PROLINK™

Reference Manual

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Contents

Overview ProLINK™ 1-1

Chapter 1 Introduction 1-1

1.1 Documentation Conventions 1-3
1.2 Using this Manual 1-3
1.3 How to Get Technical Support 1-5

Chapter 2 Basic Operations 2-1

2.1 Hardware and Software Requirements 2-1
2.2 Installing ProLINK 2-2
2.3 ProLINK vs. ProLINK COMMS 2-2
2.4 Learning the Main Screen 2-3
2.4.1 Navigating the ProLINK menu structure 2-5
2.4.2 Using the toolbar 2-6
2.4.3 Using shortcut menus 2-7
2.4.4 Shortcut keys 2-8
2.5 Accessing Views 2-8
2.6 Navigating the Field Book Editor's Tree Structure 2-9
2.6.1 Moving around a tree structure 2-9
2.6.2 Expanding and collapsing records 2-10
2.6.3 Accessing edit fields 2-13
2.6.4 Sizing columns 2-13
2.7 Determining Preferences 2-13
2.7.1 Field book reduction mode 2-15
2.7.2 Import records 2-15
2.7.3 Export duplicate point conflict 2-15

2.8 Defining Unit Formats 2-15
2.8.1 General settings 2-17
2.8.2 Angle units 2-18
2.8.3 Latitude and Longitude 2-19
2.8.4 Orientation 2-20
2.8.5 Roading 2-21
2.9 Printing 2-21
2.9.1 Setting up printing parameters 2-23
2.10 Understanding System Messages 2-24
2.11 Accessing On-Line Help 2-24

Chapter 3 Project Management 3-1

3.1 Creating a New Project 3-2
3.2 Opening an Existing Project 3-4
3.3 Saving a Project 3-5
3.4 Updating a Project's Backup File 3-6
3.5 Making a Snapshot Copy 3-7
3.6 Renaming or Moving a Project 3-8
3.7 Closing an Open Project 3-10
3.8 Exiting ProLINK 3-11

Chapter 4 Field Book Management 4-1

4.1 Creating a New Field Book 4-2
4.2 Making a Field Book Current 4-3
4.3 Renaming a Field Book 4-4
4.4 Removing a Field Book 4-5
4.5 Populating Field Books with Files 4-6
4.5.1 Receiving files from a device 4-7
4.5.2 Importing files from the hard drive 4-7
4.6 Field Book Settings 4-10

Chapter 5 Field Book Editing 5-1

5.1 Viewing Raw Data in the Field Book Editor 5-1
5.2 Editing the Contents of a Record 5-2
5.2.1 Using the Field Book Editor's shortcut menu 5-4
5.2.2 Basic editing functions 5-4
5.2.3 Modifying point IDs 5-6
5.2.4 Modifying values 5-7
5.2.5 Calculate station 5-8
5.2.6 Changing record views 5-8
5.2.7 Using the search option 5-14
5.2.8 Using the replace option 5-16
5.3 Inserting records 5-18
5.3.1 Inserting and editing records: general rules 5-19
5.4 Deleting records 5-22
5.4.1 Deleting records: general rules 5-22

Chapter 6 Reduction 6-1

6.1 Understanding the Reduction Process 6-1
6.1.1 Reduction mode 6-2
6.1.2 Multiple field book reduction 6-4
6.1.3 Applying SDR search rules 6-6
6.2 Applying Reduction Parameters in *Field Book Settings* *6-9*
6.2.1 Reduction settings 6-9
6.2.2 Job settings 6-11
6.2.3 Duplicate IDs in reduced coordinates 6-13
6.2.4 Saving defaults 6-17
6.2.5 Helmert Transformation 6-18
6.2.6 Understanding the calculation of transformation parameters 6-30

Chapter 7 Results and Output 7-1

7.1 Viewing Results in the Reduced Coordinates View 7-1

7.1.1 Using the Reduced Coordinates View shortcut menu 7-3
7.1.2 Determining the field book usage 7-3
7.1.3 Encountering duplicate points 7-6
7.1.4 Point usage 7-6
7.2 Generating Output 7-8
7.2.1 Sending files to an external device 7-8
7.2.2 Exporting data to an output file 7-9

Chapter 8 Reviewing the ProLINK Database 8-1

8.1 Working with Database Records 8-1
8.1.1 Using SDR search rules with database 8-1
8.1.2 Exporting database records guidelines 8-2
8.1.3 Inserting and deleting records guidelines 8-2
8.2 Understanding ProLINK Database Records 8-9
8.2.1 ANT HT - GPS Antenna height 8-9
8.2.2 APPLY SUPER - Apply super-elevation 8-9
8.2.3 ATMOS - Atmospheric 8-10
8.2.4 BKB - Back bearing details 8-11
8.2.5 CIRCULAR VC - Vertical circular 8-12
8.2.6 COL - Collimation record 8-13
8.2.7 DEFINE SUPER - Define super-elevation 8-13
8.2.8 GROBS - GPS-S/K raw observation 8-14
8.2.9 GOBS - GPS/RTK observation 8-15
8.2.10 GPOS - GPS/RTK position 8-16
8.2.11 GPS - Point defined by latitude and longitude 8-17
8.2.12 GPS INSTR - GPS instrument 8-18
8.2.13 GRED - GPS/RTK reduced measurements 8-19
8.2.14 GROBS 8-20
8.2.15 GSTN - GPS/RTK station 8-21
8.2.16 HEADER 8-23
8.2.17 HORZ ADJ - GPS horizontal adjustment 8-24
8.2.18 HORZ ALIGN - Horizontal align 8-25
8.2.19 HORZ ARC - Horizontal arc 8-25

8.2.20 HORZ POINT - Horizontal point 8-26
8.2.21 HORZ SPIRAL - Horizontal spiral 8-26
8.2.22 HORZ STRAIGHT - Horizontal straight 8-27
8.2.23 INSTR - Instrument details 8-28
8.2.24 JOB 8-29
8.2.25 LEVEL ELEVATION 8-30
8.2.26 LEVEL INSTR - Level instrument 8-30
8.2.27 LEVEL OBSERVATION 8-31
8.2.28 LEVEL OFFSET 8-33
8.2.29 LEVEL STATION 8-33
8.2.30 LLH Stn 8-34
8.2.31 Local LLH 8-34
8.2.32 NOTE 8-34
8.2.33 NOTE AR - Note area calculation 8-35
8.2.34 NOTE CP - Note correction parameters 8-35
8.2.35 NOTE MD - Note multidistance observation 8-36
8.2.36 NOTE OS - Note offset observation 8-36
8.2.37 NOTE RO - Note roading 8-37
8.2.38 NOTE RS - Note resection calculation 8-37
8.2.39 NOTE SC - Note set collection 8-37
8.2.40 NOTE SS - Note road surface 8-38
8.2.41 NOTE TL - Note tolerance error 8-38
8.2.42 NOTE TP - Note topography 8-38
8.2.43 NOTE TS - Note timestamp 8-39
8.2.44 NOTE TV - Note traverse calculations 8-39
8.2.45 OBS F1 - Observation face one 8-40
8.2.46 OBS F2 - Observation face two 8-41
8.2.47 OBS MC - Observation measured and corrected 8-41
8.2.48 PARABOLIC VC - Vertical parabolic 8-42
8.2.49 POS - Coordinates 8-43
8.2.50 PROJ - Projection 8-43
8.2.51 RCHK - Road check 8-44
8.2.52 RED - Reduced measurements 8-45

8.2.53 ROAD NAME 8-47
8.2.54 RPOS - Road position 8-47
8.2.55 RSTN - Road station 8-48
8.2.56 SCALE - Scale factor 8-49
8.2.57 SET - Set of observations 8-49
8.2.58 STN - Station details 8-50
8.2.59 TEMP - Template 8-51
8.2.60 TEMP-OFS/HTDIFF - Template offset 8-52
8.2.61 TEMP-GRADE/DIST - Template grade 8-52
8.2.62 TEMP-ELEMENT - Template element 8-53
8.2.63 TEMP-SIDESLOPE - Template sideslope 8-54
8.2.64 TRGT HT - Target height 8-54
8.2.65 VERT ADJ - GPS vertical adjustment 8-55
8.2.66 VERT ALIGN - Vertical align 8-56
8.2.67 VERT POINT 8-57
8.2.68 WGS84LLH 8-57
8.2.69 XFORM 8-58
8.2.70 XSEC - Cross-section 8-59

Chapter 9 Conversion Definition Manager 9-1

9.1 Understanding the Conversion Definition Process 9-1
9.2 Reviewing the Conversion Definition Manager's Main Screen 9-3
9.3 Creating or Copying a New Conversion Definition 9-4
9.4 Editing Conversion Definitions 9-7
9.5 Defining the Conversion 9-8
9.5.1 Renaming the conversion 9-10
9.5.2 Establishing record and field properties 9-11
9.5.3 Managing and defining data records 9-14
9.6 Linking Records to Import 9-41
9.6.1 Defining an import conversion 9-42
9.7 Linking Records to Export 9-50
9.7.1 Defining the export conversion 9-51
9.8 Using Conversion Definitions 9-60

Chapter 10 Communications.. 10-1

10.1 General Information 10-1
10.1.1 Save files to a Disk or Device 10-3
10.1.2 Transfer Settings 10-3
10.2 Specific Device Transfer Information...10-4
10.2.1 SDR Devices 10-4
10.2.2 Total Stations...10-7
10.2.3 Memory Card Readers..10-9
10.3 Transmission Problems 10-12

Chapter 11 Coordinate Systems 11-1

11.1 Understanding Coordinate System Manager's Main Screen 11-2
11.1.1 Establishing the path...11-4
11.1.2 Displaying only user-defined files 11-5
11.2 Applying a Coordinate System..11-5
11.3 Creating or Copying a Transformation File...11-5
11.4 Creating or Copying a Coordinate System 11-6
11.5 Transferring a Coordinate System...11-8
11.6 Deleting a Coordinate System Definition..11-9
11.7 Editing a Coordinate System...11-10
11.7.1 Renaming a coordinate system...11-11
11.7.2 Adding transformation nodes 11-11
11.7.3 Editing a transformation node..11-14
11.7.4 Deleting a transformation node..11-16

Appendix A System Messages.. A-1

A.1 ProLINK Messages A-1
A.2 Project Messages A-2
A.3 Field Book Messages..A-3
A.4 Field Book Settings Messages..A-5
A.5 Reduction Processing Messages A-5

A.6 Import / Export Messages A-6
A.7 Conversion Manager Definition Messages A-7

Appendix B PROLINK.INI B-1

Appendix C ProLINK Calculations C-1

C.1 Types of Data C-1
C.1.1 Total Station data C-1
C.1.2 GPS/RTK data C-5
C.2 Instruments, Environmental and Job-related Corrections C-7
C.2.1 Prism constant correction (total station only) C-9
C.2.2 PPM correction (total station only) C-9
C.2.3 Face 1/Face 2 observations (total station only) C-10
C.2.4 Instrument, target and antenna height reduction C-10
C.2.5 Collimation correction (total station only) C-11
C.2.6 Orientation correction C-11
C.3 Geometric Reductions C-12
C.3.1 Curvature and refraction correction (total station only) C-13
C.3.2 Sea level correction (total station only) C-13
C.3.3 Projection correction (total station only) C-14
C.3.4 Slope reduction C-14
C.3.5 Plane curvature correction (GPS/RTK only) C-15
C.4 Coordinate Calculation C-15
C.5 Observational Calculation C-17
C.6 Rules for STN/GSTN and projection records C-17

Appendix D Working with Memory Cards D-1

D.1 Determining Card Size D-1
D.2 Using the Memory Card D-1
D.2.1 SETC/SETCII memory cards D-2
D.2.2 PowerSET memory card D-3

Appendix E Understanding Coordinate Systems..E-1

E.1 Understanding Coordinate Systems E-1
E.1.1 Ellipsoidal coordinates.. E-1
E.1.2 Rectangular coordinates E-4
E.2 Understanding Transformations E-4
E.2.1 Ellipsoid to ellipsoid transformation E-6
E.2.2 Projection transformations E-21

Glossary G-1

Figures

Figure 1: ProLINK main screen 2-4
Figure 2: Main menu items 2-5
Figure 3: Toolbar icon buttons 2-6
Figure 4: Shortcut menus 2-7
Figure 5: Error message 2-24
Figure 6: Record view options for data 5-9
Figure 7: Record view options for data with transformation 5-10
Figure 8: Record view options for GPS/RTK data 5-10
Figure 9: Record view options for GPS/RTK data with transformation 5-10
Figure 10: Examples of the point types 6-14
Figure 11: Examples of the renumbering option 6-16
Figure 12: Steps to define a conversion 9-2
Figure 13: Config showing the OBS and OBS MC measurements C-1
Figure 14: Corrections sequence C-3
Figure 15: Corrections Sequence with Transformation C-4
Figure 16: Config showing the GOBS and GPOS/POS measurements C-5
Figure 17: GPS/RTK Corrections Sequence with Transformation C-6
Figure 18: Corrections sequence C-7
Figure 19: Config where EDM and prisim are distinct. C-8
Figure 20: A diagram showing the GPS/RTK measurements. C-9
Figure 21: A reference figure for some of the reductions C-12
Figure 22: Reference ellipsoids E-2
Figure 23: Latitude and longitude E-3
Figure 24: Geoidal undulation E-4
Figure 25: Typical transformation E-5
Figure 26: Ellipsoid To Ellipsoid Transformation E-7
Figure 27: Datum Transformation with 3D transformation E-7
Figure 28: Datum Transformation without 3D transformation E-8
Figure 29: General Projections E-22
Figure 30: Lambert with two parallel projections E-23
Figure 31: Transverse Mercator Projections with varying cylinder diameters E-24
Figure 32: Oblique mercator E-27

Overview

ProLINK™

ProLINK software is your survey's link between the field and the office, facilitating the exchange of data between data collectors and various CAD and mapping software. ProLINK provides a concise approach toward editing, reducing, providing the output of a survey project, as well as providing the input for a survey to a data collector.

Survey Data

ProLINK manages survey data. ProLINK contends with data from Total Station surveys, GPS/RTK surveys or both. The raw data gathered on a variety of devices is stored, organized, edited, reduced and analyzed. The data can be manually input, imported from a wide variety of file formats, or received directly from an Electronic Total Station or from a data collector such as the SDR.

Field Books

Field books organize data. Multiple field books can be used to separate data, allowing you to apply specific parameters to individual survey jobs, and to output the data contained in field books separately — or together.

Field Book Editing

The ***Field Book Editor*** presents your data with intelligent data editing capabilities to maintain the integrity of your data. You can modify point IDs and field values, and insert and delete records. Additional functionality, such as search and replace options, enhances standard editing capabilities.

Reduction

ProLINK's reduction process adheres to the SDR Search Rules, enabling you to work with the data in a familiar structure. Additional reduction capabilities provide you the capability to recalculate station coordinates and backsight bearings or change a record's view.

Transformations

As part of the reduction process, a coordinate transformation can be applied to field books independently. The transformation parameters can be inputted or calculated directly, based on manually input coordinates or coordinates that exist within the project. The same Transformation tool can be utilized to determine horizontal and vertical calibration values for GPS/RTK projects.

Reduced Coordinates View

The results of the reduction process are presented in the ***Reduced Coordinates View*** and can be immediately exported to a variety of formats. The ***Reduced Coordinates View*** and subsequent output can be made to reflect the current, all, or a specific combination of field books. In this view, you control the results and subsequent output by excluding individual points. Displaying the coordinates in a organized list, the ***Reduced Coordinates View*** makes managing data for export easy.

Output

The output can meet a variety of specifications by employing conversion files during export. ProLINK not only offers several import and export formats, it allows you to define your own. Exports, as well as imports, can be based on the conversion files created by ProLINK's ***Conversion Definition Manager***.

Conversion Definition Manager

ProLINK's ***Conversion Definition Manager*** is a comprehensive tool to create conversion files. You can map records and fields from the external format to ProLINK records and fields, as well as from ProLINK's format to an external format. The conversions can be defined to incorporate live records, to make multiple passes through the data and to apply equations to individual field values

Communications

The importing and exporting of data is greatly enhanced with the ability to communicate with a variety of external devices. ProLINK includes communication functionality, creating one comprehensive application that organizes all of your Sokkia devices and file management needs. ProLINK allows you to import data from or export data to an external device or a common file format on your hard drive.

Project-oriented Approach

ProLINK's project-oriented approach allows you to manage field books and project related parameters, and unit settings and preferences to give you greater flexibility in organizing survey data. Projects incorporating multiple field books provide methods of selecting the pertinent data to output. The project approach facilitates file management and archives. Files are automatically saved at critical points as data is modified in the ***Field Book Editor,*** or when the project is closed. ProLINK's intuitive method of file management allows you to focus on your data.

Chapter 1 Introduction

ProLINK facilitates the exchange of data between data collectors and various software. It provides you the functionality necessary to import, convert, reduce and export a variety of data formats. Its functionality as an intelligent raw data editor for Total Station, GPS/ RTK survey data is enhanced by its capability to convert to and from a wide range of file formats.

ProLINK provides a concise approach toward editing, reducing and managing a survey project. Importing and exporting data to and from ProLINK can be customized to a variety of file formats using ProLINK's powerful ***Conversion Definition Manager.***

This reference manual is a comprehensive guide to the ProLINK program. The chapters in this manual focus on specific topics to help you locate the information you need to run ProLINK.

The chapters and appendices are summarized below.

Chapter 1, ***Introduction*****,** describes how to use this reference manual and how to access technical support.

Chapter 2, ***Basic Operations*****,** covers installation, the main screen, toolbar, menus, table management, unit formats, printing, system messages and on-line help.

Chapter 3, ***Project Management*****,** describes the use of project, files and tables, creating, saving and closing projects and other related tasks.

Chapter 4, ***Field Book Management***, describes the use of field books — creating, renaming, deleting, populating, and establishing settings.

Chapter 5, ***Field Book Editing,*** describes editing of the raw data.

Chapter 6, ***Reduction,*** explains the reduction parameters, reduction process, transformation and automatic reduction.

Chapter 7, ***Results and Output,*** covers the evaluation of results and the available output options.

Chapter 8, ***Reviewing the ProLINK Database,*** covers the SDR database and how ProLINK stores data.

Chapter 9, ***Conversion Definition Manager,*** explains how to create file conversion formats for importing and exporting ASCII data.

Chapter 10, ***Communications,*** explains how to send and receive data with various devices.

Appendix A, ***System Messages,*** describes the messages that display during the operation of ProLINK.

Appendix B, ***PROLINK.INI***, shows how to modify the PROLINK.INI file to directly establish specific settings within ProLINK.

Appendix C, ***ProLINK Calculations,*** shows the specific calculations corresponding to ProLINK's settings and preferences.

Appendix D, ***Working with Memory Cards,*** explains communication parameters that apply to working with memory cards.

The ***Glossary*** provides a comprehensive description of ProLINK terminology.

1.1 Documentation Conventions

The following conventions are used in this manual:

Keys you are to press are enclosed in angle brackets, for example **<Alt>** and **<Page Up>**. If you are to press multiple keys to initiate an action, the combination will be shown with a plus sign between the keystrokes; for example, **<Alt>** + **<F4>**.

The return or enter key is called **<Enter>**.

A menu bar selection followed by a menu selection is shown in boldface in the format **Menu bar item | Menu item**, like this example, **File | Print**.

A “dialog” is a screen that displays and requires input or verification from the user to complete a command.

A “field” is a location within a dialog or table in which values or options are viewed, entered, modified, or selected.

1.2 Using this Manual

Typefaces and icons are used in this manual as follows:

Main Menu... Indicates field, menus, and functions.

Options.......... Indicates a menu option.

Prompt .... Represents screen prompts and other information displayed on the screen.

<KEY>............ Indicates a keystroke or button that causes an immediate action. Examples: **<F1>**, **<ESC>**, **<Ctrl>**, **<Help>, <Close>**

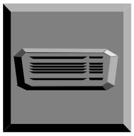
TEXT .... Represents user-typed text, numeric or special character input (always followed by one of the action keys above).

`Print`............. Represents reports or output to a printer.

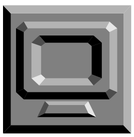
⌧ Indicates that adjoining text explains previous text.

Icons

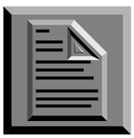
The following icons may be used in this manual.



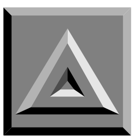
Indicates that adjoining text is to be typed by the user.



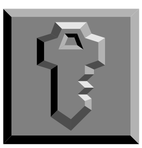
Indicates that adjoining information is displayed on the computer screen.



Indicates that adjoining text is either a printed report or text from a disk file.



Indicates important information or warning information concerning adjoining text.



Indicates a shortcut key can be used for the corresponding action.

1.3 How to Get Technical Support

Technical support for this product is available from the distributor where you purchased it. You also may contact the appropriate Sokkia subsidiaries listed below. Sokkia Technology, Inc., welcomes written communication regarding its products; use the address on the back.

Canada
Sokkia Corp.
1050 Stacey Court
Mississauga, Ontario
L4W 2X8
Phone +1-905-238-5810
Fax +1-905-238-9383
Web www.sokkia.com

Australia
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Fax +27-12-663-7998
Web www.sokkia.com/Worldwide/
sg.htm

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Sokkia Central & South America
1200 N.W. 78 Avenue
Suite 109
Miami, FL
USA 33126
Phone +1-305-599-4701
Fax +1-305-599-4703
Web www.sokkia.com/Worldwide/
sa.htm

Chapter 2 Basic Operations

This chapter provides information on the fundamentals of working with ProLINK including installing, entering and exiting the program, using tree structures, and printing.

2.1 Hardware and Software Requirements

The following table lists the requirements for the minimum and maximum system configurations.

	Minimum Configuration
Computer	Windows 95®, Windows 2000®, Windows NT®-compatible computer
Memory	16 Mb of RAM
Operating Systems	Microsoft Windows 95 or higher; Windows NT Service Pack 4 or higher
Hard Disk	One hard drive with 15 Mb of available space
Display	VGA monitor and VGA adapter card
Ports	One serial port, one parallel
Security Device	One Sokkia security device with appropriate activation code

	Recommended Configuration
Computer	Intel Pentium®-class processor
Memory	24 Mb of RAM
Operating Systems	Microsoft Windows 95 or higher; Windows NT Service Pack 4 or higher
Hard Disk	One hard drive with 15 Mb of available space
Display	SVGA monitor and SVGA adapter card
Ports	One serial port, two parallel port
Security Device	One Sokkia security device with appropriate actication code

☒ **Note**: Without the Sokkia security device, ProLINK will run with limited functionality and will be described as ProLINK COMMS.

2.2 Installing ProLINK

You must use the **SETUP** program to install ProLINK programs correctly. Simply copying files from your original CD will not properly configure your programs. **SETUP** will copy only the appropriate files to your hard disk and optimize all programs for your system.

Steps to run the SETUP program:

1. Insert the Sokkia Complete Product CD in the appropriate drive.
2. The ***Main Menu*** screen should automatically appear (if it doesn't, select **Start | Run** from the desktop).
3. Select **Install ProLINK** from the ***Main Menu*** screen. ProLINK will install itself on your machine.

☒ **Note:** A file named README.TXT may be among the files copied. Be sure to read this file if available. It contains information about ProLINK that was not included in this manual at the time of print.

2.3 ProLINK vs. ProLINK COMMS

ProLINK is an application with full functionality that links your survey field data to your office. You can manage data by archiving files, populating a field book, editing, and reducing and exporting raw data or results to an external file format or device. ProLINK software requires a properly activated hardware security device.

ProLINK COMMS provides limited access to functionality in your ProLINK software; no hardware security device is required. If you run your ProLINK software without a hardware security device, ProLINK COMMS will open. Functionality will be limited to the following:

- archive your data from devices
- import data to a single field book
- edit data values
- edit job setting options
- select unit settings
- export raw data

You can determine which program is running by verifying the software name in the following locations:

- title bar of the application
- initial splash screen when loading the application
- the ***Help About*** dialog accessed from the **Help** menu

☒ **Note:** When opening ProLINK, and the port containing the hardware security device is busy, you may open ProLINK COMMS.

