, the GNSS cross, representing your position, is fixed in the center of the screen and the bull's-eye moves around it.

Configure the close-up style from the *Navigation Options* form (see page 143)..

Lightbar

The navigation lightbar appears at the top of the *Direction Dial* and *Close-up* screens, as well as in the Map section (see page 67). It uses colored icons to simulate the colored LEDs of a physical lightbar.

Tip – The lightbar can also be displayed at the top of the map. To do this, in the Map section tap **Options** and then select *Cross-Track Light Bar*.

The lightbar guides you towards the navigation target by graphically representing the **cross-track error**. This is the amount and direction by which your **heading** differs from the **cross-track line**. The cross-track line is the shortest path between the navigation start and target.

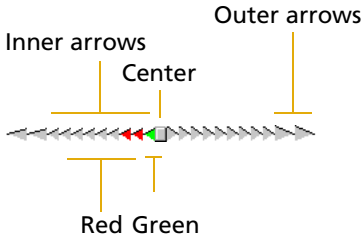
Note – *The lightbar is only available if you have set both a navigation start and a navigation target. You can set the start and target in the Data section (see page 91) or the Map section (see page 67).*

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

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

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

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



The lightbar display consists of a square icon in the center, with nine inner arrows and two larger outer arrows on each side. Each inner arrow represents a small cross-track error. The size of the error that each arrow represents is determined by the Inner Lightbar Spacing setting (see page 143). Each outer arrow represents a large cross-track error. The size of the error that each arrow represents is determined by the Outer Lightbar Spacing (see page 143). The total cross-track error is the sum of the errors of each arrow from the center to the middle arrow that is lit.

When you are on track, the square center icon is green. When you are off track, three adjacent arrow icons are "lit". The size of the cross-track error is indicated by the color and location of the lit icons.

If the ***square center*** icon, and the two arrow icons on each side of it, are green, then you are on track. You do not need to adjust your heading.

If ***inner*** arrow icons are lit, then you are off track. If a green arrow icon is lit, then you are only slightly off track. If any of the lit icons are red, a larger heading adjustment is required. The farther the lit icons are from the center, the larger the adjustment. For example, if the inner lightbar spacing is 0.5 m, and the middle lit arrow is six from the center, then you are 3 m (6 × 0.5 m) off track.

If ***outer*** arrow icons are lit, you are significantly off track. A large heading adjustment is required. For example, if the outer lightbar spacing is 5 m, the inner spacing is 0.5 m, and the middle lit arrow is the first outer arrow, then the cross-track error is 9.5 m. This distance is the sum of the inner arrow error (4.5 m = 9 × 0.5 m) and the outer arrow error (5 m = 1 × 5 m).

Information fields

Additional information about the selected navigation target appears in the configurable information fields. These fields appear on four buttons on the *Direction Dial* screen (see page 134) and on the *Close-up* screen (see page 136).

Note – *If the field computer uses the landscape orientation, the buttons appear to the right of the Navigation screen.*

By default, the four buttons show the Distance, Bearing, Turn, and Heading information fields. You can choose four information fields out of a total of twelve to display on the buttons.

To change the information field that is displayed on a button, tap the drop-down arrow on the right side of the button, and select the information field from the list that appears. The button displays the label and data for the selected field. If the selected field is already selected on another button, the two fields swap position.

Tip – Use the Units form (see page 205) in the Setup section to change the distance units, velocity units, north reference, and altitude reference.

Note – *Most information fields are only relevant if a target is selected. Only the Velocity, Heading, and Altitude fields show data when no target is selected. If no target is selected, all other fields show the value **N/A**, and the message line prompts you to select a target (see Message line, page 142). If you are stationary or are not moving fast enough for the software to calculate a heading, these fields show the value **?**, and the message line prompts you to start moving.*

Table 7.3 Navigation section: Information fields

Field	Label	Description
Distance	Label: Dist.	The distance to the navigation target. This is the shortest **great-circle distance** to the target, computed on the local **datum**.
Bearing	Label: Bear.	The compass bearing (angle) that you should follow in order to take the shortest path between the current GNSS position and the target. The bearing 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**.
Turn	Label: Turn	The direction that you need to turn in, to head towards the target. It indicates the magnitude by which your course should vary. This is the difference between the bearing to the target and the current heading.
Heading	Label: Head	Your current direction of travel. The heading is the angle between the last two GNSS positions computed. If you are stationary, or moving very slowly, the heading is locked 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 north** or **magnetic north**. The heading is displayed whether or not you have chosen a target.
Cross-track	Label: X-Tk	The direction and distance to the cross-track line. The direction of the cross-track line (left or right) is indicated by **(L)** or **(R)**. The numeric value indicates the distance that you must travel in that direction to get back on track. The cross-track error is only displayed if you have selected a start and a target.
Time to Go	Label: TTG	The expected time to reach the target. 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.
ETA	Label: ETA	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, this field displays **>24 hr**.
Velocity	Label: Vel.	Your two-dimensional velocity. The velocity is displayed whether or not you have chosen a target.
Altitude	Label: Alt.	The current altitude. This field also shows the configured altitude reference (**HAE** or **MSL**). The altitude is displayed whether or not you have chosen a target.
Go Up/Go Down	Label: Up/Down	The difference in altitude between your current altitude and the altitude of the target. This field is 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. ***Note –*** *This value is calculated using the altitude of the GNSS antenna. If you have specified an antenna height, it is based on the GNSS antenna's height minus the antenna height (pole or handheld) offset value.*

Table 7.3 Navigation section: Information fields (continued)

Field	Label	Description
Go North	Label: Go N	The northerly distance component of the bearing to the target. This field shows the north/south distance from the current GNSS position to the target. The Go North and Go East information fields are useful for navigation around city blocks, or when you cannot travel in a direct line to the target.
Go East	Label: Go E	The easterly distance component of the bearing to the target. This field shows the east/west distance from the current GNSS position to the target. The Go North and Go East information fields are useful for navigation around city blocks, or when you cannot travel in a direct line to the target.

Message line

The message line appears above the information fields (see page 140). It displays important messages relevant to navigation. The following messages may appear:

Table 7.4 Navigation section: Messages

Message	Meaning
Heading locked	You are stationary or moving too slowly for an accurate heading to be computed. This message flashes alternately with the message Start moving. The direction dial arrow and any Information fields affected freeze. To unlock the heading, start moving faster than the ***cutoff velocity*** of 0.35 meters/second (1.26 kilometers/hour, or 0.78 miles/hour). ***Note –*** *The heading is always locked when the Close-up screen is visible.*
Heading not available	No heading can be calculated because you have not started moving (fast enough) since the GNSS receiver was connected. This message alternates with the message Start moving until you begin to move.
No GNSS	The TerraSync software is not connected to a GNSS receiver.
Old navigation	GNSS position information is temporarily unavailable (for example, because one or more satellites is obscured, or satellite geometry is poor). The TerraSync software still displays the most recent navigation information, but the direction dial arrow flashes.
Set your navigation target in the Map or Data section	You have not selected a navigation target. Select a target in the Map section (see page 67), or the Data section (see page 91).
Start moving	Your speed is not sufficient for an accurate heading to be calculated: you are either stationary or are not moving fast enough. This message alternates with Heading not available, if you have not moved since connecting to GNSS, or Heading locked, if you have slowed down too much since the last heading was calculated.

Navigation Options form

To display the *Navigation options* form, tap **Options** in the Direction Dial screen or the Close-up screen, and select Navigation Options.

Use this form to specify settings for the Navigation section.

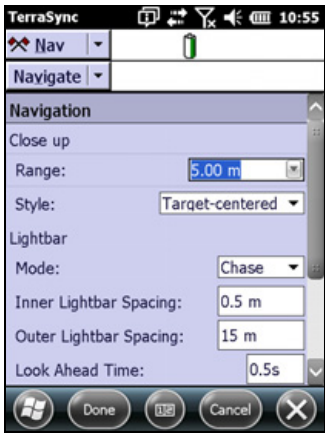


Table 7.5 Navigation Options form: Fields

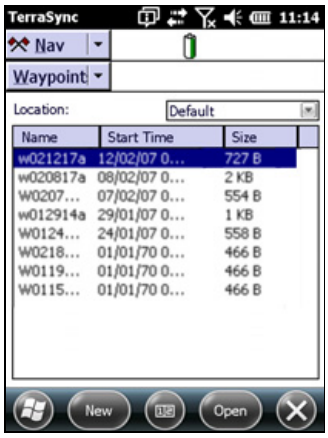
Field	Default	Description
Range	5.00 m	The distance from the target to activate the *Close-up* screen. Enter a value to activate the *Close-up* screen at that distance, or select None to stop the *Close-up* screen from ever appearing.
Style	Target-centered	The style for the *Close-up* screen. The options are: • Target-centered — The target remains still in the center of the screen and your GNSS position is displayed relative to it. • GNSS-centered — Your GNSS position remains still in the center of the screen and the target is displayed relative to it.
Mode	Center	The lightbar mode. The options are: • Chase — The center of the lightbar represents your current heading, and the lit arrow icons represent the direction of the cross-track line. • Center — The center of the lightbar represents the direction of the cross-track line, and the lit arrow icons represent your current heading.
Inner Lightbar Spacing	0.5 m	The amount of cross-track error that each small inner arrow icon represents.
Outer Lightbar Spacing	15 m	The amount of cross-track error that each large outer arrow icon represents. This value must be greater than or equal to the value that you set for the inner lightbar spacing.
Look Ahead Time	0.5 s	The lightbar display gives guidance for your predicted position, not your current position. Providing feedback for your predicted position helps you to correct your heading before you move too far off track. The look ahead time specifies how far into the future the lightbar should predict your position. The look ahead time must be short enough to ensure accurate and timely feedback, but must also be long enough to prevent the lightbar from recalculating the prediction too often. If the look ahead time is too short, the lightbar recalculates your position and changes the display feedback too quickly for you to respond with appropriate course corrections.

Waypoints

Use the Waypoints subsection to create or open a waypoints file and to create or edit waypoints.

To display the Waypoints subsection, tap the arrow on the Subsection button below the Section button and then select *Waypoints*. The Waypoint Files screen appears. If there are no waypoint files, the *New Waypoint File* form appears (see page 145).

Waypoint Files screen



Use the *Waypoint Files* screen to open an existing waypoint file.

To open the *Waypoint Files* screen, tap the arrow on the Subsection button below the Section button and then select *Waypoints*.

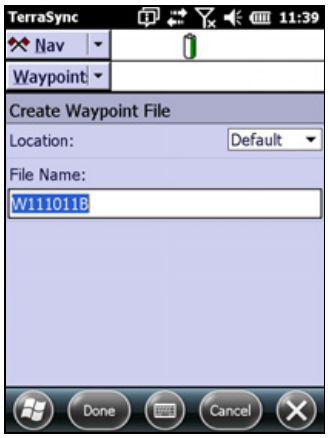
Note – *This screen is not available if a waypoint file is already open. To access this section, close the open waypoint file (tap Options / Close File).*

Select an existing waypoint file from the list of files and then tap **Open** to open this file and begin reviewing existing waypoints in the *Waypoint List* screen (see page 145).

Table 7.6 Waypoint Files screen: Fields

Field	Description
Location	The TerraSync software enables you to write waypoint files directly to internal or removable secondary storage locations. This field contains an entry for each storage location on the device. There is also an option called Default, which represents the TerraSync documents folder.
List of files	A list of all the waypoint files that are available for update. The list contains the following columns: • Name — The name of the waypoint file. • Time — The date and time when the file was created or was last updated. • Size — The size of the file. You can drag each column heading to resize the column, or tap a column heading to sort by that column. If the list is already sorted by the column you tap, the sort order reverses. To open a file, highlight it in this list and then tap **Open**. The *Waypoint List* screen appears (see page 145).
Waypoints	The number of waypoints in the selected file.

New Waypoint File form



Use the *New Waypoint File* form to create a new waypoint file for the name and location of geographical points.

To open the *New Waypoint File* form, tap **New** in the *Waypoint Files* screen. The *New Waypoint File* form appears.

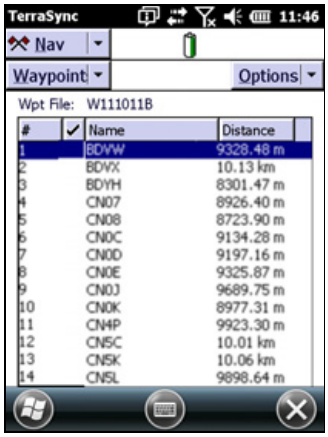
Select a location and enter a filename, and then tap **Done** to create a new file. The *Waypoint List* screen appears.

Tip – To edit the waypoints you have collected so far, use the *Waypoint List* screen (see page 145).

Table 7.7 New Waypoint File form: Fields

Field	Description
Location	The TerraSync software enables you to write waypoint files directly to internal or removable secondary storage locations. This field contains an entry for each storage location on the device. There is also an option called Default, which represents the TerraSync documents folder.
File Name	The name of the new file. When you open this section, the TerraSync software automatically generates a filename for the new waypoint file, using the date and time from the field computer's clock. It uses the formula WMMDDHHX, where: • **W** is the Filename Prefix. • **MM** is the current month, • **DD** is the current day of the month, • **HH** is the current hour of the day, • **X** increments within this hour, starting at *A* for the first file in that hour, then *B* for the second file, and so on. ***Note –*** *You can change the prefix character for waypoint files in the Logging Settings form in the Setup section (see page 178).* The auto-generated filename is only a suggestion. You can edit it, or replace it with an entirely different name. Filenames must follow the naming rules for Windows.

Waypoint List screen



Use the *Waypoint List* screen to review and maintain waypoints that have already been collected. You can update name and location information.

To open the *Waypoint List* screen, open a new or existing waypoint file. To open a waypoint file, tap the arrow on the Subsection button below the Section button and then select *Waypoints*. Tap **New** to open a new file, or select a file from the list of waypoint files and then tap **Open** to open the file.

The *Waypoint List* screen lists all the waypoints in the open waypoint file.

To update the name or location of a waypoint, do one of the following:

- in the list of waypoints, tap and hold the waypoint you want to edit.
- select the waypoint in the list, tap the **Options** button and then tap **Edit**.

The *Edit Waypoint* form appears (see page 150).

Table 7.8 Waypoint List screen: Fields

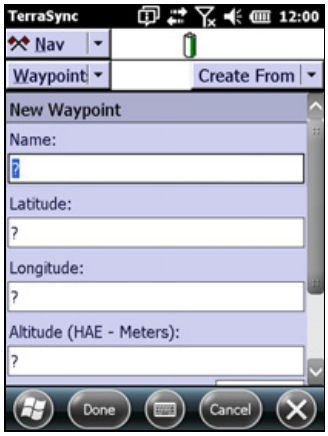
Field	Description
File	The filename of the open file. This field is read-only.
Choose Waypoint list	The list of waypoints for review or update. The list contains the following columns: #: The waypoint number. This number is not stored in the .wpt file, but is dynamically assigned according to the order of waypoints in the file. ✔: Check mark statuts to indicate if the waypoint has been updated. Name: The name of the waypoint. Distance: The distance from the waypoint to the current GNSS position.

Table 7.9 Waypoint List screen: Options

Option	Description
Set Nav Start	This option is only available if you have selected a waypoint from the list. Sets the currently selected waypoint as the navigation start point. When you set the start, the waypoint icon beside the selected waypoint is replaced by the start icon . If there was already a navigation start selected, the icon of that waypoint or feature changes from the start icon back to its usual waypoint or feature icon
Set Nav Target	This option is only available if you have selected a waypoint from the list. Sets the currently selected waypoint as the navigation target. When you set the target, the waypoint icon beside the selected waypoint is replaced by the target icon . If there was already a navigation target selected, the icon of that waypoint or feature changes from the target icon back to its usual waypoint or feature icon. ***Note –*** *You can also set the navigation start and target in the Map section (see page 67).*
Clear Nav Target	Clears any Nav Start or Nav Target option that has been set.
Delete	This option is only available if you have selected a waypoint from the list. Flags the selected waypoint as deleted, so that it does not appear on the map. A deleted waypoint is indicated by a horizontal line through it. Deleted waypoints can be undeleted in the TerraSync software or in the postprocessing software.
Undelete	This option is only available if you have selected a deleted waypoint from the list. Undeletes the selected waypoint. The line through the waypoint is removed.
Edit	This option is only available if you have selected a waypoint from the list. Opens the selected waypoint for editing.
New	Create a new waypoint.
Close	Close the open waypoint file and return to the *Waypoint Files* screen.

New Waypoint form

Note – *The New Waypoint form is only available when a waypoint file is open. Use the New Waypoint File form to create a new waypoint file (see page 145) or the Waypoint Files screen to open an existing waypoint file (see page 144).*



Use the *New Waypoint* form to create a new waypoint.

To open the *New Waypoint* screen, tap the **Options** button in the *Waypoint List* screen and then select *New*. The *New Waypoint* screen appears.

Enter the coordinates of the waypoint yourself, or use the *Create From* option to automatically fill out the coordinate fields using the location of a selected point.

Note – *Waypoints can only be entered using the current coordinate system, but are always stored as WGS-84.*

When you have finished entering information for the waypoint, tap **Done**. The waypoint is created and the *Waypoint List* screen reappears (see page 145).

To return to the *Waypoint List* screen without saving the waypoint, tap **Cancel**.

Using the Create From option

You can create a waypoint using the position of any of the following items:

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

To create a waypoint using the coordinates of another item:

1. Do one of the following:
   - To create a waypoint from the current GNSS position, connect to GNSS.
   - To create a waypoint from a map point, a feature, or another waypoint, select the map point, feature, or waypoint in the Map section (see page 67).

     Alternatively, select the feature from the *Update Features* screen in the Data section (see page 114), or select the waypoint from the *Waypoint List* screen (see page 145).
2. Tap the **Create From** button and then select the item that you want to use the coordinates from. Do one of the following:
   - To use the coordinates of the current GNSS position, select *GNSS*.

- To use the coordinates of the selected map point, select *Map Point*.
- To use the coordinates of a location on the selected feature, select one of the feature options. The feature options are identified by the feature number and feature type (for example, **173 Road - Start** is the feature option for the start point of the Road feature that has ID number 173).
- To use the coordinates of the selected waypoint, select *Waypoint*.

The values in the location fields in the *New Waypoint* screen are updated with the location information for the selected point.

3. If required, edit the location values.
4. To specify a distance-bearing offset for the waypoint from the item you selected as the reference position, fill out the *Bearing* field and then the *Horizontal Distance* and *Vertical Distance* fields or the *Slope Distance* and *Inclination* fields.

Table 7.10 New Waypoint form: Fields

Field	Default	Description
Name		The name of the waypoint. You can enter up to 20 characters, including spaces and underscores, but you cannot use punctuation.
Latitude		This field only appears if the current coordinate system is Lat/Long. The latitude of the waypoint. The value entered is displayed in the units specified in the *Coordinate System* form (see page 203). ***Note –*** *To indicate a Southern hemisphere latitude or Western hemisphere longitude, you must include the hemisphere letter (S or W) or a minus sign (–). The hemisphere letter or plus sign is optional for Northern or Eastern hemisphere positions.* **Tip –** The symbols for degrees (°), minutes ('), and seconds (") can be omitted or replaced with a space, but you must include the decimal point (.).
Longitude		This field only appears if the current coordinate system is Lat/Long. The longitude of the waypoint. The formats you can use are as for the *Latitude* field.
North		This field only appears if the current coordinate system uses North/East. The northing of the waypoint, in the coordinate units specified in the *Coordinate System* form (see page 203).
East		This field only appears if the current coordinate system uses North/East. The easting of the waypoint, in the coordinate units specified in the *Coordinate System* form (see page 203).
Altitude		The altitude of the waypoint. The altitude is expressed as a **Height Above Ellipsoid** or **Mean Sea Level**, depending on the option configured in the *Coordinate System* form (see page 203), and is in the altitude units specified in this form.
Bearing	0.00°	The bearing, in the selected angle units, from the reference position to the waypoint you are creating. For example, if you are facing North and the waypoint is directly to your right (East), enter 90°. The angle you enter is relative to the configured north reference, which is indicated by a T (true north) or M (magnetic north) after the field name. To configure the north reference, use the *Units* form (see page 205).

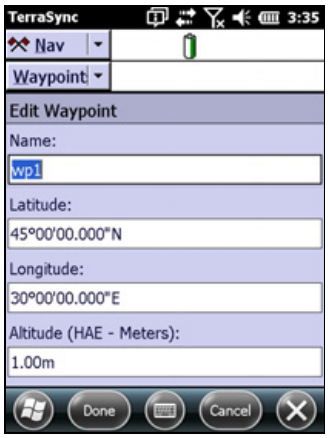
Table 7.10 New Waypoint form: Fields (continued)

Field	Default	Description
Horizontal distance	0.00 m	This field only appears if the *Offset Format* field in the *Units* form is set to Horizontal/Vertical (see page 205). The two-dimensional distance to the waypoint. The horizontal distance ignores any difference in height between the reference position and the waypoint.
Vertical distance	0.00 m	This field only appears if the *Offset Format* field in the *Units* form is set to Horizontal/Vertical (see page 205). The vertical distance between the reference position and the waypoint.
Slope distance	0.00 m	This field only appears if the *Offset Format* field in the *Units* form is set to Slope distance (see page 205). The distance from the reference position to the waypoint, including any difference in height.
Inclination	0.00°	This field only appears if the *Offset Format* field in the *Units* form is set to Slope distance (see page 205). The angle of inclination between the reference position and the waypoint.

Table 7.11 New Waypoint form: Create From options

Create From	Description	
GNSS	This option is not available if you are not connected to GNSS. Use the current GNSS position for the location of the waypoint.	
Map Point	This option is not available if you have not selected a point on the map. Use the selected map point for the location of the waypoint.	
Feature	This option is not available if you have not selected a feature from the map or in the Data section. The options available depend on the type of feature selected. The options are:	
	Point	Use the selected point feature for the location of the waypoint.
	Line	Use the vertex, start, middle, or end of the line feature for the location of the waypoint.
	Area	Use the vertex, start, centroid, or end of the area feature for the location of the waypoint.
Waypoint	This option is not available if you have not selected a waypoint from the map or in the *Waypoints List* screen. Use the selected waypoint for the location of the new waypoint.	

Edit Waypoint form



Use the *Edit Waypoint* form to edit the name and location information of an existing waypoint. To update a feature, select the waypoint in the *Waypoint List* screen and tap **Options** and then select *Edit*.

When you have finished editing the waypoint, tap **Done**. The updated information is stored and the *Waypoint List* screen reappears (see page 145).

To abandon changes to a waypoint, tap **Cancel**. You are prompted to confirm this cancellation.

Table 7.12 Edit Waypoint form: Fields

Field	Description
Name	The name of the waypoint. You can enter up to 20 characters, including spaces and underscores, but you cannot use punctuation.
Latitude	This field only appears if the current coordinate system is Lat/Long. The latitude of the waypoint. The value entered is displayed in the units specified in the *Coordinate System* form (see page 203). ***Note –*** *To indicate a Southern hemisphere latitude or Western hemisphere longitude, you must include the hemisphere letter (S or W) or a minus sign (–). The hemisphere letter or plus sign is optional for Northern or Eastern hemisphere positions.* **Tip –** The symbols for degrees (°), minutes (′), and seconds (″) can be omitted or replaced with a space, but you must include the decimal point (.).
Longitude	This field only appears if the current coordinate system is Lat/Long. The longitude of the waypoint. The formats you can use are as for the *Latitude* field.
North	This field only appears if the current coordinate system uses North/East. The northing of the reference position, in the coordinate units specified in the *Coordinate System* form (see page 203).
East	This field only appears if the current coordinate system uses North/East. The easting of the reference position, in the coordinate units specified in the *Coordinate System* form (see page 203).
Altitude	The altitude of the reference position. The altitude is expressed as a **Height Above Ellipsoid** or **Mean Sea Level**, depending on the option configured in the *Coordinate System* form (see page 203), and is in the altitude units specified in this form.

CHAPTER

8

Status Section

In this chapter:

- Skyplot
- Satellite Information
- Receiver
- Real-time
- Sensor
- Comms
- Time
- About

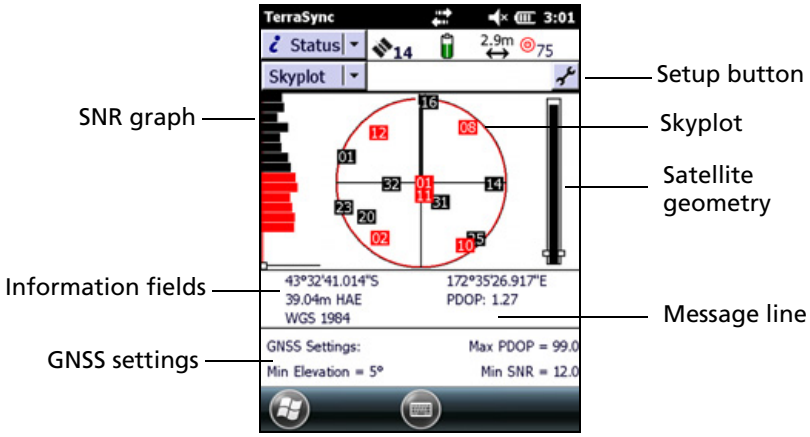
Use the Status section to view information about external connections, including the GNSS receiver and any real-time differential correction source.

To open the Status section, tap the Section list button and select *Status*.

Skyplot

Use the Skyplot screen to view a graphical display of the satellites available to the receiver. The Skyplot screen is the default screen displayed when you open the Status section.

To access the Skyplot screen when another screen in the Status section is visible, tap the arrow on the Subsection button and from the drop-down list select *Skyplot*.



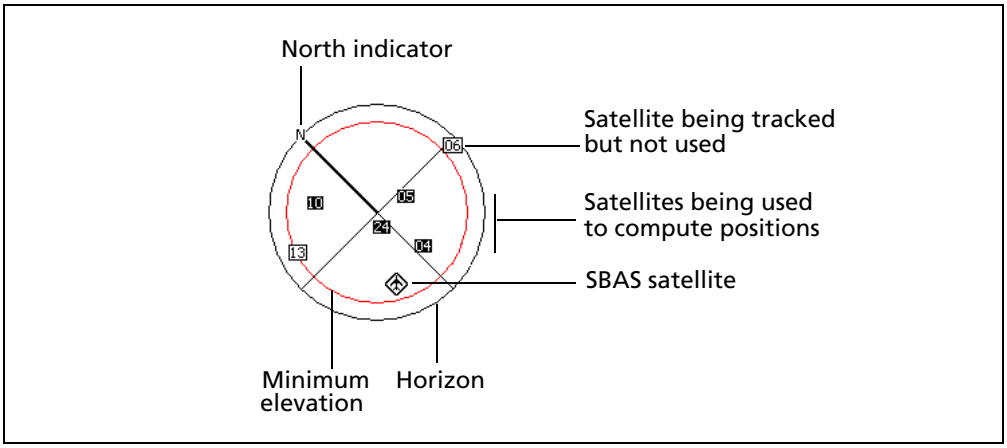
The Skyplot screen includes the following items:

- Skyplot (see page 152)
- SNR graph (see page 154)
- Satellite geometry indicator (see page 154)
- Information fields (see page 155)
- Message line (see page 155)
- GNSS settings area (see page 156)

Skyplot

When you turn on the receiver, it begins to track visible satellites and to calculate the current position. Once the first position is displayed, subsequent positions are updated once per second.

Tip – If no positions are computed, look for obstructions that might be blocking satellite signals. Move away from possible obstructions. If the receiver is still not computing positions, see Appendix D, Troubleshooting.



Numbered boxes represent the satellites currently available to the TerraSync software.

- Satellites shown as filled boxes are currently being used by the TerraSync software to compute GNSS positions.
- Satellites shown as empty boxes are being tracked, but are not being used to compute positions (for example, if their elevation is too low).
- If an SBAS satellite is being tracked, its location is indicated by this icon: .

The black outer circle represents the **horizon** (at 0°).

The satellites near the center of the circle are higher in the sky (overhead), while those toward the edge are closer to the horizon. The location of a satellite can be determined by noting its direction (N, S, E, W) and its approximate elevation in the skyplot.

The inner circle, which is red on a color screen, represents the configured minimum elevation (see GNSS Settings, page 183). When the minimum elevation value is changed, the inner circle of the skyplot changes diameter accordingly.

- If the minimum elevation is increased, the inner circle gets smaller and only those satellites higher in the sky are used to compute GNSS positions.
- If the minimum elevation is decreased, the inner circle gets larger, and satellites closer to the horizon are included when GNSS positions are computed.

The skyplot rotates (like a compass) to indicate the direction that you are travelling in. With most devices the direction is calculated from the last GNSS positions received. If no positions have been received recently, the direction shown may not be correct.

Note – *The skyplot only rotates if you are moving, or if your device has orientation sensors that are enabled and calibrated.*

Tap the skyplot to display a tooltip showing details about the area you have tapped. See Tooltips, page 154.

SNR graph

The Signal-to-Noise Ratio (SNR) bar graph to the left of the skyplot is a graphical representation of the L1 frequency signal quality of each satellite that the GNSS receiver is currently using to calculate positions.

The satellites being tracked for each GNSS constellation are grouped together and shown with a different color that matches the satellite icons in the Skyplot.

Note – *Satellites that are being tracked but not used to calculate positions are not included in the SNR graph. The signal strength of those satellites is shown under the Satellite Information screen.*

The vertical red line shows the configured minimum SNR value.

Note – *If the satellite is connected to a survey GNSS receiver, the red line does not appear, because these receivers do not use minimum SNR values.*

Tap the SNR graph to display a tooltip showing details about the area you have tapped. See Tooltips below.

Satellite geometry indicator

The satellite geometry indicator to the right of the skyplot is a graphical representation of the overall quality of the GNSS positions computed. The white horizontal bar shows the configured minimum quality value, and the level of black inside the indicator shows the current quality value.

Tap the satellite geometry indicator to display a tooltip showing details about the area that you tapped. See Tooltips below.

The quality of the computed positions is a function of the geometry of the visible satellites (how they are positioned in the sky relative to each other and you). When the satellites are well spaced, and cover a large portion of the sky, the GNSS receiver can compute accurate positions and the level inside the indicator is high. If satellites are grouped together in the sky, the precision of the computed positions is reduced, and the level inside the indicator is low.

Tooltips

When you tap an item in the Skyplot screen, a tooltip appears. The tooltip provides detailed information about the selected item.

Table 8.1 Skyplot screen: Tooltips

Skyplot screen element	Tooltip
Bar on SNR graph	Satellite pseudo-random number (PRN) and SNR value(s)
White box on indicator below SNR graph	Configured minimum SNR value
Geometry indicator	Current PDOP or HDOP value
Horizontal bar on geometry indicator	Configured maximum PDOP or HDOP value

Table 8.1 Skyplot screen: Tooltips

Skyplot screen element	Tooltip
Satellite on skyplot	Satellite system and PRN, SNR value(s), elevation, and bearing
Inner circle on skyplot	Configured minimum elevation value

Information fields

Information fields show the current GNSS position and settings.

Note – *If the screen on the field computer uses a landscape orientation, the information fields appear to the right of the skyplot.*

Table 8.2 Skyplot screen: Information fields

Display	Description
GNSS position	The current GNSS position is displayed in terms of the currently configured coordinate system and datum. To change this configuration, use the *Coordinate System* form in the Setup section (see page 203. ***Note –*** *Positions viewed on the screen are not saved. To save them, open a data file and start a feature.*
Height	The height (based on HAE or above MSL) shows the GNSS height minus the antenna height (pole or handheld) offset value.
PDOP	This field only appears if you have configured a maximum PDOP. The **Position Dilution of Precision** (PDOP) is a numeric value representing the satellite geometry. If you set a maximum PDOP value (see GNSS Settings, page 183), and the PDOP rises above the value set, the TerraSync software stops computing positions. To set the maximum PDOP value, tap the *Setup* button to open the *GNSS Settings* form.
HDOP	This field only appears if you have configured a maximum HDOP. The **Horizontal Dilution of Precision** (HDOP) represents the horizontal component of the PDOP. If you set a maximum HDOP value (see GNSS Settings, page 183), and the HDOP rises above the value set, the TerraSync software stops computing positions. To set the maximum HDOP value, tap the Setup button to open the *GNSS Settings* form.