☒ **Note**: This manual discusses the ProLINK functionality. For specific ProLINK COMMS options, refer to Section 2.4.1, *Navigating the ProLINK menu structure*, page 2-5.

2.4 Learning the Main Screen

The main screen, as seen in Figure 1, consists of six parts:

- **Title bar** — displays the name of the program, **ProLINK**, and the name of the current project.
- **Menu bar** — displays menu titles which represent categories of programs options.

- **Toolbar —** displays icons that represent commonly-used commands.
- **Field Book Editor —** provides access to raw data for reviewing and editing.
- **Reduced Coordinate View —** (*ProLINK only*) displays a list of the reduced coordinates from the selected field books.
- **Status bar —** displays the status of a current program operation and additional information about selected menu items.

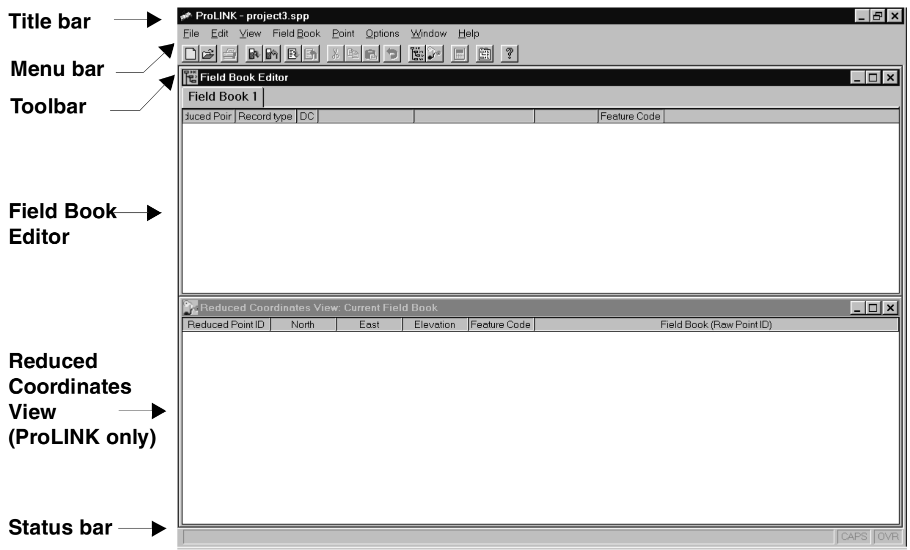


Figure 1: ProLINK main screen

2.4.1 Navigating the ProLINK menu structure

The ProLINK menu structure is organized as shown in this table. The menu titles are shown in bold. Below the menu titles are the items available from each pull-down menu.

File	**Edit**	**View**	**Field Book**	**Point**	**Options**	**Window**	**Help**
New Project Open Project Reopen Project Close Project	**Undo**	Field Book Editor **Reduced Coordinates**	New Field Book Rename Field Book Remove Field Book	**Include in output** **Exclude from output** **Show Excluded Points**	**Unit Settings** **Preferences**	Cascade Tile Horizontal Tile Vertical Arrange Icons Close All	Contents Search for Help On How to Use Help
Rename/Move Current Project Make Snapshot Copy Abandon Changes Update Backup	**Cut** **Copy** **Paste**		Reduce		**Conversion Definition Manager** **Coordinate Systems Manager**		About ProLINK
Send/Receive	**Insert Record** **Delete Record**		Field Book Settings				
Import Export	**Search** **Replace**		Field Book Usage				
Print Print Setup	Expand Collapse						
Exit							

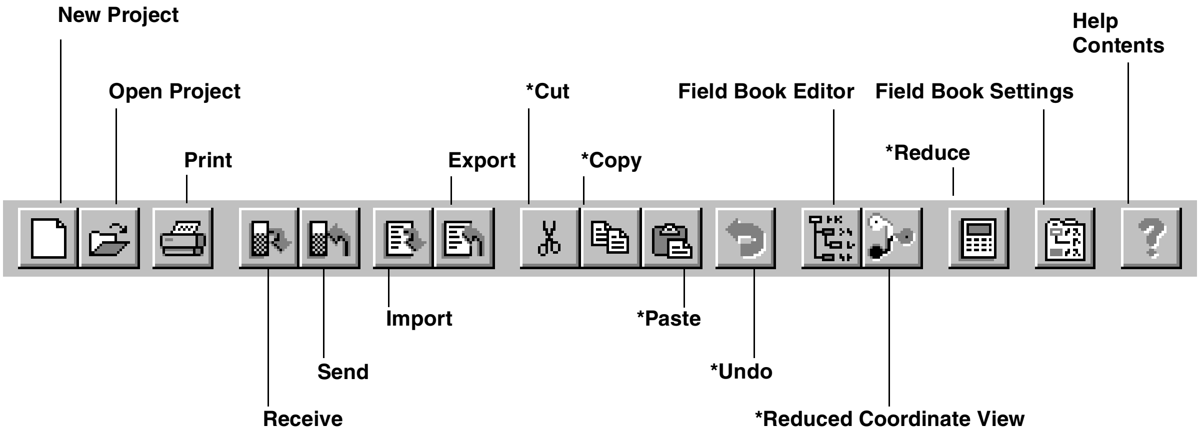
Bold items are not available in ProLINK COMMS.

Figure 2: Main menu items

Note: When some menu items are grayed out, it may mean you are running ProLINK COMMS, in which the functionality is not available, or it may mean you cannot select items because a requirement has not been met.

2.4.2 Using the toolbar

The icons on the toolbar represent commands that will initiate an immediate action.



*These options are not available in ProLINK COMMS.

Figure 3: Toolbar icon buttons

2.4.3 Using shortcut menus

When you position the cursor over the ***Field Book Editor*** or the ***Reduced Coordinate View*** and press the right mouse button, a shortcut menu displays. The shortcut menu provides commands specific to each dialog box.

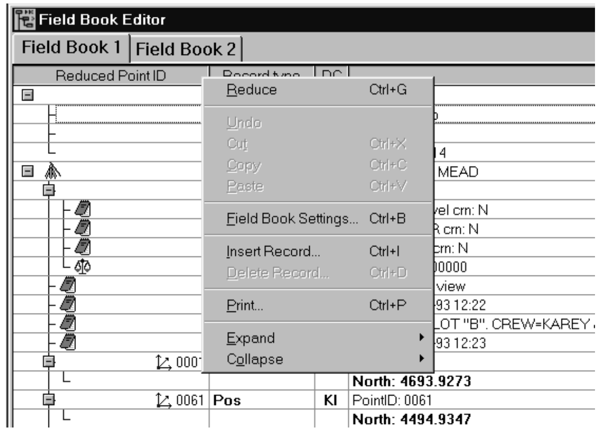
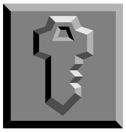


Figure 4: Shortcut menus

2.4.4 Shortcut keys



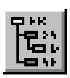
Some functions have shortcut keys, **<Ctrl>** + **<*a letter*>**, assigned to them. The shortcut keystrokes are listed next to the function on every menu. The available shortcut keys are as follows:

<Ctrl> + <N> ..... Open New Project	**<Ctrl> + <A>**......Select All
<Ctrl> + <O> ..... Open Existing Project	***<Ctrl> + <I>** .... Insert Record
<**Ctrl**> + <**W**> .... Close project	*<**Ctrl**> + <**D**>... Delete Record
<Ctrl> + <P> ...... Print	***<Ctrl> + <S>**.... Search
<Ctrl> + <Z>...... Undo	***<Ctrl> + <R>** ... Replace
***<Ctrl> + <X>** .... Cut	***<Ctrl> + <F>**.... New Field Book
***<Ctrl> + <C>**.... Copy	***<Ctrl> + <G>**... Process/Reduce
***<Ctrl> + <V>**.... Paste	**<Ctrl> + <B>** ..... Field Book Settings

*** These options are not available in ProLINK COMMS**

2.5 Accessing Views

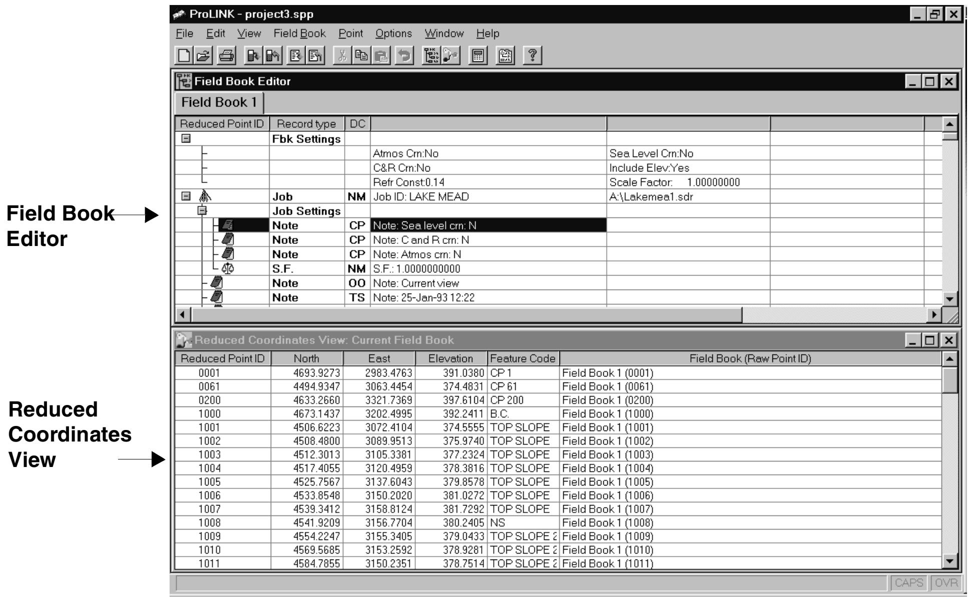
ProLINK provides access to two project data views:



- **Field Book Editor —** provides access to raw data for reviewing and editing.

- **Reduced Coordinate View —** *(ProLINK only)* displays a list of the reduced coordinates from the selected field book(s).

The views automatically display when you create a project. You can close a view by using its window controls in the title bar. To display a view you can select the view option from the **View** menu, or you can select the corresponding icon from the toolbar.



2.6 Navigating the *Field Book Editor's* Tree Structure

ProLINK uses tree structures to display, edit and process data as seen in the *Field Book Editor*.

2.6.1 Moving around a tree structure

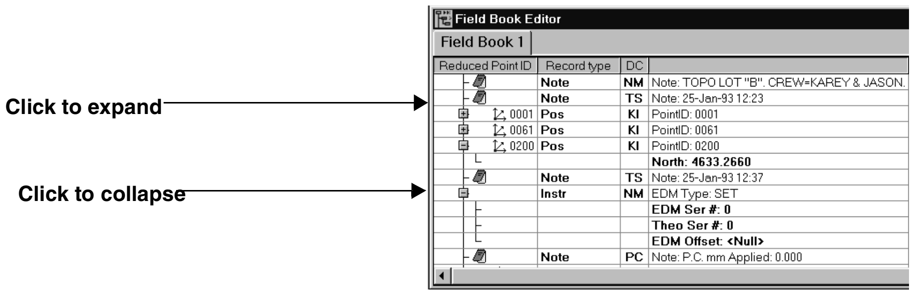
You can move the cursor from cell to cell in the tree, using the following methods:

- the <←>, <→>, <↑> or <↓> keys
- **<Tab>** — moves one cell forward
- **<Shift>** + **<Tab>** — moves one cell backward
- clicking on cells with the mouse

2.6.2 Expanding and collapsing records

The tree structure used in the ***Field Book Editor*** denotes hierarchical relationships between files, records and details. Each item is depicted as a node on a tree.

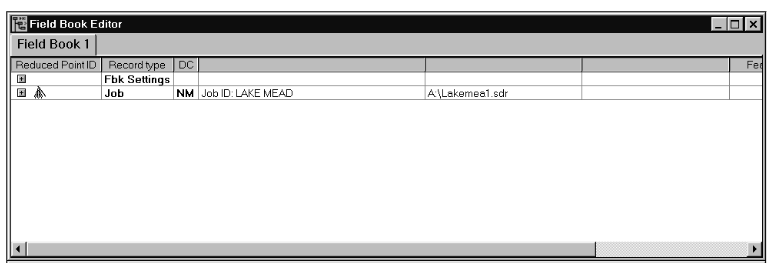
Click the "-" and "+" to expand or collapse a node.



You can also expand or collapse the tree structure using options from the **Edit** menu or shortcut menu.

2.6.2.1 Collapsing records

Expanded records can be collapsed by clicking the "-" sign next to the record's name or symbol, or by selecting **Edit | Collapse Branch**. All records in the database can be collapsed completely by selecting **Edit | Collapse All**.



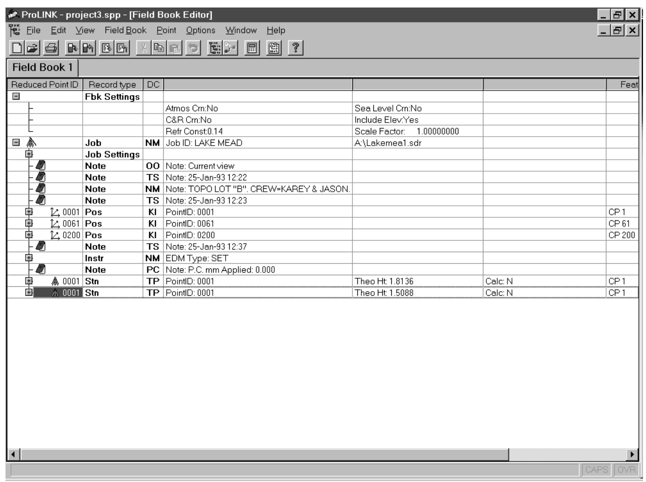
2.6.2.2 Expanding records

Collapsed records can be expanded by clicking the "+" sign next to the record's name or symbol. ProLINK also has three commands in the **Edit** menu or shortcut menu to expand nodes:

- Expand Level
- Expand Branch
- Expand All

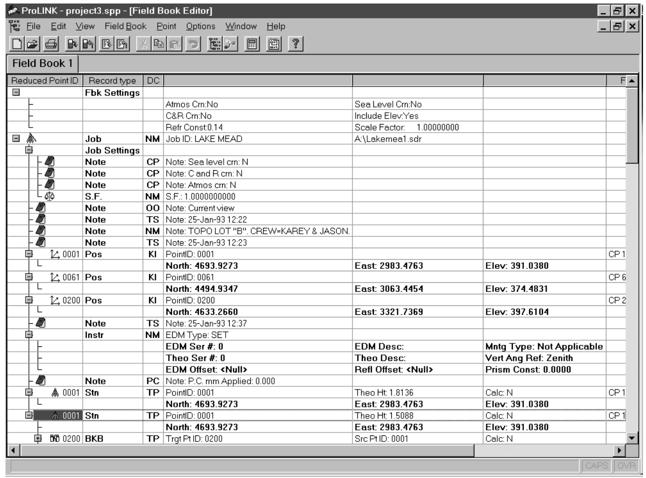
2.6.2.3 Expanding a level

Expanding a level displays the details below the selected node without expanding the lower level nodes.



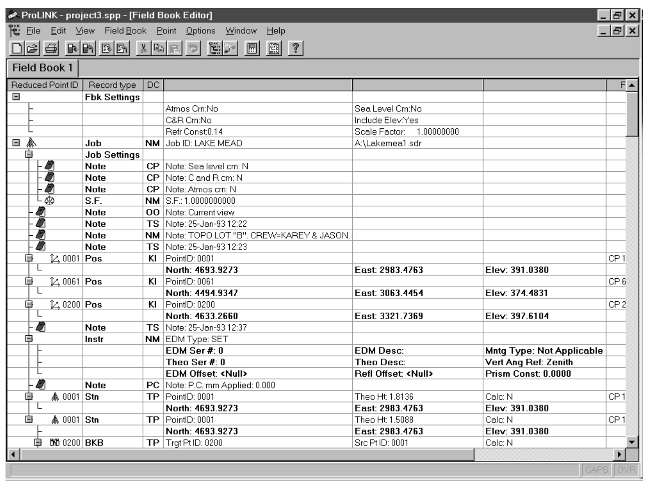
Expanding a branch

Expanding a branch displays the details below the selected node including the lower-level nodes in an expanded state.



Expanding all records in the database

The *Expand All* command expands all records in the database to their lowest levels.



2.6.3 Accessing edit fields

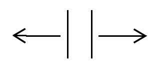
Each cell within a table is a data field. Some fields only display processed information. You cannot access or modify these fields. Other fields can be edited. You can access an editable field by double clicking on it (the cursor will display in the cell), or by placing your cursor in the cell and using <**Enter**> to toggle in and out of edit mode.

2.6.4 Sizing columns

You can adjust the width of each column to display longer texts within a cell, or shorten the width to display more cells. The adjusted widths are maintained within the project.

Steps to adjust column width

1. Place your cursor on the line separating the column. The cursor will change to the following shape:

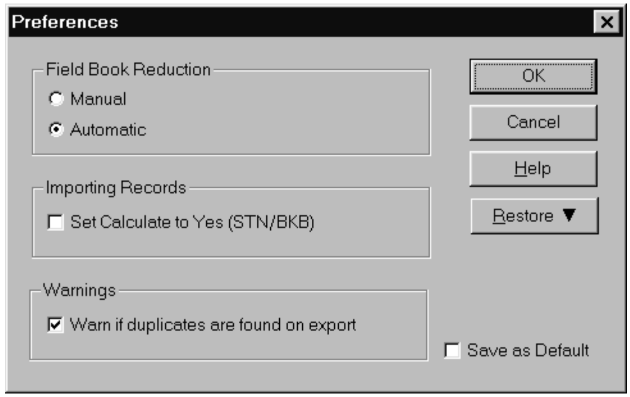


2. Press the left mouse button and drag the border in the direction you want to resize.

☒ **Note:** Resizing one column does not add or subtract from the widths of other columns.

2.7 Determining Preferences

By selecting the **Preferences** option through the ***Option*** menu, you can determine user preferences. The preferences apply to the current project. These settings control how and when the field books are processed, how station records are handled upon importing a file into a field book, and if a warning is provided if duplicates are found during export procedures.



The settings apply to the following areas:

- Reduction mode
- Station records
- Warning for export

You can establish the settings as defaults for future projects as they are created by selecting the ***Save As Default*** check box. The settings will automatically display in subsequent uses of the ***Preferences*** dialog. If you later change the settings, you can easily restore the former defaults by clicking the **<Restore>** button. The following defaults are available:

- **Saved Defaults**. This option will populate ***Preferences*** with the previously saved field selections.

⌧ Note: Changing preferences will not change prior projects. The defaults will be applied to all subsequent created projects.

- **Factory Defaults**. This option will populate ***Preferences*** with the field selections that were preset prior to installation.

2.7.1 Field book reduction mode

You can reduce field book data automatically or manually. For more information on reducing, see Section 6.1.1, *Reduction mode*, page 6-2.

Automatic ..... The field book data is automatically reduced each time data changes and the reduced results are invalid.

Manual .... The field book data is reduced only when you select **Field Book | Reduce**.

2.7.2 Import records

Select the ***Set Calculate to Yes*** check box to set the calculate option in a station record and the subsequent back bearing record to Yes upon import. With this option selected, ProLINK will use previous data about the station point and the back bearing point to calculate new coordinates and back bearing azimuths for all station setups. For more information, Section 5.2.5, *Calculate station*, page 5-8.

2.7.3 Export duplicate point conflict

You can export the results displayed in the ***Reduced Coordinates View*** to a format that can be recognized by a separate program. Some destination software will not accept duplicate point IDs. You can choose to be warned of duplicate point conflicts when exporting by selecting the ***Warn if duplicates found on export*** check box.

2.8 Defining Unit Formats

Determine unit formats for values that ProLINK displays and outputs in the ***Unit Settings*** dialog. You can define settings for the following units:

Unit Measurement/Display	Found on this Tab
Antenna/ Target height	General
Coordinate order	General
Temperature	General

Unit Measurement/Display	Found on this Tab
Distance	General
Pressure	General
Angle units and display format	Angle
Latitude and Longitude display format	Latitude/Longitude
Latitude and Longitude direction symbols	Latitude/Longitude
Orientation by azimuth or by quad bearing	Orientation
Azimuth units and display format	Orientation
Stationing	Roading
Grades	Roading

Note: Date and time formats used in ProLINK are defined in Window's International settings found in the ***Control Panel*** (see *Microsoft Window's User Guide*).

Steps to define units

1. Select **Options | Unit Settings** from the menu bar.

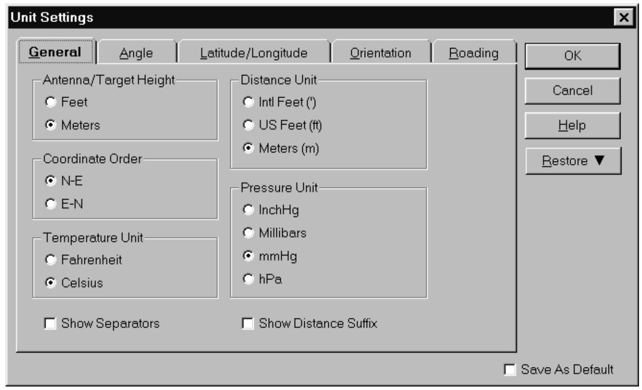
2. Choose the appropriate options from the tabs at the top of the ***Unit Settings*** dialog.

3. Choose the field settings by selecting the buttons next to the unit measurement. If a button is grayed out, it cannot be selected.

4. When settings have been determined, click on **<OK>**.

2.8.1 General settings

The General tab accommodates basic unit measurements, and the display of comma separators and units (distance suffix)



Antenna/Target Height .... The antenna and target height is set separately from other distance units.

Distance Unit................ The units are set for all other distances.

Coordinate Order.......... This field sets the display order for coordinates.

Pressure Units .... This field sets the display units for air pressure measurements.

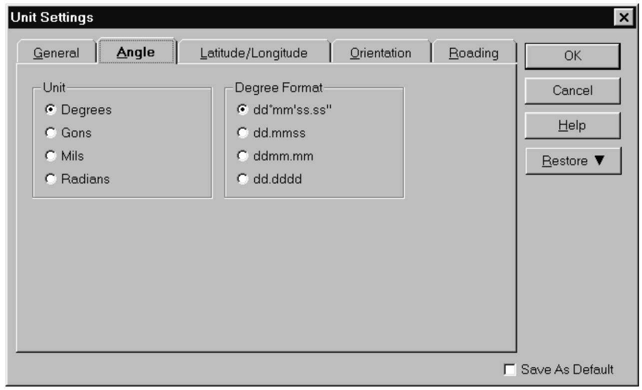
Temperature Unit.......... This field sets the display units for air temperature measurements.

Show Separators .... Commas are inserted to indicate thousands in displayed numbers.

Show Distance Suffix .. To display the unit measurement after a value, select the ***Show Distance Suffix*** check box.

2.8.2 Angle units

The Angle Units tab allows angular values to be adjusted.

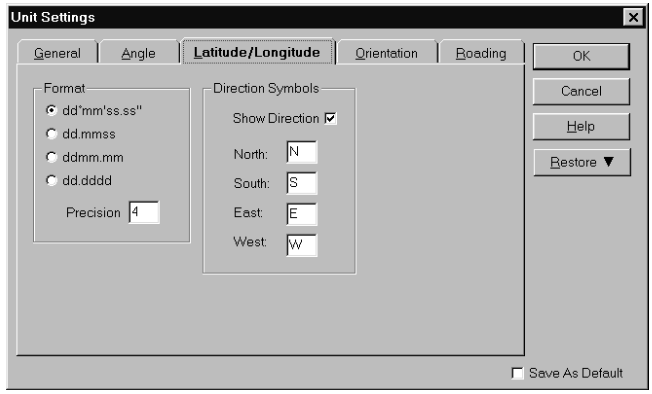


Unit.......................... The unit options set the angular values.

Degree format......... The available options determine the display format, if degrees are selected in the ***Unit*** field.

2.8.3 Latitude and Longitude

Latitude and longitude are always displayed in degrees. The Latitude/Longitude tab allows you to determine the display format of the units, exhibit direction, and select a symbol to represent direction.