Message line

The message line is displayed midway down the Skyplot screen, below the skyplot. The message line displays error or warning messages.

Note – *The message line also appears below the table in the Satellite Information section (see page 157).*

Messages only appear when there is a problem or a condition you should be aware of. For example, if satellite geometry is good, no message appears; when it is poor, a message appears.

Table 8.3 Messages

Message	Meaning
GNSS disconnected	The GNSS receiver is not connected.
Attempting to connect to GNSS receiver	The TerraSync software is trying to establish a connection with the GNSS receiver. This message appears when you start the TerraSync software, and whenever you try to reconnect to GNSS.
Antenna is not connected to GNSS receiver	The GNSS receiver cannot detect the antenna, or the antenna cable is not connected to the GNSS receiver.
Heading locked	The GNSS receiver is stationary or is moving too slowly to calculate an accurate heading, or the integrated orientation sensors are not calibrated and being used. When the heading is locked, the skyplot does not rotate.
Old position	The receiver has stopped computing positions, so the GNSS position displayed in the Information fields (see page 155) is not the current position. This message alternates with either the Poor satellite geometry message or the Too few satellites message.
Poor satellite geometry	The **PDOP** or **HDOP** is higher than the level specified in the GNSS Settings form (see GNSS Settings, page 183). ***Note –*** *When the geometry of the satellites is poor, the satellite icon in the Status bar flashes. This icon is always visible, regardless of which section you are in.*
Too few satellites	The GNSS receiver is not tracking enough satellites to compute a GNSS position. ***Note –*** *When there are too few satellites to compute GNSS positions, the number below the satellite icon in the Status bar flashes. This icon is always visible, regardless of which section you are in.*

GNSS settings area

The GNSS settings area appears at the bottom of the Skyplot screen and the Satellite Information screen (see page 157). It shows the current GNSS settings.

Note – *If you are using a Juno® series handheld, a Trimble Nomad G series handheld with an integrated GPS receiver, or a Trimble Yuma® rugged tablet computer, you cannot configure GNSS settings. The default settings for the receiver appear in the GNSS settings area as read-only.*

The GNSS settings area shows the configured limits for PDOP or HDOP, elevation, and SNR. To change GNSS settings, tap the Setup button below the status bar to open the *GNSS Settings* form in the Setup section (see page 183).

Satellite Information

Use the Satellite information screen to view information about satellites in text form.

To display the Satellite information screen, tap the Subsection list button and from the drop-down list select *Sat Info*.

Note – *The TerraSync software can be customized; the Satelite Information option may have been disabled and will not be visible.*

The table below describes the information in each column of the table that appears in the Satellite Information section.

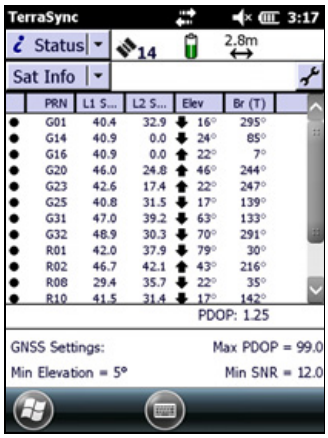


Table 8.4 Satellite Information screen: Columns

Column	Description	
Use indicator	Filled circle (●)	Satellite is being used to calculate positions.
	Empty circle (○)	Satellite is being tracked but is not being used to calculate positions (for example, if the satellite's elevation is below the configured minimum elevation).
	No circle	Satellite is available, but is not being tracked by the GNSS receiver (for example, if the satellite's signal is blocked by a tall building).
PRN	The **pseudo-random number** of each satellite. A satellite is identified by a prefix for each GNSS constellation and its unique PRN.	
L1 SNR	The current signal-to-noise ratio of the L1 signal from each satellite, in dBHz. A satellite that is below the configured Min SNR (see page 183) is not used to compute positions.	
L2 SNR	This column only appears if the connected GNSS receiver is a dual-frequency receiver with a dual-frequency antenna. The current signal-to-noise ratio of the L2 signal from each satellite, in dBHz. ***Note –*** *If a satellite is marked as "unhealthy" by the GNSS Control Segment, the characters **UIH** appear in the SNR columns for that satellite.*	
Elev	The current elevation above the horizon of each satellite. A satellite that is below the configured Min Elevation (see page 183) is not used to compute positions.	
Br(T) or Br(M)	The current **bearing** to each satellite. This bearing is shown relative to either **true north** (T) or **magnetic north** (M), as determined by the currently configured North Reference (see page 205).	

As in the Skyplot screen, the following appear at the bottom of the Satellite Information screen:

- Information fields (see page 155)

- Message line (see page 155)
- GNSS settings area (see page 156)

Information fields

Information fields show the current GNSS position and settings

Note – *If the screen on the field computer uses the landscape orientation, the information fields appear to the right of the satellite information table.*

Table 8.5 Satellite Information screen: Information fields

Display	Description
PDOP	This field only appears if you have configured a maximum PDOP. The current PDOP value (see page 183).
HDOP	This field only appears if you have configured a maximum HDOP. The current HDOP value (see page 183).

Receiver

Use the *Receiver* screen to view information about the connected GNSS receiver.

To display the *Receiver* screen, tap the Subsection button and from the drop-down list select *Receiver*.

Note – *The TerraSync software can be customized; the Receiver option may have been disabled and will not be visible.*

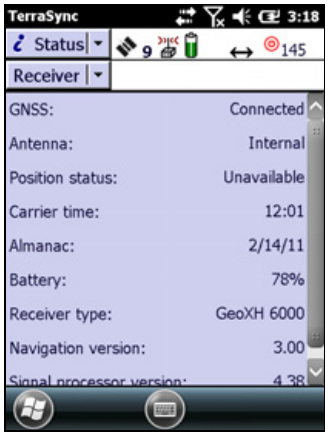


Table 8.6 Receiver screen: Fields

Field	Description	
GNSS	The current status of the GNSS receiver connection. The options are:	
	• Connected	The TerraSync software is connected to the GNSS receiver.
	• Attempting to connect to GNSS	The TerraSync software is trying to connect to the receiver. If this message appears, no other fields appear.
	• GNSS is disconnected	The receiver has been disconnected from the TerraSync software. If this message appears, no other fields appear.
	• No GNSS detected. Check cables, batteries etc	The TerraSync software has failed to detect the receiver, because it is not connected to the port specified in the *GNSS Settings* form (see page 183), or has no power. If this message appears, no other fields appear.
Antenna	The current status of the antenna connection. ***Note –*** *The antenna status field does not appear if the TerraSync software is connected to a Juno series handheld, a Trimble Nomad G series handheld with an integrated GNSS receiver, or a Trimble Yuma rugged tablet computer* The options are:	
	• Connected	The TerraSync software is connected to a GNSS receiver that does not have an internal antenna, and the receiver is connected to an external GNSS antenna.
	• Not connected	The TerraSync software is connected to a GNSS receiver that does not have an internal antenna, and no antenna is connected. The antenna icon also appears in the Status bar instead of the satellite icon
	• Internal	The TerraSync software is connected to a GNSS receiver that is using the internal antenna.
	• External	The TerraSync software is connected to a GNSS receiver that has an internal antenna, but the receiver is connected to an external GNSS antenna.

Table 8.6 Receiver screen: Fields (Continued)

Field	Description	
Position status	An indicator of the GNSS status. The options are:	
	• Calculating positions	The receiver is computing GNSS position fixes. The current satellite constellation is therefore acceptable.
	• Code-correction	The receiver is computing real-time code-corrected GNSS position fixes. The current satellite constellation and real-time source is therefore acceptable.
	• Carrier-correction	The receiver is computing real-time carrier-corrected GNSS position fixes. The current satellite constellation and real-time source is therefore acceptable.
	• Poor satellite geometry	The current **PDOP** or **HDOP** value is greater than the maximum value, so The GNSS receiver is not computing GNSS positions.
	• Too few satellites	The GNSS receiver has acquired satellites, has not acquired enough satellites to compute a position.
	• Unavailable	No position is available. For example, there may be no antenna connected to the receiver.
Battery	The current level of charge in the GNSS receiver battery. This value appears as a percentage. ***Note –*** *If the connected receiver is integrated with or powered by the field computer, the field computer's battery level appears in this field. If the receiver does not report any battery status, this field is not displayed.*	
Receiver type	The name of the receiver model currently connected to the field computer. *The TerraSync software shows the internal name supplied by the receiver, which may not exactly match the name you use for the receiver.*	
Navigation version	The version number of the navigation firmware that is installed in the connected GNSS receiver.	
Signal processor version	The version number of the signal processing firmware that is installed in the connected GNSS receiver.	
OmniSTAR ID	The activation code for the OmniSTAR satellite differential service. You need this code when contacting your OmniSTAR provider for activation. This field only appears if the connected receiver supports real-time corrections from a satellite differential service.	

Real-time

Use the screens in the Real-time section to view information about the real-time correction sources you have set up.

To view real-time information, tap the Subsection button and from the drop-down list select *Real-time*.

Note – *The TerraSync software can be customized; the Real-time option may have been disabled and will not be visible.*

By default, the real-time screen that appears is the *Real-time Summary* screen.

Depending on the real-time configuration, the following detailed status screens may also be available:

- *External Source* status screen (see page 163)
- *External Beacon* status screen (see page 164)
- *Integrated OmniSTAR* status screen (see page 182)
- *Integrated SBAS* status screen (see page 168)
- *Integrated RTK Radio* status screen (see page 185)

Use the Summary list button to move between the real-time status screens. Tap the Summary list button to display a list of status screens and then select an option to open the corresponding screen.

Real-time Summary screen

The *Real-time Summary* screen contains a heading for each real-time correction source you have set up. The heading shows the name of the source. The order of the correction sources matches the order of the choices made in the Setup section using the *Real-time Settings* form (see page 188).

The correction source currently in use for real-time differential corrections has an icon beside its name. The icon used matches the icon that appears in the status bar, to provide a quick indicator of the real-time correction source in use.

If no icon is shown, the TerraSync software is waiting for real-time corrections to resume, or it is logging uncorrected positions. The real-time icon in the status bar flashes to indicate that real-time differential corrections are not available.

Brief summary information on each configured real-time correction source is included in this screen. For more information about the summary information provided for each real-time correction source, see Table 8.8 through Table 8.10 below.

For full status information on any correction source you have configured, tap the Summary list button and select the source name. The screen also includes a Setup button below the status bar for quick access to real-time correction source settings in the *Real-time Settings* form (see page 188).

Table 8.7 Real-time Summary screen: External Source fields

Field	Description
External Source	The status of the External Source real-time correction source. When the GNSS receiver is using an external source receiver for real-time corrections, the external source icon appears to the left of this field. Options are: • In use - The source is being used for real-time differential corrections. • Waiting - This source is configured but a lower-ranked choice is currently in use. The status of the source is being monitored and the TerraSync software will switch to this source if it becomes available and is the highest-ranked available source. • Not connected - This source is configured but you are not connected to an External Source. • (none) - This source is configured but is not being monitored or used.

Table 8.8 Real-time Summary screen: External Beacon fields

Field	Description
External Beacon	The status of the External Beacon real-time correction source.The options are the same as the options for the External Source field. When the GNSS receiver is using an external beacon receiver for real-time corrections, the external beacon icon appears to the left of this field.
Frequency	The current beacon frequency being tracked or locked on to by the external beacon receiver.
State	The real-time operating status of the external beacon receiver.
SNR	The signal-to-noise ratio of the beacon signal that is being monitored.

Table 8.9 Real-time Summary screen: Integrated OmniSTAR fields

Field	Description
Integrated Satellite	The status of the Integrated OmniSTAR real-time correction source. The options are the same as the options for the *Integrated Beacon* status field (see Table 8.9). When the GNSS receiver is using an integrated OmniSTAR receiver for real-time corrections, the integrated OmniSTAR icon appears to the left of this field.
Service Provider	The name of the satellite differential service provider that the satellite in use belongs to.
Frequency	The current satellite frequency being tracked or locked on to.
State	The real-time operating status of the integrated OmniSTAR receiver.
Service Level	The service level of the OmniSTAR differential service.
SNR	The signal-to-noise ratio of the satellite signal that is being monitored.

Table 8.10 Real-time Summary screen: Integrated SBAS fields

Field	Description
Integrated SBAS	The status of the Integrated SBAS real-time correction source. The options are the same as the options for the *External Beacon* status field (see Table 8.8). When the GNSS receiver is using an integrated SBAS receiver for real-time corrections, the integrated SBAS icon appears to the left of this field.
SNR	The signal-to-noise ratio of the SBAS satellite signal that is being monitored.

Table 8.11 Real-time Summary screen: RTK Radio fields

Field	Description
RTK Radio	The status of the Integrated RTK radio real-time correction source. The options are the same as the options for the *Integrated Beacon* status field (see Table 8.9). When the GNSS receiver is using an integrated RTK radio for real-time corrections, the integrated RTK icon appears to the left of this field.
Frequency	The frequency that the RTK radio is listening to.
State	The RTK state: • Initializing • Initialized • Link down • Waiting for base info
Position is	The type of RTK position being logged: • Roving • Static

Setup button

A Setup button below the status bar in each screen in the Real-time section provides a shortcut to the *Real-time Settings* form (see page 188) in the Setup section.

To configure real-time settings, tap the Setup button. The *Real-time Settings* form appears. Make any required changes and then tap **Done** to return to the status screen for the real-time correction source.

External Source status screen

Note – *If an external beacon is configured as the external source, the External Beacon status screen (see page 179) is available instead of the External Source status screen.*

The *External Source* status screen shows detailed information about the external real-time correction source you have set up.

To display the *External Source* status screen, open the Real-time section (see page 161). Then tap the arrow on the Summary list button below the status bar, and from the drop-down list select *External*.

Table 8.12 External Source status screen: Fields

Field	Description
External Source	The status of the external real-time correction source. The options are: • In use — The external real-time correction source is currently being used to correct positions in real time. • Waiting — A lower-ranked choice is currently being used to correct positions in real time. The status of the external source is being monitored and the TerraSync software will switch to the external source if it becomes available and it is the highest-ranked available source. • Not in use — The external real-time correction source is set up but is not currently being used for real-time differential corrections.
Correction Type	This field only appears if the external source is a virtual reference station (VRS). The type of VRS correction being received. The options are: • Network — The VRS is providing a network solution, using corrections from more than one base station to calculate the position of the virtual reference station. • Single Station — The VRS is operating in raw mode, and is using only one base station to provide RTCM corrections.
Connection Up-time	This field only appears if the external source is a VRS. The duration, in hours, minutes, and seconds, of the current VRS connection.
Data Received	This field only appears if the external source is a VRS. The amount of data, in megabytes, kilobytes, or bytes as appropriate, that has been sent and received since the connection was established.
Last correction	The time, in seconds, since the last correction message from this source was received.

External Beacon status screen

Note – *If you have configured an external source that is not an external beacon receiver, the External Source status screen (see page 163) is available instead of the External Beacon status screen.*

The *External Beacon* status screen shows detailed information about the external beacon receiver you have set up as an external real-time correction source.

To display the *External Beacon* status screen, open the Real-time section (see page 161). Then tap the arrow on the Summary list button below the status bar, and from the drop-down list select *Ext. Beacon*

Table 8.13 External Beacon status screen: Fields

Field	Description
External Beacon	The status of the external beacon receiver. The options are: • In use — The external beacon receiver is currently being used to correct positions in real time. • Waiting — A lower-ranked choice is currently being used to correct positions in real time. The external beacon receiver status is being monitored and the TerraSync software will switch to the external beacon receiver if it becomes available and it is the highest-ranked available source. • Not in use — The external beacon receiver is set up but is not currently being used for real-time differential corrections. • Not supported — The connected GNSS receiver does not support real-time differential corrections from an external beacon receiver.
Frequency	The current beacon station frequency being tracked or locked on to by the external beacon receiver. ***Note –*** *Use the configuration software provided with the beacon receiver to set the external beacon frequency.*
State	The operating state of the external beacon receiver. Select an option from the drop-down list.
SNR	The signal-to-noise ratio, in decibels, of the beacon signal the external beacon receiver is monitoring.
Last correction	The time, in seconds, since the last correction message from this source was received by the GNSS receiver.
Beacon mode	The mode the external beacon receiver is operating in. The options are: • Best — The external beacon receiver tracks the best frequency available and automatically switches frequency if a better signal is available. • Fixed — The external beacon receiver tracks only the frequency specified in the beacon receiver configuration software.
Filter applied	This field specifies whether a filter has been applied to the list of frequencies the external beacon receiver can track.
External beacon battery level	The remaining battery power of the external beacon receiver, as a percentage.
Diagnostic Information	A heading used to group together fields that contain information for troubleshooting the beacon service.
Error Rate	The RTCM Word Error Rate, which shows the proportion of RTCM words that have parity errors. The error rate should be 0.1 or less.
Input Level	The intensity level of the electromagnetic field. This value should be between 10 and 100 dBuV/M.
Data Rate	The data modulation rate from the beacon.
Health	The health of the beacon signal. Select an option from the drop-down list.

Integrated Satellite status screen

The *Integrated Satellite* status screen shows detailed information about the satellite differential service you have set up as a real-time correction source.

To display the *Integrated Satellite* status screen, open the Real-time section (see page 174). Then tap the arrow on the Summary list button below the status bar, and from the drop-down list select *Satellite*.

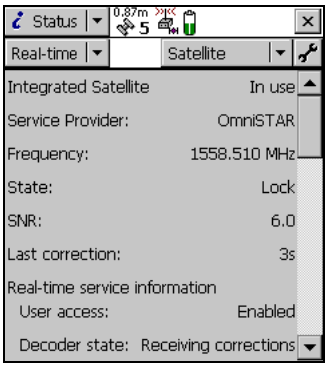


Table 8.14 Integrated Satellite status screen: Fields

Field	Description
Integrated Satellite	The status of this real-time correction source. The options are: • In use — The integrated satellite real-time correction source is being used to correct positions in real time. • Waiting — A lower-ranked choice is currently being used to correct positions in real time. The satellite status is being monitored and the TerraSync software will switch to the satellite source if it becomes available. • Not in use — An integrated satellite real-time correction source is set up but is not currently being used for real-time differential corrections. • Not supported — The connected GNSS receiver does not support corrections from a satellite differential service.
Service Provider	The name of the provider of the satellite differential service being used.
Frequency	The current satellite frequency being tracked or locked on to.
State	The operating state of the integrated satellite receiver. Select an option from the drop-down list.
SNR	The signal-to-noise ratio, in decibels, of the selected satellite signal. An SNR above 3.0 dBHz indicates that the signal is usable.
Last correction	The time, in seconds, since the last correction message from this source was received by the GNSS receiver.
Real-time Service Information	A heading used to group together fields that contain information about the satellite differential service subscription.
User access	Specifies whether the selected satellite differential service has been enabled for the GNSS receiver. The options are: • Enabled — The service is enabled. • Disabled — The activation has expired. • Unknown — The service has not yet been activated on this receiver, or the receiver has not yet determined the activation status.

Table 8.14 Integrated Satellite status screen: Fields (Continued)

Field	Description
Decoder state	The current status of the satellite activation. The options are: • Initializing — The real-time correction decoder is initializing. • Receiving corrections — The decoder is providing corrections. • No recent data — Real-time correction data has not been received from the decoder in the last 10 seconds. • Decoder unavailable — The decoder is not available or is not operating correctly. • Decoder reset — A reset has been detected in the decoder. • Invalid link — The decoder is using a satellite link that is not valid for the subscription. • Invalid region — The decoder is being used in a region that is not covered by the current subscription. • Update required — The decoder requires an update from the master station before corrections can be provided. • No offshore — The decoder is being used in a marine area but the current subscription does not provide for offshore operation.
Expiration	The date on which the satellite differential service subscription expires, or the time remaining until the subscription expires.
Diagnostic Information	A heading used to group together fields that contain information for troubleshooting the satellite differential service.
Quality figure	The percentage of error-free data received from the satellite in the last data block. This value should be 90% or higher.
Decoder version	The version number of the satellite decoder in the GNSS receiver.

Integrated SBAS status screen

The *Integrated SBAS* status screen shows detailed information about the SBAS correction service you have set up as a real-time correction source.

To display the *Integrated SBAS* status screen, open the Real-time section (see page 161). Then tap the arrow on the Summary list button below the status bar, and from the drop-down list select *SBAS*.

Table 8.15 Integrated SBAS status screen: Fields

Field	Description	
Integrated SBAS	The status of this real-time correction source. The options are:	
	• In use	The SBAS real-time correction source is being used to correct positions in real time.
	• Waiting	A lower-ranked choice is currently being used to correct positions in real time. The SBAS status is being monitored and the TerraSync software will switch to the SBAS source if it becomes available.
	• Not in use	The SBAS real-time correction source is set up but is not currently being used for real-time differential corrections.
	• Not supported	The connected GNSS receiver does not support corrections from an SBAS satellite.
SNR	The signal-to-noise ratio, in decibels, of the SBAS satellite being monitored. An SNR above 3.0 dBHz indicates that the signal is usable.	
Last correction	The time, in seconds, since the last correction message from this source was received by the GNSS receiver.	

Integrated RTK Radio status screen

Note – *This section applies only to the TerraSync Centimeter edition software.*

The *Integrated RTK Radio Status* screen shows detailed information about the corrections being received by the GNSS receiver's internal RTK radio.

To display the *Integrated RTK Radio Status* screen, open the Real-time section (see page 174). Then tap the arrow on the Summary list button below the status bar, and from the drop-down list select *RTK Radio*.

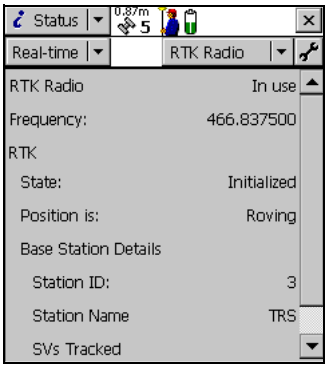
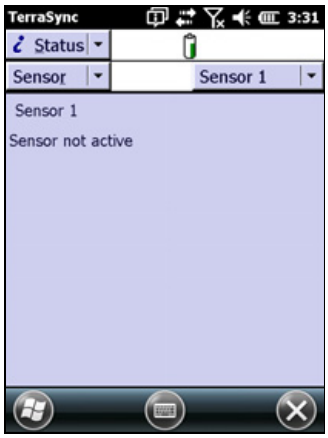


Table 8.16 Integrated RTK Radio status screen: Fields

Field	Description
RTK Radio	The status of this real-time source. The options are: • In use — Data from the integrated RTK radio is being used to correct positions in real time. • Waiting — The RTK radio is initializing. • Not supported — The connected GNSS receiver does not support corrections from an RTK radio.
Frequency	The frequency that the RTK radio is listening to.
State	The RTK state. The options are: • No base station coordinates — The integrated RTK radio has not yet received coordinate information from the base station. • Waiting for base info — The integrated RTK radio is waiting for information from the base station radio. • Initializing — The GNSS receiver is performing RTK initialization. • Initialized — RTK is initialized and in use. • Link down — The integrated RTK radio is not receiving corrections from the base station radio.
Position is	The type of RTK position being logged. The options are: • Roving — A line or area feature is being logged. All positions that meet the required precision for roving mode are logged. • Static — A point feature or vertex is being logged. Only the position with the best precision estimate is recorded. All other positions are discarded.
Station ID	The ID number that the base station uses to identify itself to rovers.
Station Name	The name of the base station.
SVs Tracked	The PRNs of the GNSS satellites that the base station is tracking.

Sensor



Note – *The Sensor subsection does not appear in the TerraSync Standard edition software as the standard edition does not support external sensors.*

There is a sensor status screen for each sensor that you can configure. Use these screens to view information about the external sensors that you have set up.

To view sensor information, tap the Subsection list button and select *Sensor*.

Note – *The TerraSync software can be customized; the Sensor option may have been disabled and will not be visible.*

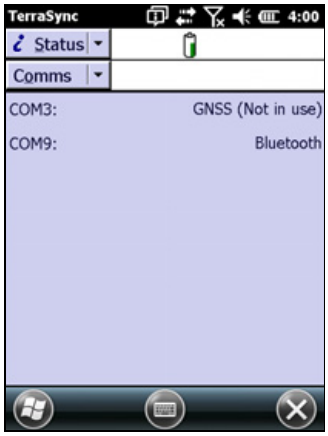
Use the Sensor mode button to move between the sensor status screens. Tap the Sensor mode button to display a list of sensors and then select an option to open the status screen for that sensor.

If the sensor is not enabled or connected, the message Sensor not active appears instead of information fields.

Table 8.17 Sensor screen: Fields

Field	Description
<Sensor name>	The name of the sensor, as defined in the Sensor Properties form (see page 207).
Feature Count	The number of messages received from the sensor since the start of the current feature. This field is only displayed if a feature is open.
Total Count	The total number of messages received from the sensor.
Last String	The last message string received from the sensor.

Comms



To view communication port information, tap the Subsection list button and select Comms.

Note – *The TerraSync software can be customized; the Comms option may have been disabled and will not be visible.*

The Comms screen contains a field for each serial (COM) port that is available on the field computer. The value in each field is the name of the device that is connected to that port.

Table 8.18 Comms screen: Fields

Value	Description
GNSS	A GNSS receiver is connected.
Laser	A laser rangefinder is connected.
<Sensor name>	An external sensor is connected.
Unknown Application	Another application is using the port.
None	No device is connected to the port.

Time

The *Time* screen displays the current time, calculated from the GNSS time reported by the connected GNSS receiver, in the time zone selected on the field computer.

To display the Time section, tap the arrow on the Section button next to the status bar and from the drop-down list select *Time*.

Note – *The TerraSync software can be customized; the Time option may have been disabled and will not be visible.*

Whenever a GNSS receiver is connected, the TerraSync software synchronizes its time display every five seconds with the time reported by the GNSS receiver. The time is always up to date when the TerraSync software is connected to GNSS.

If the receiver is disconnected, the extension uses the field computer's internal clock to update the time display. However, the internal clock is not as accurate as the GNSS time from the receiver, so the time displayed becomes less and less accurate. After 24 hours without synchronization (that is, without reconnecting to GNSS), the time displayed is no longer accurate and is replaced with the message Time not available. Connect to GNSS.

About

Use the *About* screen to view information about the installed TerraSync software.

To display the *About* screen, tap the Subsection list button and select About.

The *About* screen also contains the **System Report** button. Tap this button to create a text file in the TerraSync documents folder describing the configuration of the field computer. If you encounter a problem with the field computer or the TerraSync software, this file (Report.txt) may be requested by a technical support representative to assist with troubleshooting

Table 8.19 About screen: Fields

Field	Description
Version number	The version and edition of the TerraSync software that is installed.
Installation code	The first two fields of the installation code of the TerraSync software that you received when you purchased the software and registered the POPN.
Software Expiry Date	The date until which you are entitled to telephone support, email support, and upgrades to later versions of the TerraSync software.
Registered By	The name of the person who registered the software.
Lisence type	The type of license.
Copyright	Copyright information.
Acknowledgments	Acknowledgments for the parts of the TerraSync software that were developed by other companies.

CHAPTER

9

Setup Section

In this chapter:

- Setup screen
- Configuration files
- Logging Settings form
- GNSS Settings
- Real-time Settings form
- Coordinate System
- Units
- External Sensors

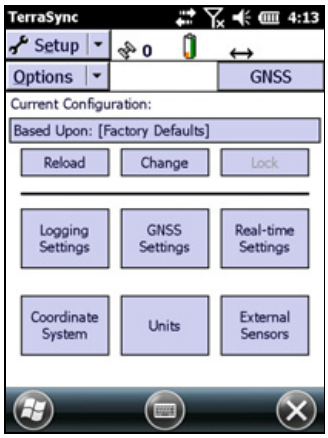
Use the *Setup* section to configure the TerraSync software.

To open the Setup section, tap the Section list button and select Setup. The *Setup* screen appears.

The Setup section may be disabled; the TerraSync software can be customized to hide the entire section from TerraSync users.

Setup screen

Use the *Setup* screen to perform common setup tasks, and to access the six subsections of the *Setup* section. See:



- Logging Settings form, page 178
- GNSS Settings, page 183
- Real-time Settings form, page 188
- Coordinate System, page 203
- Units, page 205
- External Sensors, page 206

Table 9.20 Setup screen: Buttons

Button	Description
Ext Source	This button appears only if you have configured an external real-time correction source, and the TerraSync software is connected to a GNSS receiver. Connects to or disconnects from an external correction source. This button is a shortcut to the *Connect to External Source* and *Disconnect from External Source* options (see Table 9.22).
GNSS	Connects to or disconnects from the GNSS receiver. This button is a shortcut to the *Connect to GNSS* and *Disconnect from GNSS* options (see Table 9.22).
Reload	Re-applies the settings from the selected configuration file. Any changes made to the configuration will be lost.
Change	If the current configuration file specifies that you cannot change configurations, this button is not available. Opens the *Choose Configuration* form (see page 177). Use this form to change to a different configuration file.
Lock	Locks the current configuration, or opens the *Enter Password* form (see page 178). Use this form to unlock the current configuration.
Logging Settings	If a base data file is open, this button is unavailable. Opens the *Logging Settings* form (see page 178).
GNSS Settings	If a base data file is open, this button is unavailable. Opens the *GNSS Settings* form (see page 183).
Real-time Settings	Opens the *Real-time Settings* form (see page 188).
Coordinate System	Opens the *Coordinate System* form (see page 203).
Units	Opens the *Units* form (see page 205).
External Sensors	Opens the *External Sensors* form (see page 206).

Table 9.21 Setup screen: Fields

Field or icon	Description
Current Configuration	A read-only field that shows the name of the selected configuration file. If you have changed any settings since loading the configuration file, the text **Based Upon** is displayed in front of the filename. See Configuration files, page 176.
Lock icon	This icon indicates whether the loaded configuration file is locked or unlocked.

Table 9.22 Setup screen: Options

Option	Description
Connect to GNSS	Establishes a connection with the GNSS receiver. If the GNSS receiver is already connected, this option is not available.
Disconnect from GNSS	Disconnects the TerraSync software from the GNSS receiver. When you select this option, a message box appears, asking you to confirm that you want to disconnect from GNSS. Tap **Yes** to disconnect. If the GNSS receiver is already disconnected, this option is not available.
Reset GNSS receiver	Resets the GNSS receiver to its default settings. **Tip –** If the GNSS receiver does not operate as expected after it has been connected to another field computer or another data collection application, reset the receiver. This clears any settings that may prevent it from working properly with the TerraSync software.
Activate Integrated Satellite	Allows you to enter an activation code to enable your subscription to a satellite differential service. This option is only available if a satellite differential service has been set up as a real-time choice, and you are connected to a receiver that supports this service.
Connect to External Source	Establishes a connection with the configured external correction source. If the TerraSync software is already connected, this option is not available.
Disconnect from External Source	Disconnects the TerraSync software from the configured external correction source. If the TerraSync software is already disconnected, this option is not available.

Configuration files

The configuration of the TerraSync software determines how data is collected, entered, and communicated with external devices. Use configuration files to ensure that data collected by different field crews or on different days is collected in a consistent way.

A configuration file contains instructions that define, and optionally lock, the configuration of the TerraSync software.

To create a configuration file, use the Configuration Manager utility in the GPS Pathfinder Office software. You can specify a value for each setting, and you can specify whether each setting is password-locked. If a setting is password-locked, you cannot change it in the TerraSync software until you enter the correct password to unlock the configuration file.

In addition to configuring software settings, a configuration file can also be used to lock some tasks and options. You cannot use a locked option or perform a locked task until you unlock the configuration file.

A locked menu item or option appears grayed out, and has a locked icon ( ) beside it. The same icon appears beside locked fields in the *Setup* section, which are read-only.

Changing configuration

Although you can send any number of configuration files to the TerraSync software, only one configuration can be loaded at a time. Provided the loaded configuration file permits you to change configurations, you can load a different configuration file at any time. You do not have to close any open files or restart the software for the changes to take effect.

To load a different configuration file, tap **Change** in the main *Setup* screen, select a file in the *Choose Configuration* form (see page 177) and then tap **Done** or **Load**.

If the **Change** button is not available, the current configuration file is locked and does not permit you to change configurations. You must unlock the current configuration file before you can load a different file, or edit password-locked settings. Tap **Unlock** and in the *Enter Password* form (see page 178), enter the password for the configuration file. Once you have unlocked the configuration, you can edit all settings and access all menu items. Either leave the configuration unlocked, or tap **Lock** to lock it again.

Reloading a configuration

Once you have changed settings from those defined in the selected configuration file, the name of the configuration file in the *Current Configuration* field of the *Settings* screen is prefixed by **Based Upon**, and the **Reload** button becomes available.

You can reload a configuration at any time. Reloading returns all settings to the values defined in the selected configuration file. To reload a configuration, tap **Reload**. A message appears, asking you to confirm that you want to discard all changes to settings. Tap **Yes** to continue with reloading.

Resetting to factory defaults

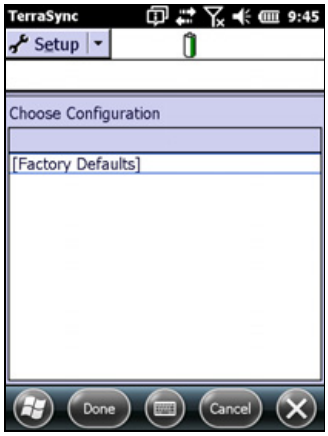
The Factory Defaults configuration file is always available, and is loaded in the same way as any other configuration file. Provided the current configuration allows you to change configurations, click the **Reload** button to reset the software to the factory default settings.

The factory default settings include:

- layer colors and any background file that is selected in the Map section
- filtering conditions and logging intervals in the Data section
- the default data dictionary for a new file (reset to Generic)
- options in the Navigation section
- all settings in the *Setup* section
- window size and pane layout, if the field computer displays Panes

Resetting does not delete data dictionaries, data files, or coordinate systems.

Choose Configuration form



Use the *Choose Configuration* form to select the configuration file you want to use to configure the TerraSync software.

To open the *Choose Configuration* form, tap **Change** in the *Setup* screen.

To load a configuration from the list, highlight it and tap **Done** or **Load**. The *Choose Configuration* form closes and the settings in the selected configuration file are applied.

Tip – The Factory Defaults configuration file is always available. Load it to reset the software to the factory default settings.

Table 9.23 Choose Configuration form: Buttons

Button	Description
Done / Load	Loads the settings in the selected configuration file.
Cancel	Returns to the *Setup* screen without changing the current configuration.

Table 9.24 Choose Configuration form: Fields

Field	Description
List of files	A list of all of the configuration files loaded in the TerraSync software. To load a configuration file, select it from this list and then tap **Done** or **Load**.

Enter Password form

To open the *Enter Password* form, tap **Unlock** in the Setup screen.

Use this form to unlock the current configuration file. Once you have entered the correct password, you can change settings and use options that are locked in this configuration.

Note – *Passwords are case-sensitive.*

If you have forgotten the password, see Appendix D, Troubleshooting.

Table 9.25 Enter Password form: Fields

Field	Description
Enter Password	The password for the current locked configuration file.

Logging Settings form

Use the *Logging Settings* form to configure settings that control what data is stored, and how.

To open the *Logging Settings* form, tap **Logging Settings** in the *Setup* screen.

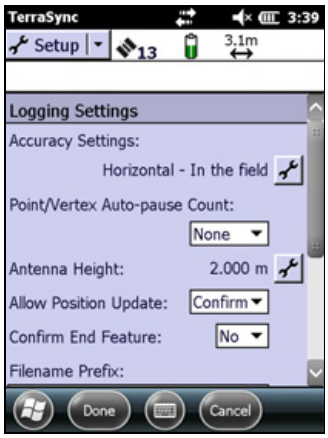


Table 9.26 Logging Settings form form: Fields

Field	Description
Accuracy Settings	This read-only field displays the parameters that the TerraSync software will use to determine the estimated accuracy of the current GNSS position. If you are using accuracy-based logging, the required accuracy is also displayed in this field. To specify the accuracy settings, tap the Setup button beside this field. The Accuracy Settings form appears.
Point/Vertex Auto-pause Count	This field specifies the number of positions that the software will log for a point feature or an averaged vertex in a line or area feature, before automatically pausing logging. When the number of positions specified in this field is reached, the Minimum Positions Stored event sounds and logging is paused. You can resume the feature to continue logging positions, or close the point feature or the vertex.
Antenna Height	This read-only field displays the height of the GNSS antenna. To specify antenna details, tap the Setup button beside this field. The *Antenna Settings* form appears (see page 181).

Table 9.26 Logging Settings form form: Fields (continued)

Field	Description
Allow Position Update	The conditions under which updating of feature position information is allowed. The options are: • Yes Position information for existing features can always be updated. • No Positions cannot be updated. • Confirm Confirmation is required before you are allowed to update the position.
Confirm End Feature	Select the Yes option to display a confirmation message when you close an updated feature. The message asks you to confirm that you want to end the current feature and save any changes to the attributes or position information of the feature. Select the No option to disable the confirmation message.
Filename Prefix	The prefix to be included at the beginning of the default name of each new data file. The prefix may be any alphanumeric string between 1 and 30 characters long. ***Note –*** *The prefix that you define in this field is for rover files only. The default filename prefix for base files is Base. You cannot change this default prefix. However, when you create a new base file, you can edit the default filename.*
Waypoint Filename Prefix	The prefix to be included at the beginning of the default name of each new waypoint file. The prefix may be any alphanumeric string between 1 and 30 characters long.
Style	The method of measurement for between feature positions. The options are: • Time A position is logged after a specified time has elapsed since the last position logged. • Distance A position is logged once you have traveled a specified distance from the last position logged.
Interval	The logging interval for the between feature positions: If you selected Distance from the Style list, enter the number of meters between logging positions, or select an existing value from the list. If you selected Time from the Style list, enter the number of seconds between logging positions, or select an existing value from the list. Select Off to turn off between feature logging.
Style	This field only appears if a data file is open. It is repeated for each feature type in the file. The method of measurement for the specified feature type. The options are as for *Style* above. ***Note –*** *If the feature is a point feature, this field is set to Time and cannot be changed.*
Interval	This field only appears if a data file is open. It is repeated for each feature type in the file. The logging interval for the specified feature type. The options are as for *Interval* above.

Accuracy Settings form

To open the *Accuracy Settings* form, tap the Setup button beside the *Accuracy Settings* field on the *Logging Settings* form (see page 178).

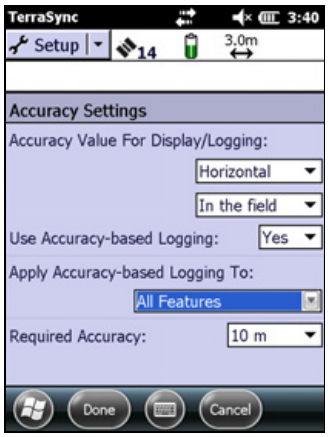


Table 9.27 Accuracy Settings form: Fields

Field	Description
Accuracy Value for Display/Logging	The parameters that the TerraSync software will use to determine the estimated accuracy of the current GNSS position. The value is displayed by the Estimated Accuracy icon on the status bar. Select two out of four available parameters. The options are: • Horizontal — Use the horizontal estimated accuracy of the current GNSS position. • Vertical — Use the vertical estimated accuracy of the current GNSS position. • In the field — Use the current estimated accuracy of the current GNSS position. The value calculated depends on several factors, including satellite geometry and the type of GNSS receiver that is connected. • Postprocessed — Use the predicted estimated accuracy of the current GNSS position, which is the estimated accuracy that is likely to be achieved after the field data has been postprocessed.
Postprocessing Base Distance	This field is only visible if the Accuracy Value for Display/Logging field (above) is set to postprocessed. The estimated distance to the base station that will be used during postprocessing.
Base Data	Specify whether the data will be postprocessed against GPS data only from the base station, or multi-constellation data. The option selected here affects the calculation of the predicted postprocessed accuracy; using multi-constellation data enables a more accurate predicted postprocessed accuracy value to be calculated.
Use Accuracy-based Logging	Whether the calculated estimated accuracy determines whether the GNSS position is logged. The options are: • No — GNSS positions are always logged if they can be calculated. • Yes — GNSS positions are only logged if they can be calculated and they meet the estimated accuracy specified in the Required Accuracy field. The Required Accuracy field appears at the bottom of this form once you select Yes in this field.

Table 9.27 Accuracy Settings form: Fields (continued)

Field	Description
Apply Accuracy-based Logging To	***Note –*** *This field only appears if you select Yes in the Use Accuracy-based Logging field above.* The feature types that the accuracy requirements will apply to. Features of the selected type will only contain GNSS positions that meet the estimated accuracy specified in the Required Accuracy field above. Select all features, point features and averaged vertices, or line and area features.
Required Accuracy	***Note –*** *This field only appears if you select Yes in the Use Accuracy-based Logging field above.* The estimated accuracy that is required before the current GNSS position is logged. If the current GNSS position has a poorer estimated accuracy than the value specified in this field, the GNSS position is not logged. Select a value from the drop-down list, or enter the required value. ***Note –*** *The estimated accuracy of a GNSS position depends on several factors, including the satellite geometry, the type of GNSS receiver that is connected, and whether you are using real-time differential corrections.*

Antenna Settings form

Use the *Antenna Settings* form to specify the antenna type you want to use, and the height of the antenna.

To open the *Antenna Settings* form, tap the Setup button beside the *Antenna Height* field on the *Logging Settings* form (see page 178).

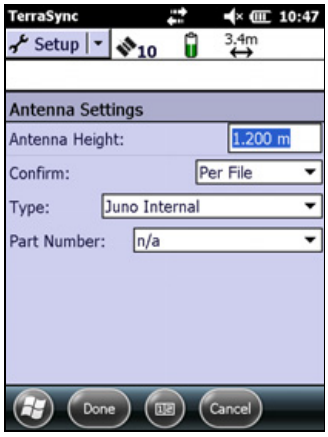


Table 9.28 Antenna Settings form: Fields

Field	Default	Description
Height	0.00 m	The height of the GNSS antenna that is connected to the GNSS receiver. This is used as a vertical offset on each position.
Confirm	Per File	How often the software asks you to confirm the configured antenna height during data collection. The options are: • Never — Do not confirm the antenna height before logging positions. • Per File — Display the *Confirm Antenna Height* form (see page 93) whenever you open a new or existing data file. • Per Feature — Display the *Confirm Antenna Height* form (see page 93) when you start a new feature, or when you update the position information of an existing feature.
Type	Unknown External	The type of antenna that is connected to the GNSS receiver. If TerraSync is connected to a receiver that can only connect to an internal antenna, this field automatically shows the correct antenna type. To specify the antenna that you are using, either select an option from this field, or select the correct part number in the *Part Number* field. When you change a value in one of these two fields, the other field updates accordingly.
Part Number	n/a	The part number of the antenna that is connected to the GNSS receiver. If is the receiver can only connect to an internal antenna, this field automatically shows the correct part number. To specify the antenna that you are using, either select an option from this field, or select the correct antenna type in the *Type* field. When you change a value in one of these two fields, the other field updates accordingly.
Measure Height To	(none)	The point on the antenna that you have measured to. For accurate altitude measurements, the antenna height must be measured to the electronic center of the antenna (its Antenna Phase Center, or APC). For some antenna types, the APC is not accessible. To accurately measure the antenna height, measure to another location, then select that location from this field. The TerraSync software automatically adjusts the antenna height by the distance between the measurement location and the APC. The options in this field vary depending on the selected antenna type. If the selected antenna type does not allow alternative measurement locations (for example, if you are using the internal antenna in a GeoExplorer series handheld), this field does not appear.

GNSS Settings

Use the *GNSS Settings* form to control the precision you require for GNSS positions, and to specify which port on the field computer the GNSS receiver is connected to.

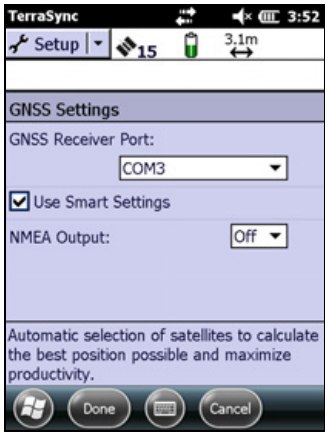
To open the *GNSS Settings* form, do one of the following:

- In the Setup section, tap **GNSS Settings.**
- In the Status section tap the Setup button at the bottom of the *Skyplot* screen (see page 152), or at the bottom of the *Satellite Information* screen (see page 157).

There are two configuration modes in the *GNSS Settings* form: Smart Settings, or custom.

Note – *If you are using a GPS Pathfinder XB or XC receiver, you cannot configure GNSS settings. The default settings for these receivers are shown as read-only fields.*

Using Smart Settings



To configure GNSS settings for the receiver to increase the precision of your data, and to minimize the effect of atmospheric interference and poor satellite geometry, select *Use Smart Settings*. All other fields in the form are hidden.

Note – *Trimble recommends that you use accuracy-based logging (see Accuracy Settings form, page 180) and Smart Settings to control the quality of the GNSS positions logged and let the TerraSync software manage the logging of positions based on your required accuracy.*

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

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

Configuring custom GNSS settings

To configure custom GNSS settings, clear the *Use Smart Settings* check box. The GNSS Settings fields appear and are editable. Enter values in these fields to specify the required GNSS settings.

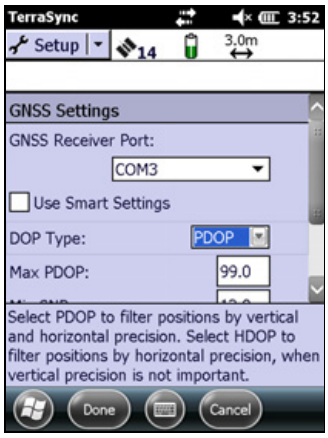


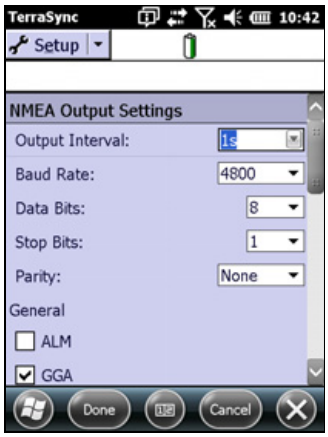
Table 9.29 GNSS Settings form: Fields

Field	Default	Description
GNSS Receiver Port	COM1	The port on the field computer that the receiver is connected to.
DOP Type	PDOP	The type of maximum DOP value to use. The options are: • PDOP Set a maximum PDOP. When you select this option, the *Max PDOP* field appears. • HDOP Set a maximum HDOP. When you select this option, the *Max HDOP* field appears. A low **DOP** value indicates that the visible satellites are widely separated in the sky, which gives better position information. When the DOP value rises above the maximum value, the TerraSync software stops logging GNSS positions. ***Note –*** *When using a GPS Pathfinder XB or XC receiver, the DOP Type is set to PDOP.*
Max PDOP	99.0	The maximum **PDOP** value. A low PDOP value indicates that the visible satellites are widely separated in the sky, which gives better position information. When the PDOP value rises above the maximum value, the GNSS receiver stops logging GNSS positions. Specify a lower maximum PDOP to collect fewer, more precise positions. Specify a higher maximum PDOP to collect more, less precise positions.

Table 9.29 GNSS Settings form: Fields (continued)

Field	Default	Description
Max HDOP	4.0	The maximum **HDOP** value. Specifying a maximum HDOP can give greater productivity than filtering the solutions with a maximum PDOP. Setting a maximum PDOP rejects some positions that have an acceptable HDOP value, because their VDOP value is unacceptable. When you use a maximum HDOP, these positions are accepted. Use a maximum HDOP value when vertical precision is not particularly important, and productivity would be decreased by excluding positions with a high vertical component in the PDOP value (for example, if you are collecting data under canopy). ***Note –*** *To achieve the same precision horizontally as you would achieve with a given maximum PDOP, set this value to two-thirds of the maximum PDOP.*
Min SNR	12.0	The minimum L1 SNR value. The SNR is a measure of the quality of the signal from a satellite. When the SNR of a satellite falls below the minimum value, the TerraSync software stops using that satellite to calculate your GNSS position.
Min Elevation	5°	The minimum elevation. Signals from satellites that have a low elevation from the horizon can be of poor quality. The TerraSync software does not use any satellite that is below the minimum value to calculate your GNSS position. ***Note –*** *For postprocessing with the GPS Pathfinder Office software version 4.20 or later, Trimble recommends that MIn Elevation is set to the minimum (5°) and the GPS Pathfinder Office software will automatically determine the optimum level to use.* ***Note –*** *If Min Elevation is set to be greater than the recommended minimum of 5°, satellites lower than this are excluded from postprocessing in the GPS Pathfinder Office software version 4.20 or later.*
NMEA Output	Off	Specifies whether the GNSS receiver will output NMEA messages. If this is set to On, tap the Setup button beside this field to open the *NMEA Output Settings* form, where you can configure NMEA communication settings and the messages that will be generated (see page 186). *The TerraSync software does not support NMEA output from Recon GPS CF Card or GPS Pathfinder XB and XC receivers.*

NMEA Output Settings form



If your GNSS receiver supports NMEA messages, use the *NMEA Output Settings* form to specify which NMEA messages the GNSS receiver will generate, and the communication settings for the GNSS receiver port(s) that the messages are output on.

To open the *NMEA Output Settings* form, in the *GNSS Settings* form tap the Setup button beside the *NMEA Output* field.

Note – *You can use the GeoExplorer 6000 series handheld's integrated GNSS receiver with any GNSS field software that accepts NMEA messages, if you have purchased the NMEA output option and it has been activated on the handheld.*

Table 9.30 NMEA Output Settings form: Fields

Field	Default	Description
Output Interval	5s	The interval at which NMEA messages are output. Select an option from the drop-down list or enter the time interval (in seconds).
Receiver Port (Primary)	Port 1	This field only appears if the connected GNSS receiver is a survey receiver or one of the following GNSS receivers: GPS Pathfinder ProXRT, GPS Pathfinder ProXT, GPS Pathfinder ProXH, Pro 6T or Pro 6H. The port on the GNSS receiver that NMEA messages are output on.
Primary	None	The first port on the receiver on which to output NMEA messages.
Secondary	None	The second port on the receiver on which to output NMEA messages. If the receiver has both a primary and a secondary portm NMEA messages can be output on both ports at the same time.
Baud Rate	9600	The baud rate that the GNSS receiver and external device communicate at. Select from the drop-down list.
Data Bits	8	The number of data bits used when the GNSS receiver and external device communicate. The options are 7 or 8.
Stop Bits	1	The number of stop bits used when the GNSS receiver and external device communicate. The options are 1 or 2.
Parity	None	The parity setting used when the GNSS receiver and external device communicate. Select an option from the drop-down list.

Table 9.30 NMEA Output Settings form: Fields (continued)

Field	Default	Description
General	(none)	Below this heading is a check box for each general NMEA message type. To output a message type, select the corresponding check box. Select an option from the drop-down list.
Survey	(none)	These fields only appear if a survey receiver is connected. Below this heading is a check box for each NMEA message type that is used by survey receivers. To output a message type, select the corresponding check box. Select an option from the drop-down list.

RTK Precision Settings form

Note – *This section applies only to the TerraSync Centimeter edition software.*

Use the *RTK Precision Settings* form to specify the minimum precision estimates for GNSS positions corrected using RTK measurements. Positions that do not meet the specified precisions are not logged.

To open the *RTK Precision Settings* form, in the *Real-time Settings* screen tap the Setup button beside the *RTK Precisions* field.

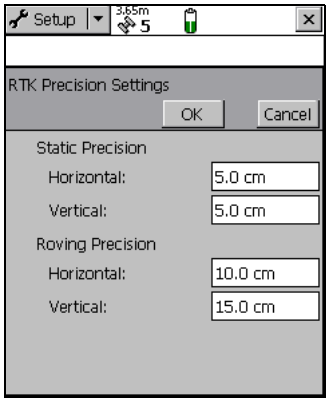
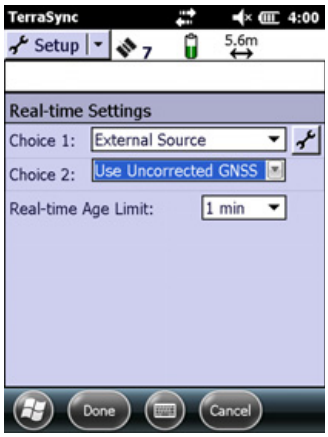


Table 9.31 RTK Precision Settings form: Fields

Field	Default	Description
Static Precision	(none)	Use the fields in this group to specify the required precision for positions in static mode. Static mode is used when collecting point features, or vertices for line or area features. In static mode, only the position with the best precision estimate is logged. All other positions are discarded.
Horizontal	5.0 cm	The minimum horizontal precision for positions collected in static mode.
Vertical	5.0 cm	The minimum vertical precision for positions collected in static mode.
Roving Precision	(none)	Use the fields in this group to specify the required precision for positions in roving mode. Roving mode is used when collecting line and area features. In roving mode, all positions that meet the required precision are logged.
Horizontal	10.0 cm	The minimum horizontal precision for positions collected in roving mode.
Vertical	15.0 cm	The minimum vertical precision for positions collected in roving mode.

Real-time Settings form



Use the *Real-time Settings* form to select the real-time differential GNSS sources that you use, if any, and to configure how your system communicates with each source.

To open the *Real-time Settings* form, do one of the following:

- In the Setup section, tap **Real-time Settings**.
- In any screen in the Real-time section, tap the Setup button .

To configure your choice of real-time differential correction sources:

1. In the *Choice 1* field, select the real-time correction source that you would prefer to receive real-time corrections from. Depending on the type of GNSS receiver you are using, the options are:

Source	Description
External Source	Use corrections from an external correction source (for example a radio or an external beacon receiver).
Integrated OmniSTAR	This option only appears if the connected GNSS receiver is a GPS Pathfinder ProXRT receiver. Use corrections from an integrated OmniSTAR receiver.
Integrated SBAS	Use corrections from a Satellite Based Augmentation System (SBAS) using the GNSS receiver's integrated SBAS receiver.
Integrated RTK Radio	Use RTK corrections from an integrated data radio in the GNSS receiver (survey receivers only). To use RTK data with a survey receiver that does not have the optional internal radio, use the External Source option instead.
Use Uncorrected GNSS	Log autonomous GNSS positions without applying real-time corrections.

   To record ***uncorrected*** GNSS positions only, without using any real-time corrections, select Use Uncorrected GNSS in the *Choice 1* field. You can correct these positions using Trimble postprocessing software.

2. If a Setup button appears next to the Choice 1 field, click the Setup button to open the relevant dialog and set up options for the selected real-time correction source. For more information, see:
   - External Source Settings form, page 192
   - Integrated OmniSTAR Settings form, page 224
   - Integrated SBAS Settings form, page 200
   - RTK Radio Settings form, page 227

Note – *No Setup button appears for the Use Uncorrected GNSS and Wait for Real-time selections. There are no settings to configure for these selections.*

3. If you want to configure a second source for real-time corrections if your first choice is not available, select the type of source in the *Choice 2* field. The options for the *Choice 2* field are the same as for *Choice 1*, except that External Source is not available, and the additional option is available.

Source	Description
Wait for Real-time	Suspend logging until a real-time correction source becomes available.

Note – *The Choice 2, Choice 3, and Choice 4 fields only appear if there are further options to choose from. For example, if you choose Use Uncorrected GNSS in the Choice 1 field, there are no further valid choices, and the Choice 2, Choice 3, and Choice 4 fields do not appear.*

4. Repeat steps 2 and 3 for all the choice fields that appear, or until you have selected all the real-time correction sources that you want to use.
   The options for *Choice 3* and *Choice 4* are a subset of the options for *Choice 1* and *Choice 2*.
   For information about valid combinations of real-time correction sources, see Table 9.32.

5. If the *Real-Time Age Limit* field appears, select a maximum age at which a correction message will be used. The age of the message is the time that has elapsed since it was received.

Note – *When using real-time H-Star™ technology, the configured real-time age limit is ignored, and a limit of 20 seconds always applies.*

6. Click **Done**.

It is important that you set up all of the choices correctly, so that when the TerraSync software switches between choices it can continue to receive corrections.

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

The Choice fields let you select up to three options for real-time corrections. However, there are restrictions on the correction combinations you can select. 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 GNSS 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 the subsequent Choice fields disappear.

You do not have to remember which combinations are valid: the TerraSync software manages this for you by hiding invalid options or Choice fields depending on your previous choices. The software also ensures that you do not select choices that are not valid for the connected GNSS receiver.

If you configured an invalid real-time combination before connecting the GNSS receiver, a warning message appears when you connect to GNSS, telling you to check your real-time settings. When you open the *Real-time Settings* form, the only changes you can make to your real-time settings are those that are compatible with the connected receiver.

Table 9.32 summarizes the valid combinations of real-time correction sources.

Table 9.32 Real-time Settings form: Valid real-time correction choices

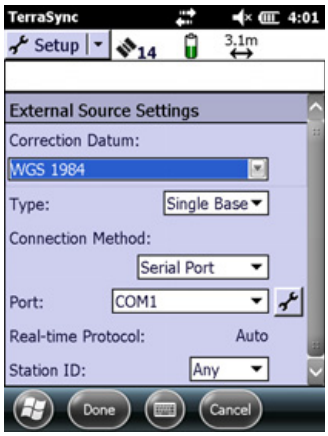
Choice 1	Choice 2	Choice 3
	Integrated OmniSTAR	Integrated SBAS
		Use Uncorrected GNSS
		Wait for Real-time
External Source	Integrated SBAS	Use Uncorrected GNSS
		Wait for Real-time
	Use Uncorrected GNSS	–
	Wait for Real-time	–
Integrated OmniSTAR	Integrated SBAS	Use Uncorrected GNSS
		Wait for Real-time
	Use Uncorrected GNSS	–
	Wait for Real-time	–
Integrated SBAS	Use Uncorrected GNSS	–
	Wait for Real-time	–
Integrated RTK Radio	Wait for Real-time	
Use Uncorrected GNSS	–	–

Table 9.33 describes the fields available in the *Real-time Settings* form.

Table 9.33 Real-time Settings form: Fields

Field	Default	Description
Choice 1	External Source	The preferred source of real-time corrections. The options are: • External Source — Use an external correction source such as a virtual reference station (VRS), data radio, or GeoBeacon receiver. • Integrated OmniSTAR — Use corrections from an integrated OmniSTAR receiver. • Integrated SBAS — Use corrections from an integrated SBAS receiver. • Integrated RTK Radio — Use RTK corrections from an integrated data radio in the GNSS receiver (survey receivers only). To use RTK data with a survey receiver that does not have the optional internal radio, use the External Source option instead. • Use Uncorrected GNSS — Log autonomous GNSS positions without applying real-time corrections.
Choice 2	Use Uncorrected GNSS	This field does not appear if you selected Use Uncorrected GNSS in the Choice 1 field. The source of real-time corrections to use when the first choice is not available. The options are as for the *Choice 1* field except that External Source is not available, and the following additional option is available: • Wait for Real-time — Suspend logging until a real-time correction source becomes available.
Choice 3	Use Uncorrected GNSS	This field does not appear if you selected Use Uncorrected GNSS in the Choice 2 field. The source of real-time corrections to use when the first and second choices are not available. The options are: • Use Uncorrected GNSS • Wait for Real-time

External Source Settings form



Use the *External Source Settings* form to configure settings specific to an external real-time source, such as a GeoBeacon receiver or a virtual reference station (VRS).

Tip – You cannot use the settings in this form to change settings on the external beacon receiver. To change external beacon receiver settings, use the software that is supplied with the receiver.

Note – *For details of receivers that support real-time VRS differential correction, refer to the datasheet for the receiver.*

To open the *External Source Settings* form, in the *Real-time Settings* form select External Source in the *Choice 1* field. Then tap the Setup button that appears beside the *Choice 1* field.

You can connect the application to an external real-time correction source using a variety of connection methods.

VRS and single base stations deliver real-time corrections using the same methods (Internet, direct dial, or serial port connections). For example, you can use a broadcast (NTRIP) server to relay single base corrections over the Internet in the same way that a VRS relays corrections using a VRS server. In addition, you can also connect to a single base station using a receiver port connection.

Table 9.34 indicates which connection method to use when connecting to an external real-time differential correction source.

Table 9.34 External DGNSS source connection methods

Use a...	if you have *all* of the following:
Internet connection	• an Internet connection, for example using the integrated data modem in the GeoExplorer 6000 series handheld or a wireless LAN (Local Area Network) • access to a base station or VRS server that outputs RTCM correction messages to the Internet
Direct dial connection	• a cellphone and modem, or a cellular modem • direct dial access to a base station or VRS server
serial port connection	• an external device that receives RTCM messages, for example a GeoBeacon receiver or a data radio • access to a single base station or VRS server that outputs RTCM messages
receiver port connection	• a Trimble GNSS receiver that does not support a serial port connection • access to a single base station that outputs RTCM, CMR™, or CMR+™ correction messages • an external device that receives RTCM, CMR, or CMR+ correction messages

Table 9.35 describes the fields in the *External Source Settings* form.

Table 9.35 External Source Settings form: Fields

Field	Default	Description
Correction Datum	WGS 1984	Select the datum used by the real-time correction source to calculate corrections. The TerraSync software uses this information to correctly transform the real-time corrected positions to the WGS84 datum before storing them in the SSF file. If the external source is a VRS network, select the same datum as the VRS network coordinate system. If the external source is an external beacon receiver, Trimble recommends that you select NAD 1983 (Conus) CORS96 or NAD 1983 (PACP00 Epoch 2002.0) if you are using a US Coast Guard beacon service, ETRF89 if you are using a European beacon service, and WGS84 for any other beacon service. The default setting for this field is WGS84. ***Note –*** *If you are outputting GNSS data as NMEA messages, the NMEA data stream does not apply the correction datum transformation and instead outputs GNSS positions in whatever datum the correction source is using.*
Type	Single Base	The type of source. The options are: • Single Base — Corrections are sent by a single base station. • VRS — Corrections are sent by a virtual reference station (VRS) system, which uses corrections from several base stations to compute corrections for a virtual base station at your location.
Connection Method	Serial Port	How the TerraSync software connects to the external correction source. The options are: • Internet — The TerraSync software communicates with the correction source over a TCP/IP connection, for example using a GSM or GPRS cellphone. The connection must be configured and made outside TerraSync. • Direct Dial — The TerraSync software communicates the correction source using a dial-up modem connection. • Serial Port — RTCM corrections are received by a data radio, such as an external beacon receiver or TRIMTALK™ radio, connected to a serial port on the field computer. • Receiver Port — Corrections are received by a data radio that is connected to the GNSS receiver. This option is only available if the *Type* field is set to Single Base. To configure communication settings for the port, tap the Setup button beside this field. The *Receiver Port Settings* form (see page 220) appears.