Format .... The options set the display format for latitude and longitude.

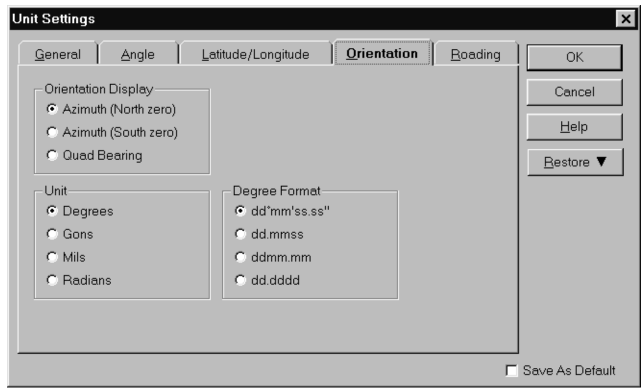
Precision .... This field indicates the number of digits allowed behind the decimal place.

Show Direction ...... Select this check box to display a ***Direction Symbol*** in ProLINK values.

Direction Symbol .. This field determines what symbols are used to display direction if the ***Show Direction*** field is selected.

2.8.4 Orientation

The horizontal orientation may be set to one of two options: azimuth or quad bearing. Quad bearing units default to degrees, but azimuth units may be user-defined.



Orientation............. These fields determine the option for horizontal orientation:

Azimuth (North zero) **—** This option determines the horizontal clockwise measurement of an angle, using north as zero.

Azimuth (South zero) **—** This option determines the horizontal clockwise measurement of an angle, using south as zero.

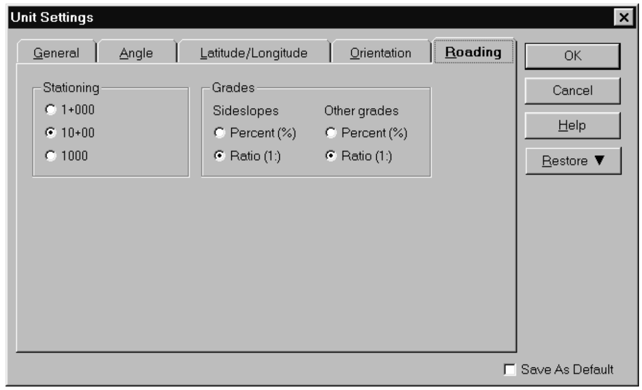
Quad Bearing **—** This option determines the horizontal measurement of a direction, using north or south as zero and the angle away from as east or west; for example, N20E.

Unit.......................... The available options set the unit measurement if azimuth is chosen for orientation.

Degree format......... This field sets the display format for degrees if applicable.

2.8.5 Roading

You may set the ***Stationing*** and ***Grades*** to a variety of units. Sideslopes and other grades may be viewed in different values.



Stationing............... this allows you to define the units you wish to display.

There are three options:

1+000 - thousands + hundreds of feet

10+00 - hundreds + tens of feet

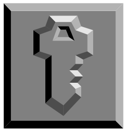
1000 - thousands of feet

Grades..................... this allows you to specify percent “%” or ratio “1:” for sideslopes and other grades.

2.9 Printing

ProLINK can print the ***Field Book Editor*** and the ***Reduced Coordinate View***.

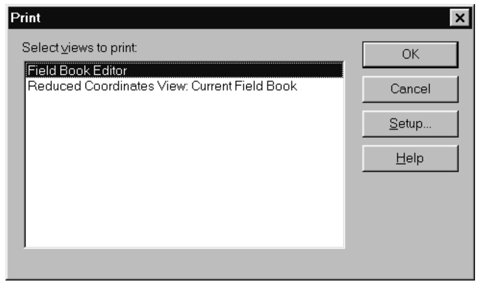
☒ **Note:** To print a specific item, it must be displayed on the screen.



<Ctrl>+<P>
Print

Steps to printing

1. Select **File | Print** from the menu bar.
2. Highlight the item(s) to print in the **Print** screen. To select more than one item, hold down **<Ctrl>** while selecting item with the mouse.



3. Click **<OK>**.
4. Each selected item will print in succession.

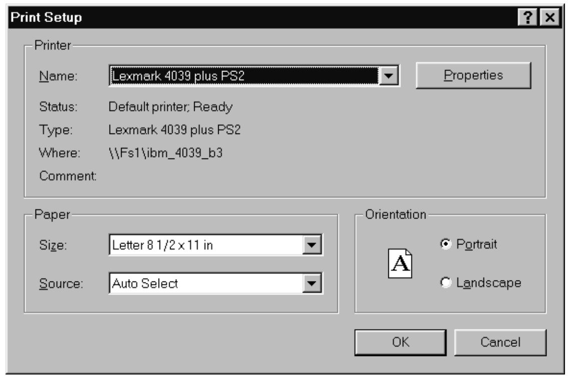
⌧ **Note:** If printing to a parallel port, ProLINK may try to access the port containing the hardware security device. If the port is busy when ProLINK tries to accesses the security device, the following message will display:

If you press **<Stop>**, ProLINK will close.

2.9.1 Setting up printing parameters

ProLINK accepts the defaults set in the **Printers** dialog box from the Window's ***Control Panel***. To override the defaults follow these steps:

1. Select **File | Printer Setup** from the menu bar.



2. Determine the settings for the following fields:

Printer .... Select the default printer or select a specific printer from the pull-down menu.

Orientation............. Select **Portrait** (short-side at top of page) or **Landscape** (long-side at top of page).

Paper Size............... Select the appropriate paper size from the pull-down menu.

Paper Source........... Select the correct paper source from the pull-down menu.

3. More settings can be defined by clicking on the **<Options>** button in the ***Printer Setup*** dialog box.

4. When all appropriate settings have been defined, click **<OK>**.

2.10 Understanding System Messages

If there is a problem with an option you are trying to execute, the program will display a system message as shown in Figure 5:

Figure 5: Error message

For information about what to do when you get a specific message, see Appendix A *System Messages* or the on-line **Help** system.

2.11 Accessing On-Line Help

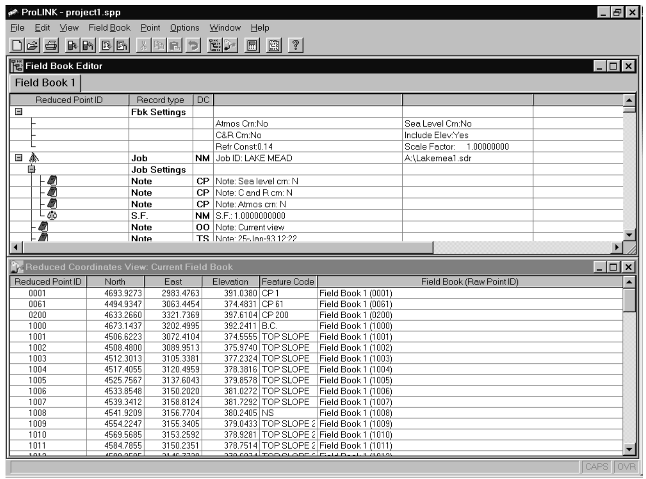
You can get on-line information for many of the operations you perform using ProLINK. Use the **Help** feature to complete your tasks without having to look further than the computer screen.

You can access **Help** in four ways:

- The **Help** icon on the toolbar
- The **Help** menu
- The **<F1>** key
- The **<Help>** button available on most dialog boxes and message windows.

Chapter 3 Project Management

ProLINK relies on projects to store and manage data associated with those files. Projects also store user-defined and project-related parameters, such as preferences and unit settings.



The data housed in a project is displayed and accessed in two views:

Field Book Editor .... The *Field Book Editor* provides access to raw data for reviewing and editing. The data can be organized into separate field books.

Reduced Coordinates View .... The *Reduced Coordinates View* displays a list of the reduced coordinates results from the selected field books.

You can manage projects in the following ways:

- Create a project
- Open a project
- Copy a project
- Rename or move a project
- Update the project's backup file
- Close with or without saving changes

Most project and project file options can be found in the **File** menu.

3.1 Creating a New Project

Projects are created by selecting **File | New Project** from the menu bar, or corresponding button on the toolbar. Once created, the project name displays in the ProLINK title bar.

A default name and extension is provided (Project 1.SPP). The number at the end of the name automatically increments as new projects are created. You can enter a different name; however, all projects have an *.SPP extension.

☒ **Note:** When a project is created, the ***Field Book Editor*** displays an empty field book that is ready to be populated with data. You can opt to rename the empty field book and/or to add field books to the project. For more information on Field Books, see Chapter 4 *Field Book Management*.

Once a project is established, you manage raw data by establishing field books to organize your data. You also specify the data files which will populate the field book(s). The files may be imported from a local drive or added to the current field book when files are transferred from an external device.

Project Files/Directories

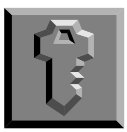
A project is comprised of two components as seen in the appropriate directory containing the project:

- A project file (Project1.SPP) — opens the project

- A project directory (Project1.dir) — contains project-related settings, such as the state of the project, the applied coordinate system and unit settings

Both components must exist in the same directory and have the same base name to reopen the file at a later time. ProLINK automatically places the components in the same directory when a project is created.

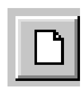
Note: If file management is performed outside of ProLINK, such as in Windows Explorer, both components must be considered.



<**Ctrl**>+<**N**>
Open New
Project

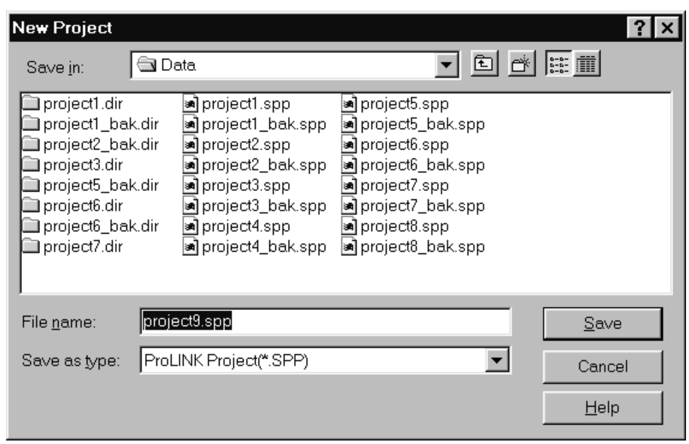
Steps to create a new project

1. Select **File | New Project** from the Menu bar, or click the <***New Project***> button on the toolbar.



New Project button

2. Accept the default or enter a project name and location in the ***New Project*** dialog.

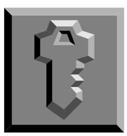


3. Click **<Save>**. Creation of a new project automatically displays the ***Field Book Editor.*** The Editor contains an empty field book with the default name **Field Book 1**. For information, see Chapter 4 *Field Book Management*.

3.2 Opening an Existing Project

Select **File | Open Project** from the menu bar to open an existing file. You can also open an existing project by selecting **File | Reopen Project** from the menu bar. The reopen option provides a list of the last ten projects accessed and allows you to select one of the projects from this list to open.

Note: When opening a project, a backup file (*.BAK) is automatically created or updated.



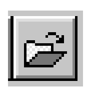
<Ctrl>+<O>
Open Project

Steps to open an existing project

1. Select **File | Reopen** from menu bar to select and open a project from a list of the last ten projects opened.

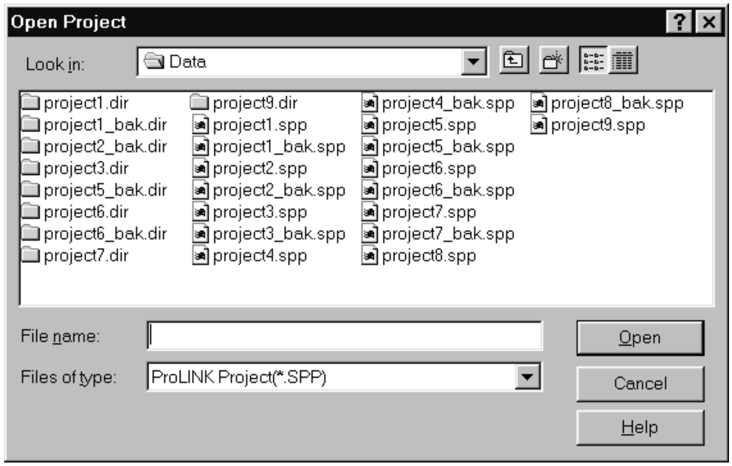
   — Or —

   Select **File | Open Project** from the menu bar, or use the Open button on the toolbar.



Open Project button

2. Identify the project to be opened in the ***Open Project*** dialog.



To select a project, click on the appropriately named project (*.SPP), or type the project name in the ***File Name*** field.

3. Click on **<Open>** or double-click on the highlighted selection. When the project opens, it will display the last saved views

3.3 Saving a Project

A project is automatically saved with the *.SPP extension when its closed or exited. Any modifications made to an open project will be saved when you close that project, or exit ProLINK. Additionally, ProLINK saves a project automatically at the following times:

- when edits are performed
- after reduction
- after a project has been modified
- when making a snapshot copy
- when renaming a project
- when the project is closed
- when the program has been inactive for 15 seconds

⌧ **Note:** To change the Auto Update Delta, see Appendix B *PROLINK.INI*.

You can ignore the automatically saved file and choose to return to the state of the project as defined by the backup file. Simply select **File | Abandon Changes** from the menu bar.

⌧ **Note:** The backup file (*.BAK) is unaffected by the periodic, automatic saves. To update the backup file (*BAK) with the current version of the project (*SPP), select **File | Update Backup** from the menu bar. For more information, see 3.4 *Updating a Project's Backup File*.

3.4 Updating a Project's Backup File

ProLINK maintains a backup file (*.BAK) of the current project. This backup file overrides the project file if you choose to abandon changes when closing (see Section 3.7, *Closing an Open Project*, page 3-10). The backup file is created or updated when you open an existing project or when you select **File | Update Backup** from the menu bar.

Before you open a project, two versions exist: the *.SPP and a backup file (*.BAK). When you open an existing project, the *.SPP file is copied to a file with the same name and a *.BAK extension. Backup files automatically update when you open an existing project.

You can manually update the backup file while working in the project to create a new benchmark that can be used if the **Abandon Changes** option is selected. To manually update the backup, select **File | Update Backup** from the menu bar. If a new project is displayed, selecting **Update Backup** will create a new backup file.

3.5 Making a Snapshot Copy

ProLINK can make a “snapshot” copy of the current project. When a snapshot copy is made, you remain in the original project while the copy is stored as a separate file. Any changes made to the original project after copying does not affect the copied project.

The copied project is given a new name and is stored in a user-defined location. The default file name is the original file name with a new three digit numeric identifier appended before the *.SPP extension; for example, Project1_001.SPP. This numeric identifier is incremented by one each time a another snapshot is made.

Project Files/Directories

A project is comprised of two components seen in the appropriate directory containing the project:

- A project file (Project1_001.SPP) — opens the project
- A project directory (Project1_001.dir) — contains project-related settings, such as the state of the project, the applied coordinate system and unit settings

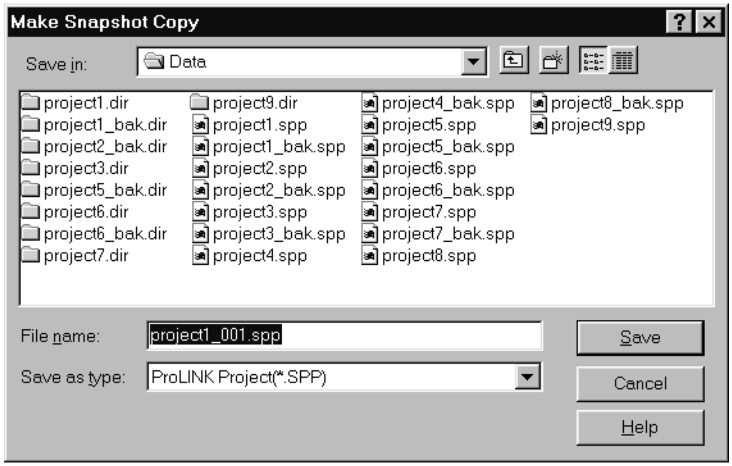
Both components must exist in the same directory and have the same base name to reopen the file at a later time. ProLINK automatically places the components in the same directory when a snapshot copy is made.

☒ **Note:** To display ProLINK projects, the project must have an *.SPP extension.

Steps to copy the project

1. Select **File | Make Snapshot Copy** from the menu bar.

2. Accept the default or enter a project name and location in the ***Make Snapshot Copy*** dialog.



3. Complete the snapshot copying task by clicking on **<Save>**.

3.6 Renaming or Moving a Project

The current project can be assigned a new name or moved to a new location by selecting **File | Rename/Move Current Project** from the menu bar. A project must be open to perform these tasks. When renaming a project, the *.SPP extension should be retained for ProLINK to easily identify the file.

Project Files/Directories

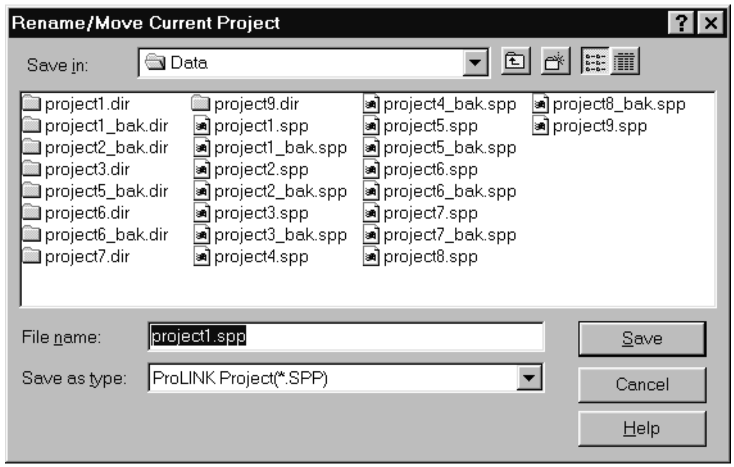
A project is comprised of two components as seen in the appropriate directory containing the project:

- A project file (Project1.SPP) — used to open the project
- A project directory (Project1.dir) — containing project-related settings, such as the state of the project, the applied coordinate system and unit settings

Both components must exist in the same directory and have the same base name to reopen the file at a later time. ProLINK automatically places the components in the same directory when moving. The program automatically renames both the file and the corresponding directory when the project is renamed.

Steps to rename or move a project

1. Select **File | Rename/Move Current Project** from the menu bar. The ***Rename/Move Project*** dialog is displayed.



2. **Renaming —** Enter a new name in the File Name field. Retain the *.SPP extension.

   Moving —Choose a new location. ProLINK displays the last directory location you accessed.

☒ **Note:** The project's subdirectory will be renamed and/or moved in addition to the *.SPP file.

3. Click on <**Save**>.

3.7 Closing an Open Project

An open project can be closed three ways:

- Close and save changes to the project (**File | Close**)
- Close and save changes to the project while opening or creating another project (**File | Open** or **File | New**)
- Close without saving changes (**File | Abandon Changes**)

Note: Closing the view of the project does not close the project. If the project name shows in the title bar, the project is still open.

Steps to close the current project and save changes

1. From the ***File*** menu, click **Close**.

2. The project closes, saving all changes made during your work session.

Steps to access another project and save the changes to the current project

1. Select **File | Open project** or **New project** from the menu bar, or use the corresponding icons.

2. The current project remains open until the action to access another project is complete.

3. As the new file opens, the current file is closed with all changes saved.

Steps to close the current project without saving changes:

1. Select **File | Abandon Changes** from the menu bar.

2. At the warning prompt, select **<Yes>** to close without saving changes. To cancel this action, select **<No>**.

3. The project closes and reverts to the *.BAK file. For more information, see Section 3.4, *Updating a Project's Backup File*, page 3-6.

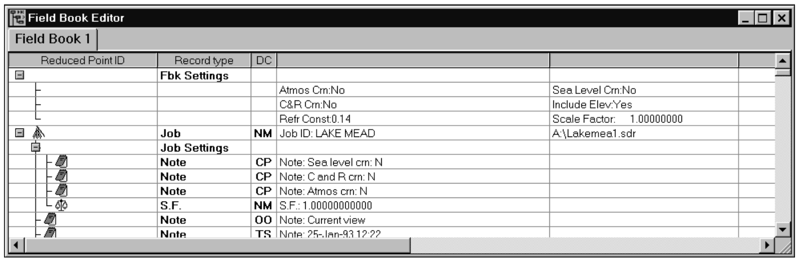
3.8 Exiting ProLINK

You can exit ProLINK by selecting **File | Exit** from the menu bar. If a project is open when this option is selected, it automatically will be saved before exiting the program.

✉ **Note:** To exit without saving, select **File | Abandon Changes** from the menu bar before exiting.

Chapter 4 Field Book Management

A field book is a repository where raw survey data is stored, organized, edited, processed and analyzed. A project's field books are viewed and maintained as individual tabbed pages within the ***Field Book Editor***.



The raw data is assembled, modified, and reduced in each field book. ProLINK provides an intelligent data editor that inserts, modifies and deletes records. For more information, see Chapter 5 *Field Book Editing*.

Using field books, you can tailor a ProLINK project to correspond to your work needs. A field book can represent an entire survey or any portion of one, depending on the imported raw data files. You can import an individual file or combination of files into a single field book, or multiple field books. Reduction parameters are assigned to individual field books within the ***Field Book Settings*** dialog. For example, you can apply different coordinate transformations to separate field books.

You can view the results of the reduction process in the ***Reduced Coordinates View***. The results can be exported to a variety of file formats to be used with popular mapping and design software. For more information, see Section 7.2, *Generating Output*, page 7-8.

You can manage field books in the following ways:

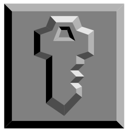
- Create a field book
- Make a field book current
- Rename a field book
- Delete a field book
- Populate a field book
- Determine ***Field Book Settings***

Most of the options for working with field books and field book files can be found in the ***Field Book*** menu.

4.1 Creating a New Field Book

Field books can be created by selecting **Field Book | New Field Book** from the menu bar. The new field book displays as a tab in the ***Field Book Editor***. It is resident only to the current project.

☒ **Note:** When a new project is created, the ***Field Book Editor*** displays and is populated with an empty field book with the default name "Field Book 1." You can change the name of this field book. For information, see Section 4.3, *Renaming a Field Book*, page 4-4.



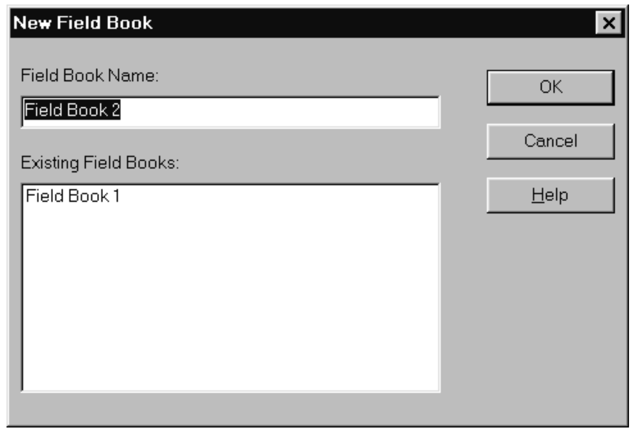
<**Ctrl**>+<**F**>

New Field Book

Steps to create a new field book

1. Select **Field Book | New Field Book** from the menu bar.

2. A default field book name is automatically incremented to the next number. Accept the default or enter a field book name in the ***New Field Book*** dialog.



3. Click **<OK>**. The field book is displayed as a tab in the ***Field Book Editor***.

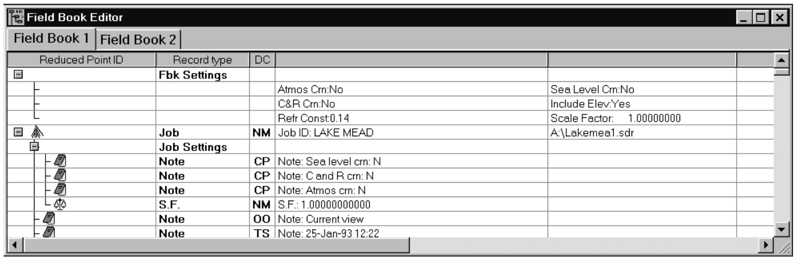
4.2 Making a Field Book Current

Several operations, including renaming and deleting field books, and importing and editing raw data, require identifying a field book as the “current” field book. The current field book is the tab displaying in the foreground of the ***Field Book Editor***. It also displays in the ***Field Book*** menu with a checkmark.