Table 9.35 External Source Settings form: Fields (continued)

Field	Default	Description
Address	(blank)	This field only appears if the *Connection Method* field is set to Internet. The IP address (for example, 255.255.255.255) or URL (for example, vrs.seaview.gov) of the server or NTRIP server that is supplying the VRS corrections. An NTRIP server manages authentication and password control for differential correction sources, and relays corrections from the source that you select to the TerraSync software.
Port	COM1 (Serial Port) or 80 (Internet)	This field only appears if the *Connection Method* field is set to Serial Port or Internet. When the *Connection Method* field is set to: • Serial Port: specifies the serial (COM) port on the field computer that the external correction source is connected to. Tap the Setup button beside the *Port* field to open the *Serial Port Settings* form (see page 220), and configure the serial port settings. • Internet: specifies the port on the server or NTRIP server to connect to.
Modem Type	(blank)	This field only appears if the *Connection Method* field is set to Direct Dial. The type of modem you are using to connect to the base station or the VRS station.
Phone Number	(blank)	This field only appears if the *Connection Method* field is set to Direct Dial. The telephone number of the modem you are using to connect to the base station or the VRS system.
Source	Not Applicable	This field only appears if the *Connection Method* field is set to Internet. If you are connecting to a base station or VRS system through an NTRIP server, this read-only field shows the selected source of the real-time corrections. If you are connecting directly to a base station or VRS system, or have not yet selected a source, this field shows the text Not Applicable. To select a source, tap the Setup button beside the *Source* field. The TerraSync software attempts to establish a connection to the NTRIP server. If the connection is successful, the *Select Server* form (see page 222) appears. Select the server that you want to receive corrections from and tap **OK** to return to the *External Source Settings* form.
User name	(blank)	This field only appears if you are connecting to an NTRIP server that requires authentication. Specifies the username that you use to log on to the server.
Password	(blank)	This field only appears if you are connecting to an NTRIP server that requires authentication. Specifies the password that you use to log on to the server.

Table 9.35 External Source Settings form: Fields (continued)

Field	Default	Description
Connection Control	Auto	This field only appears if the *Connection Method* field is set to Internet or Direct Dial. Specifies how communication with the VRS system is controlled. The options are: • Auto — The TerraSync software automatically establishes a connection when it is needed, and re-connects if an existing connection is lost. • Manual — You must manually connect to the VRS system whenever you want to use real-time corrections from the system. To connect or disconnect, tap the **Ext Source** button in the main screen of the Setup section (see page 193).
Real-time Protocol	RTCM	The type of real-time correction messages that the external source is transmitting. If you are not connected to any receiver, or are connected to a receiver that handles multiple protocols, this read-only field displays Auto. If you are connected to any other GNSS receiver, this read-only field displays RTCM.
Station ID	Any	This field is only displayed if the *Type* field (on this form) is set to Single Base. The reference station that you want to use real-time corrections from. Select Any to use any available station, or enter a station ID number between 0 and 1023.

Receiver Port Settings form

Use the *Receiver Port Settings* form to configure communication settings when an external correction source is connected to a port on the receiver, or to configure communication settings when you choose to output corrections while collecting base station data.

To open the *Receiver Port Settings* form, in the *External Source Settings* form (see page 216), tap the Setup button beside the *Connection Method* field.

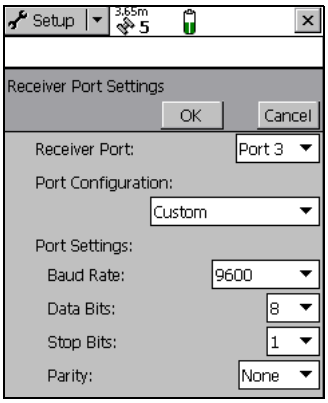
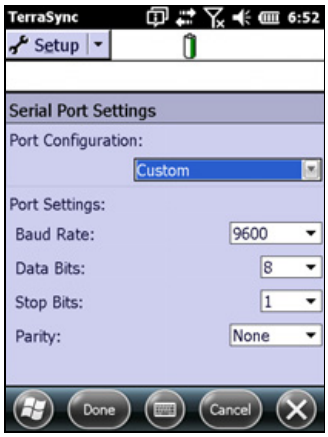


Table 9.36 Receiver Port Settings form: Fields

Field	Default	Description
Receiver Port	Port 3 (5700) ***or*** Port 1 (other receivers)	The port on the GNSS receiver that the external device is connected to. When a 5700 receiver is connected, the only option available for this field is Port 3.
Port Configuration	Custom	The communication settings for the port. There is an option for each communications protocol (NMEA, RTCM, and TSIP), and an option for each type of radio supported. These options define preset values that match the ***default*** settings of the radio. The values defined for each option appear in this form in read-only fields. If the external device allows you to configure port settings, the preset values may not match the current settings of the device. If this is the case, or if the device you want to use is not listed, select the Custom option. The remaining fields become available and you can select customized port settings.
Baud Rate	9600	This field is read-only unless you select Custom in the *Port Configuration* field. The baud rate the GNSS receiver and external source communicate at. Select the rate from the drop-down list.
Data Bits	8	This field is read-only unless you select Custom in the *Port Configuration* field. The number of data bits used when the external correction source and GNSS receiver communicate. The options are 7 or 8.
Stop Bits	1	This field is read-only unless you select Custom in the *Port Configuration* field. The number of stop bits used when the external correction source and GNSS receiver communicate. The options are 1 or 2.
Parity	None	This field is read-only unless you select Custom in the *Port Configuration* field. The parity setting used when the GNSS receiver and external source communicate. Select an option from the drop-down list.

Serial Port Settings form



Use the *Serial Port Settings* form to configure communication settings when an external correction source is connected to an external COM port.

To open the *Serial Port Settings* form, tap the Setup button beside the *Port* field in the *External Source Settings* form (see page 216).

Note – *When an application opens the serial port, it controls that port. You cannot access the port or change its settings from another application until the port is closed again. Settings specified in this form are only applied if the port is not in use by another application.*

Table 9.37 Serial Port Settings form: Fields

Field	Default	Description
Port Configuration	Custom	The communication settings for the port. There is an option for each communications protocol (NMEA, RTCM, and TSIP), and an option for each type of radio supported. These options define preset values which match the ***default*** settings of the radio. The values defined for each option appear in this form in read-only fields. If the external device allows you to configure port settings, the preset values may not match the current settings of the device. If this is the case, or if the device you want to use is not listed, select the Custom option. The remaining fields become available and you can select customized port settings.
Baud Rate	9600	This field is read-only unless you select Custom in the *Port Configuration* field. The baud rate the GNSS receiver and external source communicate at. Select the rate from the drop-down list.
Data Bits	8	This field is read-only unless you select Custom in the *Port Configuration* field. The number of data bits used when the external correction source and GNSS receiver communicate. The options are 7 or 8.
Stop Bits	1	This field is read-only unless you select Custom in the *Port Configuration* field. The number of stop bits used when the external correction source and GNSS receiver communicate. The options are 1 or 2.
Parity	None	This field is read-only unless you select Custom in the *Port Configuration* field. The parity setting used when the GNSS receiver and external source communicate. Select an option from the drop-down list.

Select Server form

Use the *Select Server* form to select the VRS server that you want to receive corrections from.

To open the *Select Server* form, do one of the following in the *External Source Settings* form (see page 192):

- tap the Setup button beside the *Source* field
- change the value in the *Address* field or the *Port* field, and then move to another field

If the specified Internet address is a VRS **broadcast server**, the *Select Server* form appears, listing the VRS servers that are available through the selected broadcast server.

Tip – If you cannot find a server on the list, return to the *External Source Settings* form and make sure that the option that you require (VRS or Single Base) is selected in the *Type* field.

The form contains a table of information about the available VRS servers. Drag each column heading to resize the column, or tap a column heading to sort by that column. If the list is already sorted by the selected column, the sort order is reversed.

To select a VRS server, highlight it in the list and then tap **OK**. You are returned to the *External Source Settings* form, where the selected server name is displayed in the *Source* field.

Table 9.38 Select Server form: Fields

Field	Description
Server	The identification code of the server.
Name	A description of the server.
Country	The three-letter code for the country where the server is located.
Carrier	This field specifies whether the data stream from the server includes carrier phase data.
System	The GNSS (Global Navigation Satellite System) used to provide the data, such as GPS and/or GLONASS.
Format	The format of the data stream, such as RTCM, raw data, CMR, or CMR+
Details	Details of the message format, such as the RTCM message types generated.
Network	The network or service provider.
Generator	The hardware or software used to generate the data stream.
Solution	This field specifies whether the data stream is generated from a single base station (Single Base) or a network of base stations (Network Solution).
Fee	This field specifies whether there is a charge for use of the correction data.
Rate	The bit rate of the data stream, in bits per second.
Misc	Miscellaneous notes about the server.

Integrated OmniSTAR Settings form

Use the *Integrated OmniSTAR Settings* form to configure settings that are specific to an integrated OmniSTAR real-time source.

To open the *Integrated OmniSTAR Settings* form, in the *Real-time Settings* form select Integrated OmniSTAR from a *Choice* field. Then tap the Setup button that appears beside the *Choice* field.

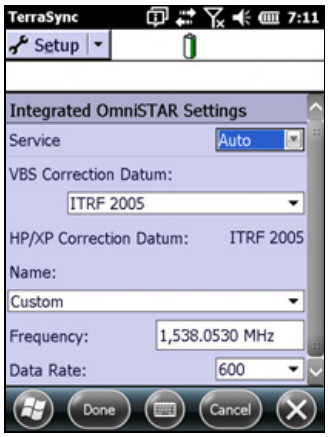


Table 9.39 Integrated OmniSTAR Settings form: Fields

Service		The OmniSTAR service level. Select an option from the drop-down list.
VBS Correction Datum	ITRF 2005	Select the datum used by the real-time correction source to calculate corrections. The TerraSync software uses this information to correctly transform the real-time corrected positions to the WGS84 datum before storing them in the SSF file. Trimble recommends that you select the appropriate datum for your OmniSTAR service level and your location. If the OmniSTAR service level is VBS — Select NAD83 (CONUS) CORS96 if you are within North America; for all other locations, select ITRF 2005. ***Note –*** *If you are outputting GNSS data as NMEA messages, the NMEA data stream does not apply the correction datum transformation and instead outputs GNSS positions in whatever datum the correction source is using.*
HP/XP Correction Datum	ITRF 2005	This read-only field displays ITRF 2005.
Name	Custom	The satellite used for satellite differential corrections. The options in this list depend on the satellite differential service provider that is selected.
Frequency	1538.053 MHz	The frequency used when you select Custom in the *Name* field.
Data Rate	600	The data rate used when you select Custom in the *Name* field. Select an option from the drop-down list.

Integrated SBAS Settings form

Use the *Integrated SBAS Settings* form to configure the SBAS satellite settings.

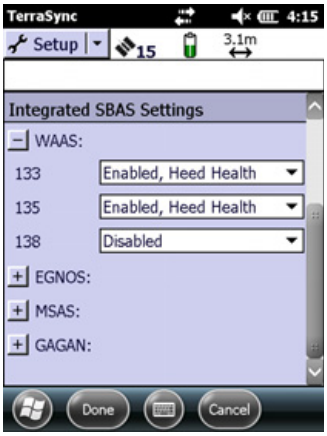
To open the *Integrated SBAS Settings* form:

1. In the *Real-time Settings* form, select Integrated SBAS from a *Choice* field.
2. Tap the Setup button that appears beside the *Choice* field.
3. To select which satellites to track, in the *Integrated SBAS Settings* form, tap the drop-down arrow in the *Tracking Mode* field, and select Custom.

Table 9.40 Integrated SBAS Settings form: Fields

Field	Description
Correction Datum	This field shows the datum used by the real-time correction source to calculate corrections. For SBAS real-time corrections, this field is read-only and is set to WGS84. ***Note –*** *If you are outputting GNSS data as NMEA messages, the NMEA data stream does not apply the correction datum transformation and instead outputs GNSS positions in whatever datum the correction source is using.*
Tracking Mode	Specify the tracking mode. The options are: • Auto — The receiver tracks or locks on to the most powerful satellite signal. The receiver uses its location to determine which SBAS system to track: • Wide Area Augmentation System (WAAS) satellites are tracked in the Continental United States including Alaska, and in southern parts of Canada. • European Geostationary Navigation Overlay Service (EGNOS) satellites are tracked in Europe • MTSAT Satellite-based Augmentation System (MSAS) satellites are tracked in Japan • GPS Aided Geo Augmented Navigation (GAGAN) satellites are tracked in India • Quasi-Zenith Satellite System, Submeter-class Augmentation with Integrity Function (QZSS L1-SAIF) satellites are tracked in Japan, with supported devices

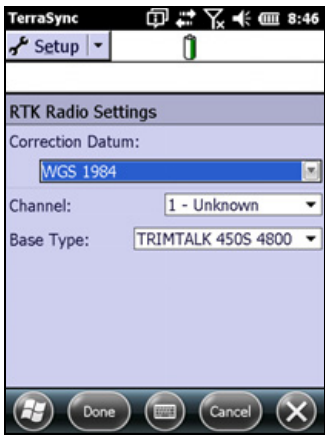
Table 9.40 Integrated SBAS Settings form: Fields (continued)

Field	Description
	• Custom — You can select the Custom option to specify the satellites you want the receiver to track or to ignore. • QZSS L1-SAIF corrections are only available with the Geo 7X handheld. On other devices the field/box is disabled. • The **Enable All** and **Disable All** buttons can be used to quickly configure SBAS satellites to track, for example click **Disable All** then expand the detailed list for the SBAS constellation for the region you are in, and then enable tracking of the particular satellite you want to use. ***Note –*** *BeiDou SBAS corrections are built into the signal received from the satellites. Although BeiDou satellites can be tracked worldwide, the SBAS corrections are only used in China with supported GNSS receivers, and are automatically applied. It is not possible to disable use of the BeiDou SBAS corrections.*
State	In custom mode, select specific satellites and then select the following options: • Disabled. The satellite is disabled. • Enabled, Heed Health. The real-time source is only used if the information is flagged as healthy by the SBAS provider. • Enabled, Override Health. The real-time information is used irrespective of the health flag in the signal. An unhealthy signal will still be tracked and used. ***Note –*** *With QZSS L1-SAIF, it is not possible to configure these options.* 

RTK Radio Settings form

Note – *This section applies only to the TerraSync Centimeter edition software.*

Use the *RTK Radio Settings* form to configure communication settings between the integrated RTK data radio of a supported survey receiver (a survey receiver), and a data radio that is transmitting RTK corrections from a base station.



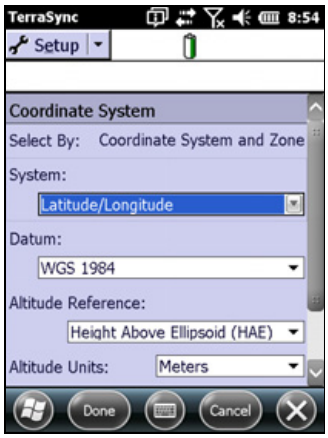
To open the *RTK Radio Settings* form, in the *Real-time Settings* form select Integrated RTK Radio from a *Choice* field. Then tap the Setup button beside the *Choice* field.

Tip – To receive RTK corrections on a survey receiver that does not have an internal RTK radio, connect the receiver to an external radio instead. Use the *External Source Settings* form (see page 216) to configure communication between the external data radio and the receiver.

Table 9.41 Integrated RTK Radio Settings form: Fields

Field	Default	Description
Correction Datum	WGS 1984	Select the same datum as the base station coordinate system. The TerraSync software uses this information to correctly transform the real-time corrected positions to the WGS84 datum before storing them in the SSF file. ***Note –*** *If you are outputting GNSS data as NMEA messages, the NMEA data stream does not apply the correction datum transformation and instead outputs GNSS positions in whatever datum the correction source is using.*
Channel		The channel that the integrated RTK radio is receiving RTK messages on. If a receiver with an integrated RTK radio is connected, this field lists the channels of the radio and their frequencies. If no receiver is connected, the frequencies are listed as Unknown
Base Type		The type of RTK radio and the wireless rate that the base station is using. The options are: • TRIMTALK™ 450S 4800 • TRIMTALK 450S 9600 • TRIMMARK™ II 4800

Coordinate System



Use the *Coordinate System* form to specify the coordinate system that you want the TerraSync software to use to display foreground and background files.

Note – *Data files are always stored using WGS-84, but are displayed using the current coordinate system. If you change the coordinate system, the coordinates of the current data file are recalculated, which may take some time.*

Note – *A background image is referenced to a particular coordinate system and can only be opened in that coordinate system. If you change the coordinate system, any open background image is unloaded.*

To open the *Coordinate System* form, in the Setup screen tap **Coordinate System**.

Table 9.42 Coordinate System form: Fields

Field	Default	Description
Select By	Coordinate system and zone	How the coordinate system is selected. By default this field is read-only. If you have transferred sites to the TerraSync software, the options are: • Coordinate system and zone — A coordinate system and a zone within that system. • Site — A named site. Each site is associated with a coordinate system and zone that you cannot change.
Site	(none)	This field does not appear if you have not transferred sites to the TerraSync software. If you selected Site in the *Select By* field, this field shows the site name.
System	Latitude/ Longitude	The coordinate system to be used in the TerraSync software. If you selected Site in the *Select By* field, this field is read-only.
Zone	(none)	This field does not appear if the selected coordinate system does not have zones. The zone in the coordinate system. If you selected Site in the *Select By* field, this field appears but is read-only.
Datum	WGS 1984	The datum that the selected coordinate system and zone are associated with. • If the system can be associated with only one datum, this field is read-only. • If you can choose a datum, this field is blank by default, and you must choose a datum from the list before you can save your changes and close the form.

Table 9.42 Coordinate System form: Fields (continued)

Field	Default	Description
Altitude Reference	Height Above Ellipsoid (HAE)	This field specifies whether to display height values relative to the **geoid** (mean sea level, or MSL) or relative to the ellipsoid (height above **ellipsoid**, or HAE).
Coordinate Units	(none)	Select the unit of measurement to be used for coordinate values. Select an option from the drop-down list. ***Note –*** *This setting is for Northing and Easting distances only. Units for direct measures of distance are controlled by the Distance Units field on the Units form (see page 205).*
Altitude Units	Meters	The unit of measurement to be used for altitude values. Options in the drop-down list are as for the *Coordinate Units* field.
Display USNG	Off	The level of precision for northing and easting values when displaying U.S. National Grid (USNG) coordinates. The options are: • Off — Disable the display of USNG values, and display coordinates to 2 decimal places • 10,000 m — Display USNG coordinates to 2 digits • 1,000 m — Display USNG coordinates to 4 digits • 100 m — Display USNG coordinates to 6 digits • 10 m — Display USNG coordinates to 8 digits • 1 m — Display USNG coordinates to 10 digits
Coordinate order		Specify the order in which Eastings and Northings are displayed throughout the TerraSync software. The options are: • North/East • East/North

Units

To open the *Units* form, in the *Setup* screen tap **Units**.

Use the *Units* form to specify the units used for measurements and display.

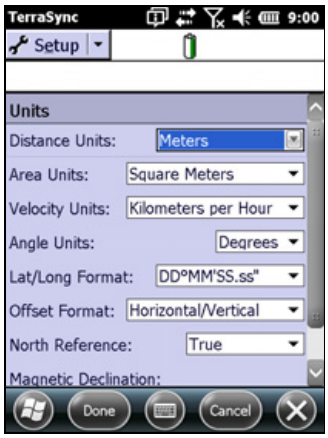


Table 9.43 Units form: Fields

Field	Default	Description
Distance Units	Meters	The unit that distances are measured and displayed in. Select an option from the drop-down list. ***Note –*** *This setting is for direct measures of distance only. Units for Northing and Easting distances are controlled by the Coordinate Units field on the Coordinate System form (see page 203).*
Area Units	Square Meters	The unit that areas are measured and displayed in. Select an option from the drop-down list.
Velocity Units	Kilometers per Hour	The unit that velocities are measured and displayed in. Select an option from the drop-down list.
Angle Units	Degrees	The unit that angles are measured and displayed in. Select an option from the drop-down list.
Lat/Long Format	DD°MM'SS.ss"	The format that latitude and longitude values are displayed in. You can enter values in a different format, but they are converted to the selected format. Select an option from the drop-down list.
Offset Format	Horizontal/ Vertical	How offset distances are measured. The options are: • Horizontal/Vertical — The offset is defined as the two-dimensional distance and vertical distance to the feature. • Slope/Inclination — The offset is defined as the three-dimensional distance to the feature and the inclination of the slope.

Table 9.43 Units form: Fields (continued)

Field	Default	Description
North Reference	True	Specifies whether north references are relative to true north or magnetic north.
Magnetic Declination	Auto	This field is only available if you have selected Magnetic in the *North Reference* field. The **magnetic declination**, in degrees. Select Auto or enter a number in the field. The number must be between –90° and 90°.

External Sensors

Note – *The External Sensors form does not appear in the TerraSync Standard edition software.*

Use the *External Sensors* form to enable and configure external sensors, such as laser rangefinders.

To open the *External Sensors* form, in the *Setup* screen tap **External Sensors**.

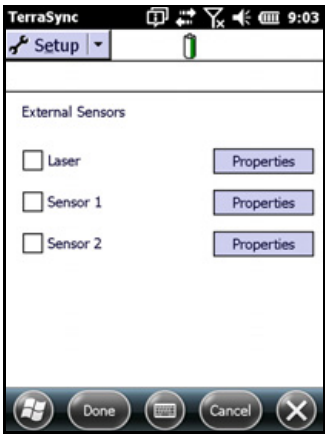


Table 9.44 External Sensors form: Buttons

Button	Description
Properties	Open the *Sensor Properties* form for the selected sensor or laser rangefinder, where you can configure communication, data, and logging properties. This button is repeated for each sensor.

Table 9.45 External Sensors form: Fields

Field	Default	Description
Check box	(cleared)	Use this check box to enable or disable input from the selected sensor or laser rangefinder. When this check box is cleared, any data received from the configured sensor is ignored by the TerraSync software.
<Sensor name>	Laser ***or*** Sensor #	The configured sensor. You cannot change the name of the Laser sensor. This is a predefined sensor for recording feature offsets. You can change the names of the other two sensors in the *Sensor Properties* form. ***Note –*** *To use a laser rangefinder to record attribute values instead of offsets (for example, to record the heights of trees), configure it using Sensor 1 or Sensor 2.*

Sensor Properties form

To open the *Sensor Properties* form, in the *External Sensors* form tap a **Properties** button.

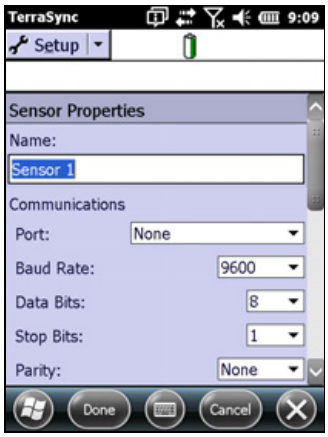


Table 9.46 Sensor Properties: Fields

Field	Default	Description
Name	(none)	The name of the sensor.
Port	None	The serial (COM) port that the sensor is connected to.
Baud Rate	9600 (external sensor) ***or*** 4800 (laser)	The baud rate the field computer and external sensor communicate at. Select an option from the drop-down list. If the selected sensor is the Laser sensor, the only options are 4800 and 9600.
Note – *The following fields do not appear if the Laser sensor is selected:*		
Data Bits	8	The number of data bits used when the field computer and external sensor communicate. The options are 7 or 8.
Stop Bits	1	The number of stop bits used when the field computer and external sensor communicate. The options are 1 or 2.
Parity	None	The parity setting used when the field computer and external sensor communicate. Select an option from the drop-down list.
Prefix String	(none)	The static sequence of characters that begins each message. The prefix is used to specify when to start recording the incoming data stream. The prefix may be up to 30 characters in length. If you do not want to specify a prefix, leave this field blank. For example, all NMEA-compliant sensors output messages that begin with a $ character, followed by one or more characters identifying the specific sensor. ***Note –*** *The TerraSync software strips off the prefix characters before it stores the message. For example, if you specify a prefix of* ***ABC****, and the message is* ***ABC12345****, only* ***12345*** *is stored.*

Table 9.46 Sensor Properties: Fields (continued)

Field	Default	Description
Suffix String	(none)	The static sequence of characters that ends each message. The suffix is used to specify when to stop recording the incoming data stream. The suffix may be up to 30 characters in length. If you do not want to specify a suffix, leave this field blank. For example, all NMEA-compliant sensors output messages that are terminated with a carriage return and line feed characters. ***Note –*** *The TerraSync software strips off the suffix characters, and any characters after the suffix, before it stores the message. For example, if you specify a suffix of* ***XYZ****, and the message is* ***12345XYZ17****, only* ***12345*** *is stored.*
Max Bytes	(none)	Limits the length of each message to a specific number of bytes. This value includes the prefix and suffix strings, if they are defined. You cannot enter a value in this field that is less than the combined length of the prefix and suffix strings. If you do not want to specify a maximum number of bytes, leave this field blank. ***Do not enter 0.*** The maximum value for the *Max Bytes* field is 242. This is the maximum length for UNINTERPRETED_SENSOR_DATA SSF records.
Time Out	0.10s	The maximum time that may elapse between receiving characters of the same message. If a character is received after the timeout period has elapsed, it is considered to be the start of a new message. The timeout value may be between 0 and 0.5 seconds.
Receive Mode	Unsolicited	How the TerraSync software receives data from the sensor. The options are: • Unsolicited — The sensor emits data continuously. Positions are logged at the configured interval for the current feature type, and whenever a sensor record is received. • Requested — Data is only logged from the sensor when it is requested by the TerraSync software. You can configure request intervals for each feature type, or use the *Trigger <sensor name>* option in the *Collect Features* screen (see page 97) to request data when you need it.
Request String	(none)	This field only appears if the *Receive Mode* field is set to Requested. The string that the TerraSync software sends to the sensor to request data. ***Note –*** *You can include non-printable characters (for example, line feeds) and system commands in the request string. See page 210.*

Table 9.46 Sensor Properties: Fields (continued)

Field	Default	Description
Point Feature	All	The interval at which data is requested or read from the sensor for point features. The options are: • Off — Data from this sensor is not recorded for point features. • 5s — Data from this sensor is requested or read every five seconds. • All — This option is only available if the *Receive Mode* field in the *Sensor Properties* form is set to Unsolicited. All data sent by the sensor is read. • Trigger — This option is only available if the *Receive Mode* field in the *Sensor Properties* form is set to Requested. Data is requested when the *Trigger <sensor name>* option in the *Collect Features* screen (see page 97) is selected. You can also enter an interval, in seconds, in this field.
Line/Area Feature	All	The interval at which data is requested or read from the sensor for line and area features. The options are as for *Point Feature* above.
Not in Feature	All	The interval at which data is requested or read from the sensor for between feature positions. The options are as for *Point Feature* above.
Data Destination	Uninterpreted	How the sensor data should be saved in the data file. The options are: • Uninterpreted — The data is stored in the data file in independent UNINTERPRETED_SENSOR_DATA records. • As attribute — The data is stored in an attribute of the current feature. Use the *Attribute Name* field below to specify which attribute to use.
Attribute Name	(not displayed)	The name of the attribute that the sensor data is to be saved in. If the feature does not contain an attribute with this name, the data is ignored. ***Note –*** *You can store sensor data in a text or numeric attribute. However, if you use a numeric attribute, any data that cannot be interpreted as a number or that is not in the value range for the attribute will be ignored. To ensure that no data is lost, use a text attribute that is as long as the longest possible message from the sensor.*

Request Codes

To include a non-printable character (for example, a line feed) or a system command in a sensor request string, enter a backslash (\) followed by a hexadecimal code. The following codes are supported:

Code	Value
\00	nul
\01	soh
\02	stx
\03	etx
\04	eot
\05	enq
\06	ack
\07	bel
\08	bs
\09	tab
\0a	lf
\0b	vt
\0c	ff
\0d	cr
\0e	so
\0f	si

Code	Value
\10	dle
\11	dc1
\12	dc2
\13	dc3
\14	dc4
\15	nak
\16	syn
\17	etb
\18	can
\19	em
\1a	sub
\1b	ec
\1c	fs
\1d	gs
\1e	rs
\1f	us

Tip – If you enter a single backslash, the TerraSync software treats the next two characters as hexadecimal. To include a backslash character, enter \\

CHAPTER

10

High-Accuracy Data Collection

In this chapter:

- Introduction to carrier phase GNSS
- Carrier phase techniques compared
- H-Star technology workflow and required infrastructure
- Carrier phase postprocessing workflow and required infrastructure
- Using corrections from a VRS network

This chapter contains detailed information about using high-accuracy data collection methods to achieve more accurate GNSS positions.

Introduction to carrier phase GNSS

To achieve high accuracy for GNSS positions, you need to use carrier phase data collection methods. Normally, GNSS positions are calculated using code phase measurements: how long it takes for the unique code generated by each satellite to reach the receiver. For greater accuracy, you can use the carrier signal that the PRN code is carried on. Carrier phase measurements are much more accurate, because the carrier signal has a higher frequency than the PRN code, resulting in smaller measurement errors. The disadvantage is that in difficult environments carrier phase measurements are more difficult to collect than code measurements.

The TerraSync software supports two different kinds of carrier-phase operation:

- ***H-Star*** technology provides subfoot accuracy or better in real time or after postprocessing with as little as two minutes of carrier data.

  For details of receivers that are capable of real-time and postprocessed H-Star operation, refer to the datasheet for the receiver.

- ***Carrier postprocessing*** provides accuracies ranging from 20 cm down to 1 cm, with carrier data spanning from 10 minutes up to 45 minutes.

  Real-time kinematic (RTK) techniques (available only with the TerraSync RTK edition software) provide accuracies in the centimeter (sub-inch) range, in real time. For details of receivers that support RTK techniques, refer to the datasheet for the receiver.

There are advantages and disadvantages to each of these techniques. The following section contrasts and compares these techniques, and outlines the equipment and infrastructure required to use each technique.

Carrier phase techniques compared

H-Star technology

H-Star technology offers an easy-to-use, cost-effective solution for obtaining data with subfoot accuracy or better.

Pros:

- Subfoot accuracy or better in real time or after postprocessing, with only two minutes of carrier data.
- Unlike other types of data collection, positions are usable in less than two minutes (although they may not be subfoot).
- Accuracy achieveable over longer baselines than when using carrier phase postprocessing or RTK.
- Moderately-priced field equipment.
- Potential to leverage public base station infrastructure and thereby avoid any direct infrastructure cost.

Cons:

- Areas where public base station infrastructure does not exist will require infrastructure investment to achieve subfoot accuracy.
- Requires a period of uninterrupted carrier logging (typically two minutes or less) to achieve subfoot accuracy. In tough GNSS environments where satellite signals are interrupted (for example, high multipath or under tree canopy) the required two minutes of carrier lock may be unattainable.

Carrier phase postprocessing

Carrier phase postprocessing provides a cost-effective solution for achieving accuracies ranging from 20 cm down to 1 cm, requiring carrier data spanning from 10 minutes up to 45 minutes.

Pros:

- The highest level of postprocessed GNSS accuracy.
- Moderately-priced field equipment.
- Potential to leverage public base station infrastructure and thereby avoid any direct infrastructure cost.

Cons:

- Areas where public base station infrastructure does not exist will require infrastructure investment to achieve centimeter-level accuracy.
- Operational constraints such as limited distance from a base station and precisely surveyed base station infrastructure.

- The requirement for long continuous carrier data durations makes traditional carrier postprocessing impractical in tough GNSS environments where satellite signals are interrupted (for example, in high multipath environments or under tree canopy).
- Positions are not usable until the minimum carrier lock time has elapsed.
- Inability to achieve this level of accuracy in real time, making precise relocation applications impossible.
- Accuracy degrades quite rapidly with increasing distance between the base and roving GNSS receivers.