Steps to change current field book

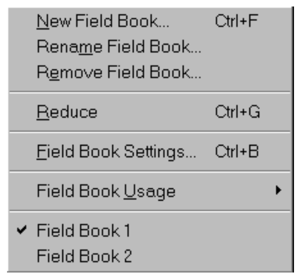
To make a field book current, click on the tab at the top of the ***Field Book Editor***.

Use mouse to select tab to make current



Alternatively, you can select a field book from the list that displays at the bottom of the ***Field Book*** menu.

Select from the list in the Field Book menu to make current



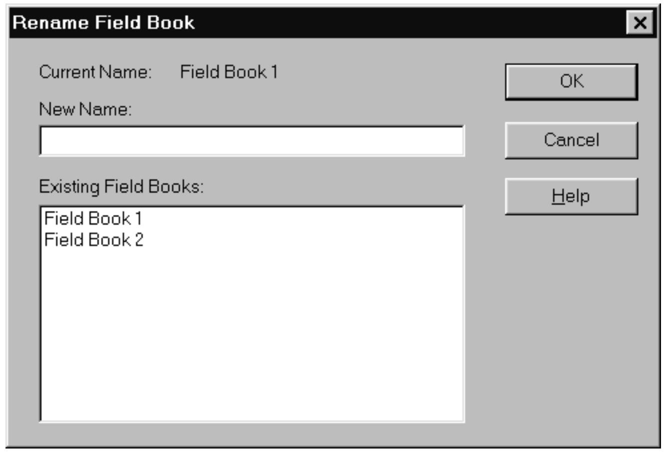
4.3 Renaming a Field Book

A field book can be assigned a new name. When renaming a field book, the field book must be current in the ***Field Book Editor***.

Steps to rename a field book

1. Rename the field book as current (see Section 4.2, *Making a Field Book Current*, page 4-3).

2. Select **Field Book | Rename Field Book** from the menu bar. The ***Rename Field Book*** dialog displays.



The existing field book names within the current project are listed. Select a name from the list to populate the ***New Name*** field. You can modify the name in this field.

Note: Field book names cannot be duplicated within a project.

3. Enter the new name of the field book in the ***New Name*** field.

4. Click **<OK>**. The name of the currently displayed field book will change automatically.

4.4 Removing a Field Book

You can remove individual field books from ProLINK. You can only remove a current field book. The associated data will be removed from the project, but the raw data files will not be deleted from your local drive. The field book settings contained within the field book will be removed from the project.

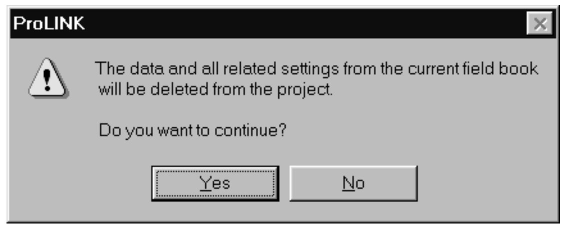
Steps to remove a field book:

1. Make the field book to be deleted current (see Section 4.2, *Making a Field Book Current*, page 4-3).

2. Select **Field Book | Remove Field Book** from the menu bar.

3. Select <**Yes**> to delete the field book.

When this option is selected, a warning message is displayed:



If **<Yes>** is selected, the field book is removed from the project and the ***Field Book Editor*** is displayed. If **<No>** is selected, the field book will not be removed.

4.5 Populating Field Books with Files

ProLINK relies on field books to organize and manage data files. Field books are populated in the following manners:

- receiving files from a device
- importing files from a local drive

You can populate field books by importing data files from a local drive, or choose to add the raw data to the current field book when transferring it from an external device. To import data into a field book, you must have the field book identified as current.

Regardless of the source of the imported data files, ProLINK uses a conversion definition to translate the file to the ProLINK database. ProLINK offers several import conversions. You can also define your own conversion. For more information, see Chapter 9 *Conversion Definition Manager*.

4.5.1 Receiving files from a device

ProLINK will accept files directly from a data collector, total station, receiver, or card reader. You can either save files to disk and simultaneously append them to the current field book, or you can simply save files to a local drive and add them to field books at a later date.

☒ **Note**: Not all external devices can import data directly into a ProLINK field book. When such a device is selected, you can save files to disk. If an import conversion is available, you can import the data at a later time from the hard drive.

4.5.2 Importing files from the hard drive

Raw data files and coordinate files that were saved to the local hard drive can be added to the end of a selected field book. If multiple files are to be imported, you can indicate the order the files are added to the field book.

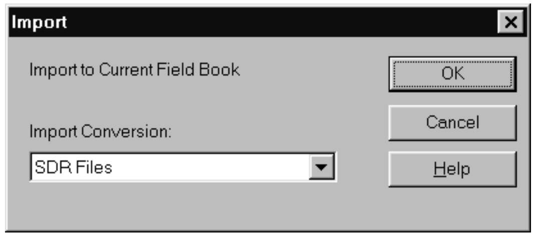
When importing a file into the current field book, the file is converted from its native format into the ProLINK database. You must select an import conversion that reflects the native format. For example, if you import an *.SDR file, select the SDR Files import conversion. You can use ProLINK-supplied conversions or create your own. For more information, see Chapter 9, *Conversion Definition Manager*.

☒ **Note**: When importing multiple files into ProLINK, they must be of the same format selected in the import conversion list.

Steps to import files to current field book

1. In the ***Field Book Editor***, verify that the field book to which the files should be appended is current.

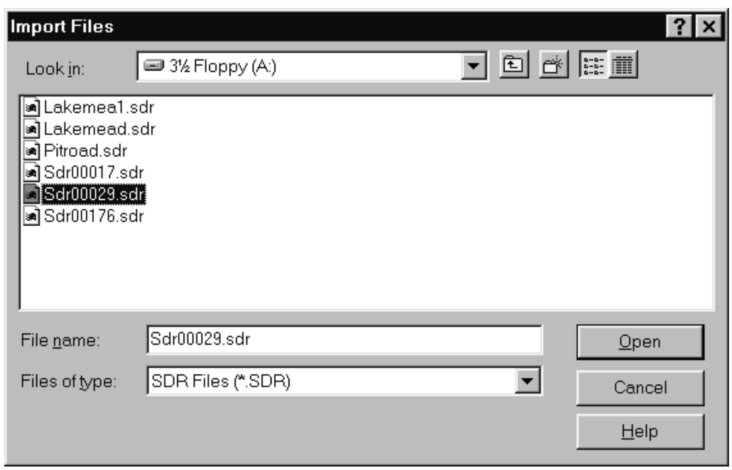
2. Select **File | Import** from the menu bar. The following ***Import*** dialog displays.



3. In the ***Import Conversion*** field, select the name of the applicable import filter.

Note: If an applicable import conversion definition does not exist in the list, you can create a conversion definition. For more information, see Chapter 4 *Field Book Management*.

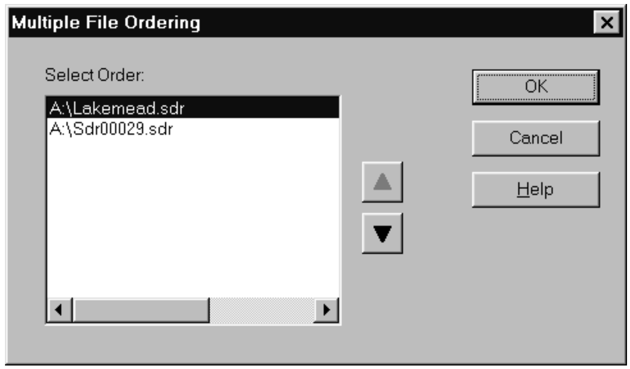
4. Click **<OK>**; the ***Import Raw Data*** dialog is displayed.



5. Select the file(s) to be imported.

6. Click on **<Open>**.

7. If multiple files were selected in Step 5, you are prompted to select the order that the files will be imported.



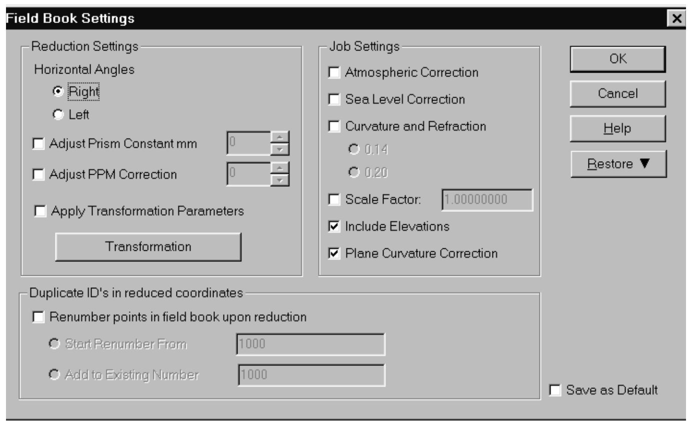
☒ **Note**: The order that files are added to the field book is essential to how the data is reduced as SDR Search Rules are applied.

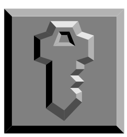
The data files will be added in the order displayed (from top to bottom). If the order needs to be changed, simply highlight a file and press the <↑> or the <↓> buttons. The highlighted file will move in the direction indicated. When the order of the files is satisfactory, press **<OK>**.

8. ProLINK appends the file(s) to the end of the current field book.

4.6 Field Book Settings

Several parameters are necessary to reduce data. These parameters are determined for each individual field book. The ***Field Book Settings*** dialog -- accessed by selecting **Field Book | Field Book Settings** from the menu bar-- applies the established parameters to the current field book.





<**CTRL**>+<**B**>
Field Book
Settings

The ***Field Book Settings*** dialog provides the reduction parameters in the following categories:

- Reduction Settings
- Job Settings
- Duplicate ID's in field book reduced coordinates

For a detailed description of these parameters, see Section 6.2, *Applying Reduction Parameters in Field Book Settings*, page 6-9.

☒ **Note:** Plane curvature corrections should be turned off in ***Field Book Settings*** when using transformations.

Chapter 5 Field Book Editing

ProLINK contains an intelligent data editor, the ***Field Book Editor***, in which you can insert, modify and delete records. The ***Field Book Editor*** provides access to the raw data of each field book in a project.

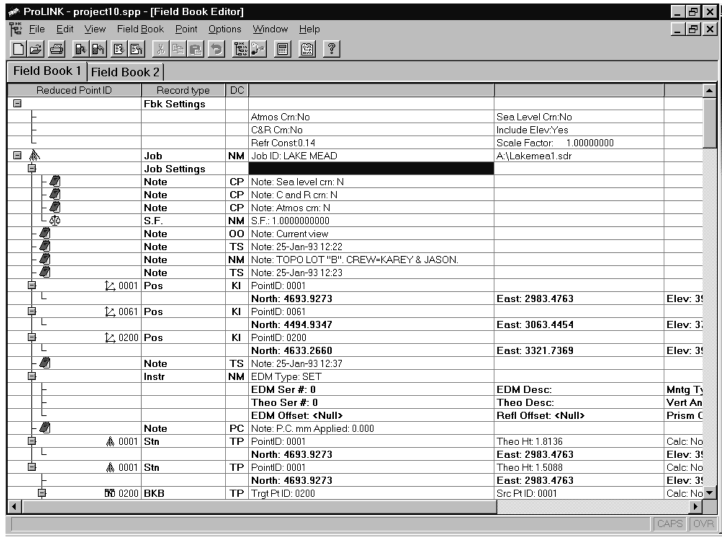
ProLINK will help you maintain the integrity of the database by following SDR search rules and providing guidelines that limit the insertion and deletion of records, warning you if modifications are invalid.

You maintain control over the data within a field book by:

- Determining the order in which files are imported, see page 4-7
- Editing records, see page 5-2
- Inserting records, see page 5-18
- Deleting records, see page 5-22
- Applying reduction parameters in ***Field Book Settings***, see page 6-9

5.1 Viewing Raw Data in the Field Book Editor

In the ***Field Book Editor***, the raw data in each field book is presented in a hierarchical tree structure with icons representing each record type. This structure represents individual job files at the highest level, stations on the next level, and is followed by sets and observations. Each level can be expanded or collapsed to enhance navigation. For more information, see Section 2.6, *Navigating the Field Book Editor's Tree Structure*, page 2-9



The various record types are clearly displayed in the left column. Raw data records are displayed in individual rows, but may consist of multiple lines. Records contain separate cells in which you can edit information.

Within the hierarchy, the application of certain records can span across several levels. For example, a target height record applies to all observations until the next target height record is encountered, regardless of whether those observations are part of the same station setup and the same hierarchical level.

5.2 Editing the Contents of a Record

The ***Field Book Editor*** provides intelligent editing of raw data, maintaining the integrity of the ProLINK database. It allows only for valid modifications — information inserted, copied, moved and deleted —ensuring that no unwanted ramifications to other records occur. For example, when deleting a station record, you have the option to first delete observations from that station setup.

☒ **Note:** For general editing rules, see Section 5.3.1, *Inserting and editing records: general rules*, page 5-19. For detailed information on editing individual records, see Chapter 8 *Reviewing the ProLINK Database*.

Each record in a field book can be individually edited. Values can be changed by highlighting the appropriate cell and entering new information. In fields where the record has specific selections, a list containing valid selections is displayed. Records can be manually inserted, deleted and modified according to the record type.

Additionally, you can cut, copy and paste information as needed to and from the clipboard. An **Undo** command also is available. Many of the editing options you will use are accessed through the ***Edit*** menu. The following actions can be performed:

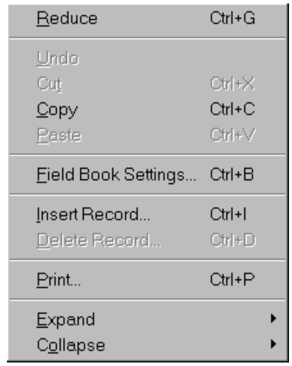
- Apply basic edit functions: undo, cut, copy, paste
- Modify point IDs
- Modify field values
- Calculate station and/or back bearing records
- Change record views
- Search for particular record types
- Search and replace fields

☒ **Note**: Modifications to the ProLINK database will not affect the original raw data.

The following sections describe each of these actions in detail.

5.2.1 Using the Field Book Editor's shortcut menu

You can access a shortcut menu in the ***Field Book Editor*** by clicking the right mouse button. Various editing options are available.



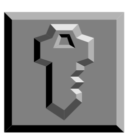
5.2.2 Basic editing functions

To simplify field book editing, ProLINK employs various editing functions. These functions are designed to reduce the amount of information that must be manually entered, as well as typographical errors. Basic editing functions include:

- Undo
- Cut
- Copy
- Paste

⌧ **Note:** These basic editing functions do not apply to the ***Reduced Coordinate View***.

5.2.2.1 Undo



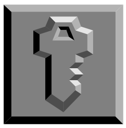
<**Ctrl**>+<**Z**>
Undo

The **Undo** option allows you to cancel actions that have been performed. Select **Edit | Undo** from the menu bar. The modification made prior to selecting the option will revert to its previous state. This option can be used multiple times to undo several changes.

Undo works in a reverse sequential order, reverting the last modification to its original state. ProLINK indicates which action will be undone in the ***Edit*** menu next to the **Undo** option.

☒ **Note**: The **Undo** option remembers every action performed since the project was opened.

5.2.2.2 Cut



<**Ctrl**>+<**X**>
Cut

The **Cut** option allows you to remove selected information from the field book and save it to the clipboard where it can be accessed for a future paste. Highlight the information you want removed and select **Edit | Cut** from the menu bar.

☒ **Note**: Contents of the clipboard are overwritten with each cut or copy action. To protect from losing data, perform the paste action immediately.

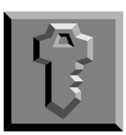
5.2.2.3 Copy

<**Ctrl**>+<**C**>
Copy

The **Copy** option allows you to duplicate selected information from the field book and save it to the clipboard where it can be accessed for a future paste. Select **Edit | Copy** from the menu bar. Highlight the information you want duplicated and select the **Copy** option.

☒ **Note**: Contents of the clipboard are overwritten with each cut or copy action.

5.2.2.4 Paste



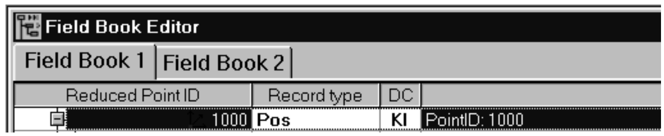
<**Ctrl**>+<**V**>
Paste

The **Paste** option allows you to populate a field with information that has already been cut or copied to the clipboard. Select the field you want populated and select **Edit | Paste** from the menu bar.

✉ **Note:** When you paste information into a populated field, the current information will be replaced by whatever information is currently on the clipboard.

5.2.3 Modifying point IDs

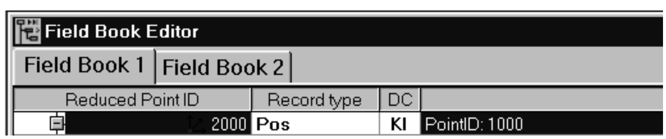
You can manually modify only the ***Raw Point ID*** field. To edit, highlight the ***Raw Point ID*** cell and begin typing.



When the point ID is modified in the ***Field Book Editor***, the updated information is automatically updated in the ***Reduced Coordinates View***.

ProLINK can automatically renumber all the points within a field book upon reduction.The renumbering option is located in the ***Field Book Setting*** dialog. For more information, see Section 6.2.3, *Duplicate IDs in reduced coordinates*, page 6-13.

If you set the renumbering option to add 1000 to every point ID in the field book, you would notice that the reduced point ID on the left differs from the raw point ID on the right as seen in the following example:



If a renumbering option is selected and the ***Raw Point ID*** field is subsequently modified, the changes and the applied renumbering are automatically updated in ***Reduced Point ID*** fields in all views.

5.2.4 Modifying values

You can edit certain field values in records directly in the ***Field Book Editor***. The editing of fields is simply a matter of highlighting the information and entering the relevant modification. Exceptions do exist, however, ***Job Settings*** can be modified in ***Field Book Settings*** dialog. For more information, see Section 4.6, *Field Book Settings*, page 4-10.

> ✉ **Note**: The **Cut**, **Copy** and **Paste** options allow you to make changes simply and efficiently.

The format for entering and displaying data is determined in ***Unit Settings*** (see Section 2.8, *Defining Unit Formats*, page 2-15). Although the values displayed in the fields can use the current unit settings, you can enter values in other units which will be converted to your select units format. You can accomplish this by the following:

Angle units:

- Use + or - to indicate a positive or negative direction in relation to the horizontal angle setting in ***Field Book Settings***
- Any angle value over 360° will resolve the angle to a value between 0° and 360°.

Coordinates and Distances:

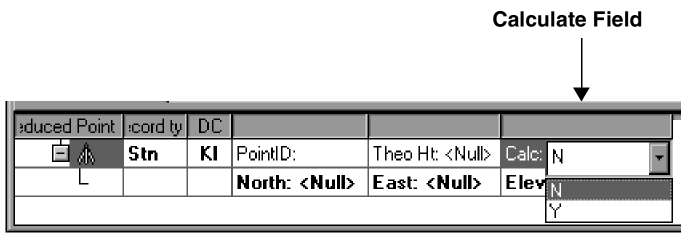
- Entering distances using values other than current unit settings use the following suffix with the value. By specifying the unit, ProLINK will convert the entry to the specified unit settings.
  (m) = value in meters

  (ft) = value in feet

  (‘) = value in U.S. feet

5.2.5 Calculate station

You can specify whether to calculate a station setup and coordinate and/or back bearing record. Normally, the station coordinate is based on the static coordinates in the STN record or the last POS record (SDR search rules). By setting the STN record's ***Calc*** field to "yes," a reduction is performed to recalculate the station's coordinates using only records above that STN record. Similarly, the back bearing record can be made to recompute its values.

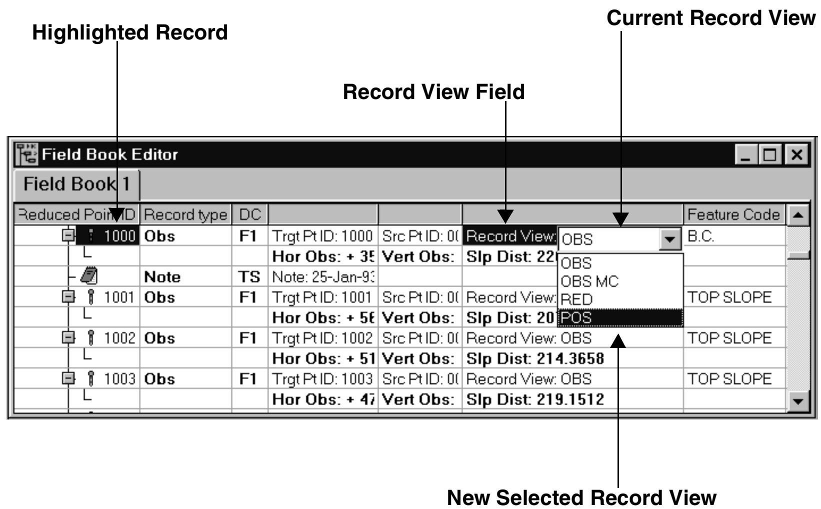


In the ***Field Book Editor***, this option can be selected for a specific STN or BKB record by selecting the drop down menu in the ***Calc*** field and selecting **Y** or **N**.

As files are imported, this option is set to **N** which reflects reduction behavior on the SDR. You can determine that all STN and BKB records are set to calculate (***Calc***=**Y**) upon being imported to the field book. This setting is established in the ***Preferences*** dialog. For more information, see Section 2.7, *Determining Preferences*, page 2-13.

5.2.6 Changing record views

ProLINK allows you to change the record view, giving a record more importance as you implement SDR search rules. Changing a record view gives you the ability to define which observation record has the most importance in your job and will be used to calculate your other records.



The different record views correspond to the importance levels of each record in SDR search rules. For total station data, OBS has the least importance and POS has the most importance as shown in Figure 5-1. For GPS/RTK data, GOBS has the least importance and POS has the most importance as shown in Figure 5-2. For more information on record views, see Section 5.2.6.1, *Types of record views*, page 5-11.