Real-time kinematic (RTK)

Note – *This section applies only to the TerraSync Centimeter edition software.*

Survey receivers with real-time kinematic capability achieve centimeter-level accuracy in real time, with no need for subsequent postprocessing.

Pros:

- The highest level of real-time GNSS accuracy.
- Accuracy available in the field, making applications such as precise asset relocation possible.

Cons:

- More expensive field equipment.
- Inability to operate in tough GNSS environments where satellite signals are interrupted (for example, in high multipath environments or under tree canopy).
- Operational constraints, such as limited distance from a base station, precisely surveyed base station infrastructure, and either radio or cellular data and equipment costs.

Principles of carrier phase data collection

This section outlines some of the underlying principles of carrier phase data collection that apply to the different carrier phase techniques, H-Star technology, and carrier phase postprocessing.

Carrier lock

To achieve the target accuracy, carrier phase data collection depends on maintaining carrier lock. Carrier lock is achieved when the receiver is continuously locked onto and tracking the carrier measurements on a minimum number of satellites. The minimum number of satellites required to maintain carrier lock depends on whether you are logging static or dynamic GNSS positions. When logging, you must maintain lock on at least five satellites.

Events that cause loss of carrier lock include anything that might interrupt the reception of the satellite signal, such as interference from tree canopy or buildings. Lock is also lost when you disconnect from the receiver or turn off the receiver. When lock is lost, the TerraSync software adjusts any accuracy estimates to reflect the degradation in accuracy due to loss of lock. In difficult conditions, code processing may be better than carrier techniques.

Initialization

For RTK, carrier lock must be achieved and maintained on five satellites until the receiver can generated a fixed carrier solution. This process is known as initialization. On today's RTK receivers, it can be less then 10 seconds with a short baseline and open sky conditions. On older receivers, initialization may take a few minutes.

While carrier lock is maintained, centimeter-level accuracy is also maintained. When carrier lock is lost the receiver must re-initialize. During initialization no positions are output from the survey RTK receiver.

Carrier blocks

For postprocessing techniques, the TerraSync software records blocks of carrier data throughout the data file. Carrier blocks are periods of carrier phase logging over which carrier lock is maintained. Figure 10.1 on page 216 shows how the number of satellites being continuously tracked affects the length of the carrier blocks.

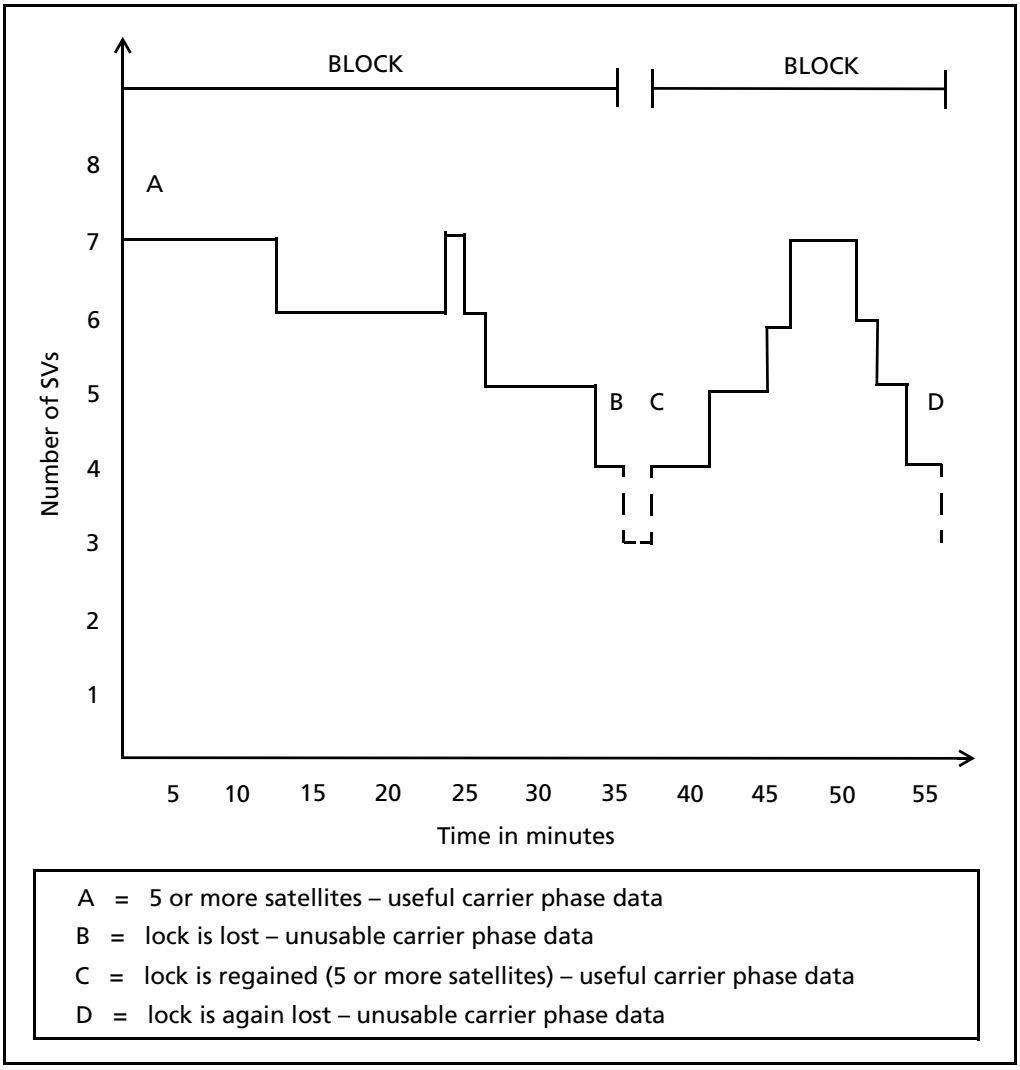


Figure 10.1 Blocks of carrier phase data for static GNSS observations, relative to satellite lock

As soon as four (or more) satellites are available, a new block begins. This block continues until lock is lost.

After postprocessing, all the data in a given block has the same level of accuracy. The accuracy achieved depends on the duration of each carrier block.

The relationship between time and accuracy

With all three carrier phase techniques, accuracy improves with the duration of carrier lock.

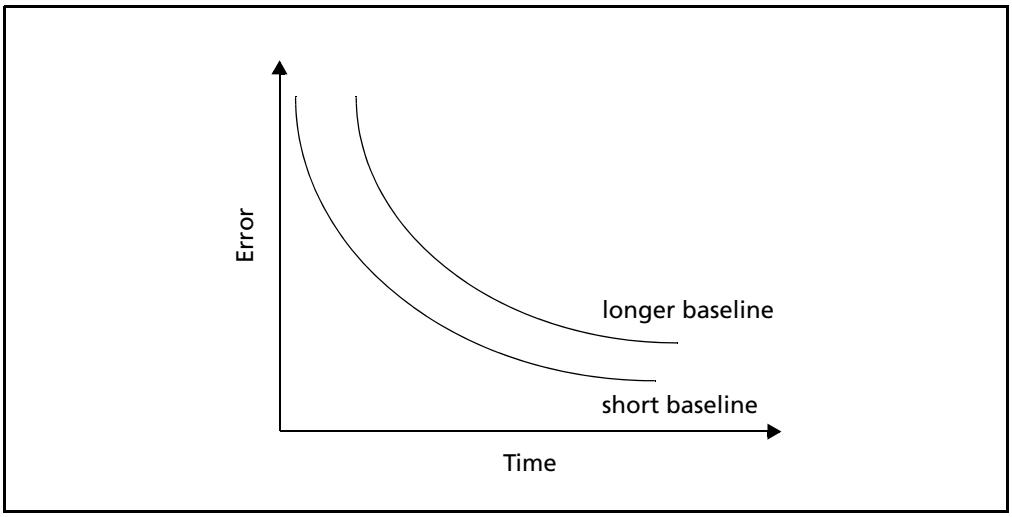


Figure 10.2 Accuracy achieved relative to time elapsed (assuming that carrier lock is maintained)

Figure 10.2 shows that the error decreases quickly at first and then more slowly as time progresses. This is true for both the real-time and postprocessed carrier phase techniques.

Tip – To automatically log data until a pre-specified accuracy level is met, use the accuracy-based logging capability provided by the TerraSync software. For example, you can specify that all positions must have a horizontal accuracy of 10 cm or less. If the GNSS receiver calculates a position that does not meet this accuracy requirement, TerraSync does not log that position.

Note – *The TerraSync software does not prevent you from closing a feature before the required accuracy is achieved, or before the lock period is complete.*

For more information about how the duration of carrier lock affects accuracy for each carrier phase data collection technique see:

- H-Star technology workflow and required infrastructure, page 218
- Carrier phase postprocessing workflow and required infrastructure, page 222
- Real-time kinematic workflow and required infrastructure, page 223

H-Star technology workflow and required infrastructure

This section explains in more detail how to obtain subfoot accuracy using H-Star technology.

H-Star technology enables you to quickly achieve high accuracy with only short periods of carrier data. For example, you can achieve subfoot accuracy or better with two minutes of continuous data. If lock on satellites is maintained, subsequent positions need only minimal occupation times. Using real-time H-Star technology generates usable positions within the first two minutes of data collection, but they may not meet your accuracy requirements until the receiver has recorded a two minute block of data.

When collecting positions using a VRS network as the real-time correction source, or when postprocessing the data using H-Star processing, the positions are corrected using data from a group of base stations. For real-time H-Star technology, the corrections are calculated from information recorded in the network of base stations by the VRS server and transmitted to the receiver. For postprocessed H-Star technology, each GNSS position is corrected using data from each base station in the group, and then the results are averaged. The averaging calculation gives more weight to base stations that are closer to where the original GNSS positions were collected and cancels out bias errors.

Required infrastructure for H-Star technology

A receiver capable of real-time H-Star technology uses base station data from a VRS or a single nearby (within 80 km) base station to generate H- Star positions in the field. For real-time H-Star operation, a wireless data link is required between the roving GNSS receiver and either a nearby base station or a VRS network.

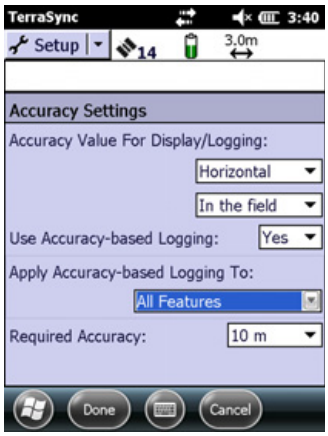
For postprocessed data to achieve subfoot accuracy, three or more good quality dual-frequency (L1/L2) base stations within 200 km are required. Alternatively, one good quality dual-frequency base station within 80 km is required.

The coordinate of each base station must be in the same coordinate system, datum, and reference frame. Furthermore, if a base station has coordinates in terms of ITRF2000 but your GIS is in terms of NAD83, this can introduce up to a meter of error, unless transformed during the Export process.

Configuring the TerraSync software to collect H-Star data

For real-time H-Star technology

1. Tap the Section list button and then select *Setup*.
2. Tap **Real-time Settings**. The *Real-time Settings* form appears.
3. From the *Choice 1* field, select *External Source*.
4. Tap the Setup button beside the *Choice 1* field to configure the correction source and then select the appropriate settings depending on the VRS server and the communication method used (see Using corrections from a VRS network, page 226). When you have finished configuring the external source, tap **Done**.
5. From the *Choice 2* field, select *Wait for Real-time*.
6. Tap **Done** to confirm the real-time settings and return to the main *Setup* screen.
7. Tap **Logging Settings**. The *Logging Settings* form appears.
8. To use accuracy-based logging:
   a. Tap the Setup button below the *Accuracy Settings* field. The *Accuracy Settings* form appears:
   b. From the *Accuracy Value for Display/Logging* fields, select *In the Field* and whether the TerraSync software should calculate the estimated horizontal or vertical accuracy.
   c. From the *Use Accuracy-based Logging* field, select *Yes*.
   d. From the *Apply Accuracy-based Logging To* field, select the feature types that will use accuracy-based logging.



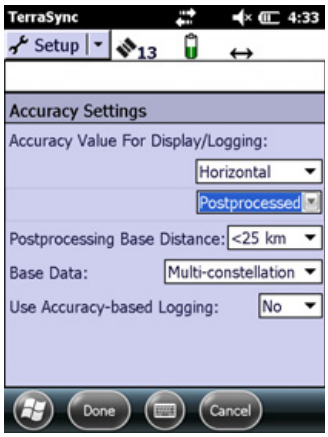
   e. In the *Required Accuracy* field, enter the accuracy you require.
   f. Tap **Done** to save the accuracy-based logging settings and return to the *Logging Settings* form.

Note – *If your GNSS receiver is not H-Star capable, the Auto setting corresponds to No. Select No if you have a GNSS receiver that is H-Star capable but you do not want to log H-Star data.*

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

For postprocessed H-Star technology

1. Tap the Section list button and then select *Setup*.
2. Tap **Logging Settings**. The *Logging Settings* form appears.
3. To use accuracy-based logging:
   a. Tap the Setup button below the *Accuracy Settings* field. The *Accuracy Settings* form appears:



   b. From the *Accuracy Value for Display/Logging* fields, select *Postprocessed* and whether the TerraSync software should calculate the estimated horizontal or vertical accuracy.
   c. If you selected Postprocessing, select the distance to the base station from the *Postprocessing Base Distance* field.
   d. Select whether your PPA is based on GPS only or Multi-constellation data.
   e. From the *Use Accuracy-based Logging* field, select *Yes*.
   f. From the *Apply Accuracy-based Logging To* field, select the feature types that will use accuracy-based logging.
   g. In the *Required Accuracy* field, enter the accuracy you require.
   h. Tap **Done** to save the accuracy-based logging settings and return to the *Logging Settings* form.
4. Tap **Done** to close the *Logging Settings* form and confirm the changes you have made.

Collecting sufficient high-accuracy data

During GNSS data collection where the TerraSync software logs data using a receiver with H-Star technology, the software will show either:

- the estimated accuracy being achieved for that position in real time, or
- a prediction of the accuracy that is likely to be achieved once the H-Star data is postprocessed.

When operating in real-time H-Star mode, configure the Estimated Accuracy icon to show an estimate of the accuracy being achieved for that position in the field. When the value shown in the Estimated Accuracy icon reaches the accuracy you require for the feature, you can stop logging.

When logging data for subsequent H-Star processing, configure the Estimated Accuracy icon to show a prediction of the accuracy that will be achieved after postprocessing. The value of the predicted accuracy is inversely related to the length of time that you have continuously collected H-Star data. The longer the duration of

carrier lock, the better the accuracy, which is indicated by a ***decreasing*** estimate. When the predicted accuracy value shown reaches the accuracy you require for the feature, you can stop logging. The predicted accuracy applies to all positions logged since you acquired carrier lock on the required number of satellites.

The accuracy estimate has a 68% confidence level, which means that 68% of the time the position will be within the estimated value shown when the position was collected, providing that the data is processed against base stations that meet H-Star technology requirements (see page 218).

Note – *If you lose carrier lock while collecting a feature, the accuracy estimate increases, and you must reacquire satellites and remain at the feature until the estimated accuracy value decreases to the required accuracy.*

When collecting data for postprocessing, you do not have to remain at the same feature until the required predicted accuracy value is reached. If you are collecting a series of features and you have a clear view of the sky and so are unlikely to lose carrier lock, you can move to the next feature before the required accuracy is reached.

CAUTION – Do not move to another feature before the required accuracy is reached unless you are unlikely to lose lock on the required number of satellites. If you lose lock while collecting a series of features, you will need to re-collect all of the features to obtain features with the required accuracy.

Provided that the predicted accuracy value passes the threshold of accuracy you require for the features, all of the features collected while carrier lock was maintained will achieve the same accuracy after H-Star processing.

Carrier phase postprocessing workflow and required infrastructure

This section explains in more detail how to obtain the accuracies specified for carrier phase data collection and postprocessing.

During GNSS data collection where the TerraSync software logs carrier phase data, measurements are collected from each individual satellite. Carrier phase processing corrects the collected GNSS positions using the data from individual satellites, so the positions generated during postprocessing are more accurate than positions logged in the field.

By logging carrier phase data, you can achieve accuracies of better than 20 cm after carrier phase processing. The following table is a guide to accuracies that can be obtained with carrier phase data collection using a high-accuracy GNSS receiver.

Table 10.1 Typical accuracies achieved after carrier phase data collection

Time since acquiring lock	Accuracy
10 minutes	20 cm +2ppm
20 minutes	10 cm +2ppm
45 minutes	1 cm +2ppm

Required infrastructure for carrier phase data

For carrier phase postprocessing, a carefully surveyed base station is essential. This must be within 80 km at all times (and within 10 km if you are aiming for accuracy at the 1-2 cm level). The base station must log dual frequency (L1/L2) GNSS data at a frequency no lower than 1/30 Hz (once every 30 seconds).

Collecting sufficient high-accuracy data

When you open a new data file, the TerraSync software starts to log carrier data in the background. This allows the carrier block to start as soon as you open the file, not just when you begin to log a feature. As soon as four or more satellites are available, a ***counter*** starts. When enough time has elapsed for the GNSS positions to obtain the accuracy you require (see Table 10.1, page 222), all of the carrier phase data recorded during that period can be used during postprocessing.

Note – *When you open an* ***existing*** *file with carrier features, the TerraSync software does not automatically log background carrier data. Carrier logging only begins when you start logging positions to the file. These may be not-in-feature positions, position records for a new feature, or updated positions for an existing feature.*

When you start a new feature that is set to carrier accuracy, the logging icon appears in the Status bar.

The Estimated Accuracy icon shows a prediction of the accuracy that will be achieved after postprocessing. The value of the predicted accuracy is inversely related to the length of time that you have continuously collected carrier data. The longer the duration of carrier lock, the better the accuracy, which is indicated by a ***decreasing*** estimate. When the predicted accuracy value shown reaches the accuracy you require for the feature, you can stop logging. The predicted accuracy applies to all positions logged since you acquired carrier lock on the required number of satellites.

The accuracy estimate has a 68% confidence level, which means that 68% of the time the position will be within the estimated value shown when the position was collected, providing that the data is processed against base stations that meet carrier phase requirements (see page 222).

Note – *If you lose carrier lock while collecting a feature, the accuracy estimate increases, and you must reacquire satellites and remain at the feature until the estimated accuracy value decreases to the required accuracy.*

Real-time kinematic workflow and required infrastructure

Note – *This section applies only to the TerraSync Centimeter edition software.*

This section explains how to obtain centimeter-level accuracy using real-time kinematic data collection.

If you are using a survey receiver, you can use real-time kinematic (RTK) data collection to achieve centimeter-level accuracy in real time.

Note – *In RTK mode, the TerraSync Centimeter edition software uses only RTK-corrected positions. You cannot configure the software to use uncorrected GNSS positions and RTK-corrected positions cannot be postprocessed.*

Required infrastructure for RTK

RTK requires one of the following:

- a local (20km) base station.

  This can be another Survey receiver that is set up as an RTK base station. For information about how to use the TerraSync software to set up a second survey receiver as an RTK base receiver. See Appendix C, Setting up a Base Station

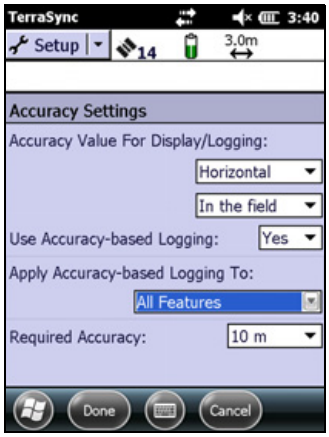
- access to a VRS network that generates RTK messages (in which case the base stations can be up to 70km away)

To use RTK corrections, the rover requires a communication link to the RTK source. This can be the receiver's integrated RTK radio or an external data radio connected to the receiver. Alternatively, if you are using RTK corrections from a VRS network, you can use a variety of methods to establish a direct dial or Internet connection between the field computer and the VRS network. See Using corrections from a VRS network, page 226.

Configuring the TerraSync Centimeter edition software for RTK data collection

To configure the TerraSync Centimeter edition software to use RTK corrections:

1. Open the *Setup* section.
2. Tap **Real-time Settings**. The *Real-time Settings* form appears.
3. From the *Choice 1* field, select the real-time correction source:
   - If the roving receiver has an internal radio, select *Integrated RTK Radio*.
   - If the roving receiver is connected to an external data radio, or the RTK source is a VRS network, select *External Source*.
4. Tap the Setup button beside the *Choice 1* field to configure the correction source:
   - If you selected Integrated RTK Radio, the *RTK Radio Settings* form appears. Select the radio channel and the base radio type at the correct wireless data rate, and then tap **Done**.
   - If you selected External Source, the *External Source Settings* form appears. To use a data radio connected to the receiver, select *Receiver Port* in the *Connection Method* field, and then select appropriate settings for the other fields. To use corrections from a VRS network, select appropriate settings depending on the server and the communication method used (see Using corrections from a VRS network, page 226). When you have finished configuring the external source, tap **Done**.
5. From the *Choice 2* field, select *Wait for Real-time*.
6. Tap **Done** to confirm the real-time settings and return to the main *Setup* screen.
7. Configure the required accuracy settings:
   a. In the main Setup screen, tap **Logging Settings**.
   b. Tap the Setup button below the *Accuracy Settings* field. The *Accuracy Settings* form appears:
   c. From the *Accuracy Value for Display/Logging* fields, select the parameters that the TerraSync software will use to determine the estimated accuracy.
   d. From the *Use Accuracy-based Logging* field, select *Yes*.
   e. From the *Apply Accuracy-based Logging To field,* select the feature types that will use accuracy-based logging.
   f. In the *Required Accuracy* field, enter the accuracy you require.



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

Collecting sufficient high-accuracy data

To start using data from the RTK receiver, connect to GNSS as usual. The appropriate RTK icon appears in the status bar. For example, if the receiver is using its integrated RTK radio to receive corrections, the integrated RTK radio icon appears.

Once the receiver is connected, it starts initializing RTK mode. While the receiver is initializing, the RTK icon flashes. When the icon stops flashing, RTK mode is initialized, and you can start using positions from the receiver.

Tip – Survey receivers are designed to initialize while moving. Depending on the GNSS constellation, and the physical environment you are in, moving around may decrease the time required to initialize. However, if you need to initialize in (for example, if the RTK communications link fails while you are logging a point feature), moving around ***increases*** the initialization time. To initialize in static mode, remain stationary and hold the GNSS antenna still.

The Estimated Accuracy icon in the status bar of the TerraSync software shows the estimated accuracy for the current GNSS position. Use the accuracy-based logging capability provided by the TerraSync software to reject any positions that do not fall within the specified required accuracy.

Using corrections from a VRS network

A virtual reference station network consists of GNSS hardware, software, and communication links. It uses data from a network of base stations to provide roving receivers with corrections that are more accurate than corrections from a single base station.

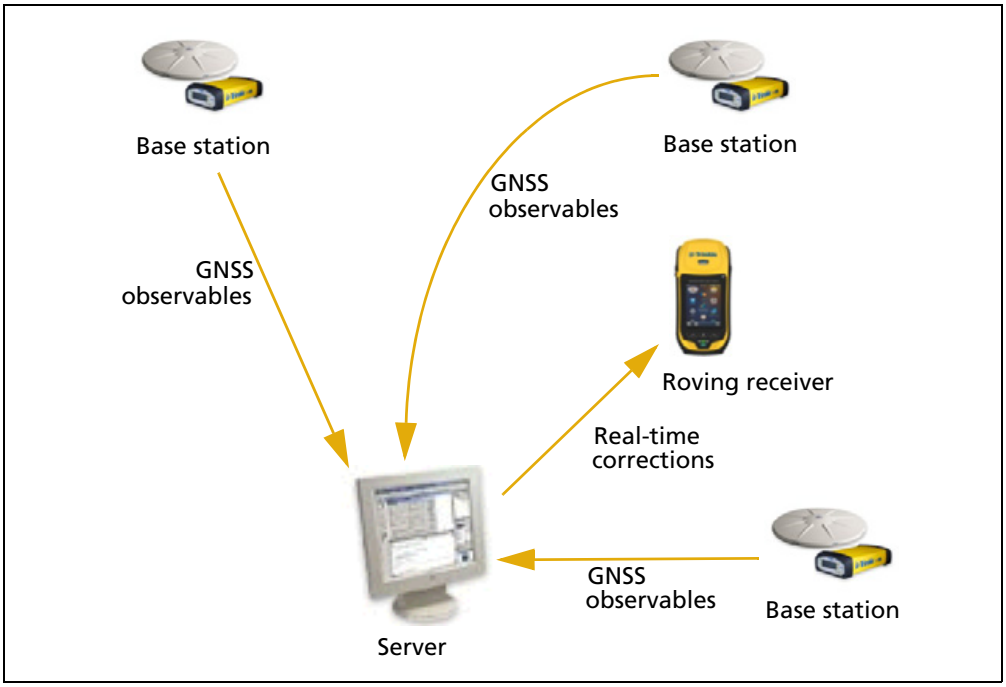


Figure 10.3 Parts of a VRS network

The server is a computer running VRS software such as the Trimble GPSNet™ software. The server uses the base station data to model systematic ephemeris, tropospheric, and ionospheric errors at the roving receiver's position. It then sends interpolated correction messages back to the roving receiver.

Depending on the VRS software, the server may also use the data from the base station network to simulate a base station (or virtual reference station) at the location of the roving receiver.

If no network corrections are available, the server may switch to raw mode. In raw mode the server simply relays the corrections from the single physical base station that is closest to the roving receiver.

Unlike other real-time correction sources, using corrections from a VRS network requires two-way communication between the server and the roving receiver. The roving receiver must send its position to the server, so that the server can calculate corrections for that position, and select the closest base station if necessary. Because the VRS network generates a unique virtual reference station for each roving receiver, the server must send separate corrections to each roving receiver.

Some VRS servers only provide carrier corrections for higher accuracy applications, whereas others provide both DGNSS code-corrections and carrier corrections. The accuracy you can achieve depends on the receiver used, and the corrections from the VRS network.

For details of receivers that support VRS technology, refer to the datasheet for the receiver.

You can connect the roving receiver to the VRS network using an:

- Internet connection (see page 227)
- Direct dial connection (see page 233)

Connecting to a VRS network using an Internet connection

You can use an existing Internet connection on the field computer to connect to a single base station or a VRS network that is transmitting corrections over the Internet.

You can connect to the Internet in a number of ways, including using the optional integrated modem, Wi-Fi (an 802.11b connection), or a Bluetooth wireless connection to a Bluetooth-enabled cellular phone.

Note – *The TerraSync software does not control or configure the Internet connection. In the software, you only specify the IP address or URL of the VRS network, and the port on the server to connect to.*

Connecting to a cellular network from the modem

If the handheld has an integrated cellular modem, use the modem to connect to a cellular network and access the Internet.

To connect to a cellular network using the modem:

1. Configure the connection to the network. This can be Automatic or Manual.
2. Connect to the cellular network.

Before you begin the steps below, Trimble recommends that you:

- make sure that a SIM card is inserted in the handheld.
- confirm that the modem can access the Internet directly. If necessary, contact your service provicer and confirm whether you must enter a user name, password, and domain details when connecting.
- make sure that you have the correct APN (Access Point Name) from your cellular provider.

Step 1: Configure the connection

To set up an automatic configuration:

1. Tap / *Settings* / *Connections* / *Wireless Manager*. If the Phone is Off, tap Phone to turn it on.
2. Tap / *Settings* / *Connections* / *Connections*.
3. On the Connections screen, on the Tasks tab, tap *Automatically configure connection*.

   The device holds a database of the most common cellular providers and the correct connection settings. The handheld will attempt to identify the SIM vendor.
4. If the SIM vendor is recognised correctly, tap **Next** to continue. The connection settings are set up automatically. The process takes about 30 seconds.

   If the SIM is not automatically detected, or the vendor settings are not known you will need to set up the configuration manually.

To set up a manual configuration:

1. Tap / *Settings* / *Connections* / *Wireless Manager*. If the Phone is Off, tap Phone to turn it on.
2. Tap / *Settings* / *Connections* / *Connections*.
3. Under Tasks, tap *Add a new modem connection*.
4. Enter a name for the connection, for example **My Connection.**
5. In the *Select a modem* field, select **Cellular Line (WWAN)** and then tap **Next**.
6. Enter the APN provided by your cellular provider (check with your provider first for correct settings, some providers have multiple APN settings).
7. Tap **Next**.
8. Enter a username password and domain if required (check with your provider, these are often not required). If not required, leave these fields empty.
9. Tap **Finished**.

Step 2: Connect to the cellular network:

1. Tap / *Settings* / *Connections* / *Wireless Manager*. If the Phone is Off, tap Phone to turn it on.
2. Tap / *Settings* / *Connections* / *Connections*.
3. Under Tasks, tap *Manage existing connections*. The configured connections are listed.
4. Tap and hold the connection that you want to use. Tap *Connect* from the pop-up menu.

   The task bar shows the “connecting” icon, for example . When the connection is open/established, the task bar shows the “connected” icon, for example . The icons shown depend on the network. For more details, see the GeoExplorer 6000 Series User Guide.

Once connected, open an application, for example, Internet Explorer, to test the connection. Some applications automatically launch the connection when you start the application, if a current connection is not already established.

Connecting to a cellular network using the Bluetooth radio

If the handheld does not have an integrated cellular modem, connect to the Internet using the Bluetooth radio to connect to a Bluetooth-enabled cellular phone and then connect to the Internet.

Note – *Some cellular phones support the Bluetooth PAN (Personal Area Networking) service as well as the Bluetooth DUN (Dialup Networking) service. Because DUN connections are more common, this section assumes you are making a dialup network connection with the Bluetooth-enabled phone.*

To connect to a Bluetooth-enabled phone using a Bluetooth DUN (Dialup Networking) connection, you must:

1. Connect the field computer to a Bluetooth-enabled phone and then configure the connection to the dialup network.
2. Connect to the Internet using the dialup network.
3. Configure the TerraSync software to use real-time corrections received from the Internet source.

Note – *Before you begin the steps below, Trimble recommends that you confirm that the phone can access the Internet directly. If necessary, contact the cellular phone provider and confirm whether you must enter a user name, password, and domain details when connecting an external device to the phone using Bluetooth dialup networking.*

Step 1: Connecting the GNSS receiver to the field computer

If you are not using a field computer that has an integrated GNSS receiver, connect the GNSS receiver to the field computer. For more information, refer to the documentation provided with the receiver.

Step 2: Connecting the field computer to the phone and configuring the connection to the dialup network

1. Make sure that the field computer and the phone are within five meters of each other, and that the Bluetooth radio in each device is turned on.
2. On the field computer, tap  / *Settings* / *Connections* / *Connections*.
3. Below ***Proxy Internet***, tap *Add a new modem connection*.

4. Enter the name for the connection. For example, enter the name of the phone or the VRS network that you will connect to.
5. From the *Select a Modem* drop-down list, select ***Bluetooth*** and then tap **Next** on the right softkey.
6. If the phone you want to connect to is:
   - listed, go to Step 7 below.
   - not listed:
     a. Tap *Add new device* or *New Partnership*. The field computer searches for other Bluetooth devices and displays them in the list.
     b. From the list of available devices, select the phone you want to connect to and then tap **Next** on the right softkey.
     c. To pair with the phone, enter a passcode of your choice that you will easily remember onto the field computer and then tap **Next** on the right softkey.
     d. When prompted by the phone, enter the same password and then accept the connection.
     e. On the field computer, in the *Partnership Settings* screen, make sure that ***Dialup Networking (DUN)*** is selected and then tap **Finish** on the right softkey.

     You have now created a partnership between the field computer and the phone so that they can communicate.
7. From the *My Connections* list, select the phone that you want to configure the connection to and then if required tap **Next** on the right softkey.
8. Enter the GPRS access number for the Internet.