The views are available as follows:

Total Station

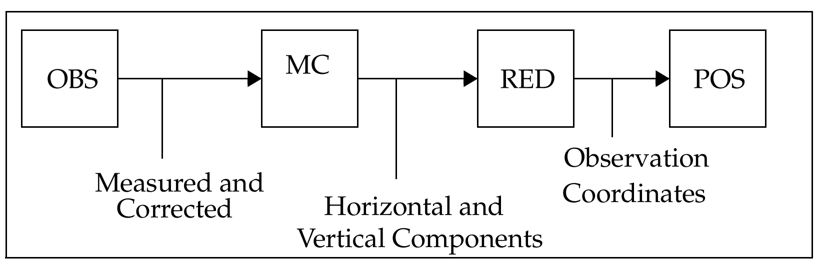


Figure 6: Record view options for data

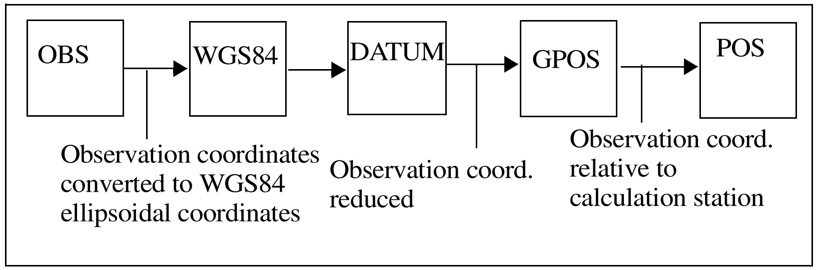


Figure 7: Record view options for data with transformation

GPS/RTK

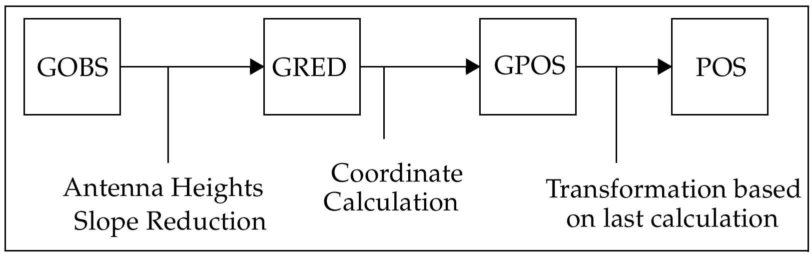


Figure 8: Record view options for GPS/RTK data

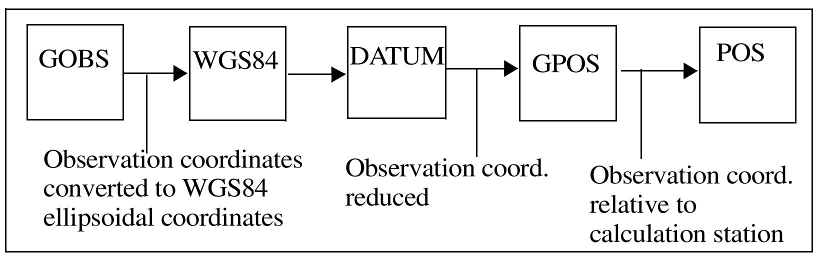


Figure 9: Record view options for GPS/RTK data with transformation

You can change the record views of individual point records to take advantage of the SDR search rules (see Section 6.1.3.2, *Understanding the search rules*, page 6-6). In the ***Field Book Editor***, highlighting the

Record View field displays a list from which to choose the preferred record type. This change affects the coordinate search logic during point reduction.

☒ **Note**: Changing a record view will recalculate the ***Reduced Coordinate View*** based on the application of SDR search rules.

5.2.6.1 Types of record views

The available record views and the default record view are dependent on the type of data collected in the field and the record view settings when you export a file from the SDR. The records that can be viewed will differ depending on whether a transformation has been applied to the observation. The following records have the indicated views available:

Total Station		**GPS/RTK**	
Current View	**Change options**	**Current View**	**Change options**
No XFM			
OBS	OBS MC RED POS	GOBS	GOBS GRED GPOS POS
MC	MC RED POS	GRED	GRED GPOS POS
RED	RED POS	GPOS	GPOS POS
POS	POS	POS	POS
With XFM			
DATUM	DATUM GPOS POS	DATUM	DATUM GPOS POS
GPOS	GPOS POS	GPOS	GPOS POS
POS	POS	POS	POS

Total Station		GPS/RTK	
Current View	**Change options**	**Current View**	**Change options**
WGS84 LLH	WGS84 LLH DATUM GPOS POS	WGS84 LLH	WGS84 LLH DATUM GPOS POS

Note: When changing the default record view, the record will not change to the selected record view, but will be recognized as that record during the reduction of data.

Each record view represents a different set of corrections applied to it. Below is a basic definition for each view:

Total Station record views (no transformation)

OBS .... Observation record, unchanged from your imported data.

MC .... The observation record is adjusted for orientation, collimation, instrument height, target height, prism constant, atmospheric corrections and curvature and refraction corrections.

RED .... The observation is reduced to its horizontal and vertical components with the sea level correction and scale factors applied where applicable.

POS .... The observation is reduced to a set of coordinates relative to the station record.

Total Station record views (with transformation)

OBS .... Observation record, unchanged from your imported data.

WGS84 LLH .... Coordinates for the station and backbearing converted to WGS84 ellipsoidal coordinates; latitude, longitude, and height.

DATUM .... This record displays the station and backbearing as local datum latitude, longitude, and height.

GPOS .... The position of the point before any calibration has occurred

POS .... The observation is reduced to a set of coordinates relative to the station record

GPS/RTK record views (no transformation)

GOBS .... The observation includes the azimuth, vertical angle and slope distance from the base antenna to the rover antenna.

GRED .... The observation is calculated as the horizontal distance and the vertical distance from the base to the rover.

GPOS .... The observation is reduced to the coordinates at the rover.

POS .... The observation is reduced to the rover's coordinates with the transformation determined from the most recent calibration applied, if available.

GPS/RTK record views (with transformation)

GOBS .... The observation includes the azimuth, vertical angle and slope distance from the base antenna to the rover antenna.

WGS84 LLH .... This record shows the original GOBS coordinates converted to WGS84 ellipsoidal coordinates; latitude, longitude, and height.

DATUM .... This record displays the GStn and backbearing as local datum latitude, longitude, and height.

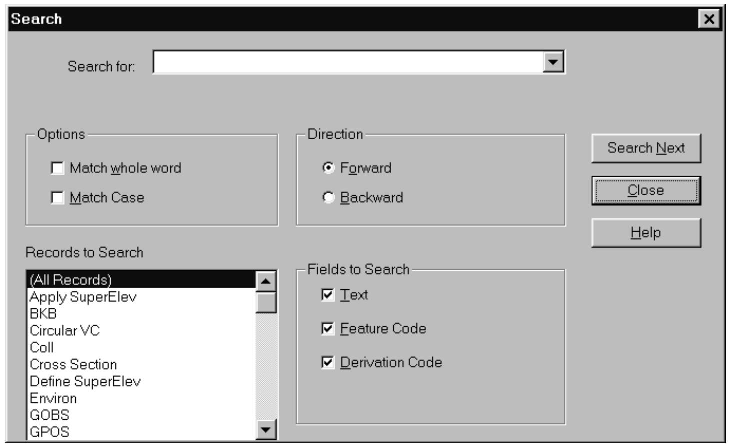
GPOS.............................. The **GPOS** record shows you the observation reduced to coordinates relative to the GStn from which it was calculated. This observation includes the uncalibrated coordinate of the rover ground point.

POS .... (position) The **POS** record shows the observation relative to the station from which it was calculated. If the record is a GPS observation, the transformation determined from the most recent calibration will be applied, if available.

5.2.7 Using the search option

The **Search** option simplifies locating specific information in the field book. By providing several classification options, **Search** provides you with greater flexibility to define your search parameters. You can search for specific values within certain record types and fields. When a search is successful, the particular information will be highlighted in the field book.

You can move around the ***Search*** dialog by either using your mouse or the keyboard. The <**Tab**> key allows you to move between fields; the <**Spacebar**> allows you to either select (highlight) or unselect any item within a field.



Use the fields in this dialog to define your search criteria:

Search for........................ Enter the specific information you want to search. ProLINK saves the last ten entries and makes them available in a list, from which you can choose.

Options .... To ensure the selection matches the case and/or the entire word precisely, select the appropriate option.

Direction......................... Specify the direction of the search. By default, ProLINK searches from the currently highlighted record to the bottom of the field book (forward).

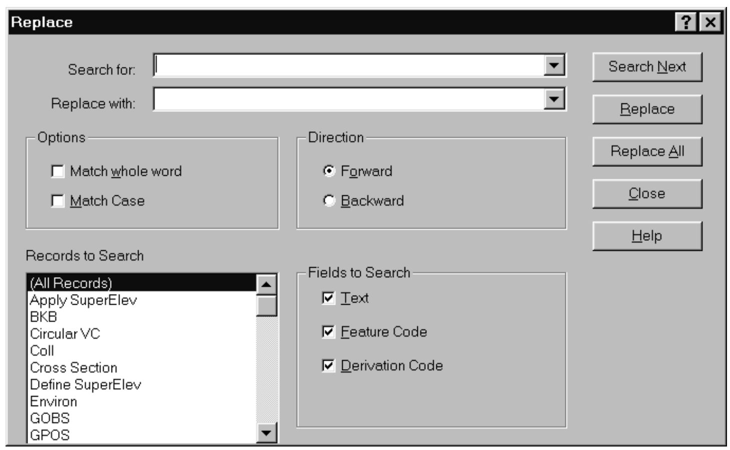
Records to Search .... Select any combination of record types to search. The **<All Records>** option will be selected by default. The selected record type to search will be maintained until changed.

Fields to Search .... Select any combination of fields from the list of available fields within a record to search. By default, all fields are selected.

Select **<Search Next>** to find the next occurrence of the value. The search will continue from the currently selected record.

5.2.8 Using the replace option

When global changes to the field book are required, the **Replace** option allows you to automatically locate and change every instance. The ***Replace*** dialog is designed to work exactly the same as the ***Search*** dialog (for more information, see Section 5.2.7, *Using the search option*, page 5-14), but includes the capability to replace information.



Use the fields in this dialog to define your search criteria:

Search for........................ Enter the specific information you want to search. ProLINK saves the last ten entries and makes them available in a list, from which you can choose.

Replace with .... Enter the specific information with which you want to replace the search information. ProLINK saves the last ten entries and makes them available in a list, from which you can choose.

Options .... To ensure the selection matches the case and/or the entire word precisely, select the appropriate option. By default, ProLINK matches the case of the word in the Search for field.

Direction......................... Specify the direction of the search. By default, ProLINK searches from the current location in the field book to the bottom (forward).

Records to Search.......... Select any combination of record types to search. All record types will be selected by default. The selected record type to search will be maintained until changed.

Fields to Search .... Select from the list of available fields within a record to search. By default, all of the fields are selected.

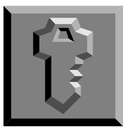
These buttons allow you to control your search and replace requirements:

<Search Next>................ Find the next occurrence of the search criteria, the search will continue from the currently selected record.

<Replace> .... Substitute the search information with the information entered in the ***Replace with*** field for the currently identified occurrence.

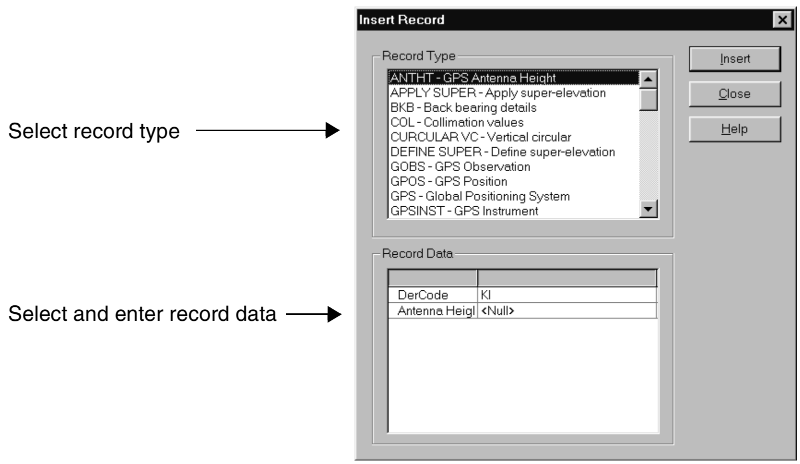
<Replace All> .... Select **<Replace All>** to substitute all occurrences of the search information with the information in the ***Replace with*** field.

5.3 Inserting records



<**Ctrl**>+<**I**>
Insert
Record

Records can be added to the field book as needed. The list of available record types is displayed in the ***Insert Record*** dialog. ProLINK conforms to the SDR database search rules; therefore, only records that adhere to the search rules can be added to the field book.



The inserted record is placed immediately below the currently selected record in the tree structure. The ***Insert Record*** dialog enables you to insert multiple records, one at a time. Select the appropriate record type and enter the data. The **<Insert>** button verifies the data and inserts the record into the field book. After inserting a record into the field book, ProLINK is ready to insert another record at the same location in the field book. For multiple record insertions, you can quickly navigate in the ***Insert Record*** dialog by using the <**Tab**> key.

Note: To insert multiple records in different locations, it is necessary to close the ***Insert Record*** dialog and move the cursor to a new insertion location.

When entering information into the ***Record Data*** fields, you can move between the cells with the <**Tab**> or arrow keys. If a field within the record has specific options, a drop-down list displays. For example, the **Calc** field in a station record (STN) allows you to select whether coordinates should be calculated based on the information from the previous observation **Y** (Yes) or not **N** (No).

Note: You can insert records with blank ***Record Data*** fields. Data can be entered in these fields at a later time in the ***Field Book Editor***.

Steps to insert a record:

1. Select a record directly above where you want your new record to be inserted.

2. Select **Edit** | **Insert Record** from the menu bar.

3. Select the ***Record Type*** and enter in the specific data to your new record. To move in the ***Insert Record*** dialog, you may use either your mouse or the <**Tab**> key.

4. Select <**Insert**> to insert your new data directly into the field book.

5. ProLINK is now ready to insert a new record. You may close the dialog, or continue inserting new records at the same location.

5.3.1 Inserting and editing records: general rules

The SDR search rules and the integrity of the database must be maintained during insertion and modification of records. The following is a general overview of rules that pertain to inserting records in ProLINK.

✉ **Note**: For more detailed information on specific records, see Section 8.2, *Understanding ProLINK Database Records*, page 8-9.

1. New instrument records will be inserted at the end of the current field book. Fields within a new or existing instrument record, such as ***Descriptions***, ***Serial Numbers***, ***Vertical Angle Setting***, ***EDM Offset*** and ***Target Offset***, can be edited directly in the ***Field Book Editor***. The ***Prism Constant*** field is editable, but will not effect reduction. If the ***Prism Constant*** value is incorrect adjustments can be made via a ***Field Book Settings*** option (see Section 4.6, *Field Book Settings*, page 4-10).

2. STN, RSTN, LSTN or GSTN records can be inserted in the field book. For subsequent records containing a source point ID field, the point ID of that STN record is inserted into the source point ID of subsequent records until the next station record is found. For example, if a STN record is inserted in the middle of a series of OBS records, the point ID of that STN record will be used in the source point ID of the OBS records following the new STN record. The point ID is updated until another STN record or the end of the field book is reached. ***An exception to this rule is any record with the "IN" (Inverse) derivation code.*** These station records can also be set to use the coordinates currently in the record or to allow other records to calculate the coordinates, such as an earlier POS or OBS record.

3. Target records and antenna records can be inserted in the field book. These records are applicable to any vector records (OBS or GOBS) that follow until the occurrence of another target, antenna record, or the end of the field book.

4. BKB record can be inserted in conjunction with a new or existing STN record. When inserting a BKB record, the associated STN point ID is inserted automatically. You can enter the starting horizontal angle. Upon reduction, if an OBS record is encountered within a station setup that has no associated BKB record, the horizontal angle of the OBS is assumed to be the azimuth. A message is displayed, indicating when this occurs.

5. OBS, RED, POS, GOBS, GRED, GPOS, GROBS and LOBS records can be inserted in the field book. When a record is inserted that requires a source point ID, the source point ID of the previous station record will be automatically placed in the record. Any record containing a source point ID will require that a station record exist prior to the insertion of the observation record. The remaining information will be entered by the user. ProLINK verifies the data entered is valid.

6. NOTE records can be inserted anywhere in the current field book, and any new or existing note record can be edited with the exception of a NOTE JS record.

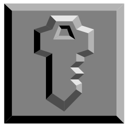
7. The NOTE JS records contain information that chronicles when and how corrections were applied to raw data. These records cannot be edited.

8. VERT ADJ and HORZ ADJ records will be inserted at the end of the field book. You can manually enter the values in these records, based on a GPS calibration or a transformation calculation (see Section 6.2.5, *Helmert Transformation*, page 6-18).

9. The Header Records which contain **Job Setting** information can not be accessed from the ***Field Book Editor***. Modifications can only be made for the field book as a whole via ***Field Book Settings***. These fields cannot be edited in the Field Book Editor.

10. Sea Level Correction, Scale Factor, Atmospheric Correction and Curvature & Refraction Correction cannot be inserted in the ***Field Book Editor***. Modifications to these records do not effect the reduction of the field book. Apply these corrections using the ***Field Book Settings.***

5.4 Deleting records



<Ctrl>+<D>
Delete
Record

The **Delete Records** option allows you to remove a selected record from the field book. Select the appropriate record; then, select **Edit | Delete Record** from menu bar.

Steps to delete records:

1. Select the record to be deleted in the ***Field Book Editor***.

2. Select **Edit | Delete Record** from the menu bar. A confirmation message will appear, allowing you to confirm the record deletion.

5.4.1 Deleting records: general rules

Due to the interdependence of records as specified by the SDR search rules, not all records can be deleted from ProLINK. Each record must be individually deleted from the field book. The following is a general overview of rules that pertain to deleting records in ProLINK.

Note: For more detailed information on specific records, see Section 8.2, *Understanding ProLINK Database Records*, page 8-9.

1. OBS, RED, POS, GOBS, GRED, GROBS, GPOS and LOBS records can be deleted.

2. Target records can be deleted. If no target height was specified at the beginning of an SDR file or for an SDR file in its entirety, the target height is assumed to be zero, until a new target height is encountered in the file.

3. ROAD records can be deleted.

4. RPOS or RSTNs record can be deleted.

5. NOTE records can be deleted with the exception of a NOTE JS record (see Section 5.4, *Deleting records*, page 5-19).

6. Transformation records can be deleted.

7. Collimation records can be deleted.

8. XFORM records cannot be deleted, but will be noted out.

9. STN, GSTN, LLH STN, LOCAL LLH, WGS84 LLH and LSTN records can be deleted. When you select a station record to be deleted, a system message will be displayed, indicating the records with that station point ID serving as its source point ID will be deleted.

10. BKB records can be deleted. Upon reduction, if an OBS record is encountered within a station setup that has no associated BKB record, the horizontal angle of the OBS is assumed to be the azimuth. A message is displayed, indicating when this occurs.

11. Instrument records cannot be deleted although there are fields such as ***Descriptions***, ***Serial Numbers***, ***Vertical Angle***, ***EDM Offset*** and ***Target Offset*** that can be edited. The ***Prism Constant*** can be edited but it does not effect the reduction of the field book. If the value is incorrect the difference that needs to be applied can be accessed in the ***Field Book Settings*** option (see Section 4.6, *Field Book Settings*, page 4-10).

Chapter 6 Reduction

The raw data contained in a project's field books can be reduced to coordinates. The results of the reduction process are presented in the ***Reduced Coordinates View,*** and are available for exporting to a variety of file formats.

6.1 Understanding the Reduction Process

The reduction process accomplishes the following steps:

- Determination of station coordinates
- Determination of target coordinates by adding observation vectors to their respective station coordinates
- Transformation of coordinates (GPS/RTK only)

The first two steps are done in accordance to SDR search rules as described in Section 6.1.3, *Applying SDR search rules*, page 6-6. The last step is optionally performed as described in Section 6.2.5, *Helmert Transformation*, page 6-18.

The reduction of raw data to coordinates can be affected by several parameters of the reduction process. ProLINK provides access to these parameters with the ***Field Book Settings*** option. For more information on specific reduction calculations, see Appendix C *ProLINK Calculations*.

In addition to the reduction parameters, the actual application of the reduction process can affect the reduced coordinate results. You can apply the reduction process automatically or manually. You can apply the reduction process to multiple field books. Additionally, SDR Search Rules govern the data and reduction process as they identify records' positions within an entire field book and recognize their interdependent relationships. The following sections describe these factors in more detail.

6.1.1 Reduction mode

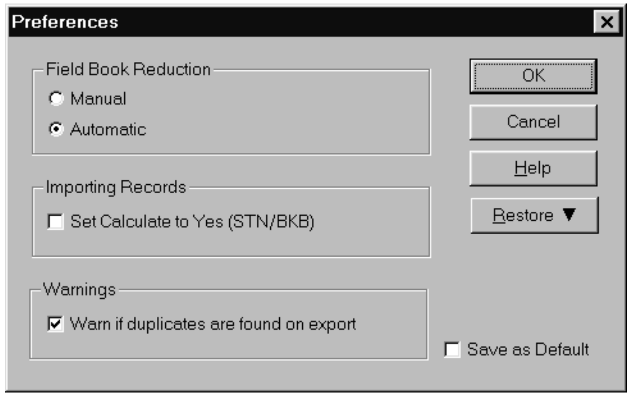
ProLINK offers two reduction modes to determine when the reduction is applied to the data in your field book:

Automatic .... ProLINK will automatically reduce the data as changes are made to the field book. This mode helps your work processes by continually updating the results in the ***Reduced Coordinates View*** as modifications are made to the field book.

Manual .... ProLINK will reduce data on your demand. This mode can assist in decreasing distracting delays in your work flow as you import or edit data in your field book.

☒ **Note:** The ***Reduced Coordinates View*** is populated and updated only at the time of reduction.

To establish the reduction mode, select **Options | Preferences** from the menu bar. Select the appropriate mode under ***Field Book Reduction*** and press **<OK>**. For more information on the Preferences dialog, see Section 2.7, *Determining Preferences*, page 2-13.



6.1.1.1 Automatic mode

The Automatic mode automatically initiates the reduction process whenever one of the following tasks is performed:

- Raw data is added
- Data is modified (records inserted, deleted or values modified)
- ***Field Book Settings*** are changed

The ***Reduced Coordinates View*** is appropriately updated after the reduction process.

6.1.1.2 Manual mode

You can choose to manually reduce the data. If the manual mode is selected, you determine when to implement the reduction process. To reduce, simply select **Field Book | Reduce** from the menu bar. The ***Reduced Coordinate View*** is updated after the reduction process.

Note: The ***Reduced Coordinates View*** will update only upon reduction. To have the most updated results, perform a reduction before exporting results.

Note: When alternating from the manual reduction mode to automatic, and a reduction is necessary, a message is displayed: "Field Book has been edited since last reduction." Select whether to reduce the points and change the reduction mode to Automatic, or refrain from reducing the points and remain in manual mode.

6.1.2 Multiple field book reduction

You can independently reduce data from multiple field books and join the data in the same ***Reduced Coordinate View***. This feature allows you to take data from different times, locations or sources and create a single reduced view or export file. This feature maximizes flexibility in creating useful data files, while preserving the integrity of the data.

6.1.2.1 Selecting a reduction mode

If your reduction mode is set to **Manual** in the ***Preferences*** dialog, then the reduction will be applied to the field books selected with the **Field Book Usage** option on the ***Field Book*** menu. For example, if you select the option **Field Book Combination** and you enable two of three field books, only those two field books will run through the reduction process when the **Reduction** option is selected from the ***Field Book*** menu.

If your processing mode is set to **Automatic**, the current field book will be processed.

6.1.2.2 Viewing results for multiple field books

As you reduce multiple field books, you can view the data from any or all of the field books in the ***Reduced Coordinates View***. To view and reduce multiple field books, select an option from **Field Book Usage** on the ***Field Book*** menu. For more information on selecting field books for viewing, see Section 7.1.2, *Determining the field book usage*, page 7-3.

When multiple field books are selected with the **Field Book Usage** option, each is independently reduced, then its results are contributed to the overall reduced coordinate list.

6.1.2.3 Resolving duplicate point IDs across multiple field books

SDR Search Rules maintain unique Point IDs within a single field book; however, when multiple field books are displayed within the ***Reduced Coordinates View***, the point IDs may be duplicated. Duplicates are indicated in this view with a bold font.

You can ignore the point ID duplication and choose to export your data with duplicate point IDs. If duplicate point IDs are not accepted in your destination package, of if you do not desire duplicate point IDs, you may address the issue as described in the following paragraphs. Additionally, you can establish within the ***Preferences*** dialog that a warning message displays if duplicate points are encountered on export. For more information, see Section 2.7, *Determining Preferences*, page 2-13.

If records from two field books contain the same ID, you may resolve this automatically, by selecting a renumbering option in the ***Field Book Settings***. This reduced point ID will be added as a separate identifier to the records. The raw point ID, or the original ID, will be retained in the field book. For more information, see Section 6.2.3, *Duplicate IDs in reduced coordinates*, page 6-13.

Alternatively, you may rename or renumber your records manually in the field book, and preserve control over the identification of each record. Manual modifications are made to the ***Raw Point ID*** field in the ***Field Book Editor***.

You also have the option of excluding individual points from output. This option, **Exclude from output**, is available from the ***Point*** menu. For more information, see Section 2.7, *Determining Preferences*, page 2-13.