   Two of the common GPRS access numbers for cellular phones on GSM networks are *99***1# and *99#. If these access numbers do not work, contact the cellular phone provider to obtain the appropriate number to use.

Note – *You do not need to set up dialling rules or change the Internet connection settings on the phone. The connection settings you enter on the field computer are passed to the phone to use for this connection.*

9. Tap **Next** on the right softkey.

10. Unless the phone provider confirmed that you must enter user name, password, and domain settings to access the Internet, tap **Finish** on the right softkey without entering any information in this screen.

    Otherwise:

    a. Enter the required information.

    b. If the phone provider has told you that you need to change the baud rate or other settings for the connection, tap **Advanced**, configure these settings and then tap **OK**.

    c. Tap **Finish** on the right softkey.

    You are returned to the *Connections* screen.

    You have now configured the dialup networking connection.

Step 2: Connecting to the Internet using the dialup network

1. On the field computer, go to the *Connections* screen, if it is not already open (tap / *Settings* / *Connections* / *Connections)*.
2. Below ***Proxy Internet***, tap *Manage existing connections*.
3. Tap and hold the connection you want to use and then select *Connect*.
4. Unless the phone provider confirmed that you must enter user name, password, and domain settings to access the Internet, tap **OK** on the left softkey without entering any information in this screen. Otherwise, enter the required information and then tap **OK** on the left softkey.
5. If the phone prompts you for confirmation to connect to the Internet, accept the connection.

   The phone dials the configured GPRS access number and then connects to the Internet.

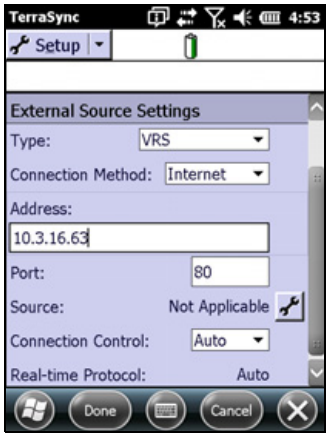
   A Connectivity notification appears on the field computer as the connection is being made.

   After the connection is made you are returned to the *Proxy Internet* screen.
6. Tap **OK** to close the *Proxy Internet* screen.
7. Tap **OK** to close the *Connections* screen.
8. Tap to close the *Settings* screen.

To check the connection status at any time, tap the title bar and then tap the required connectivity icon on the pull-down list. To end the connection at any time, tap *Wireless Manager* and then tap the required connection to turn it off.

Configuring the TerraSync software to use real-time corrections from the Internet source

1. On the field computer, start the TerraSync software and then open the *Setup* section.
2. Tap **Real-time Settings**. The *Real-time Settings* form appears.
3. From the *Choice 1* field, select ***External Source***.
4. Configure the external source:
   a. Tap the Setup button beside the *Choice 1* field. The *External Source Settings* form appears.



   b. From the *Correction Datum* field, select the same datum as the VRS network coordinate system.
   c. From the *Type* field, select:
      – ***VRS*** if the real-time correction source is a VRS network.
      – ***Single Base*** if the real-time correction source is a single base station that broadcasts its corrections over the Internet.
   d. From the *Connection Method* field, select ***Internet***.
   e. In the *Address* field, enter the IP address or URL of the VRS network or the server that is supplying the corrections from the VRS network.

      Typically, the IP address or URL of a VRS network has the format 218.101.54.6:5024, where the digits before the colon (:) are the address, and the digits after the colon (:) are the port number.
   f. In the *Port* field, enter the port number that you will use to connect to the server.
   g. If you are connecting to a VRS network through an NTRIP server, tap the Setup button beside the *Source* field. The GNSS field software attempts to establish a connection to the NTRIP server. If the connection is successful, the *Select Server* form appears. Select the server that you want to use and then tap **Done** to return to the *External Source Settings* form.
   h. If you selected a VRS network that requires authentication, the *Name* and *Password* fields appear. Enter the user name and password that you obtained from the service provider.
   i. From the *Connection Control* field, select:
      – ***Auto*** if you want the TerraSync software to automatically establish and end connections to the VRS network as necessary.

– ***Manual*** if you want to connect or disconnect only when you tap **Ext Source** in the *Setup* screen.

j. Tap **Done** to confirm the settings and return to the *Real-time Settings* form.

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

   If you selected ***Auto*** in the *Connection Control* field, the **Ext Source** button is depressed and the software attempts to connect to the server.

6. If you selected ***Manual*** in the *Connection Control* field, tap the **Ext Source** button that appears below the Status bar in the Setup section to connect the TerraSync software to the Internet correction source.

Tip – To disconnect or reconnect to the server at any time, tap **Ext Source**. To view the status of the real-time correction source, open the Status section, select the Real-time subsection and then select *External* from the **Summary** list button.

Reconnecting to the Internet

To reconnect to the Internet at any time after setting up the connection, repeat steps 3 through 8 on page 231.

If you selected Auto in the *Connection Control* field of the TerraSync software, the software automatically connects to the Internet source that is providing real-time differential corrections.

To ***manually*** reconnect the TerraSync software to the Internet source that is providing real-time differential corrections, open the software and then tap the **Ext Source** button that appears below the status bar in the Setup section.

Connecting to a VRS network using a direct dial connection

The direct dial connection method uses a cellular modem, or a cellphone and modem, to dial up the base station or VRS network directly. If the handheld does not have an integrated modem, the devices may be connected to the field computer by cable, or using Bluetooth wireless technology. For more information about establishing a Bluetooth wireless link, refer to the manufacturer's instructions for the Bluetooth-enabled device.

Unlike the Internet connection method, a direct dial connection is configured, established, and terminated from within the TerraSync software.

Authentication

If the call is authenticated using Caller ID, you will need to inform the service provider of the cellphone number that you are using. Otherwise, you may need to configure the modem to use a terminal window after dialling.

Before you begin

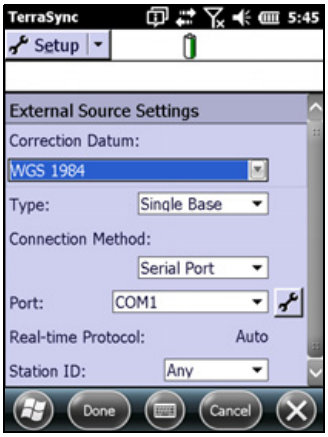
For a direct dial connection, you need the following information from the service provider:

- The dial-up telephone number of the VRS network
- Your username and password, if the service provider requires you to enter these details when you connect to the VRS network

Configuring a direct dial connection to a VRS network

To configure the TerraSync software to establish a direct dial connection to a VRS network:

1. Install any software or drivers for the modem if required.
2. Start the TerraSync software and then open the *Setup* section.
3. Tap **Real-time Settings**. The *Real-time Settings* form appears.
4. From the *Choice 1* field, select External Source.
5. Configure the external source:
   a. Tap the Setup button beside the *Choice 1* field. The *External Source Settings* form appears.
   b. From the *Correction Datum* field, select the same datum as the VRS network coordinate system.
   c. From the *Type* field, select VRS.
   d. From the *Connection Method* field, select Direct Dial.
   e. From the *Modem Type* field, select the modem that you want to use. Then tap the Setup button to open the *Connection Properties* form.



   f. Specify appropriate port connection settings. For detailed connection information, refer to the documentation for the cellular phone or modem.
   g. If the call is authenticated with a username and password, select the *Use terminal window after dialing* check box.
   h. Tap **Done** to return to the *External Source Settings* form.
   i. From the *Phone Number* field, enter the telephone number of the VRS network, including any prefix or area code required.
   j. From the *Connection Control* field, select Auto to automatically connect to and disconnect from the VRS network as necessary. Select Manual to only connect or disconnect when you tap **Options** in the *Setup* screen.

k. Tap **Done** to confirm the settings and return to the *Real-time Settings* form.

6. Tap **Done**.

Connecting to the VRS network using a direct dial connection

To connect to the VRS network using the direct dial connection that you have set up:

1. Connect to the VRS network:
   a. If the TerraSync software is not connected to the GNSS receiver, tap the GNSS button to connect to the GNSS receiver.
   b. If you selected the Auto option in the *Connection Control* field, the TerraSync software automatically initiates the connection. If you selected the Auto option, you must initiate the connection to the server. To do this, tap **Options** and then select *Connect to External Source*.
   c. If necessary, enter your username and password in the terminal window that appears.
2. Proceed with data collection. Use the *Real-time Summary* screen in the Status section if you want to check the status of the VRS network.
3. When you have finished using corrections from the VRS network:
   a. To manually disconnect from the VRS network, in the *Setup* section of the TerraSync software, tap **Options** and then select *Disconnect from External Source*.
   b. To ensure that the call is ended, use the End Call command on the cellphone.

Appendix

A

Advanced Datalogging Options

In this chapter:

- Data collection modes
- Recording between feature positions
- Continuing line and area features
- Offsets
- Using a laser rangefinder to record offsets
- Using an external sensor
- Repeating features
- Segmenting line features
- Recording averaged vertices
- Enhanced support for adding image files as attributes to features.

This chapter contains detailed information about using advanced datalogging options. These options enable you to gain more accurate and time saving results in the field.

Data collection modes

Advanced data collection methods offer time-saving techniques for efficient field work.

The TerraSync software provides three data collection modes for logging GNSS data:

- QuickPoint - select a feature type and quickly log one GNSS position for each of a number of features of that type.
- Log Now – start a feature and simultaneously start collecting GNSS positions.
- Log Later – start a feature, and start collecting GNSS positions later.

The Log Now and Log Later options differ in their timing of GNSS data collection relative to the start of a feature.

Note – *The TerraSync software can be customized; the data collection Options button may have been disabled, and the QuickPoint, Log Now, and Log Later options will not be available.*

QuickPoint Data collection mode

If you select the QuickPoint option, you must select a point feature type that you want to log multiple instances of, for example, a line of trees along a path. As you reach each tree along the path, tap the **QuickPoint Feature Capture** button (for example,). The TerraSync software logs one GNSS position for each point feature (for example, each tree).

To select QuickPoint data collection mode, tap **Options** in the *Collect Features* screen and then select QuickPoint from the option list.

Log Now and Log Later data collection modes

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

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

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

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

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

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

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

Recording between feature positions

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

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

By default, the TerraSync software does not record between feature positions. Use the *Logging Settings* form to enable between feature logging. If the *Interval* field contains a time or distance value, then between feature logging is enabled. If the *Interval* field is set to Off, then between feature logging is disabled. For more information, see page 111.

Between feature positions can be spaced by distance or time. For example, use the distance option to force the TerraSync software to log a position every three meters you travel; or use the time option to log a position every five seconds. To set the logging interval, select the logging style (Distance or Time) in the *Style* field, and then enter the rate in the *Interval* field.

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

Note – *As the name implies, between feature logging only logs positions once a feature has been collected or updated. Creating or opening a data file does not initiate logging of between feature positions.*

Continuing line and area features

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

You can continue any line or area feature, not just the last one collected, provided you have not used the Continue option for any other features since collecting that line or area feature.

Once you continue a feature, you cannot continue any line or area features collected between the two segments of that feature. These features are now nested within the continued feature. Any features you collected before the continued feature are also unavailable for continuation.

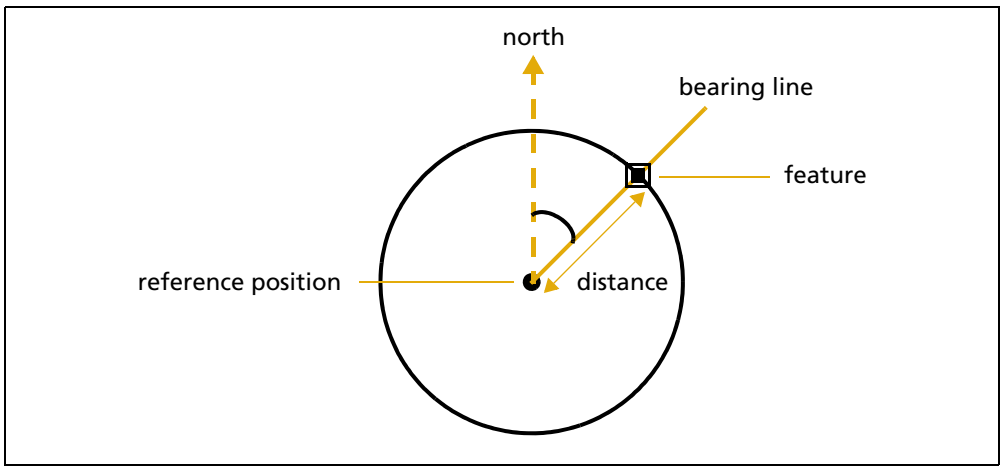
New features that you collect after the continued segment will be available for continuation, because you have not continued any other feature since they were collected. If you replace the positions of an existing feature with new GNSS or digitized positions, the Continue option treats the feature as a new feature, so it can be continued.

Note – *You can collect as many features within a line or area as you need. The number is limited only by storage space on the field device.*

Offsets

Note – *The TerraSync software may have been customized so that the Offset options are hidden.*

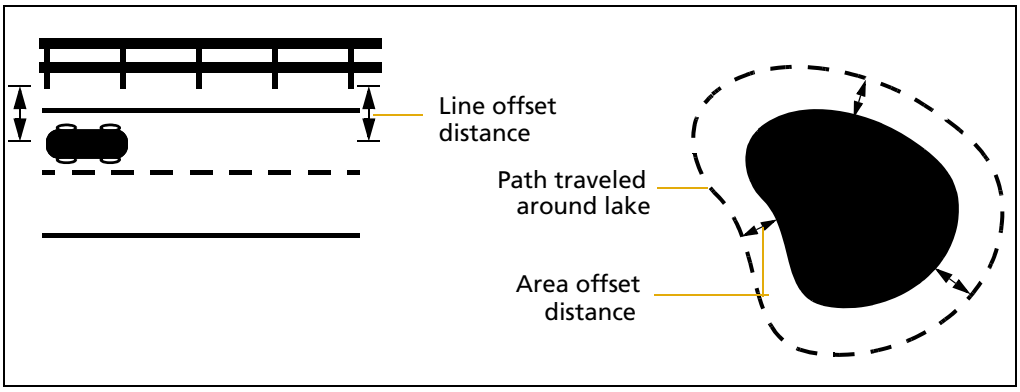
If you cannot travel over the top of, or right next to, a feature, you can enter an offset and record it at the specified distance. When collecting a tree feature, for example, it may be easier to stand some distance (for example, 10 paces to the North) from the tree and record its attributes. This ensures good GNSS reception, and lets you see the tree clearly to assess its condition. Specify an offset to the tree of 10 m South. This is an example of an ***offset point feature***. Entering an accurate offset ensures that the feature is positioned correctly in the GIS.



Note – *The example above is a simple distance-bearing offset. For point features, you can also record* ***complex offsets****, which use measurements from two or more reference positions to calculate the feature position. See also* Complex offsets, page 242.

To view or enter the offset for the feature being collected or updated, tap **Options** in the attribute entry form and then select *Offset*.

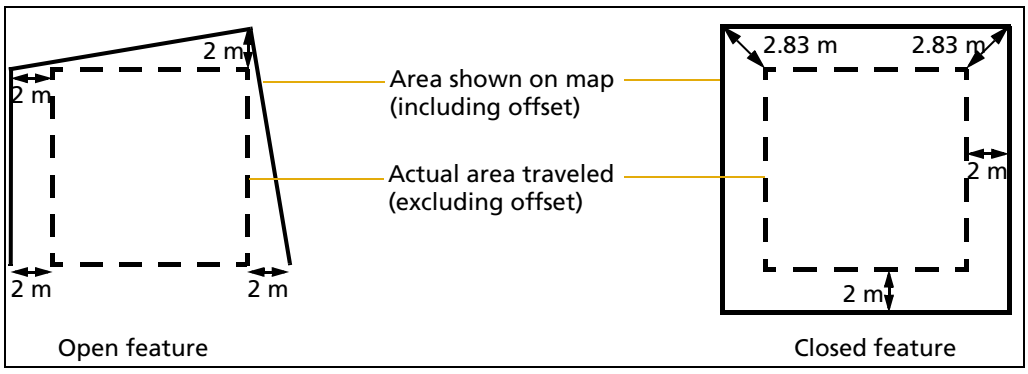
You can also use offsets for line and area features. For example, when collecting a line feature such as a fence, it may be easier to drive along the road beside the fence and record the positions of the fence as an offset. When collecting an area feature such as a lake, you could walk some distance from the lake edge and record its perimeter using an offset.



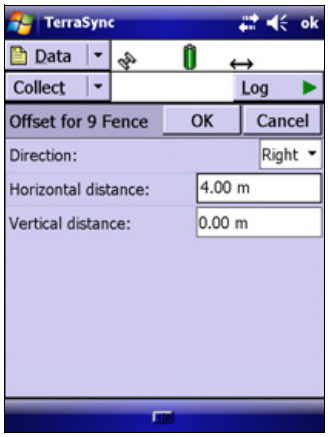
Note – *A feature (point, line, or area) can have only* ***one*** *offset associated with it. To collect a line or area feature using offsets, the same offset value must apply to the whole feature. This may require a test run around or along an object to make sure that you can remain a consistent distance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

Note – *You can record a line feature as a series of joined line segments, each with a different offset. See also* Segmenting line features, page 247**.**

Offsets are added to GNSS and digitized positions as they are recorded, and features are displayed in the Map section with their offsets. However, if the currently open line or area feature has an offset, acute angles and corners can appear distorted on the map. This is because exact offset values are not calculated for these positions until the feature is closed. When you close a feature, offsets for these positions are interpolated, and the feature is redrawn more accurately.



To record an offset for a feature:



1. Start the feature.
2. In the attribute entry form, tap **Options** and then select *Offset*.
3. If the current feature is a point feature, select the type of offset you want to record. Then tap **OK**.

   The appropriate offset form appears. The fields on the offset form depend on the type of feature you are collecting (point, line, or area) and the type of offset you are collecting.
4. Enter a value in each field as necessary.
   Alternatively, use data from a laser rangefinder. See also Using a laser rangefinder to record offsets, page 246.
5. Log GNSS positions for the feature.
6. When the offset form is complete, tap **OK**. The attribute entry form reappears.
7. When you have recorded attributes for the feature and logged sufficient GNSS positions, tap **OK** to store the feature. The *Collect Features* screen appears.

Note – *You can also record complex offsets for point features (see below).*

Complex offsets

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

In the TerraSync software, record a complex offset using either two or three reference positions, and specify either the distance to the feature, or the bearing (direction).

You can record the following types of complex offset:

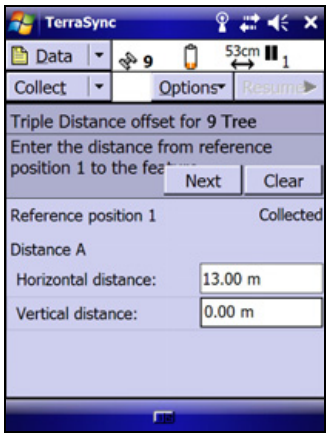
- Distance-distance offset (see page 244)
- Triple distance offset (see page 244)
- Bearing-bearing offset (see page 245)
- Triple bearing offset (see page 245)

To increase accuracy, record each reference position as if it were an averaged vertex. If you log a number of positions at each reference point, the TerraSync software averages these positions to give a more accurate reference position. The principle of ***Dilution of Precision*** applies to complex offsets, so you should choose reference positions that are widely spaced.

For detailed instructions, see Recording a complex offset, page 243.

Recording a complex offset

To record a complex point offset:



1. Start the point feature.
2. From the attribute entry form, tap **Options**, select *Offset*, and then from the pullout menu select the type of offset you want to record.

   The appropriate offset form appears.
3. Follow the instructions at the top of the form. When you have completed each step, tap **Next** to move to the next step. For each reference position:
   a. Move to the reference position.
   b. Tap **Log** (or **Resume**) to begin logging.
   c. Remain stationary at the reference position while you log positions.
   d. When you have collected sufficient positions, tap **Next** to stop logging.
   e. Measure the offset. This is the distance or the bearing from the reference position to the feature. You can use data from a laser rangefinder. See Using a laser rangefinder to record offsets, page 246.
   f. Tap **Next** to confirm the measurement for this reference position.
4. If you are recording an offset that uses distances, enter the direction that the features lies in relative to the path between the reference positions.

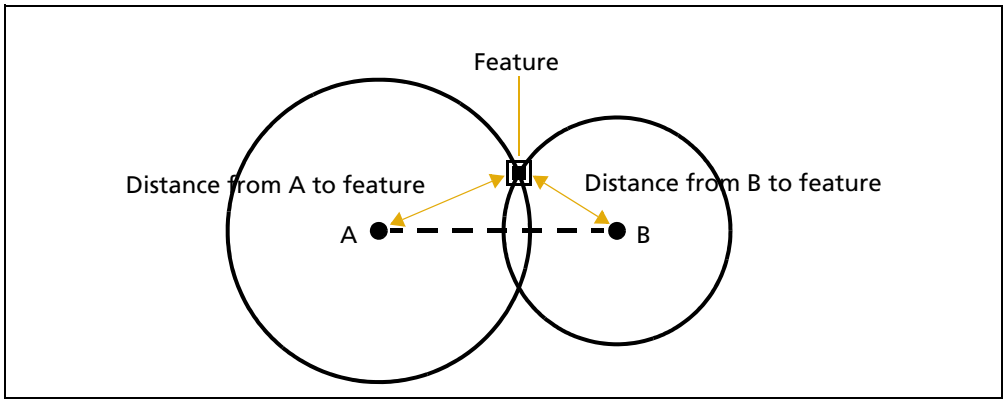
   The software calculates the position of the feature.
5. When the offset form is complete, tap **OK**. The attribute entry form reappears.

Note – *Logging is paused because you only have to record positions for the reference positions, not the feature itself.*

6. Record attributes for the feature, and then tap **OK** to store the feature. The *Collect Features* screen appears.

Distance-distance offset

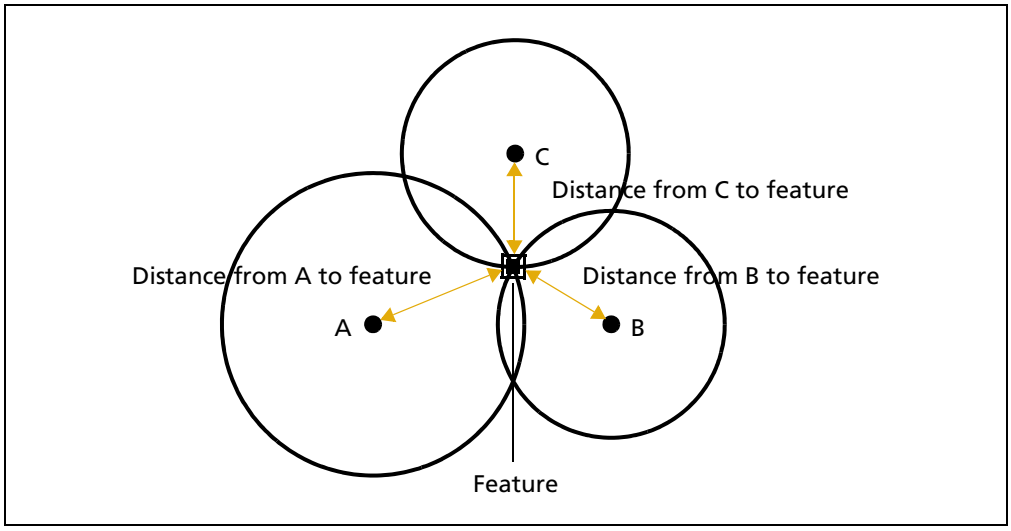
A distance-distance offset uses the distance between the feature and two reference positions (A and B) to specify the position of the feature. The feature lies at the point where the circles centered on A and B intersect. Because there are two points where the circles intersect, you need to specify which direction the feature is in, relative to the path from A to B.



Triple distance offset

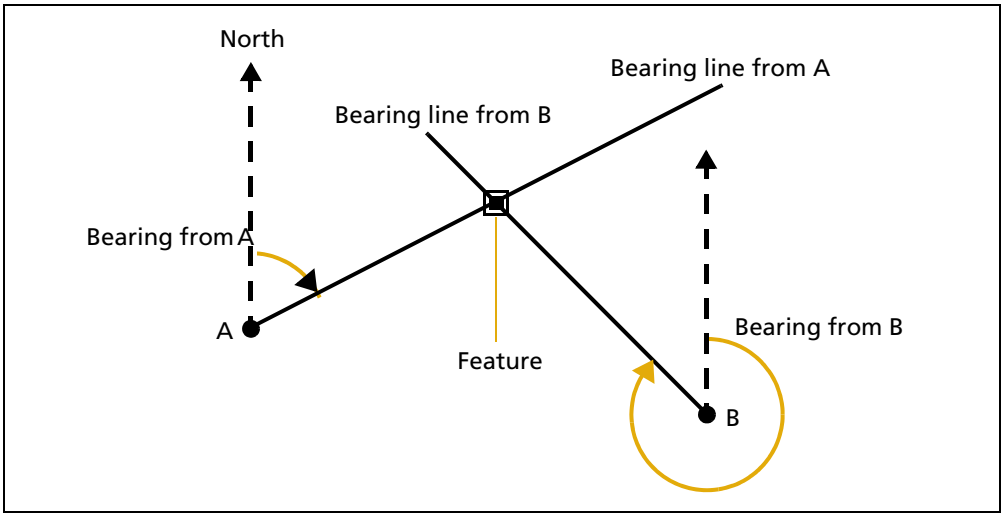
A triple distance offset uses the distance between the feature and three reference positions (A, B, and C) to specify the position of the feature. The feature lies at the point where the circles centered on A, B, and C intersect. There can be only one point where the three circles intersect, so you usually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

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



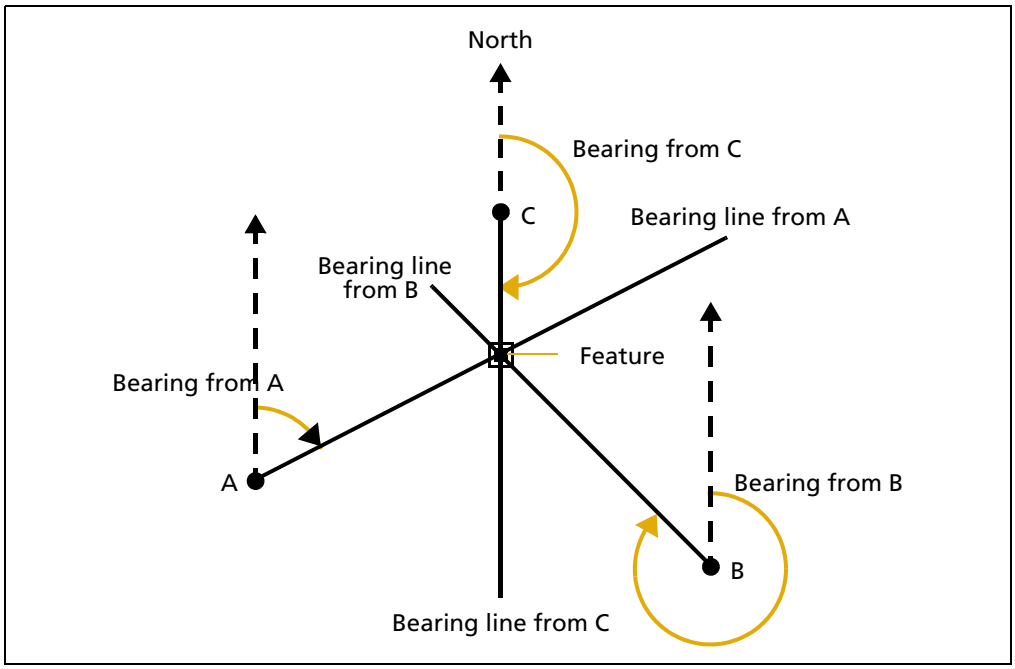
Bearing-bearing offset

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



Triple bearing offset

A triple bearing offset uses the bearing from north from each of three reference points (A, B, and C) to the feature to specify the position of the feature. The feature lies at the point where the three bearing lines intersect. A triple bearing offset is similar to a bearing-bearing offset, but a third measurement provides some mathematical redundancy that can improve accuracy.



Using a laser rangefinder to record offsets

You can use a laser rangefinder to record accurate offsets for a feature.

You can use the Geo 7X handheld with its (optional) integrated Geo 7 rangefinder module. To use other rangefinders with the TerraSync software, you need to specify which serial (COM) port on the field device the rangefinder is connected to.

Note – *This option is not available in the TerraSync software Standard edition.*

For a list of the laser rangefinders that the TerraSync software supports in addition to the Geo 7 rangefinder module, refer to the support note TerraSync Software - Supported Laser Rangefinders.

To record an offset from a laser rangefinder:

- make sure that a feature is open, and that the attribute entry form for the feature, the appropriate offset form, or the Map screen is open.
- if you are using a Geo 7X handheld with the Geo 7 rangefinder module, use the Rangefinder application to select the Offset workflow. (See the *Trimble Geo 7X Handheld User Guide* for more information.)

Then fire the laser rangefinder. The TerraSync software stores the distance and, if the laser rangefinder supports it, the bearing, in the appropriate field(s) in the offset form.

Before storing an offset from a laser rangefinder, the TerraSync software subtracts the antenna height from the measurement. The antenna height is specified in the *Setup* section.

An incorrect antenna height can reduce the vertical accuracy of the position of the feature. If vertical accuracy is important, make sure that you do the following:

- Set the antenna height to the vertical distance from the laser rangefinder to the antenna, not to the distance from the ground to the antenna. You can use a configuration file to do this.
- Keep the laser rangefinder as close to the antenna phase center as possible when shooting.
- Shoot at a higher position on the feature to compensate for the antenna height being subtracted from the altitude of the feature.

For more information on configuring a laser rangefinder to work with the TerraSync software, see page 206.

You can also use a laser rangefinder as an external sensor (see below).

Using an external sensor

You can use an external sensor with the TerraSync software.

Note – *This option is not available in the TerraSync software Standard edition.*

The data recorded by the sensor can be stored as an attribute, or it can be stored in the data file as an uninterpreted sensor data record. You can export uninterpreted sensor data from the GPS Pathfinder Office software to the GIS or processing software.

Depending on the way you want to store the sensor data, and the capabilities of the sensor, you can configure the TerraSync software to read data from the sensor at specified intervals, or only when you request it.

Note – *A laser rangefinder can be used either as an external sensor, as described here, or to supply data for feature offsets. See* Using a laser rangefinder to record offsets, page 246.

Repeating features

Note – *The TerraSync software may have been customized so that the Repeat option is hidden.*

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

To repeat attributes for similar features:

1. From the *Collect Features* screen, tap **Options** and then select *Repeat*. When Repeat is selected, a check mark (✓) appears beside it in the option list.
2. Select a feature from the *Choose Feature* list and then tap **Create**. The attribute entry form appears. The attribute values that appear are those of the last recorded feature of that type. Edit them if necessary. Tap **OK** to save the attribute values and store the feature.
3. Select another feature. Continue until you want to turn off Repeat mode.

To turn off Repeat mode:

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

Note – *When Repeat is not selected, the data dictionary determines default attribute values. Where appropriate, the data dictionary specifies a default value for each attribute of a feature.*

Segmenting line features

Note – *The TerraSync software may have been customized so that the Segment option is hidden.*

Use segmenting to record a line as several segments that are joined together, each with different attribute values. For example, you can record a road feature that has one surface for part of its length, and a different surface for the rest of its length.

When you segment a line feature, the TerraSync software immediately records a position, even if the logging interval does not require a position at that time. This position becomes the last position in the old line and the first position in the new line. Recording a position at the segmentation point ensures that the two line segments join up in the Trimble postprocessing software and the GIS.

The offset of the new line segment defaults to the offset of the previous line segment, if there is one. The new line feature has the same attribute values as the previous line segment, except that any auto-incrementing attributes are incremented to the next value.