6.1.3 Applying SDR search rules

ProLINK adheres to SDR search rules, recognizing records' positions within an entire field book and their interdependent relationships. This provides a familiar structure to the raw data and the application of the reduction process.

✉ **Note:** For a complete list of record types and the rules that govern manual inserting and deleting, see Chapter 8 *Reviewing the ProLINK Database*. Additional inserting and deleting guidelines are located in Chapter 5 *Field Book Editing*.

6.1.3.1 Using coordinate search logic

When ProLINK reduces a field book, it always uses the latest information in that field book, except **POS** and **POS** view records that are used before more recent **GOBS/OBS** records. The hierarchy is as follows:

- **STN/POS/POS-VIEW**
- **GSTN/GPOS**
- **GRED/RED**
- **OBS MC**
- **GOBS/OBS**

ProLINK searches for the latest coordinates of the station point to calculate the target's coordinates from the observation — adding observation vectors to a station's coordinates to determine the target point's coordinates.

Coordinates are one of the following:

- Station record (**GSTN/STN**)
- Position record (**POS**)
- An uncalibrated RTK coordinate (**GPOS**)

Coordinates can be calculated from one of the following:

- A STN or BKB record with **Calculate** set to **Yes** (**Calc=Y**)

- An observation record (**GOBS/OBS**) stored in **POS** view
- An observation record (**GOBS/OBS**) in raw or reduced view
- A reduced record (**GRED/RED**)

6.1.3.2 Understanding the search rules

When reducing a field book to a list of coordinates, ProLINK uses the following rules.

Rule 1: Observations in POS view are treated as a POS record.

For search purposes, any **GOBS, OBS, MC**, **GRED, RED** or **GPOS** record in **POS** view is treated the same as a true **POS** record.

A **POS** view record is, most typically, an observation (**GOBS/OBS**) in position (**POS**) view. However, **MC**, **RED, GROB and GPOS** records can also be stored in **POS** view. These four types of **POS** view records (**GOBS/OBS** in POS view, **MC** in POS view, **GRED**/**RED** in POS view and **GPOS** in POS view) are equal in precedence to true **POS** (or **STN**) records in the coordinate search rules.

Rule 2: ProLINK uses POS, GSTN, STN, GPOS and POS view records before using GOBS/OBS records even if the GOBS/OBS record is more recent.

ProLINK will look for any **POS** records, **GSTN, GPOS** or **STN** records, or **POS** view records, starting at the end of the field book (most recent records), and going backward in time. The first **POS**, **GSTN**, **STN, GPOS** or **POS** view record found per point ID is used to determine the coordinates of that associated point.

- If ProLINK finds a **POS**, **GSTN, GPOS** or **STN** record, the coordinates are immediately available from that record.

- If ProLINK finds a STN or BKB record with **Calculate** set to **Yes** (**Calc=Y**), it will calculate the coordinates and, in the latter case, also calculate the back bearing. In calculating these coordinates, ProLINK will perform an above-only reduction, using only those records that precede it to determine its coordinates.

Note: The option to set a STN or BKB record to calculate=yes is not available on the SDR.

- If ProLINK finds a record in **POS** view, it will reduce that record to coordinates.

Rule 3: If there are no applicable POS, GSTN, STN or POS view records, ProLINK will use the most recent GOBS, OBS, GPOS, MC, GRED or RED record. The record's view is no longer significant.

ProLINK will look for any **GOBS**, **OBS**, **GPOS**, **MC**, **GRED** or **RED** records, starting at the end of the current job and going backwards in chronological order. If ProLINK finds an **GOBS**, **OBS**, **MC**, **GRED** or **RED** record in its search with an associated point ID that has not yet been determined, it will reduce it to coordinates (see Section 8.2, *Understanding ProLINK Database Records*, page 8-9).

Rule 4: If no such record can be found, the search fails.

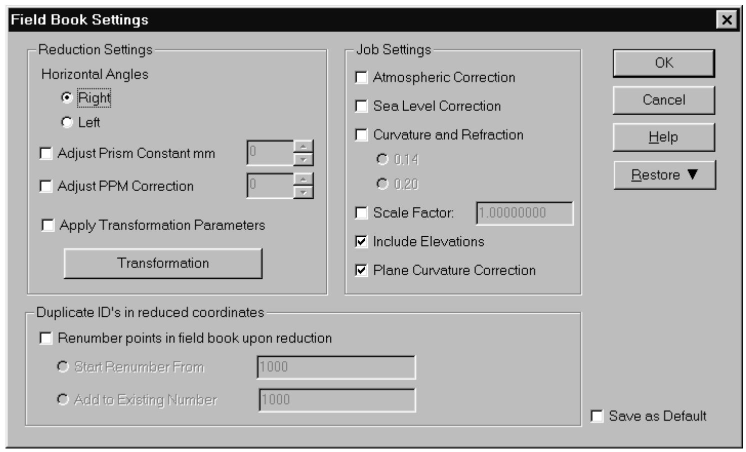
If ProLINK cannot find any **POS**, **GPOS**, **GSTN**, **STN**, **POS** view, **OBS**, **GPOS**, **MC**, **GRED** or **RED** records for a point, it simply does not appear in the reduced coordinate results.

Rule 5: Coordinate searching is iterative.

Finding the coordinates of the point may necessitate finding the coordinates of several other points. This process will continue until a fixed position for some point (a **POS**, **GPOS**, **GSTN** or **STN** record, not a **POS** view record) is found.

6.2 Applying Reduction Parameters in *Field Book Settings*

Reduction parameters are established for each individual field book in the ***Field Book Settings*** dialog. Several parameters are necessary to process data. The ***Field Book Settings*** dialog — accessed by selecting **Field Book | Field Book Settings** from the menu bar — defines those parameters for the reduction of the current field book.



The ***Field Book Settings*** dialog provide the following options:

- Reduction Settings
- Job Settings
- Duplicate Points

☒ **Note:** ***Field Book Settings*** are applied for individual field books. The settings can vary between field books within the same project.

6.2.1 Reduction settings

The field book settings for reduction allow you to specify the following values.

Note: For more information on specific reduction calculations associated with these settings, see Appendix C *ProLINK Calculations*.

Horizontal Angles......... The horizontal angle refers to the direction in which horizontal angles are measured (as stored in the data collection from the Total Station). Select the direction in which the horizontal angles increase. The default is **Right**.

Adjust Prism Constant.......................... Prism constant is used to correct the slope distance for the time it takes light to travel in and out of the prism. Select the ***Adjust Prism Constant*** check box and then enter or select the value by which the slope distance of each OBS record is added or subtracted. The default is **0 mm**.

Adjust PPM Correction....................... PPM (parts per million) correction is an atmospheric correction; specifically, it is a function of temperature and pressure (1 mm per 1,000 m is equivalent to 1 part per million). Select the ***Adjust PPM Correction*** check box and then enter or select the value by which the slope distance of each OBS record is added or subtracted. The default is **0 mm**. The correction is as follows:

$$(X\ ppm) * (1/1{,}000{,}000) * S.Dist + S.Dist$$

Note: The prism constant and PPM correction are applied to the measured slope distance prior to storing the value on the SDR database. These can not be unapplied. Therefore, access is given to adjust every slope distance by a specific amount.

Apply Transformation Parameters .... Transformation parameters are determined by pressing <**Transformation**>. These parameters are applied to the current field book by selecting this check box. The current calculated transformation parameters will be applied to every coordinate in the field book.

☒ **Note:** Deselecting this check box, will not affect transformation parameters identified in the ***Helmert Transformation*** dialog.

Transformation .... This button accesses the ***Helmert Transformation*** dialog, in which you can directly supply transformation values or calculate based on measured and known coordinates. For detailed information on ***Helmert Transformation*** see, Section 6.2.5, *Helmert Transformation*, page 6-18.

6.2.2 Job settings

Job settings can affect both how data is collected and how it is reduced. Every SDR job has associated job settings which define the application of certain corrections. Similar job settings are available in ***Field Book Settings*** to define the application of corrections within individual field books.

☒ **Note**: The job settings of individual SDR jobs that are imported have no affect on the job settings of the field book into which it is being imported.

☒ **Note**: When exporting an SDR file from a field book, the destination file's job settings will reflect the field book's current settings.

Atmospheric Corrections .... Atmospheric corrections (ppm) based on supplied temperature and pressure values are applied to the total station observations (OBS records) prior to their storage on the SDR Data Collector. Select this option to similarly apply atmospheric corrections to subsequently recorded data.

Note: This option will not affect data which currently exists in the field book. However, PPM adjustments can be made to an entire field book, see Section 6.2.1, *Reduction settings*, page 6-9.

Sea Level Corrections... Select this option to apply sea-level corrections to all total station collected data. The horizontal distance at the elevation of the instrument station is reduced to the corresponding sea-level chord when generating coordinates.

Curvature and Refraction .... Select this option to apply a curvature and refraction correction to all total station collected data. This correction allows for the curvature of the Earth and refraction on the EDM beam through the atmosphere. It is applied to the vertical angle upon reduction. The refraction constant is the coefficient of refraction. Chose between 0.14 and 0.20; the default is 0.14.

Scale Factor..................... Select this option to apply the specified scale factor to all total station collected data. The scale factor is applied to the horizontal component during reduction. The default is 1.00000.

Include Elevations .... Select this option to collect subsequent data in three-dimensional space. If not selected, subsequently recorded data will be forced to a two-dimensional plane by assigning all points with the same indeterminate elevation.

☒ **Note**: This option will not affect data which currently exists in the field book.

Plane Curvature Correction .... Select this option to apply a curvature correction to the reduction of GPS RTK data (GOBS records). This correction accounts for the curvature of the Earth.

☒ **Note:** For more information on specific reduction calculations associated with these settings, see Appendix C *ProLINK Calculations*.

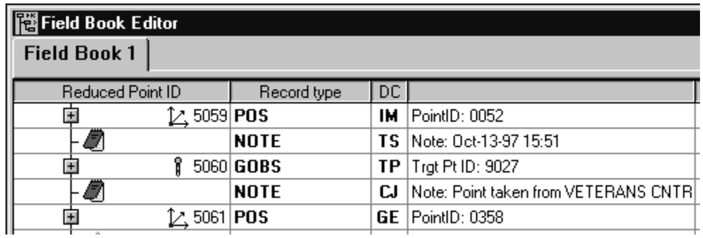
6.2.3 Duplicate IDs in reduced coordinates

Two point IDs represent each point record in each view:

Reduced point ID.......... Point ID assigned by ProLINK when renumbering options are applied

Raw point ID .... Original ID assigned when data was collected:

Field Book Editor



Reduced Point ID **Raw Point ID**

Figure 10: Examples of the point types

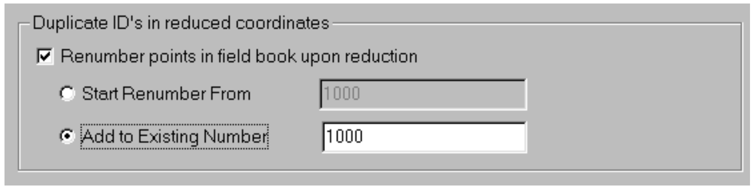
The reduced point ID initially matches the raw point ID assigned in the field data collection; however, the reduced point ID can change based on renumbering options that you apply. The raw point ID is also maintained and displayed in the ***Field Book Editor*** and the ***Reduced Coordinates View***.

☒ **Note:** The raw point ID is used when exporting from the current field book; the reduced point ID is used when exporting from the ***Reduced Coordinate View***.

Within a field book, SDR search rules rectify any duplicate point conflicts between field books. Each field book's contribution to the ***Reduced Coordinate View*** will contain one, and only one, coordinate for any point ID. Multiple field books can individually contribute the same point ID to the ***Reduced Coordinate View*** if field book usage specifies more than one field book. Viewing multiple field books in ***Reduced Coordinate View*** can result in duplicate point IDs.

☒ **Note:** The ***Reduced Coordinates View*** indicates duplicate point conflicts by display matching point IDs in a bold font.

You may choose to avoid duplicate point conflicts between multiple field books in the ***Reduced Coordinates View*** (and subsequent exports). The tools to accomplish this exist in ***Field Book Settings*** in the ***Duplicate IDs in reduced coordinates*** section of the dialog. You apply the renumbering options from the ***Field Book Settings*** dialog access from the ***Field Book*** menu. ProLINK will automatically renumber all points within the current field book.



Two renumbering methods are available in the ***Field Book Settings*** dialog:

Start Renumbering From .... This option will renumber each point ID in the field book starting from the value entered. The renumbering will be applied to each point in order from top to bottom as displayed in the ***Field Book Editor***.

Add to IDs .... This option will add the entered value to each point ID to determine the Reduced ID.

If the identified point ends in a letter then the increment will be appended to the end of the point identifier.

XYZ ⇒ XYZ01

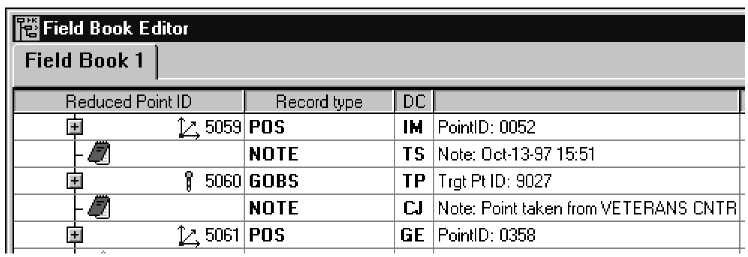
If the identified point ends in a number, the point identifier will increment numerically.

A100 ⇒ A101

> **Note:** Take care when applying a renumbering option that the method for renumbering will account for all conflicts. For example, if Field Book 1 has point IDs 1 to 500 and Field Book 2 has matching point IDs, adding 100 to each point number will not rectify all conflicts.

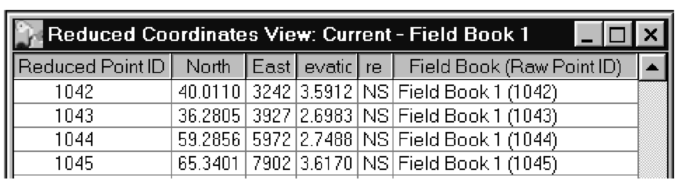
For example, if you set the renumbering option to add 1000 to every point ID in the field book, you would notice that the reduced point ID on the left differs from the raw point ID on the right as seen in Figure 11.

Field Book Editor



Reduced Point ID **Raw Point ID**

Reduced Coordinates View



Reduced Point ID **Raw Point ID**

Figure 11: Examples of the renumbering option

6.2.4 Saving defaults

Once you establish the reduction parameters for the current field book in the ***Field Book Settings*** dialog, you can use the settings as defaults for any new field book that is added to the project. When you define the settings, select the ***Save As Default*** check box (an “X” displays).

☒ **Note:** Parameters are set only for the current field book. Establishing a default is applied only to subsequently added field books, not to existing field books already in the project.

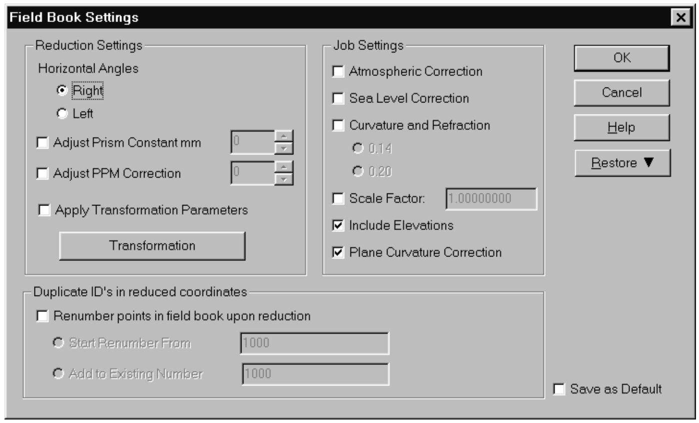
The defined settings can be explicitly applied to existing field books using the **<Restore>** button. Two default settings are available to be restored:

Saved Defaults .... This option will populate the ***Field Book Settings*** with the field selections determined the last time that the ***Save As Default*** check box was used.

Factory Defaults .... This option will populate the ***Field Book Settings*** with the field selections that were preset at the factory.

6.2.5 Helmert Transformation

A transformation can be applied to every point in a field book via the ***Field Book Settings*** dialog, accessed from the ***Field Book*** menu.



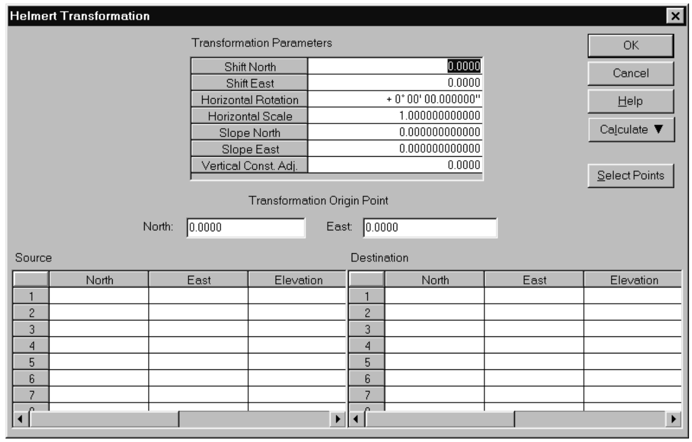
To apply a transformation, select the ***Apply Transformation Parameters*** check box. The specified transformation will be applied during the reduction process. To review or modify the transformation, press **<Transformation>**.

The transformation parameters can be specified by:

- Manually entering values in the ***Transformation Parameter*** fields.
- Calculating the values from manually entered coordinates.
- Calculating the values based on selected points from the project's field books.

☒ **Note**: Calculated transformation parameters can be used to populate horizontal adjustment and vertical adjustment records and serve as a GPS RTK calibration for that field book.

Access to the transformation parameters is provided by selecting the <**Transformation**> in the ***Field Book Settings*** dialog. The ***Helmert Transformation*** dialog is displayed.



The dialog consists of four easily identifiable sections:

- **Transformation Parameters** - The values can be directly input or calculated based on coordinates in source and destination.
- **Transformation Origin Point** - The transformation parameters are applied based on the indicated origin point. This origin point is also used in the optional calculations of the transformation parameters.
- **Source** - The Source coordinates are used in calculating transformation parameters. They can be directly input or populated with points from project.
- **Destination Coordinates** - The Destination coordinates can be directly input or populated with points from project.

This dialog offers great flexibility in defining a transformation, you can directly enter values in the ***Transformation Parameters*** section of the dialog. You can calculate the transformation based on coordinates manually entered into source and destination with coordinates from points within the project before calculations.

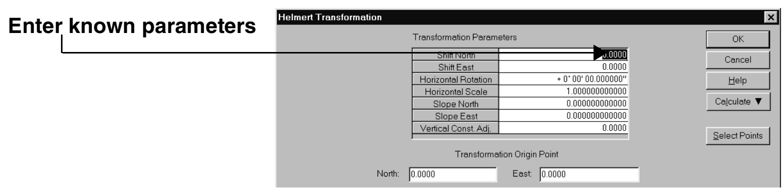
These methods are discussed in the following sections.

6.2.5.1 Entering transformation parameters

When entering known transformation parameters, you need only enter values in the ***Transformation Parameters*** and the ***Transformation Origin Point*** sections. It is here you will manually enter the parameters and the point of rotation.

Steps to manually enter known transformation parameters

1. In the ***Transformation Parameters*** section, enter the value on which the transformation is to be based.



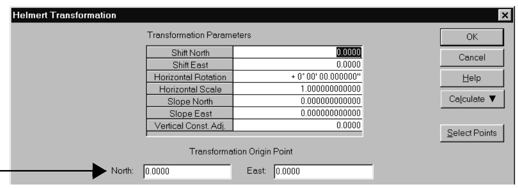
To enter parameter values that will produce no transformation, highlight the value and select the backspace key. The default value will be used.

Default Values	
Shift North	0.000
Shift East	0.000
Horizontal Rotation	0°00°00.0000″

Default Values	
Horizontal Scale	1.00000000000
Slope North	0.000000000000
Slope East	0.000000000000
Vertical Constant Adjustment	0.000

2. In the ***Transformation Origin Point*** section, enter the coordinates for the fixed point around which all other points are to be rotated, the point of rotation.

Enter point of rotation



3. Press **<OK>**. Reduction of the current field book will now be transformed based on the values entered in the ***Transformation Parameters***.

6.2.5.2 Calculating parameters from manually entered coordinates

The measured coordinates of positions and their actual known positions can be used to derive the transformation parameters. When entering positions, you will use the ***Transformation Origin Point*** section, the ***Source*** and ***Destination*** sections of the ***Helmert Transformation*** dialog. In the **Source** section, you enter measured coordinates; in the **Destination** section you enter the known coordinates as they correspond to the **Source**. After matching the coordinates, you initiate a calculation that will compute and display the transformation parameters.

Calculation options

Three calculation options are available when you select the <**Calculate**> button.

- **Hz/Vt** - performs both a horizontal and a vertical calculation.
- **Horizontal Only** - performs a horizontal calculation.
- **Vertical Only** - performs a vertical calculation.

To perform a calculation, you must select at least one point for a horizontal calculation. For a vertical calculation, you must select one point or three or more points (two points are not valid for vertical calculations). These requirements also apply to the Hz/Vt calculation. Additional requirements exist for each calculation option:

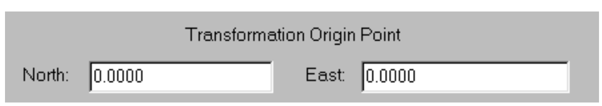
Hz/Vt .... Points must have Northing, Easting and Elevation coordinate values.

Horizontal Only .... One or more points required. Points must have at least Northing and Easting coordinate values.

Vertical Only .... One point or three or more points required (two points are not valid). If a single point is used, it must have at least Elevation coordinate values. If three or more points are used, Northing, Easting, and Elevation coordinate values are required.

Steps to enter positions

1. In the ***Transformation Origin Point*** section, enter the coordinates for the fixed point around which all other points are to be rotated, the point of rotation.



2. In the **Source** section, enter the measured coordinates of as many positions as required to derive adequate transformation parameters.

Source

	North	East	Elevation
1	234222.0800	7845.8348	324.0900
2			
3			
4			
5			
6			
7			

North .... Enter the North value for the source coordinate.

East .... Enter the East value for the source coordinate.

Elevation .... Enter the Elevation value for source coordinate.

Note: For point requirements, see *Calculation options*, page 6-22.

3. In the **Destination** section, enter the known coordinates of the same positions as entered in Source.

Destination

	North	East	Elevation
1	43431123.7822	98777.9090	324.0900
2			
3			
4			
5			
6			
7			

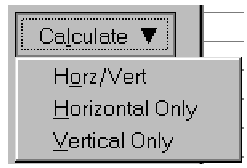
North .... Enter the known North value for the corresponding position in Source.

East .... Enter the known East value for the corresponding position in Source.

Elevation .... Enter the known Elevation value for the corresponding position in Source.

Note: For point requirements, see *Calculation options*, page 6-22.

4. To derive the transformation parameters, select the **<Calculate>** button and choose a calculate option. Three options are displayed from which to choose:



Horiz/Vert .... Choose **Horiz/Vert** if you want to derive both the horizontal and vertical transformation parameters from the positions entered.

Horizontal Only .... Choose **Horizontal Only** if you want to derive horizontal transformation parameters from the positions entered. The horizontal parameters are:

- Shift N
- Shift E
- Rotation
- Scale

Vertical Only .... Choose **Vertical Only** if you want to derive vertical transformation parameters from the positions entered. The vertical parameters are:

- Slope N
- Slope E
- Const Adj *(Constant Adjustment)*

When the **<Calculate>** option is selected, the transformation parameters will be derived and their appropriate values will be displayed in the Transformation Parameters section of the ***Helmert Transformation*** dialog.