Note – *If the line feature has an offset, the two line segments may not "snap" together.*

CAUTION – If you are logging an averaged vertex when you segment a line feature, the first position of the new segment is located at the last GNSS position, not at the calculated position of the last averaged vertex. This can cause a gap between the segments. To ensure that the two segments join, record a single, unaveraged GNSS position as the last position in the first segment. Then segment the feature, and start recording averaged vertices for the new segment if required.

CAUTION – If logging has been paused for more than five seconds before you segment the line, the two line segments may not "snap" together.

Recording averaged vertices

A line or area feature consists of a number of positions, joined in sequence from the first position logged to the last. Each position represents a ***vertex*** (see page 283) of the feature. For more accurate recording of line and area features, you can record several GNSS positions at each vertex, then average these GNSS positions to calculate the vertex position.

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

Because an averaged vertex is similar to a point feature, the same limitations that apply to a point feature apply when the *Vertex* form is open:

- You cannot segment a line feature while recording an averaged vertex.
- You can enter or edit the offset of the feature using the line/area *Offset* form.
- While the *Vertex* form is open, you must remain stationary, as though you were recording a point feature. The messages Vertex # open and Remain stationary appear to remind you to stay still. The number of positions recorded for this vertex also appears in the status bar.

A line or area feature can include both averaged vertices and positions logged normally as you travel. If you want to record only averaged vertices, use the Log Later function to pause logging before you open the feature. Logging starts automatically when you open the *Vertex* form, and returns to its former state when you close the *Vertex* form.

Using Log Later ensures that positions are only logged when the *Vertex* form is open. See Log Now and Log Later data collection modes, page 238.

Enhanced support for adding image files as attributes to features.

On Trimble handhelds with integrated cameras, TerraSync software version 3.30 and later includes a **Camera** button in the attribute entry form for Image file attributes. The **Camera** button launches the camera directly from within the TerraSync software and the resulting photo is automatically selected as the image to attach to the feature.

On all devices, thumbnails of the selected image are now displayed in the attribute entry form when using an Image file attribute. Tap the thumbnail image to open and review the image.

GNSS information is added to the EXIF header when images are attached. When a jpg image file is attached to a feature, and there is a current GNSS position, the EXIF header of the image file is populated with the following fields:

- GPS Time and Date
- GPS Latitude, Longitude, Altitude, and Datum
- Feature name
- Labels 1 and 2 as defined in the Data Dictionary

If the GNSS position for the feature is updated, the GNSS information in the EXIF record is also updated, but the Original Time and Date the photo was taken is not changed unless the photo is also replaced.

Appendix

B

Coordinate Systems

In this chapter:

- Modelling the earth's surface
- Transforming and projecting collected GNSS positions
- Coordinate systems available in the TerraSync software
- Using the Coordinate System Manager utility
- Transferring coordinate systems
- Configuring coordinate systems

It is useful to have some understanding of coordinate systems and datums before collecting GNSS data.

The GNSS receiver computes positions in terms of the WGS-84 coordinate system and stores them as latitude, longitude, and height above ellipsoid (LLH) values. However, you may want to work with positions in terms of a different coordinate system.

The TerraSync software transforms GNSS positions from the WGS-84 coordinate system to the selected coordinate system. This lets you enter and display coordinates using the coordinate system that best suits you and the location you are working in.

Note – *The TerraSync software records all positions internally in terms of the WGS-84 coordinate system. This makes it possible to use different coordinate systems and datums without compromising the data. To allow for seamless data transfer when correcting data in real time, it is imperative that the real-time correction source reference system is correctly identified before use and selected during use. See* *Transforming real-time corrected GNSS positions, page 255**.*

Modelling the earth's surface

Because it is difficult to represent the earth's surface on a flat, rectangular map, mathematical formulas are used to project the earth's surface onto maps. These mathematical formulas are called geoids and ellipsoids. Frameworks called datums and coordinate systems help to further define how the earth is projected onto a particular map.

Geoids and ellipsoids

A ***geoid*** is an imaginary three-dimensional surface representing mean sea level (MSL) if it was projected to extend through the continents. While we might assume that mean sea level remains constant over the surface of the globe, in fact it does not. Rather, mean sea level varies from place to place due to variations in local gravitational forces, which are in turn caused by local variations in the size, shape, and density of geological features. This means that, unlike an ellipsoid or datum, which has a symmetrical surface, the geoid undulates perpendicular to the force of gravity.

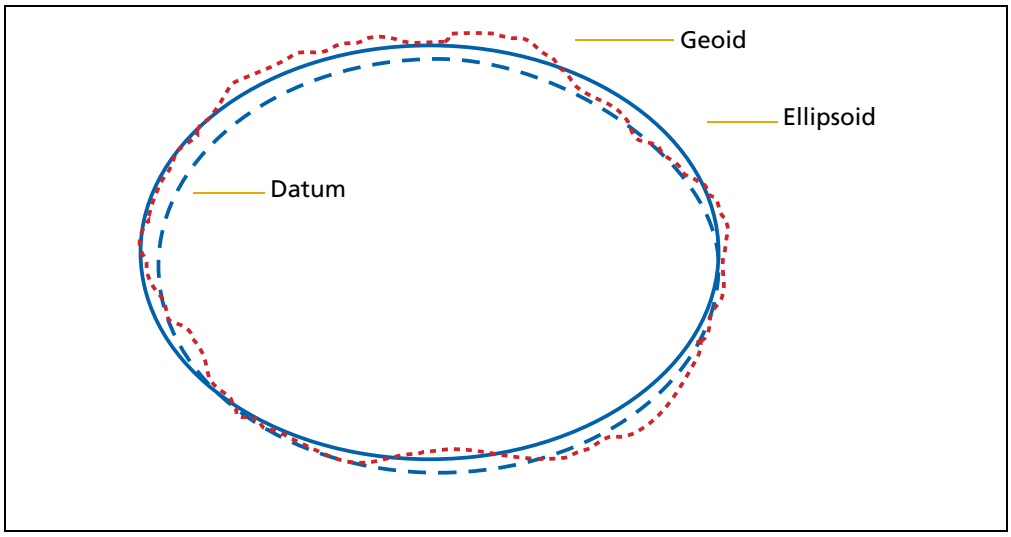


Figure B.4 A geoid

Using a geoid, we can describe a feature of the earth in terms of the earth's actual terrain as well as by measuring gravity. For example, if we say that Mount Everest is 8848 meters above mean sea level, then the vertical location of the feature on the surface of the earth has been identified by measuring gravity and comparing to mean sea level gravity. Unfortunately, a geoid is an extremely complex surface, and is not always suitable for modelling the surface of the earth. However, over limited areas and depending on the accuracy required, a simple ellipsoidal model of the earth's gravity fits quite well.

An ***ellipsoid*** is a three-dimensional surface shaped like a squashed sphere, which approximately models the shape of the earth.

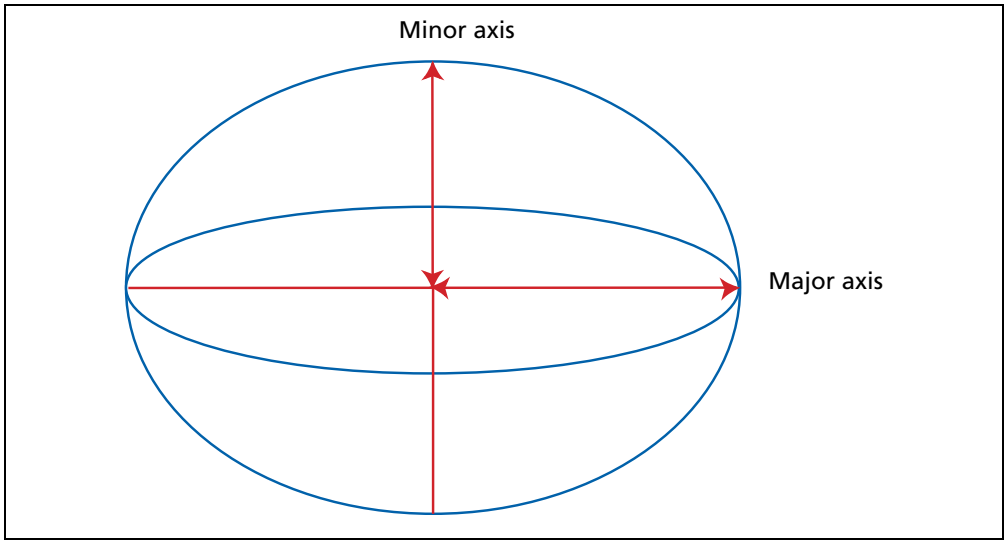


Figure B.5 An ellipsoid

An ellipsoid treats the earth as a smooth, featureless sphere, and approximates the shape of the earth at sea level without regard to land masses. The size and shape of the best fitted ellipsoid, as well as its location relative to the center of mass of the earth, differs from place to place. As a result, many local ellipsoids have been created to fit the geoid in different parts of the world.

Figure B.6 provides a representation of these different models for the earth's surface.

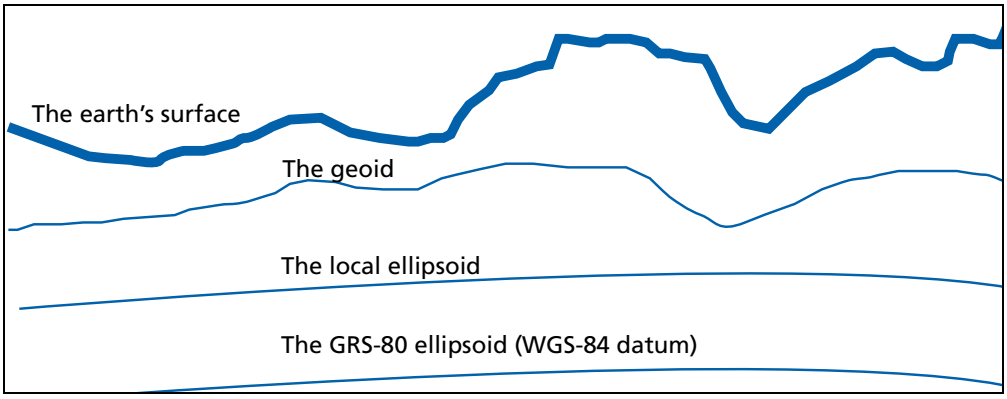


Figure B.6 Models of the earth's surface

A datum transformation and a projection are then used to transform coordinates from this local ellipsoid to the flat-earth model used in maps and in the GIS.

Coordinate systems and datums

A ***datum*** specifies the ellipsoid used to represent the earth, and the point on the surface of the earth that is used as the origin of the datum. Various datums have been established that best suit particular regions. For example, maps in the United States are often based on the North American Datum of 1927 or 1983 (NAD-27, NAD-83). The only global datum is WGS-84, which is based on the GRS-80 ellipsoid. All GNSS coordinates are based on the WGS-84 datum surface.

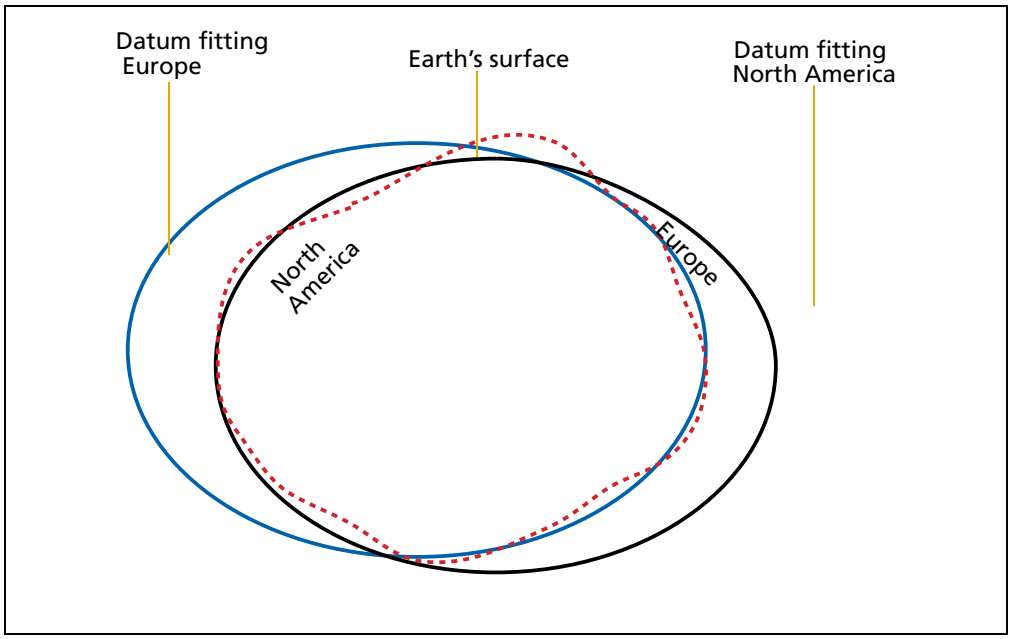


Figure B.7 Comparing datums

A ***coordinate system*** is a three-dimensional reference frame used to describe the location of objects within a spatial reference system (a datum). There are two types of global coordinate systems:

- Angular coordinates (for example, Latitude and Longitude)
- Cartesian (rectangular) coordinates (for example, Universal Transverse Mercator)

In the Latitude and Longitude coordinate system, position coordinates are based on an angular distance from a known reference point (the Prime Meridian) located at Greenwich. Coordinates are expressed in degrees, minutes, and seconds. Angular coordinates are unprojected as they are perfectly suited to the spherical surface of the earth. Latitude and Longitude is the predominant coordinate system used for nautical and aeronautical navigation.

For most land-based GNSS applications, and particularly for GIS data collection applications, latitudes and longitudes are much 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. In a GIS, the spherical coordinates of latitude, longitude and height are translated into planar coordinates of northing, easting, and elevation. Coordinates are expressed in

the unit of measurement defined for the coordinate system, for example meters. Worldwide there are a number of standard grid coordinate systems defined. The US State Plane grids are an example of this kind of grid coordinate system.

Transforming and projecting collected GNSS positions

Transforming real-time corrected GNSS positions

When GNSS positions are differentially corrected, they use the datum (or reference frame) of the correction source. Examples are:

- WAAS, EGNOS: ITRF2000
- NDGPS beacons: NAD83
- NDGPS beacons in the Pacific Ocean: NAD83 (PACP00 Epoch 2003.0)
- Europe beacons: ETRF89
- OmniSTAR VBS (US): NAD83
- OmniSTAR VBS (non-US): ITRF2005
- OmniSTAR HP/XP (worldwide): ITRF2005
- VRS networks: contact the system operator

The usual convention is that SSF files store GNSS positions in the WGS-84 datum, which is almost identical to the ITRF2000 or ITRF2005 datums. However coordinates in the NAD83 or ETRF89 datum can be up one meter apart from the same coordinates in the WGS-84 datum. To resolve this issue, the TerraSync software allows you to specify the datum of each real-time correction source, so that the corrected positions can be automatically transformed to WGS-84, before being saved to the SSF file.

In the Setup section, for each real-time correction source you use, assign the appropriate Correction Datum value. Some (such as SBAS) are assigned by default, but if you use other sources such as a VRS network, you need to find out which datum the system uses so that you can assign the correct value.

To send the WGS-84 positions that are stored in the SSF file to a GIS as North, East coordinates, the GNSS latitudes and longitudes need to be processed in a number of ways. The remainder of this section describes the steps that are required to perform this processing.

First, the collected GNSS positions 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***.

Note – *Data files exported from the GPS Pathfinder Office software are stored using the currently configured export coordinate system. If you change export coordinate systems, the coordinates of the current data file are recalculated, which may take some time. SSF files are assumed to contain positions in terms of WGS-84.*

Note – *Each background image is associated permanently with a coordinate system. To display correctly when opened, the coordinate system of a background image must match the current TerraSync coordinate system.*

Tip – If no coordinate system has been assigned to an image when you open it in the background, the TerraSync software associates it with the current coordinate system. To change the coordinate system that is associated with a background image, change the coordinate system of the image using Trimble postprocessing software and transfer the image to the TerraSync software again. Alternatively, delete the corresponding .cs file in the TerraSync documents folder, change to the required coordinate system in the TerraSync software, and open the image in the Map background.

Finally, if altitudes are to be stored by the GIS, they need to 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 GPS Pathfinder Office software contains a geoid separation model which enables it to transform altitudes relative to GRS-80 (or some local ellipsoid) into heights relative to mean sea level.

The geoid separation models used by the TerraSync software and the GPS Pathfinder Office software differ in accuracy. The TerraSync software is necessarily approximate, while 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 model, you will need to process the heights in GPS Pathfinder Office before exporting them to the GIS.

The TerraSync software lets you specify a datum transformation and a map projection so that you can see your GNSS position (and the position of features you may have recorded) in the local coordinate system. This makes it easy for you to check your position or to navigate using a map produced by your GIS. It also lets you specify whether heights will be shown relative to the local ellipsoid, or relative to mean sea level.

For your convenience, the TerraSync 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).

Coordinate systems available in the TerraSync software

The TerraSync software is supplied with a large number of coordinate systems and datums, including most National Coordinate Systems.

You can also create your own coordinate systems and sites using the Coordinate System Manager utility in the GPS Pathfinder Office software. You can easily load these coordinate systems into the TerraSync software using the Trimble Data Transfer utility.

Note – *The default geoid in the TerraSync software is the DMA 10x10 (Global) model. This is different from the default used by the GPS Pathfinder Office software. As a result, MSL heights in the TerraSync software may differ from those displayed in the GPS Pathfinder Office software.*

Using the Coordinate System Manager utility

Use the Coordinate System Manager utility in the GPS Pathfinder Office software to create and edit custom coordinate systems and sites for use with the TerraSync software. This data can be saved to a coordinate system export file, which you can then transfer to the field device.

To use the Coordinate System Manager utility:

1. On the office computer, start the Coordinate System Manager utility from the GPS Pathfinder Office software.
2. Use the tabs in the main window to select or edit coordinate systems, zones, and sites.

CAUTION – When you transfer a new coordinate system file to the field device, it replaces all coordinate systems already stored in the TerraSync software. Make sure that the new file includes all the coordinate systems that you want to use in the TerraSync software.

3. Export the coordinate system database file. Select *File / Export*. The *Export* dialog appears.
4. Select the *Selected records only* option in the *Export* dialog.
5. Click **OK**. The *Save As* dialog appears.
6. Specify the filename and click **Save**.

When you have saved the coordinate system database files and the related support files, use the Data Transfer utility to transfer the coordinate system export file to the TerraSync software (see Transferring coordinate systems, page 258).

For more information on using the Coordinate System Manager utility, refer to the *GPS Pathfinder Office Online Help*.

Transferring coordinate systems

There are two ways to transfer coordinate systems or sites to the TerraSync software:

- You can transfer a single coordinate system or site which you select at the time of transfer (see page 259).
- You can use the Coordinate System Manager utility to create a coordinate system export file that contains a number of coordinate systems, zones, datums and sites, and then transfer this file to the TerraSync software (see below).

The TerraSync software stores all its coordinate systems in one file. When you load a new coordinate system into the TerraSync software, the new file replaces any existing coordinate system or systems in the software. If you transfer a single coordinate system or site, all existing systems in the software are lost. If you transfer a coordinate system export file, make sure that you include any coordinate systems that you want to keep, plus any new systems that you want to transfer to the TerraSync software.

CAUTION – To prevent the loss of coordinate system information in the TerraSync software, Trimble strongly recommends that you transfer coordinate systems to the field device in a coordinate system export file. This is preferable to selecting and sending a single coordinate system.

Transferring a coordinate system export file

Use the Trimble Data Transfer utility to transfer a coordinate system export file to the TerraSync software. A coordinate system export file can contain a number of coordinate systems and sites.

To transfer a coordinate system export file:

1. Connect the field device to the office computer, start the Data Transfer utility, and connect to the appropriate device definition. For detailed instructions, see the *TerraSync Software Getting Started Guide*.
2. Select the *Send* tab.
3. Click **Add** and select Coordinate System Export File from the drop-down list. The *Open* dialog appears, showing all coordinate system export (.cse and .csw) files in the default location for coordinate system files, C:\Program Files\Common Files\Trimble\Geodata.
4. Browse for the correct drive and folder if necessary, then select a .cse file and click **Open**.

Note – *If you select more than one .cse or .csw file to send, only the coordinate systems in the last file you transfer will be loaded into the TerraSync software. Each transferred file replaces any previously transferred files.*

5. The *Open* dialog disappears. The selected coordinate system export file is added to the *Send* list in the *Data Transfer* dialog.
6. Click **Transfer**.

7. If coordinate systems or sites in the selected export file reference other files such as geoid grid files, the *Associated Files* dialog appears. Select the appropriate check box to send each file required, and then click **OK**.

The selected coordinate system export file and any associated files are transferred to the field computer, replacing any coordinate systems stored in the TerraSync software.

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

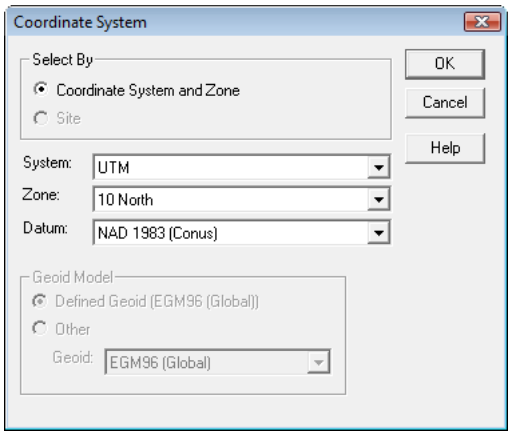
Transferring a single coordinate system

CAUTION – To prevent the loss of coordinate system information in the TerraSync software, Trimble strongly recommends that you transfer coordinate systems to the field device in a coordinate system export file. This is preferable to selecting and sending a single coordinate system.

Use the Trimble Data Transfer utility to transfer a single coordinate system to the TerraSync software.

To transfer a coordinate system:

1. Connect the field device to the office computer, start the Data Transfer utility, and connect to the appropriate device definition. For detailed instructions, see the *TerraSync Software Getting Started Guide*.
2. Select the *Send* tab.
3. Click **Add** and select Coordinate System from the drop-down list. The *Coordinate System* dialog appears:



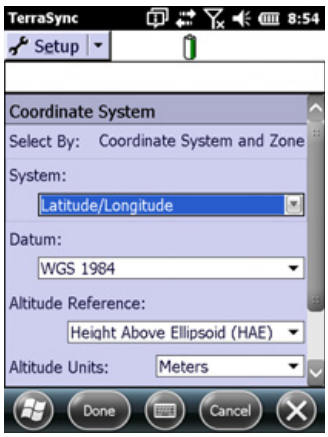
4. From the *Select By* group, select the appropriate option for sending a coordinate system or a site.
5. Select the options in the *Site, System, Zone*, and *Datum* fields that match the coordinate data you want to send. Some of these fields are read-only or hidden, depending on the selections in other fields.

6. Click **OK**. The *Coordinate System* dialog disappears. The selected coordinate system or site is added to the *Send* list in the *Data Transfer* dialog.
7. Click **Transfer**.
8. If the selected coordinate system references other files such as geoid grid files, the *Associated Files* dialog appears. Select the appropriate check box to send each file required, and then click **OK**.

The selected coordinate system and associated files are transferred to the field computer, replacing any coordinate systems stored in the TerraSync software.

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

Configuring coordinate systems



Use the *Coordinate System* form to edit the coordinate system, zone, and datum parameters. The TerraSync software lets you specify a datum transformation and a map projection so that you can see your GNSS position, and the position of features you collect, in your local coordinate system. This makes it easy for you to check your position or to navigate using a map produced by your GIS.

To configure the *Coordinate System* form:

1. From the Setup section, tap **Coordinate System**.

   The *Coordinate System* form appears.
2. Use this form to specify the coordinate system, site, zone, datum, and altitude reference. You can also specify the units used to display the coordinates and altitude.
3. Tap **Done** when you have finished.

   The *Coordinate System* form closes and any changes made are applied immediately throughout the TerraSync software. If any points in the Map section are not within the selected coordinate system, a warning message appears, asking you to confirm that you want to apply the new coordinate system. If you do, the map points that are outside this system are not displayed on the map.

Appendix

C

Setting up a Base Station

In this chapter:

- Logging base data to a file

This chapter contains information about setting up a base station.

Logging base data to a file

You can use the TerraSync software to configure a GNSS receiver as a base station and set up the base station to log base data to a file, which can be used to postprocess rover data in Trimble postprocessing software.

The receiver must be supported by the TerraSync software and must be capable of carrier phase data collection. The following receivers are supported:

- Pro 6H receiver
- Pro 6T receiver
- GPS Pathfinder ProXH receiver
- GPS Pathfinder ProXT receiver
- Geo 7X handheld
- GeoExplorer 6000 series GeoXH handheld
- GeoExplorer 6000 series GeoXT handheld
- GeoExplorer 2008/3000 series GeoXH handheld
- GeoExplorer 2008/3000 series GeoXT handheld

To log base data to a file, open the *New File* screen and start a new base data file. Then step through the Base Station Setup wizard.

Appendix

D

Troubleshooting

In this appendix:

- Communications
- Field computer
- GNSS
- Real-time differential correction
- Data files
- Map screen
- Coordinate system
- Position accuracy

This section lists possible causes of, and solutions to, problems you may encounter when using the TerraSync software.

Communications

The following table describes possible causes of communication problems.

Problem	Possible cause	Solution
The ActiveSync technology does not connect to the mobile device.	The device is not connected securely to the cradle or data cable.	Check cabling and then try to connect again.
	ActiveSync technology has timed out.	Lift the device out of the cradle and then replace it.
		Unplug the data cable of the device and then plug it in again.
	The TerraSync software is trying to connect to the GNSS receiver using the COM port that ActiveSync technology is using.	Disconnect from GNSS (see Table 9.22), or exit the TerraSync software.
	The serial (COM) port is configured in the TerraSync software for use with a laser rangefinder.	Exit the TerraSync software.
		Change the selected port in the *Laser port* field on the *Logging Settings* form (see page 178).
	An ActiveSync technology **partnership** with another mobile device is interfering with connection to the device.	In ActiveSync technology, delete any partnerships with other mobile devices.
		Use a guest relationship, not a partnership.
Data transfer is slow.	The mobile device is not configured to connect at the maximum **baud rate** available.	Increase the connection speed. See the installation instructions.
The TerraSync software does not list the COM port that you want to use.	You added the COM port after you started the TerraSync software. For example, you inserted a PC card adaptor into a PCMCIA or CompactFlash slot on the field computer.	The TerraSync software only checks which COM ports are defined when it starts up. To force the software to check for new COM ports, exit and then restart the TerraSync software. *On a GeoExplorer series handheld, the COM1 serial port is always defined, even if the serial clip is not connected to the handheld.*
	The port is a Bluetooth port that is no longer available.	Re-enable Bluetooth to re-configure the COM port.
The desktop computer does not connect to the mobile device.	The device is not set up to establish an office computer connection.	Open the Communications Properties dialog on the device. For information on how to do this, refer to the documentation for the device. Select the PC Connection tab and check that the *Allow connection with desktop computer when device is attached* check box is selected.
	Another application is using the COM port.	Exit the other application, or disconnect it from the COM port.
You cannot send or receive data files by email from within the TerraSync software.	The TerraSync software cannot connect to your ISP because it does not have your account login details.	In the settings for the email service that you are using, specify the login details for connecting to your ISP.
	The data files attached to emails are not being downloaded from the mail server.	Configure the email service that you are using to download the entire message and any attachments, not just the message header.
	The field computer does not support email.	Use the Trimble Data Transfer utility to transfer files to or from the TerraSync software.

Field computer

This section lists describes problems you may encounter when using a field computer.

Problem	Possible cause	Solution
The field computer does not turn on, or turns off immediately after being turned on.	The field computer's batteries are dead.	Replace or recharge the field computer batteries.
		Connect to an external power source.
The message Not enough memory appears.	Not enough memory on the mobile device is allocated to programs, because too much is allocated for storage.	Adjust the memory allocation. For more information, refer to the documentation for the device.
	There is not enough free memory on the field computer.	Delete unwanted files.
The screen is not visible outside or in bright light.	The backlight brightness is too low.	Adjust the backlight brightness. See page 38.
A file attached to a filename field does not open or play on a desktop computer.	The file has been recorded in a special file format that is used only on a Windows Mobile powered device, or on a specific brand of Windows Mobile powered device. For example, there are a number of ways of encoding WAV (.wav) audio files that are specific to one brand of device.	In the software that you use to record or create the file, change the settings to record files in a format that can be read on a desktop computer.
A TerraSync software data file has been corrupted.	The field computer was reset or the batteries were removed while the software was logging data.	Open the file in the TerraSync software. The software automatically repairs and rebuilds the file. ***Note –*** *If you suspect that a file is corrupted, rebuild it* ***before*** *transferring it to the office computer or sending it by email.*
The TerraSync software has not been activated.	The TerraSync software is not yet activated on the device or the activation key is not on the device	Run the Activation Wizard on the computer you installed the TerraSync software from. See Activating the TerraSync software, page 29

GNSS

This section lists problems when you use GNSS or a GNSS receiver:

Problem	Possible cause	Solution
The message No GNSS detected appears.	The cable connecting the field computer to the GNSS receiver has not been connected, 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 COM port on the field computer is faulty.	Check that the COM port is undamaged. If it appears to be damaged, the field computer may require servicing.
	The GNSS receiver's battery has not been connected correctly.	Check that the battery is correctly connected.
	The GNSS receiver's battery is dead.	Recharge the GNSS receiver's battery.
		Connect to an external power source.
The receiver has not acquired a satellite within three minutes of starting the TerraSync software.	The receiver is still looking for satellites.	Check the Satellite Information section (see page 157) to see how many satellites are being tracked by the receiver.
	The expected satellites are being obstructed.	The obstruction may be a building, a tree, or a large vehicle. Identify the obstruction and move away from it. ***Note –*** *GNSS does not work indoors.*
	The GNSS 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 the receiver still fails to acquire signals from a satellite, then the antenna and/or antenna cable may require servicing.
	The receiver has not been used for a very long time, and the almanac is outdated.	Wait for up to 15 minutes until a new almanac has been recorded. Subsequent restarts should then be rapid.
	The receiver has been set to Base mode by another application.	Reset the GNSS receiver. To do this, open the Setup Section (see page 174), tap **Options** and then select *Reset GNSS receiver.*

Problem	Possible cause	Solution
The receiver is not able to compute a GNSS position within one minute of starting the TerraSync software.	There are not enough satellites available. Four SVs are required to compute a position.	Use mission planning to check that there are sufficient satellites visible at this time.
		In the *GNSS Settings* form (see page 183), check that the minimum elevation value is not too high.
		In the *GNSS Settings* form (see page 183), check that the minimum SNR value is not too high.
	The current **DOP** value is too high.	Use mission planning in the office to check for times when the **PDOP** or **HDOP** value will be below the configured maximum value.
		In the *GNSS Settings* form (see page 183), check that the configured maximum DOP value (PDOP or HDOP) is not too low.
Unable to connect to the GNSS receiver	The receiver firmware is not supported by the version of the TerraSync software.	Check the Compatibility Matrix and use the correct versions of the receiver firmware and the TerraSync software.

Real-time differential correction

This section lists problems you may encounter when using real-time differential corrections or real-time differential correction sources:

Problem	Possible cause	Solution
Not all positions are corrected in real time.	You have chosen to use uncorrected GNSS if no real-time corrections are available.	From the last Choice field on the *Real-time Settings* form (see page 188), select Wait for real-time.
The TerraSync software is not using the first choice real-time correction source.	The first choice correction source is not available, so the second or third choice is being used.	In the Real-time section (see page 161), check the status of your preferred correction source. If necessary, change the configuration in the *Real-time Settings* form (see page 188), or wait until this source is available again.
	The correction source you expected is not set up as the preferred source.	In the *Real-time Settings* form (see page 188), select your preferred real-time correction source in the *Choice 1* field.
The integrated OmniSTAR component (ProXRT receiver only) does not appear to work.	You have set the real-time source incorrectly.	In the *Real-time Settings* form (see page 188), set one of the Choice fields to Integrated OmniSTAR. If integrated OmniSTAR is your preferred correction source, set the *Choice 1* field to Integrated OmniSTAR.
	You have entered the incorrect provider, satellite, and/or frequency.	In the *Real-time Settings* form (see page 188), select appropriate options in the *Service Provider*, *Name*, and *Frequency* fields.
	Your OmniSTAR subscription has expired or has not yet been activated.	In the *Integrated OmniSTAR Settings* form (see page 199), check the expiry date of the subscription.
The real-time differential correction link does not appear to work.	The 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 set the station ID incorrectly.	In the *Real-time Settings* form (see page 188), check that you have set the *Station ID* field correctly.
	You have configured the real-time settings incorrectly.	In the *Real-time Settings* form (see page 188), check that the settings under the *External Source* heading match the telemetry link and the transmitted RTCM data stream.

Data files

This section lists problems you may encounter with data files.

Problem	Possible cause	Solution
You cannot update a feature, add new features, or open a data file.	You are using the TerraSync Standard edition software, which does not allow you to open imported files. In this edition of the software, any file that you transfer from the office computer, create from Shapefiles, or receive by email is marked Not Usable.	Upgrade to the fully functional TerraSync Professional edition or Centimeter edition software.
	The file is already open in the background of the Map section.	Set the map background file to None.
		Select another file for the map background.
	Position updates are not allowed.	Set the *Allow Position Update* field (see page 178) on the *Logging Settings* form to Yes or Confirm.
You cannot change settings or use some menu items.	The setting or menu item is locked by the current configuration. A locked icon appears beside locked settings and menu items.	Unlock the configuration file.
You cannot unlock a configuration file.	You have forgotten the password for the configuration file.	Use the manager's password, **TrimbleTerraSync**.
Automatically generated time attributes are incorrect.	The internal clock on the field computer has been set incorrectly, or the selected time zone is incorrect.	Before you open any data files, use the World Clock utility on the field computer to set the local time and time zone correctly. For more information, refer to the documentation for the field computer.
File dates are incorrect.	The internal clock on the field computer has been set incorrectly, or the selected time zone is incorrect.	Before you open any data files, use the World Clock utility on the field computer to set the local time and time zone correctly. For more information, refer to the documentation for the field computer.

Map screen

This section lists problems you may encounter with map files.

Problem	Possible cause	Solution
Some or all features are missing from the *Update Features* screen or the Map section.	There is no data file open.	Use the *New File* form to create a new file (see page 92), or the *Existing File* screen (see page 113) to open an existing file.
	There are no features in the file to display.	Open the *Collect Features* screen to collect some features (see page 97).
	The layer in the Map section that the features belong to has been turned off, or the group in the Data section that the features belong to has been hidden.	In the Map section, tap **Layers** and select *Filtered Features*, or *Unfiltered Features*, to display the appropriate layer (see page 74).
		In the *Update Features* screen, tap **Options** and then select *Show Filtered Features*, or *Show Unfiltered Features*, to display the appropriate group (see page 114).
	The background file in the Map section is turned off or has not been selected.	If the data you want to see is in a background file, use the *Background File* form to check that the map is set to display this file (see page 75). Then tap **Layers** and make sure that the *Background* option has a check mark beside it.
	The zoom scale is incorrect.	Check that you are not zoomed in too close or out too far to see the data. If you have distant items to display, the zoom extents of the map will be at a more distant scale.
Some or all features are missing from the *Update Features* screen or the Map section.	You are viewing the wrong area in the Map screen.	Use the Pan map tool (see page 82) or the Pan button on the Command bar to pan the display to the appropriate area.
		Use the Zoom Extents mode (see page 83) or the Zoom Extents button on the Command bar to zoom to a scale where all features are visible.
	The features have been filtered out.	Open the *Filter By* form where you can disable or change the criteria for filters (see page 119).
	The features have been deleted.	Deleted features are never shown in the Map section. In the *Update Features* screen (see page 114), select a deleted feature (a feature with a line through it), tap **Options**, and then select *Undelete*.

Coordinate system

This section lists problems you may encounter with the coordinate system.

Problem	Possible cause	Solution
The coordinates displayed by the TerraSync software seem to be incorrect.	You have selected the wrong coordinate system or zone.	In the *Coordinate System* form, select the correct coordinate system and zone (see page 203).
	You have selected the wrong coordinate units.	In the *Coordinate System* form, select the coordinate system, then select the correct coordinate units (see page 203).
	You are using the Latitude/Longitude coordinate system and have selected the wrong datum.	In the *System* field on the *Coordinate System* form (see page 203), select Latitude/Longitude and specify the correct datum.
	You are using the UTM coordinate system and have selected the wrong UTM zone or datum.	In the *System* field on the *Coordinate System* form (see page 203), select UTM, then specify the correct zone and datum. The recommended UTM datum for the U.S.A. is NAD-83.
	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.
You cannot select some coordinate system datums, zones, or ellipsoids.	You transferred a single coordinate system to the TerraSync software, or a coordinate system export file that did not include all the coordinate systems you want. When you transfer coordinate systems to TerraSync, the transferred data overwrites the existing data, so you must make sure that you transfer all the coordinate systems you require.	Create a coordinate system export file that contains all the coordinate systems that you want to use, and transfer this file to TerraSync.
	The required coordinate system files have been deleted from the field computer.	Transfer the files from the GPS Pathfinder Office software again.
		To restore default coordinate systems, re-install the TerraSync software.
The target icon is not at the location of the feature you selected as the navigation target.	You re-recorded the GNSS position of the feature, or digitized its position. The navigation target remains at the old position of the feature.	Reselect the feature as the navigation target.
The message The system time of this device does not match GPS time appears.	The selected time zone of the field computer is incorrect.	Before you open any data files, use the World Clock utility on the field computer to set the local time zone correctly. For more information, refer to the documentation for the field computer.

Position accuracy

This section lists possible causes of, and solutions to, problems with the accuracy of GNSS positions.

Problem	Possible cause	Solution
The accuracy of recorded GNSS positions is not as good as expected.	You did not record sufficient positions to achieve the required accuracy.	In the Data Dictionary Editor, increase the value in the *Minimum Positions* field to make sure that the TerraSync software records enough positions.
		Collect more positions at each point feature.
	The maximum DOP value was too high. If you record positions when the **DOP** is high, this has a detrimental effect on the accuracy of these positions.	In the *GNSS Settings* form (see page 183), lower the maximum **PDOP** or **HDOP** value to make sure that the TerraSync software only logs accurate positions.
The accuracy of recorded GNSS positions is not as good as expected.	You are operating in an area of high multipath.	Move to an area with better GNSS coverage and use offsets.
	No configured real-time source is available, so the TerraSync software is using uncorrected positions.	In the last Choice field on the *Real-time Settings* form, select Wait for Real-time, to use differentially corrected positions only.
You are unable to differentially correct GNSS positions (either in real time or in postprocessing).	The TerraSync software used satellites that were not visible to the base station.	Make sure that the minimum elevation value in the TerraSync software is set sufficiently high so that the software only uses satellites which are also visible to the base station.
		Try correcting the data using another base station file.
	You reset the receiver and began logging data before a new almanac was collected, causing the TerraSync software to use satellites that were not visible to the base station.	Wait until the receiver has collected a new almanac before you log data.
Real-time corrected GNSS positions and known truth points do not coincide.	You have incorrectly configured the real-time correction source datum.	In the Real-time Settings form (see page 188), check that the datum for the real-time source you are using is correctly selected.

Glossary

This section explains some of the terms used in this manual.

almanac An almanac is data transmitted by a GNSS satellite, which includes orbit information on all the satellites, clock corrections, and atmospheric delay parameters. It is used to facilitate rapid acquisition of GNSS signals when you turn on the TerraSync software, or when you have lost track of satellites and are trying to regain GNSS signals.

attribute An attribute is information about a geographic feature in a GIS or database, usually stored in a table and linked to the feature by a unique identifier. Every identifiable feature has attributes. One common attribute of all mapped features is geographic position. Other attributes depend on the type of feature. For example, attributes of a road might include its name, surface type, and number of lanes. Each attribute has a range of possible values, called a domain. The value selected is called the attribute value.

attribute value An attribute is the particular value for a feature, chosen from the domain of an attribute. For example, for a road feature, surface type is an attribute; bitumen, gravel, and concrete are domains; and gravel is an attribute value.

base station Also called a reference station. A base station is a GNSS antenna and receiver positioned on a known location specifically to collect data for differential correction. Base data needs to be collected at the same time as you collect data on a rover unit. A base station can be a permanent station that collects base data for provision to multiple users, or a rover unit that you locate on known coordinates for the duration of the datalogging session.

baud rate A baud is a unit used to measure the speed of electronic code transmissions, generally one bit per second. The higher the baud rate, the faster the transfer of data. However, both the input and output device must be configured to the same baud rate for data to be successfully transferred.

bearing A bearing is the direction from one point to another, usually measured clockwise from north. In the TerraSync software, the bearing indicates the direction from your current position to the target.

BeiDou China's global navigation satellite system.

broadcast server A broadcast server is an Internet server that manages authentication and password control for differential correction sources such as virtual reference station (VRS network) networks, and relays corrections from the source that you select. An NTRIP server is an example of a broadcast server.

C/A code See code phase.

carrier phase Carrier phase is the time taken for the L1 or L2 carrier signal generated by the satellite to reach the GNSS receiver. Measuring the number of carrier waves between the satellite and receiver is a very accurate method of calculating the distance between them.

Cartesian coordinates The Cartesian coordinate system is a system of coordinates that defines the location of a point in space in terms of its perpendicular distance from each of a set of mutually perpendicular axes. The X direction is 0° latitude (the Greenwich meridian) and the Y direction is 90° east longitude.

centroid The calculated center of an area feature.

CMR (Compact Measurement Record)

A real-time message format developed by Trimble for broadcasting corrections to other Trimble receivers. CMR is a more efficient alternative to RTCM correction messages, but is not supported by all non-Trimble receivers.

Coarse Acquisition code See code phase.

code phase (also known as Coarse Acquisition code, or C/A code)

The difference between the pseudo-random number code generated by the TerraSync software and the pseudorandom number code coming in from the satellite. The code phase data is used to quickly compute the distance to a satellite and therefore calculate your position.

coordinate system A set of transformations that allow GNSS positions (in the WGS-84 ellipsoid) to be transformed to projection coordinates with elevations above the geoid. Essentially, a coordinate system consists of a datum transformation, a geoid model allocation, and a projection definition.

cross-track error The amount and direction by which your current heading differs from the cross-track line.

cross-track line The shortest direct path from the navigation start to the navigation target.

data dictionary A data dictionary is a description of the objects to be collected for a particular project or job. It is used in the field to control the collection of the spatial and attribute information about these objects. The elements of a data dictionary could include point, line, and area **features**.

datum A datum is a mathematical model of the earth's surface. World geodetic datums are typically defined by the size and shape of an ellipsoid and the relationship between the center of the ellipsoid and the center of the earth.

Because the earth is not a perfect ellipsoid, any single datum will provide a better model in some locations than others. Therefore, various datums have been established to suit particular regions.

For example, maps in Europe are often based on the European datum of 1950 (ED-50). Maps in the United States are often based on the North American datum of 1927 (NAD-27) or 1983 (NAD-83).

All GNSS coordinates are based on the WGS-84 datum surface.

For more information, see Modelling the earth's surface, page 252.

datum transformation A datum transformation defines the method and parameters that are used to transform the coordinates of a point defined in one datum to coordinates in a different datum. Trimble software supports several methods of datum transformation including Seven-Parameter, Three-Parameter (also referred to as Molodensky), and grid-based transformations. Typically, you use datum transformations to convert data collected in terms of the WGS-84 datum using GNSS methods onto datums used for mapping purposes in individual regions and countries.

declination See magnetic declination.

DGNSS See real-time differential GNSS.

differential correction

Differential correction is the process of correcting GNSS data collected on a rover with data collected simultaneously at a base station. Because it is on a known location, any errors in data collected at the base station can be measured, and the necessary corrections applied to the rover data.

Differential correction can be done in real time, or after the data has been collected by postprocessing.

differential GNSS

See real-time differential GNSS.

digitizing

The process of creating positions manually by selecting a point on a map.

Dilution of Precision

(DOP)

A measure of the quality of GNSS positions, based on the geometry of the satellites used to compute the positions. When satellites are widely spaced relative to each other, the DOP value is lower, and position accuracy is greater. When satellites are close together in the sky, the DOP is higher and GNSS positions may contain a greater level of error.

PDOP (Position DOP) indicates the three-dimensional geometry of the satellites. Other DOP values include HDOP (Horizontal DOP) and VDOP (Vertical DOP), which indicate the accuracy of horizontal measurements (latitude and longitude) and vertical measurements respectively. PDOP is related to HDOP and VDOP as follows:

$PDOP^2 = HDOP^2 + VDOP^2$

DOP

See Dilution of Precision.

EGNOS

(European Geostationary Navigation Overlay Service)

A satellite-based augmentation system (SBAS) that provides a free-to-air differential correction service for GNSS. EGNOS is the European equivalent of WAAS, which is available in the United States.

ellipsoid

An ellipsoid is the three-dimensional shape that is used as the basis for mathematically modeling the earth's surface. The ellipsoid is defined by the lengths of the minor and major axes. The earth's minor axis is the polar axis and the major axis is the equatorial axis. For more information, see Modelling the earth's surface, page 252.

feature

A feature is a physical object or event that has a location in the real world, which you want to collect position and/or descriptive information (**attributes**) about. Features can be classified as points, lines, or areas. For example, a road sign is a point feature, a road is a line feature, and a park is an area feature.

Features are defined in a data dictionary.

field computer

In the TerraSync software documentation, a field computer is any portable computer such as a handheld device, a laptop, or a Tablet PC running the TerraSync software.

See also **Windows Mobile or Windows Embedded Handheld powered device**.

Galileo

Europe's global navigation satellite system.

geoid

A geoid is an imaginary three-dimensional surface representing Mean Sea Level (MSL) if it was projected to extend through the continents. Unlike an ellipsoid or datum, which have a symmetrical surface, the geoid undulates perpendicular to the force of gravity.

For more information, see Modelling the earth's surface, page 252.

geoid height

(Also known as geoid separation and geoidal undulation.)

The geoid height is the distance of the geoid (MSL) above or below the reference ellipsoid.

GLONASS

Russia's global navigation satellite system.

geoid model

A geoid model is a mathematical representation of the geoid for a specific area, or for the whole earth.

great-circle distance

The great-circle distance is the shortest distance between two points on the surface of a sphere.

guest

A guest connection lets a **Windows Mobile or Windows Embedded Handheld powered device** exchange and share information with a desktop computer. You need a guest connection or a partnership to transfer data between the TerraSync software on the device and the GPS Pathfinder Office software on the desktop computer.

When you connect as a guest, you can:

- move or copy files between the two computers
- back up files on the mobile device
- install or uninstall programs on the mobile device

However, you cannot synchronize data between the two computers when you connect as a guest. To synchronize data you must set up a partnership.

A guest connection is temporary. When the guest mobile device is disconnected from the desktop computer, any settings for the guest connection are lost. The next time you connect the device to the desktop computer, you must set the guest connection again.

For more information, refer to the *ActiveSync Help*.

HAE

See Height Above Ellipsoid.

HDOP

See Horizontal Dilution of Precision.

heading

The heading is the direction you are facing or traveling, usually measured clockwise from north.

Height Above Ellipsoid

(HAE)

HAE is a method for referencing altitude. Altitudes expressed in HAE are actually giving the height above the datum, not the ellipsoid. GNSS uses the WGS-84 datum and all heights are collected in relation to this surface. It is important to use the same datum when comparing altitudes in HAE.

horizon

The line at which the earth and sky seem to meet.

Horizontal Dilution of Precision (HDOP)

Dilution of Precision (DOP) is a measure of the quality of GNSS positions, based on the geometry of the satellites used to compute the positions. When satellites are widely spaced relative to each other, the DOP value is lower, and position accuracy is greater. When satellites are close together in the sky, the DOP is higher and GNSS positions may contain a greater level of error.

HDOP is a DOP value that indicates the accuracy of horizontal measurements. Other DOP values include VDOP (vertical DOP) and PDOP (Position DOP).

The TerraSync software lets you specify either a maximum HDOP value or a maximum PDOP. It uses this maximum value as an upper bound on DOP values. You can configure the desired level of accuracy, and make sure that the positions logged are of a certain quality. When the DOP exceeds this maximum, the TerraSync software stops computing GNSS positions.

Using a maximum HDOP is ideal for situations where vertical precision is not particularly important, and your position yield would be decreased by the vertical component of the PDOP (for example, if you are collecting data under canopy).

H-Star technology H-Star technology is a Trimble-patented technology allowing the collection of high accuracy GNSS data. A GNSS receiver that has H-Star technology logs L1 data or, if used with an external dual-frequency antenna, logs L1 and L2 data. Real-time H-Star technology uses corrections from an external source to provide decimeter accuracy in the field. Postprocessed H-Star technology uses base data from multiple base stations to obtain better postprocessed accuracy for the collected data once back in the office.

IMS See Web map server.

International Terrestrial Reference Frame (ITRF)

A reference frame defined by the International Earth Rotation Service (IERS), with its origin at the Earth's center of mass. The WGS-84 datum is aligned with the current realization of ITRF, ITRF 2000 (also called ITRF00).

Internet Map Server (IMS)

See Web map server.

ionospheric noise Ionospheric noise is the effect that the ionosphere has on GNSS signals. The ionosphere is the band of charged particles 100 to 200 kilometers (60 to 125 miles approximately) above the surface of the earth.

ITRF See International Terrestrial Reference Frame**.**

L1 The primary L-band carrier used by GNSS satellites to transmit satellite data. The frequency is 1575.42 MHz. It is modulated by C/A code, P-code, or Y-code, and a 50bps navigation message.

L2 The secondary L-band carrier used by GNSS satellites to transmit satellite data. The frequency is 1227.6 MHz. It is modulated by P-code or Y-code, and a 50bps navigation message.

laser rangefinder An instrument that uses a laser beam to accurately measure the distance to a target. Some rangefinders also measure the bearing to the target. Use a laser rangefinder to measure offsets when you are unable to record positions at the exact location of the feature.

latitude

Latitude is an angular measurement made from the center of the earth to north or south of the equator. It comprises the north/south component of the latitude/longitude coordinate system, which is used in GNSS data collection.

Traditionally, north is considered positive, and south is considered negative.

local datum

The datum chosen for use in a particular region. Positions on a local datum are commonly called local geodetic coordinates.

Coordinates are traditionally given in terms of the local datum. When you survey using the satellite-based Global Positioning System (GPS), however, the coordinates you collect are based on the World Geodetic System 1984. These coordinates are given in terms of the WGS-84 datum. Before you can use WGS-84 coordinates with coordinates measured in terms of the local datum, you must perform a datum transformation.

local ellipsoid

The ellipsoid specified by a coordinate system. The WGS-84 coordinates are first transformed onto this ellipsoid, then converted to grid coordinates.

lock

To track sufficient satellites for logging carrier phase or H-Star data. 'Loss of lock' occurs when the number of available satellites drops below four when logging a static GNSS position, or below five when logging a streaming GNSS position. Loss of lock can also occur during H-Star data collection if the PDOP rises above 6.

longitude

Longitude is an angular measurement made from the center of the earth to the east or west of the Greenwich meridian (London, England). It comprises the east/west component of the latitude/longitude coordinate system, which is used in GNSS data collection.

Traditionally, east is considered positive, and west is considered negative.

magnetic declination

Magnetic declination is the difference between magnetic north and true north. Declination is expressed as an angle and differs between locations.

magnetic north

A bearing that is relative to magnetic north uses the north magnetic pole as its north reference.

Mean Sea Level

(MSL)

Mean Sea Level is a method of altitude reference. Altitudes expressed in relation to MSL actually give a height above the geoid.

It is important to use the same geoid when comparing altitudes in MSL.

MSAS

(MTSAT Satellite-Based Augmentation System)

MSAS is a satellite-based augmentation system (SBAS) that provides a free-to-air differential correction service for GNSS. MSAS is the Japanese equivalent of WAAS, which is available in the United States.

MSL

See Mean Sea Level.

MTSAT Satellite-Based Augmentation System

See **MSAS**.

multipath

Multipath is interference that occurs when GNSS signals arrive at the receiver having traveled different paths. For example, this may happen if some signals are reflected off a building before reaching the receiver. If a signal takes a longer path it will show a larger distance to the satellite and therefore decrease position accuracy.

multi-constellation

Multi-constellation refers to receivers using GNSS data from more than one satellite system, for example, GPS, GLONASS, BeiDou, Galileo.

NAD-27

North American Datum of 1927. A horizontal datum employing the Clarke 1866 ellipsoid. Height values of this era are expressed in NGVD (National Geodetic Vertical Datum) of 1929.

NAD-83

North American Datum of 1983. A horizontal datum employing the GRS-80 ellipsoid. The original realization of NAD-83 was almost identical to WGS-84. The current realization NAD-83 (CORS96) differs from WGS-84 by up to a meter.

NMEA

Initial letters of National Marine Electronics Association.

NMEA 0183 defines the standard for interfacing marine electronic navigational devices. This standard defines a number of strings referred to as NMEA sentences that contain navigational details such as positions. Most Trimble GNSS receivers can output positions as NMEA sentences.

NTRIP

(Networked Transport of RTCM via Internet Protocol)

NTRIP enables the streaming of DGNSS or RTK correction data via the Internet. Data is usually received using a modem and/or a cellphone. An NTRIP server is an Internet server that manages authentication and password control for differential correction sources including base stations and VRS networks, and relays corrections from the source that you select. An NTRIP server can be accessed by a number of users at the same time.

office computer

An office computer is any computer running Trimble postprocessing software. Usually the office computer is a desktop computer located in the office, but if you are running your data collection software on a laptop or Tablet PC then the office computer may actually be the same computer as the field computer.

parity

A digital message is composed of 0's and 1's. Parity is a form of error checking that sums the 0's and 1's of the digital message. A parity error results when one of the bits is changed so that the parity calculated at message reception is not the same as it was at message transmission. Options for parity checking include even, odd, and none.

Typically you should have the same parity setting on the **Windows Mobile or Windows Embedded Handheld powered device** as on the external device you are communicating with.

partnership

A partnership lets a **Windows Mobile or Windows Embedded Handheld powered device** exchange and share information with a desktop computer. You need a partnership or a guest connection to transfer data between the TerraSync software on the device and the GPS Pathfinder Office software on the desktop computer.

A partnership stores information about:

- how to connect to the device
- what types of files you can send and receive
- what files you can synchronize, and how to manage synchronization
- how to convert files for transfer

Unlike a guest connection, a partnership is stored on the desktop computer and remains when the device is disconnected from the desktop computer.

For more information, refer to the *ActiveSync Help*.

PC

In TerraSync software documentation, a field computer that is running a supported Windows desktop operating system.

PDOP

See Position Dilution of Precision.

Position Dilution of Precision

(PDOP)

Dilution of Precision (DOP) is a measure of the quality of GNSS positions, based on the geometry of the satellites used to compute the positions. When satellites are widely spaced relative to each other, the DOP value is lower, and position accuracy is greater. When satellites are close together in the sky, the DOP is higher and GNSS positions may contain a greater level of error.

PDOP is a DOP value that indicates the accuracy of three-dimensional measurements. Other DOP values include VDOP (vertical DOP) and HDOP (Horizontal DOP).

The TerraSync software lets you specify either a maximum HDOP value or a maximum PDOP. It uses this maximum value as an upper bound on DOP values. You can configure the desired level of accuracy, and make sure that the positions logged are of a certain quality. When the DOP exceeds this maximum, the TerraSync software stops computing GNSS positions.

Using a maximum PDOP value is ideal for situations where both vertical and horizontal precision are important.

postprocessing

Postprocessing is the processing of satellite data after it has been collected in order to eliminate error. This involves using PC software to compare data from the rover to data collected at the base station.

Because the base station is on a known location, any errors can be determined and removed from the rover data.

predicted postprocessed accuracy

The predicted postprocessed accuracy is a prediction of the accuracy that will be achieved after postprocessing. When logging H-Star or carrier data, the predicted postprocessed accuracy value applies to all the positions collected since you achieved lock on the required minimum number of satellites. For all other receivers, this value applies only to the current position. The predicted postprocessed accuracy has a 68% confidence level, which means that 68% of the time the postprocessed position will be within the predicted postprocessed accuracy value shown when the position was collected.

PRN

See pseudo-random number.

projection

A mapping of a set of coordinates from a datum to a plane; or a set of mathematical rules for performing such a translation. Projections are used to create flat maps that represent the surface of the earth or parts of it.

pseudo-random number

(PRN)

The pseudo-random number is the code of 0s and 1s transmitted by GNSS satellites, which appears to be random “noise”, but is actually a complex pattern that can be exactly reproduced.

Each satellite has its own unique PRN code, which together are used by the GNSS receiver to calculate code phase positions.

QZSS

(Quasi-Zenith Satellite System)

A regional satellite navigation system commissioned by the Japanese government.

QZSS L1-SAIF

The Japanese satellite navigation system (QZSS) offers an augmentation signal, called L1-SAIF (submeter-class augmentation with integrity function), on the GPS L1 frequency.

raster

A raster graphic is a graphical image consisting of rows and columns of dots. The color of each dot is represented by the value of one or more data bits in the image file. A bitmap (.bmp file) is a type of raster image.

real-time differential GNSS

(also known as real-time differential correction, DGNSS)

Real-time differential GNSS is the process of correcting GNSS data as you collect it. This is achieved by having corrections calculated at a base station sent to the receiver via a radio link. As the rover receives the position it applies the corrections to give you a very accurate position in the field.

Most real-time differential correction methods apply corrections to code phase positions. RTK uses carrier phase measurements.

real-time kinematic

See RTK.

rover

A rover is any mobile GNSS datalogger collecting or updating data in the field, typically at an unknown location. Data collected on a rover can be differentially corrected relative to base station data.

roving mode

During RTK data collection, TerraSync logs line and area features, and between feature positions, in roving mode. Point features and vertices are logged in static mode.

In roving mode, the TerraSync software records all RTK-corrected positions that meet the precision tolerances you have specified. All other positions are discarded.

RTCM correction messages

RTCM are the initial letters of the Radio Technical Commission for Maritime Services. This is a commission established to define a differential data link for the real-time differential correction of roving GNSS receivers. There are two types of RTCM differential correction message. All Trimble GNSS receivers use the version 2.1 or later RTCM protocol.

RTK

(real-time kinematic)

A real-time differential GNSS method that uses carrier phase measurements for greater accuracy.

SBAS

(Satellite-Based Augmentation System)

SBAS is based on differential GNSS, but applied to wide area (**WAAS**, **EGNOS**, **MSAS**). Networks of reference stations are used and corrections and additional information are broadcast via geostationary satellites.

signal-to-noise ratio

(SNR)

The signal strength of a satellite is a measure of the information content of the signal, relative to the noise of the signal. The typical SNR of a satellite at 30° elevation is between 47 and 50 dBHz. The quality of a GNSS position is degraded if the SNR of one or more satellites in the constellation falls below 39 dBHz.

The TerraSync software lets you set a minimum SNR value. This value is used to determine whether the signal strength of a satellite is sufficient for that satellite to be used by the GNSS receiver. If the SNR of a satellite is below the configured minimum SNR, that satellite is not used to compute positions.

site

A site consists of an existing coordinate system plus an extra set of parameters for horizontal and vertical adjustments. Together these provide the best fit of GNSS data to a specific area or site. Because the additional corrections are only valid for a limited area, that area is called a ***site***, or ***local site***.

A coordinate system is designed to apply over a large area and does not provide for variations that occur in local coordinates. When you create a site, you shift coordinates obtained using GNSS so that they better fit coordinates in the existing map grid that were obtained using traditional surveying methods.

SNR

See signal-to-noise ratio.

SSF

(Standard Storage Format)

A Trimble file format. SSF files store GNSS data from a Trimble GNSS receiver. Usually these files have the filename extension .ssf. A corrected SSF file has a .cor or .phs extension; an SSF file created by importing data has the extension .imp.

static GNSS position

A static GNSS position is a GNSS position logged when the GNSS receiver is stationary, as when logging a point feature or an averaged vertex in a line or area feature.

static mode

During RTK data collection, TerraSync logs point features and vertices in static mode. Line features, area features, and between feature positions are logged in roving mode.

In static mode, the TerraSync software records only the RTK-corrected position with the best precision. All other positions are discarded.

streaming GNSS position

(Also known as dynamic GNSS positions.)

Streaming GNSS positions are GNSS positions logged when the GNSS receiver is moving. When you are moving along a line feature, or around the perimeter of a polygon feature, you log streaming GNSS positions. Your application logs a new vertex for every GNSS position received from the GNSS receiver.

synchronize

Synchronization is the process where ActiveSync technology compares information on a **Windows Mobile or Windows Embedded Handheld powered device** with the corresponding information on the desktop computer, and then updates either computer with the latest information.

The data stored by the TerraSync software is not synchronized by ActiveSync technology. Use the Trimble Data Transfer utility to transfer data to and from the TerraSync software.

For more information, refer to the *ActiveSync Help* and the *Data Transfer Utility Help*.

tracking

The process of receiving and recognizing signals from a satellite.

true north

A bearing that is relative to true north uses the north celestial pole as its north reference.

UTC

Universal Time Coordinated.

UTC is a time standard based closely on local solar meantime at the Greenwich meridian (GMT). GNSS time is directly related to UTC.

UTM

Universal Transverse Mercator Map Projection.

A special case of the Transverse Mercator projection. Abbreviated as UTM, it consists of 60 north/south zones, each 6 degrees wide in longitude.

vector

A vector graphic is a graphical image consisting of mathematical descriptions of lines, points, and areas.

When you transfer an SSF data file to the TerraSync software as a ***background file***, its attribute information is removed, leaving only the vector information. You can view the features in the map, but you cannot select them, view their attributes, or edit them.

velocity

Velocity is essentially a measure of speed that takes into account direction of travel as well as the distance traveled over a period of time.

vertex

A point on a line or area feature where two adjacent segments of the feature join. Each position that you collect for a line or area feature is a vertex of that feature.

VRS network

A VRS network consists of GNSS hardware, software, and communication links. It uses data from several base stations to provide corrections to roving receivers that are more accurate than corrections from a single base station.

Unlike other real-time correction sources, using corrections from a VRS network requires two-way communication between the VRS network and the roving receiver. The roving receiver must send its position to the server, so that the server can calculate corrections for that position, and select the closest base station if necessary. The server generates a unique virtual reference station for each roving receiver that connects to it.

WAAS

(Wide Area Augmentation System)

WAAS is a satellite based augmentation system (SBAS) that provides a free-to-air differential correction service for GNSS. WAAS was established by the Federal Aviation Administration (FAA). Its coverage area includes the continental United States and outlying parts of Canada and Mexico.

waypoint

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

Web map server

An Internet site that lets users download GIS data, background, and other files for a specified geographical area. The TerraSync software can download raster background files from a Web map server.

WGS-84

WGS-84 is an abbreviation for World Geodetic System 1984. WGS-84 has superseded WGS-72 as the datum used by GNSS since January 1987.

The WGS-84 datum is based on the ellipsoid of the same name.

Windows Mobile or Windows Embedded Handheld powered device

A small handheld device powered by the Windows Mobile or Windows Embedded Handheld operating system. A Windows Mobile or Windows Embedded Handheld powered device usually has a small screen, and limited memory and storage space.