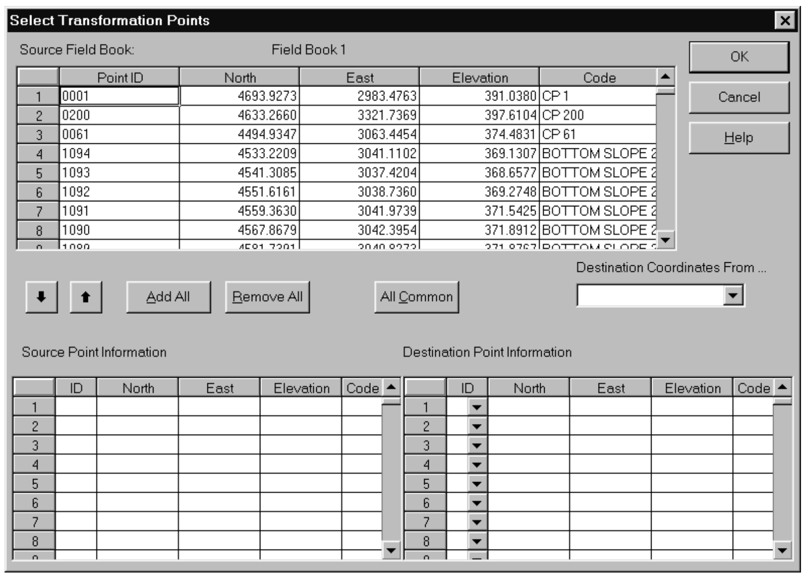
5. Select <**OK**>.

6.2.5.3 Calculating parameters from project coordinates

You can populate the source and destination coordinates in the ***Helmert Transformation*** dialog with points that exist in the project. After obtaining the matching source and destination coordinates, you will chose between the three calculation options:

- **Hz/Vt** - performs both a horizontal and a vertical calculation.
- **Horizontal Only** - performs a horizontal calculation.
- **Vertical Only** - performs a vertical calculation.

☒ **Note**: For information on point requirements for a specific calculation option, see *Calculation options*, page 6-22.



The ***Select Transformation Points*** dialog presents you with various ways to select points to be used as both the source and destination for transformation.

Source Field Book......... This section automatically displays the reduced point coordinates from the current field book. You can select points from this section to be used as the ***Source Point Information*** of the transformation.

Source Point Information.................. This section displays the coordinates of positions from which the transformation will initiate. You can populate this section with points from the ***Source Field Book***.

Destination Point Information.......... This section displays the coordinates of positions to which the source points will be transformed. The coordinates can be manually entered. You also can specify the coordinates from another field book within the same project. For more information, see step 5 on page 6-28.

The tools in the middle of the dialog allow you to control your selection of transformation points:

<↓> .... The arrow DOWN button allows you to copy selected points from the ***Source Field Book*** to the ***Source Point Information*** section for use as the source of the transformation.

<↑> .... The arrow UP button allows you to remove selected points from the ***Source Point Information*** section to the ***Source Field Book*** section.

<Add All>....................... To copy all points from the ***Source Field Book*** to the ***Source Point Information*** section, select **<Add All>**.

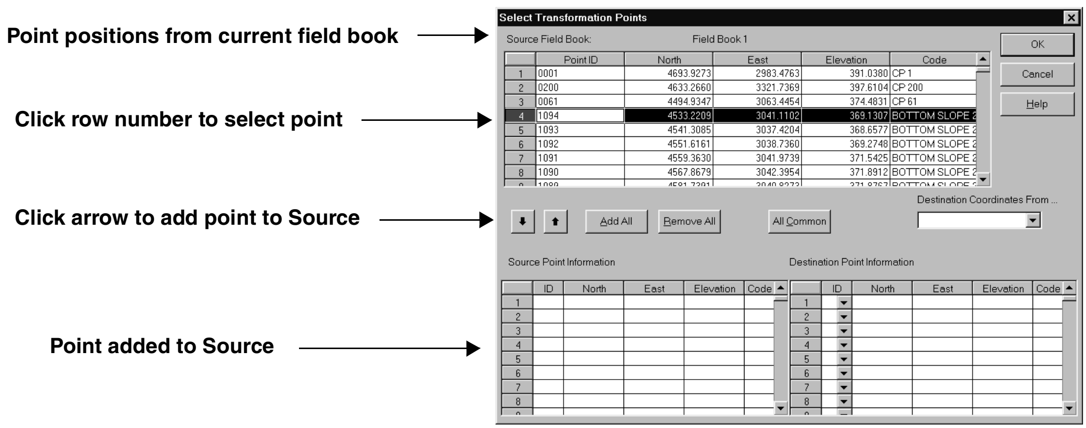
<Remove All>................ To remove all points from the ***Source Point Information*** section, select **<Remove All>**.

<All Common> .... To copy all points with point IDs that are common between the source field book and the field book selected in the *Destination Coordinates From* list, select **<All Common>**. All common points and the coordinates from their respective field books will be copied to both *Source Point Information* and *Destination Point Information*.

Destination Coordinates From .... For projects using multiple field books, select the field book you want to use for the destination values for the transformation.

Steps to enter point positions

1. In the *Helmert Transformation* dialog, select the **<Select Points>** button. The *Select Transformation Points* dialog is displayed.



2. In the *Select Transformation Points* dialog, the point positions from the current field book are displayed. Select the row number of the points to be used as the source of the transformation.

3. Select <↓> to display the point position in the *Source Point Information* section.

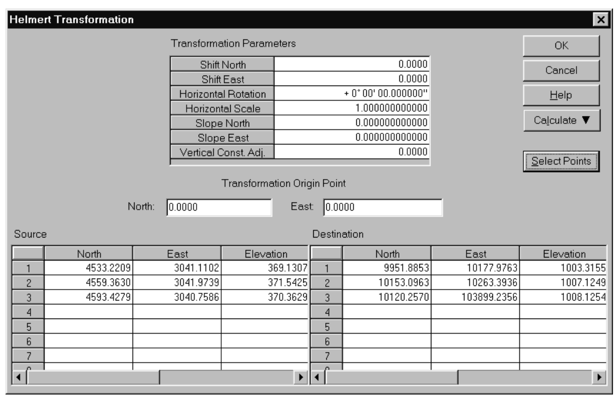
4. Repeat Steps 2 and 3 until you have selected all point positions to be used as the source of the transformation.

⌧ **Note**: For point requirements, see Section 6.2.5.2, *Calculating parameters from manually entered coordinates*, page 6-21

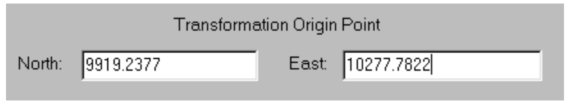
5. Enter values in the ***Destination Point Information*** fields manually or select them from a field book in your current project. To select points from a field book, identify the field book in the ***Destination Coordinates*** From field. The ***Destination Point Information*** is populated automatically with the coordinates of the corresponding point ID of the current field book. If you wish to change the point, press the <↓> in the **ID** field to display a list of point IDs from the selected field book. Choose the point that matches the corresponding point in the ***Source Point Information***.

⌧ **Note:** The ***Point ID*** list allows you to change the point ID from what was selected automatically.

6. Review the ***Destination Point Information*** section and click **<OK>**. The ***Helmert Transformation*** dialog is displayed with the ***Source*** and ***Destination*** values.

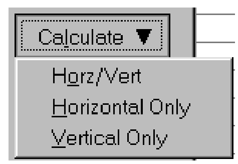


7. In the ***Transformation Origin Point*** section, enter the coordinates for the fixed point around which all other points are to be rotated, the point of rotation.



Note: If calculating parameters to use as a GPS RTK calibration, use an origin of 0, 0.

8. To derive the transformation parameters, select the **<Calculate>** button and choose a calculate option. Three options are displayed from which to choose:



Horiz/Vert .... Choose Horiz/Vert if you want to derive both the horizontal and vertical transformation parameters from the positions entered.

Horizontal Only .... Choose Horizontal Only if you want to derive horizontal transformation parameters from the positions entered. The horizontal parameters are:

- Shift N
- Shift E
- Rotation
- Scale

Vertical Only .... Choose Vertical Only if you want to derive vertical transformation parameters from the positions entered. The vertical parameters are:

- •Slope N
- •Slope E
- •Const Adj *(Constant Adjustment)*

When the **<Calculate>** option is selected, the transformation parameters will be derived and their appropriate values will be displayed in the Transformation Parameters section of the ***Helmert Transformation*** dialog.

9. Select <**OK**>.

6.2.6 Understanding the calculation of transformation parameters

Three calculation options are available: **Hz/Vt**, **Vt Only**, **Hz Only**. This section describes the calculation methods.

The horizontal transformation calculation is based upon a two dimensional conformal transformation. There are four transformation parameters, one scale factor which is constant in all directions, a rotation about the height axis and two translations, one in east and one in north. During the calculation procedure, least squares techniques are used to estimate the four parameters when more than two points are used. If only one point is used, the scale and rotation parameters are ignored and the resultant is a translation in both the east and north directions.

The vertical transformation calculation is based upon a three parameter linear plane model. The three parameters are the slope of the plane in the east direction, the slope of the plane in the north direction and a constant translation applied to all points. If one point is used in the calculation process, the slope parameters are ignored and only a translation is used. If two points are used, the calculation routine reports an error as a minimum of three points are required to define the plane. If more than three points are used, least squares techniques are used to estimate the three plane parameters.

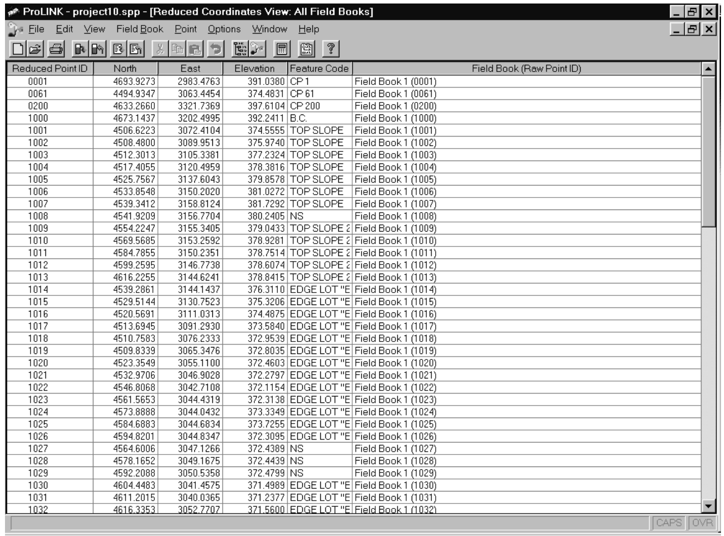
Chapter 7 Results and Output

The results of reducing the raw data in a project's field books are displayed in ProLINK's ***Reduced Coordinate View***. This list of reduced coordinates, as well as the raw data in the field book, can be output to a variety of file formats.

The output can meet a variety of specifications by employing conversion files during export —supplied by ProLINK or user-defined.

7.1 Viewing Results in the Reduced Coordinates View

The ***Reduced Coordinates View*** displays the results of the point reduction process. The information displayed in the ***Reduced Coordinates View*** can originate from a single field book, all field books, or a combination of field books. You determine which field book are used with the **Field Book Usage** option from the ***Field Book*** menu. For more information, see Section 7.1.2, *Determining the field book usage*, page 7-3.



Reduced Point ID	North	East	Elevation	Feature Code	Field Book (Raw Point ID)
0001	4693.9273	2983.4763	391.0380	CP 1	Field Book 1 (0001)
0061	4494.9347	3063.4454	374.4831	CP 61	Field Book 1 (0061)
0200	4633.2660	3321.7369	397.6104	CP 200	Field Book 1 (0200)
1000	4673.1437	3202.4995	392.2411	B.C.	Field Book 1 (1000)
1001	4506.6223	3072.4104	374.5555	TOP SLOPE	Field Book 1 (1001)
1002	4508.4800	3089.9513	375.9740	TOP SLOPE	Field Book 1 (1002)
1003	4512.3013	3105.3381	377.2324	TOP SLOPE	Field Book 1 (1003)
1004	4517.4055	3120.4959	378.3816	TOP SLOPE	Field Book 1 (1004)
1005	4525.7567	3137.6043	379.8578	TOP SLOPE	Field Book 1 (1005)
1006	4533.8548	3150.2020	381.0272	TOP SLOPE	Field Book 1 (1006)
1007	4539.3412	3158.8124	381.7292	TOP SLOPE	Field Book 1 (1007)
1008	4541.9209	3156.7704	380.2405	NS	Field Book 1 (1008)
1009	4554.2247	3155.3405	379.0433	TOP SLOPE 2	Field Book 1 (1009)
1010	4569.5685	3153.2592	378.9281	TOP SLOPE 2	Field Book 1 (1010)
1011	4584.7855	3150.2351	378.7514	TOP SLOPE 2	Field Book 1 (1011)
1012	4599.2595	3146.7738	378.6074	TOP SLOPE 2	Field Book 1 (1012)
1013	4616.2255	3144.6241	378.8415	TOP SLOPE 2	Field Book 1 (1013)
1014	4539.2861	3144.1437	376.3110	EDGE LOT "E	Field Book 1 (1014)
1015	4529.5144	3130.7523	375.3206	EDGE LOT "E	Field Book 1 (1015)
1016	4520.5691	3111.0313	374.4875	EDGE LOT "E	Field Book 1 (1016)
1017	4513.6945	3091.2930	373.5840	EDGE LOT "E	Field Book 1 (1017)
1018	4510.7583	3076.2333	372.9539	EDGE LOT "E	Field Book 1 (1018)
1019	4509.8339	3065.3476	372.8035	EDGE LOT "E	Field Book 1 (1019)
1020	4523.3549	3055.1100	372.4603	EDGE LOT "E	Field Book 1 (1020)
1021	4532.9706	3046.9028	372.2797	EDGE LOT "E	Field Book 1 (1021)
1022	4546.8068	3042.7108	372.1154	EDGE LOT "E	Field Book 1 (1022)
1023	4561.5653	3044.4319	372.3138	EDGE LOT "E	Field Book 1 (1023)
1024	4573.8888	3044.0432	373.3349	EDGE LOT "E	Field Book 1 (1024)
1025	4584.6883	3044.6834	373.7255	EDGE LOT "E	Field Book 1 (1025)
1026	4594.8201	3044.8347	372.3095	EDGE LOT "E	Field Book 1 (1026)
1027	4564.6006	3047.1266	372.4389	NS	Field Book 1 (1027)
1028	4578.1652	3049.1675	372.4439	NS	Field Book 1 (1028)
1029	4592.2088	3050.5358	372.4799	NS	Field Book 1 (1029)
1030	4604.4483	3041.4575	371.4989	EDGE LOT "E	Field Book 1 (1030)
1031	4611.2015	3040.0365	371.2377	EDGE LOT "E	Field Book 1 (1031)
1032	4616.3353	3052.7707	371.5600	EDGE LOT "E	Field Book 1 (1032)

The fields in the ***Reduced Coordinates View*** represent the following:

Reduced Point ID .... displays the reduced point ID, including any renumbering option that may have been selected in the ***Field Book Settings***.

North .... displays the Northing Coordinate

East .... displays the Easting Coordinate

Elevation .... displays the Elevation Coordinate

Feature Code .... displays the feature code of the point

Field Book (Raw Point ID) .... displays the field book name and the raw point ID from which the coordinate originated.

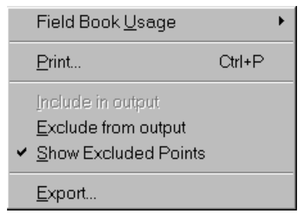
The reduced coordinate results are presented in order, sorted by the reduced point ID. Any duplicate point IDs, resulting from multiple field books, are displayed with a **Bold** font.

Information cannot be modified in the ***Reduced Coordinates View;*** all data editing is performed in the ***Field Book Editor***. However, you can select an individual point and exclude it from being exported. Points that have been excluded are displayed with a strike-through font. For more information, see Section 7.1.4, *Point usage*, page 7-6.

☒ **Note**: As the current field book is modified in the ***Field Book Editor***, the ***Reduced Coordinates View*** is updated if you are using automatic reduction.

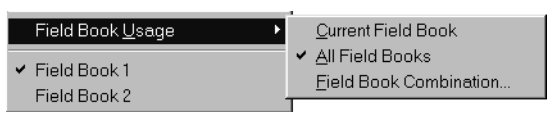
7.1.1 Using the Reduced Coordinates View shortcut menu

You can access a shortcut menu in the ***Reduced Coordinates View*** by clicking the right mouse button. Various options are available.



7.1.2 Determining the field book usage

The **Field Book Usage** option from the ***Field Book*** menu controls which field books, in a project with multiple field books, contribute to the reduced coordinate results which includes the ***Reduced Coordinates View*** and output.



The **Field Book Usage** option can contribute to the results in the ***Reduced Coordinates View*** and ***Graphical View*** with the following selections:

Current Field Book .... Only the currently selected field book in the ***Field Book Editor*** will contribute to the results. This selection is the default.

All Field Books .... Every field book in the project will contribute results.

Combination .... The user-specified combination of field books will contribute to the results.

The current **Field Book Usage** selection and field book names are identified in the title bar of the ***Reduced Coordinates View***.

7.1.2.1 Current field book

When the **Current Field Book** option is selected from **Field Book Usage**, processing and subsequent results in the ***Reduced Coordinates View, Graphical View*** and output will reflect the currently selected field book only. When a project contains multiple field books, as the current field book selection is changed, the reduction process is appropriately changed. For more information, see Section 4.2, *Making a Field Book Current*, page 4-3.

After a reduction is performed, either manually or automatically, the reduced coordinate list will contain the results of the current field book only.

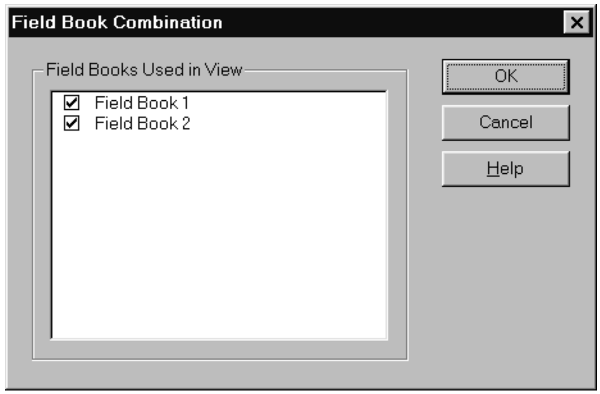
7.1.2.2 All field books

When the **All Field Books** option is selected from **Field Book Usage**, processing and subsequent results in the ***Reduced Coordinates View, Graphical View*** and output will reflect the contribution of every field book in the project simultaneously. As field books are added or removed, the reduction process will appropriately account for that field book.

After a reduction is performed, either automatically or manually, the reduced coordinate list will contain the results of all field books in the project.

7.1.2.3 Combination

The **Field Book Combination** option enables you to choose any combination of field books from those currently available in the project. The **Combination** option displays a dialog in which all the field books currently residing in the project are listed.

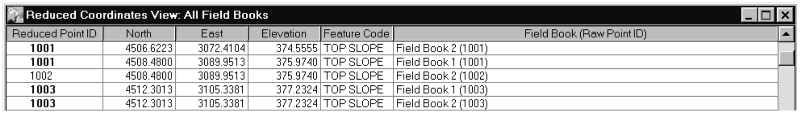


To use a combination of field books, select the appropriate check boxes next to the field book name. Once this dialog is accepted, processing and subsequent results in the ***Reduced Coordinates View***, ***Graphical View*** and output will reflect the specified combination of field books.

After a reduction is performed, either manually or automatically, the reduced coordinates list will reflect the specified combination of field books. If a selected field book is subsequently removed, the reduction process will account for it.

7.1.3 Encountering duplicate points

SDR Search Rules ensure that all points within a single field book are unique. When results from multiple field books display in the ***Reduced Coordinates View***, point IDs from different field books may be duplicated. Any matching points from various field books are displayed in a **bold** font.


Reduced Coordinates View: All Field Books

Reduced Point ID	North	East	Elevation	Feature Code	Field Book (Raw Point ID)
1001	4506.6223	3072.4104	374.5555	TOP SLOPE	Field Book 2 (1001)
1001	4508.4800	3089.9513	375.9740	TOP SLOPE	Field Book 1 (1001)
1002	4508.4800	3089.9513	375.9740	TOP SLOPE	Field Book 2 (1002)
1003	4512.3013	3105.3381	377.2324	TOP SLOPE	Field Book 1 (1003)
1003	4512.3013	3105.3381	377.2324	TOP SLOPE	Field Book 2 (1003)

Note: A warning message will display if duplicate points are encountered upon export. To enable/disable this message, see Section 2.7, *Determining Preferences*, page 2-13.

Since some destination package discourage duplicate points, you can choose to address the points in the following ways:

- Modify any raw point ID in the ***Field Book Editor*** (see Section 5.2.3, *Modifying point IDs*, page 5-6)
- Renumber all the points in a field book upon reduction (see Section 6.2.3, *Duplicate IDs in reduced coordinates*, page 6-13)
- Exclude a point from output (see Section 7.1.4.1, *Exclude from output*, page 7-7)

7.1.4 Point usage

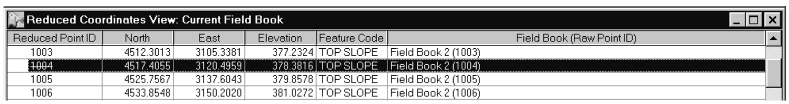
Points may be selected to be excluded from or included in the reduced coordinate results which includes the ***Reduced Coordinates View*** and output. If you decide that you don't want a specific point to be exported — for example a duplicate point — use the **Exclude from Output** option.

7.1.4.1 Exclude from output

You can exclude individual points from being used in the export process. This exclusion may help manage point conflicts for duplicate points, by selecting which point among duplicates is to be included and which is not.

☒ **Note**: Duplicate point IDs are displayed in **bold** font in the ***Reduced Coordinates View***.

To exclude a point from output, highlight the point; then, select the **Exclude in Output** option from the ***Point*** menu. Excluded points are indicated by a strike-through font.



Reduced Point ID	North	East	Elevation	Feature Code	Field Book (Raw Point ID)
1003	4512.3013	3105.3381	377.2324	TOP SLOPE	Field Book 2 (1003)
~~1004~~	4517.4055	3120.4959	378.3816	TOP SLOPE	Field Book 2 (1004)
1005	4525.7567	3137.6043	379.8578	TOP SLOPE	Field Book 2 (1005)
1006	4533.8548	3150.2020	381.0272	TOP SLOPE	Field Book 2 (1006)

☒ **Note**: You can “hide” all the excluded points in the ***Reduced Coordinates View*** by deselecting the **Show Excluded Points** option in the ***Points*** menu.

7.1.4.2 Include in output

The ProLINK default is to include all points in the reduced coordinate results. Individual points may be excluded (see above). You can change the status of an excluded point by highlighting the point then selecting the **Include in Output** option from the ***Point*** menu.

7.1.4.3 Show excluded points

You can determine whether excluded points should display in the ***Reduced Coordinates View*** or if those points should not be visible. To establish the display status, use the **Show Excluded Points** option in the ***Points*** menu. If it is selected (a small check next to the menu option is displayed), all points -- included or excluded -- are displayed. If it is unselected, excluded points are not displayed in the ***Reduced Coordinates View***.

☒ **Note**: Regardless of the status of ***Show Excluded Points***, excluded points are not included in the output of the export process.

7.2 Generating Output

ProLINK facilitates output to a variety of file formats. Two output methods are available:

- You can send files directly to a Sokkia device

- You can export raw data from the ***Field Book Editor*** or results from the ***Reduced Coordinates View*** and convert it into file formats for use with various software and devices

To meet output requirements, the export process uses ProLINK-supplied export conversions or user-defined conversions. For information on using and creating export conversions, see Chapter 9 *Conversion Definition Manager*.

7.2.1 Sending files to an external device

ProLINK can send data directly to a Sokkia device. You can choose to send data from the following sources:

- the current field book (raw data from the ***Field Book Editor***)
- reduced coordinates (results from the ***Reduced Coordinates View***)
- file(s) from a disk

☒ **Note**: For information on exporting from the ***Field Book Editor***, see Section 8.1.2, *Exporting database records guidelines*, page 8-2.

If the data source is from the project (the first two options), then ProLINK will convert the data to a file format that is accepted by the destination device. You must identify this Export Conversion as you start the sending process. You can choose from predefined Export Conversion or create your own. For more information, Chapter 9 *Conversion Definition Manager*.

If the data source is files on disk, then an Export Conversion is not applied. The file will be transferred to the device in its native format.

For a detailed explanation of transferring data to a Sokkia device, see Section 10.1.1, *Save files to a Disk or Device*, page 10-3.

7.2.2 Exporting data to an output file

ProLINK will export data to various file formats. It exports data from two locations within the projects:

- the raw data contained in the current field book as displayed in the ***Field Book Editor.***
- ***Reduced Coordinates View*** results.

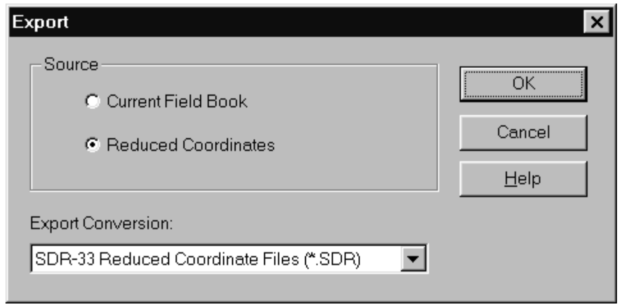
☒ **Note**: For information on exporting from the ***Field Book Editor***, see Section 8.1.2, *Exporting database records guidelines*, page 8-2

When performing the export, ProLINK will use an Export Conversion to convert the data into the appropriate file format. You can select from predefined conversions, or you can create your own conversion. For more information, see Chapter 9 *Conversion Definition Manager*.

☒ **Note:** When sending an *.sdr file with a transformation to an SDR data collector, the transformation (*.xfm) file must be available on the data collector. If the *.xfm file does not exist on the SDR, it will stall when the imported file is opened on the data collector.

Steps to export data

1. To export data from the current ProLINK project, select **Export** from the ***File*** menu. The following dialog displays:



2. Select the origin of the data to be exported in the ***Source*** section.

Current Field Book ....Select this option to export the contents of the currently selected field book to the format defined by the selected export conversion.

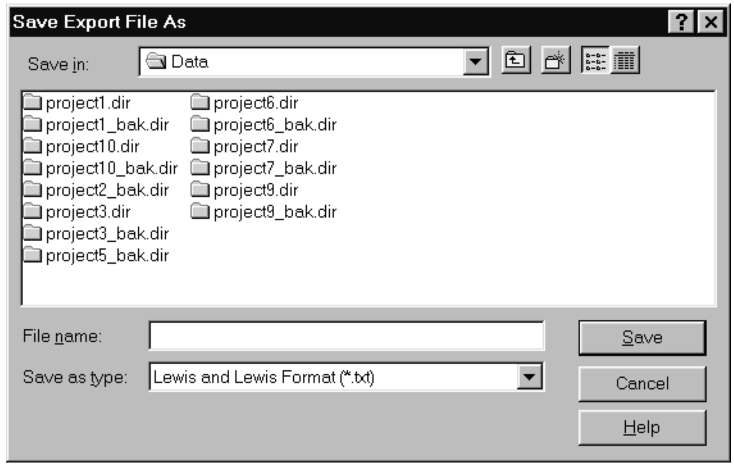
Note: This option sends the current field book only regardless of the ***Field Book Usage*** selection.

Reduced Coordinates ...Select this option to export the results of the ***Reduced Coordinates View*** to the format defined by the selected export conversion.

Note: If duplicate points exist in the reduced coordinate results, a warning message may be displayed. You can opt to continue with the export or cancel the procedure. For more information on duplicate points, see Section 7.1.3, *Encountering duplicate points*, page 7-6.

3. Identify the destination file type in the ***Export Conversion*** field. For information on how to create your own export conversion, see Chapter 9 *Conversion Definition Manager*.

4. Press **<OK>**. The ***Save Export File As*** dialog displays:



5. Enter a name for the exported file in the ***File Name*** field.

6. Identify the path in which the file will be stored.

7. Press **<Save>**.

Chapter 8 Reviewing the ProLINK Database

The ProLINK database provides logical ways to work with your data, following SDR search rules and providing multiple types of records to insert and edit. ProLINK's database is a comprehensive organizational tool for your surveying data. This chapter will explain how to work with the ProLINK database, covering SDR rules and the guidelines used for inserting, deleting, and exporting records. This chapter also includes a full listing and explanation of all the record types.

8.1 Working with Database Records

ProLINK follows guidelines within the database that allows you to implement SDR search rules, insert and delete records and export database records. The database recognizes the interdependent relationships between records and field books and the guidelines conform to those relationships, maintaining the integrity of the ProLINK database.

8.1.1 Using SDR search rules with database

The SDR search rules affect field book editing in various ways. When deleting and inserting records, the database uses SDR search rules to reduce and manage the field book. ProLINK uses the interdependent relationship between records and field books when using the SDR search rules and how the rules affect reduction. For a complete discussion on how SDR search rules affect the reduction of a field book, see 6.1.3 *Applying SDR search rules*.

8.1.2 Exporting database records guidelines

When exporting or sending data from the ***Field Book Editor*** with the SDR Conversion format, ProLINK will extract the data with the following guidelines.

Field Length

Although the ProLINK database emulates and uses the SDR records and reduction, it does not adhere to field lengths that are used within the SDR software. When exporting out of the field book, the values in the record fields may be truncated to the appropriate field's length when using the SDR format.

Header Record

The job settings within the ***Field Book Settings***' dialog are exported in the header record of the SDR file. Once a job is started in the SDR some of the job settings are not available to change.

ProLINK allows you to change the settings in an imported SDR file within the ***Field Book Settings*** dialog. Additionally, the ***Field Book Settings*** dialog provides the functionality to define settings in a non-SDR or manually entered file before sending it to the SDR.

8.1.3 Inserting and deleting records guidelines

The following table lists all the ProLINK records and their associated guidelines for inserting and deleting.

Record	Insert	Delete	Comments
ANT HT	X	X	Can be inserted anywhere in the current field book The new target record value is used until another target record is encountered. If no target record is encountered, or it is <Null>, the target height is assumed to be zero (0).
APPLY SUPER	X	X	Can be inserted after a TEMP record

Record	Insert	Delete	Comments
ATMOS	N/A	N/A	These records can exist when files are in SDR format. These records contain information about corrections used when data was collected. These values are not used during the reduction. ATMOS records are added to the file when sent to a device and contain the current field book settings.
BKB	X	X	Can only be inserted after a STN record Upon reduction, if an OBS record is encountered without an associated BKB record, the horizontal angle of the OBS is assumed to be the azimuth. A message displays, indicating when this occurs.
CIRCULAR VC	X	X	Can be inserted after a ROAD NAME record
COL	X	X	The values in the collimation record can be edited and are used in the reduction. This record affects the reduction of subsequent OBS records.
DEFINE SUPER	X	X	Can be inserted after a TEMP record
GOBS	X	X	Can be inserted after a GSTN record If the GOBS record is used to calculate coordinates for a subsequent station record, that station record reverts to existing coordinates, if available. If coordinates are not available for the station record, ProLINK will notify the user, the station record will display NULL coordinates and any GOBS records based off of the station record will calculate NULL coordinates.
GPOS	X	X	Can be inserted anywhere in the current field book
GPS	X	X	Can be inserted anywhere in the current field book
GPS INSTR	X	X	Can only be added to the end of the current field book Some of the fields are not editable.
GROBS	X	X	Can be inserted anywhere in the current field book (S/K record).

Record	Insert	Delete	Comments
GPS PROJ	X	X	Basis of local tangent plane projection
GPS ANT	X	X	Can be inserted anywhere in the current field book The new target record value is used until another target record is encountered. If no target record is encountered, the target height is assumed to be zero (0)
GRED	X	X	Can be inserted after a GSTN record If the GRED record is being used to calculate coordinates for a subsequent station record, that station record reverts to existing coordinates, if available. If coordinates are not available for the station record, ProLINK will notify the user, the station record will display NULL coordinates and any GRED records based off of the station record will calculate NULL coordinates.
GSTN	X	X	For records containing a source point ID field, the point ID of the STN record is inserted into the source point ID of subsequent records until the next STN record is found. Any GOBS records following the deleted GSTN can be deleted or retained. If retained, the previous GSTN point ID is used for the source point ID of the GOBS records. If no previous GSTN record exists, the GOBS records are deleted.
HEADER	N/A	N/A	This record is automatically placed at the beginning of each job that is imported or received into the current field book. This record has no editable fields.
HORZ ADJ	X	X	Can only be added to the end of the current field book Inserting adjustment values affects the reduction of the current field book. Deleting adjustment values affects the reduction of the current field book.
HORZ ALIGN	X	X	Can be inserted after a ROAD NAME record
HORZ ARC	X	X	Can be inserted after a ROAD NAME record

Record	Insert	Delete	Comments
HORZ POINT	X	X	Can be inserted after a ROAD NAME record
HORZ SPI-RAL	X	X	Can be inserted after a ROAD NAME record
HORZ STRAIGHT	X	X	Can be inserted after a ROAD NAME record
INSTR	X	X	Can only be added to the end of the current field book
JOB		X	Can be deleted; all data associated with the job will be deleted The file uses the JOB record contained in the SDR format.
LEVEL ELE-VATION	X	X	Can be inserted anywhere in the current field book
LEVEL INSTR	X	X	Can only be added to the end of the current field book
LEVEL STA-TION	X	X	For records containing a source point ID field, the point ID of the STN record is inserted into the source point ID of subsequent records until the next STN record is found Any LOBS records following the deleted LSTN can be deleted or retained. If retained, the previous LSTN point ID is used for the source point ID of the LOBS records. If no previous LSTN record exists, the LOBS records are deleted.
LEVEL OBSERVA-TION	X	X	Can be inserted after a LEVEL STATION record The source point field is automatically updated with the station point ID preceding the LEVEL OBSER-VATION record. If the LOBS1W/LOBS3W record is used to calculate elevations for a subsequent station record, that sta-tion record reverts to existing coordinates, if avail-able. If coordinates are not available for the station record, ProLINK will notify the user, the station record will display NULL coordinates and any LOBS1W/LOBS3W records based on the station record will calculate NULL coordinates.

Record	Insert	Delete	Comments
LEVEL OFFSET	X	X	Can be inserted before a LEVEL OBSERVATION record
LLH STN	X	X	Can be inserted anywhere in the current field book if the XFORM record exists.
Local LLH	X	X	Can be inserted anywhere in the current field book if the XFORM record exists.
NOTE	X	X	Can be inserted anywhere within a file Certain derivation codes, such as JS, can only be inserted by the software. Note records with certain derivation codes, such as JS, cannot be deleted.
NOTE AR			Can be inserted anywhere within a file
NOTE CP			Can be inserted anywhere within a file
NOTE MD			Can be inserted anywhere within a file
NOTE OS			Can be inserted anywhere within a file
NOTE RO			Can be inserted anywhere within a file
NOTE RS			Can be inserted anywhere within a file
NOTE SC			Can be inserted anywhere within a file
NOTE SS			Can be inserted anywhere within a file
NOTE TL			Can be inserted anywhere within a file
NOTE TP			Can be inserted anywhere within a file
NOTE TS			Can be inserted anywhere within a file
NOTE TV			Can be inserted anywhere within a file
OBS F1	X	X	Can only be inserted after a STATION record
OBS F2	X	X	Can only be inserted after a STATION record
OBS MC	X	X	Can only be inserted after a STATION record
OFFSET	X	X	Can only be inserted after a STATION record
PARA-BOLIC VC	X	X	Can be inserted after a ROAD NAME record

Record	Insert	Delete	Comments
POS	X	X	Can be inserted anywhere in the current field book
RCHK	X	X	Can be inserted after an RSTN record
RED	X	X	Can be inserted after an STN record The source point field ID is automatically updated with the station point ID preceding the RED record. Exception is a RED record with IN as a derivation code. If the RED record is used to calculate coordinates for a subsequent station record, that station record reverts to existing coordinates, if available. If coordinates are not available for the station record, ProLINK will notify the user, the station record will display NULL coordinates and any RED records based off of the station record will calculate NULL coordinates. Exception is a RED record with IN as a derivation code.
ROAD NAME	X	X	Can only be inserted at the end of the current field book
RPOS	X	X	Can be inserted after an RSTN
RSTN	X	X	For records containing a source point ID field, the point ID of the STN record is inserted into the source point ID of subsequent records until the next STN record is found
SCALE			Cannot be inserted or deleted
SET	X	X	This record defines sets of data and requires the user to insert it at the proper field book position for later use in the SDR.
STN	X	X	Can be inserted anywhere in the field book For records containing a source point ID field, the point ID of the STN record is inserted into the source point ID of subsequent records until a station record is found. Any OBS records subsequent to the deleted STN can be deleted or retained. If retained, the previous STN point ID is used for the source point ID of the OBS records. If no previous STN record exists, the OBS records are deleted.

Record	Insert	Delete	Comments
TRGT HT	X	X	Can be inserted anywhere in the current field book The new target record value is used until another target record is encountered. If no target record is encountered, the target height is assumed to be zero (0). The previous target record value is used until another target record is encountered. If no target record is encountered, the target height is assumed to be zero (0).
TEMP	X	X	Can only be added to the end of the current field book
TEMP-OFS/ HTDIFF	X	X	Can be inserted after a TEMP record
TEMP-GRADE/ DIST	X	X	Can be inserted after a TEMP record
TEMP-ELE-MENT	X	X	Can be inserted after a TEMP record
TEMP-SIDESLOPE	X	X	Can be inserted after a TEMP record
VERT ADJ	X	X	Can only be added to the end of the current field book Inserting adjustment values affects the reduction of the current field book. Deleting adjustment values affects the reduction of the current field book.
VERT ALIGN	X	X	Can be inserted after a ROAD NAME record
VERT POINT	X	X	Can be inserted after a ROAD NAME record
WGS84 LLH	X	X	Can be inserted anywhere in the current field book if the XFORM record exists.
XFORM	X		Can be added to a single field book project.
XSEC	X	X	Can be inserted after a ROAD NAME record

8.2 Understanding ProLINK Database Records

This section describes the use of records in the database and the fields within each record.

Each record has a *derivation* code, a two-character code describing how the record was generated and which part of the SDR software generated the record. The derivation code is sometimes blank. Special derivation codes descriptions are included in the following discussion of records.

8.2.1 ANT HT - GPS Antenna height

Antenna height record. This record specifies the height of the antenna pole (defined as the distance from the point on the ground to the center of the antenna).

The new antenna record value is used until another antenna record is encountered. If no antenna record is encountered, or it is <Null>, the antenna height is assumed to be zero (0).

This record can be inserted anywhere in the current field book; it can be deleted.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC	
	GPS Antenna	**KI**	Antenna Height: 5.0000'

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Antenna ht .... the height of the antenna pole (defined as the distance from the point on the ground to the center of the antenna)

8.2.2 APPLY SUPER - Apply super-elevation

Apply superelevation record. This record defines superelevation at a particular station on the road.

This record can be inserted after a TEMP record; it can be deleted.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC			
	Apply SuperElev	**KI**	Station: 10+00.0000~		
			Left Super: <Null>	**Right Super: <Null>**	
			Left Widen: 2.0000ft	**Right Widen: 2.0000ft**	**Pivot Position: Left**

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Stationing .... specifies the station to which these values are applied

Left super.............................. specifies the superelevation to apply to the template on the left side of the road

Right super............................ specifies the superelevation to apply to the template on the right side of the road

Left widen............................. specifies the amount of widening to add to the elements of the template on the left side of the road

Right widen........................... specifies the amount of widening to add to the elements of the template on the rightside of the road

Pivot....................................... specifies whether the center, left or right part on the cross-section is to be held at constant elevation during the application of superelevation and widening

8.2.3 ATMOS - Atmospheric

Atmospheric record. The two fields in this record define the temperature and pressure at the time of record generation (these values are used when atmospheric corrections are applied to observations within the SDR). This record is generated after the STN record only if you're applying atmospheric corrections.

These records can exist when files are in SDR format. These records contain information about corrections used when data was collected. These values are not used during the reduction. ATMOS records are added to the file when sent to a device and contain the current field book settings.

This record cannot be inserted or deleted.

The fields that correspond with this record are as follows:

Reduced Point ID	Record type	DC	
⊟	**Environ**	**NM**	Press: 30.00
	Detail		
			Temp: 75.00

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Pressure .... measurement of atmospheric pressure, which varies primarily due to elevation

Temperature .... measurement of air temperature

8.2.4 BKB - Back bearing details

Back bearing record. This record defines the orientation correction for the current instrument setup. Fields list source point, target point, horizontal observation value from the instrument, and its corresponding azimuth. The orientation correction is the difference between the last two fields.

Upon reduction, if an OBS record is encountered without an associated BKB record, the horizontal angle of the OBS is assumed to be the azimuth. A message displays, indicating when this occurs.

This record can only be inserted after an STN record; it can be deleted.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC			
	BKB	KI	Trgt Pt ID: 2000	Src Pt ID: 1000	Calc: No
			Azimuth: 0° 00' 00.000000"	Hor Obs: + 0° 00' 00.0000"	

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Source Point ID .... point name of instrument occupation

Target Point ID .... point name of the point being observed

Azimuth .... a horizontal angle measured clockwise from a reference source; the reference, typically north, is defined as zero

Horizontal Observation .... this field displays the horizontal angle of the total station upon observing the backsight point

Calc .... indicates the option to recalculate from a previous point. For more information, see Section 5.2.5, *Calculate station*, page 5-8

8.2.5 CIRCULAR VC - Vertical circular

Circular vertical curve record. This record is part of a road's vertical alignment; it defines a circular vertical curve (arc).

This record can be inserted after a ROAD NAME record; it can be deleted.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC			
	Circular VC	KI	Station: 1000.0000ft	Elev: 1000.0000ft	Radius: 1000.0000ft

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Station .... the distance along the center of the road alignment

Elevation .... this field displays the VIP elevation at the specific station

Radius.................................... this field displays the radius of the vertical curve

8.2.6 COL - Collimation record

Collimation record. Fields define the vertical and horizontal angle correction required to compensate for collimation error in the current instrument.

The values in the collimation record can be edited and are used in the reduction.This record affects the reduction of subsequent OBS records.

This record can be inserted and deleted.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC		
	Coll	KI	Vert Coll: + 0° 00' 00.0000"	Hor Coll: + 0° 00' 00.0000"

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Vertical collimation.............. vertical angle necessary to compensate for collimation error in the instrument

Horizontal collimation........ horizontal angle necessary to compensate for collimation error in the instrument

8.2.7 DEFINE SUPER - Define super-elevation

Define superelevation record. This record specifies the limits of superelevation application.

This record can be inserted after a TEMP record; it can be deleted.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC		
	Define SuperElev	**KI**	Start Station: 10+00.0000~	End Station: 20+00.0000~

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Start stationing .... distance along the road alignment where superelevation starts

End stationing....................... distance along road alignment where superelevation ends

8.2.8 GROBS - GPS-S/K raw observation

This record is generated during static/kinematic surveys and displays GPS raw observables.

Field Book Editor

Field Book 1

Reduced Point ID	Record type	DC			
	GROBS	KI	Reduced Point:	Begin Time:	End Time:
			Epoch Count: 345	**Epoch Rate: 14**	**Method: Old Position**
			WGS84 Latitude: N 38° 17' 00.0000"	**WGS84 Longitude: E 98° 12' 00.0(**	**WGS84 Height: 2300.0000**

The GROBS record includes the following information:

Begin Time .... This field indicates the time the GPS observation began

End Time............................... This field indicates the end of the observation period.

Epoch Count.......................... This field represents the number of epochs or recorded satellite measurements.

Epoch Rate .... This field represents the rate at which measurements on the receiver (epochs) are taken.

Method .... This field represents the solution method - the type of GPS process used in creating the record.

WGS84 LLH .... This field represents the observation as WGS84 latitude, longitude and height.

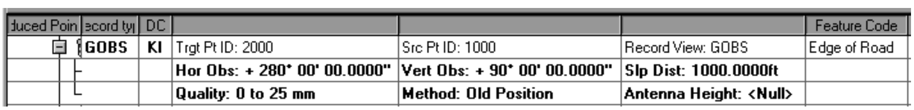
8.2.9 GOBS - GPS/RTK observation

GPS/RTK observation record. Fields include source point name, azimuth, vertical angle, slope distance, and a description code. These records appear in review as type RK.

If the GOBS record is used to calculate coordinates for a subsequent station record, that station record reverts to existing coordinates, if available. If coordinates are not available for the station record, ProLINK will notify the user, the station record will display NULL coordinates and any GOBS records based off of the station record will calculate NULL coordinates.

This record can be inserted after a GSTN record; it can be deleted.

The fields that correspond with this record are as follows:



Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Target point ID .... name of the point being observed

Source point ID .... name of the point of the base station receiver

Slope distance .... this field displays the slope distance

Vertical OBS .... this field displays the vertical observation

Horizontal OBS .... this field displays the horizontal azimuth

Feature code .... an alphanumeric code that describes an observed point

Quality .... this field displays the quality range within which the data was collected

Method .... this field displays the method in which the GPS/RTK data was collected

Antenna height .... the height of the antenna pole (defined as the distance from the point on the ground to the center of the antenna)

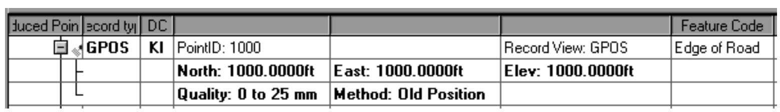
Record view .... this field allows the record to be reduced as another record type

8.2.10 GPOS - GPS/RTK position

GPS/RTK position record. This record is the position of point before any calibration or transformation has been applied.

This record can be inserted after a GSTN record; it can be deleted.

The fields that correspond with this record are as follows:



duced Poin	ecord ty	DC				Feature Code
	GPOS	KI	PointID: 1000		Record View: GPOS	Edge of Road
			North: 1000.0000ft	East: 1000.0000ft	Elev: 1000.0000ft	
			Quality: 0 to 25 mm	Method: Old Position		

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Point ID .... the name of the point being observed

Northing .... this field provides the Northing coordinate

Easting .... this field provides the Easting coordinate

Elevation .... this field provides the elevation coordinate

Feature code .... an alphanumeric code that describes an observed point

Quality .... this field displays the quality range within which the data was collected

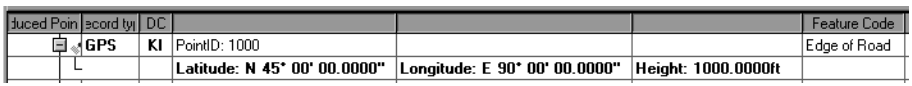
Method .... this field displays the method in which the GPS/RTK data was collected

Feature code .... an alphanumeric code that describes an observed point

8.2.11 GPS - Point defined by latitude and longitude

GPS record. This record contains the latitude, longitude, and height values of a point. This record can be inserted and deleted.

The fields that correspond with this record are as follows:



Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Point ID .... the name of the point being observed

Latitude .... the angle measured at the center of the earth from the equator to the point of interest; the latitude is 0° at the equator, 90° at the North pole, and -90° at the South pole

Longitude .... the angle measured at the center of the earth from the Greenwich meridian to the meridian of interest; east longitudes are positive and west longitudes are negative

Height .... the height of the point above sea level

Feature code .... an alphanumeric code that describes an observed point

8.2.12 GPS INSTR - GPS instrument

GPS instrument record. The fields describe the type of instrument and various instrument parameters. Some of the fields, such as the prism constant, are not editable. This record can only be added to the end of the current field book; it can be deleted.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC			
	GPS Instrume	KI	Model: GIR 1000		
			Serial Number: 0	Inst Description:	Receiver Mode: Auto
			BPS Period: 0	DBEN Period: 0	Reference Elev Mask: 0
			Antenna Type: User	Antenna Meas Method: Slant	
			Vertical Offset: 0	Radius: 0	Store OBS: No

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Model .... this field provides the model of instrument based on the selected type; the information is stored as part of the instrument record

Instrument description .... a description of up to 16 characters can be entered

Serial number .... a six-digit serial number can be entered to track the receiver used

Receiver mode .... this field identifies which receiver is currently connected and being set up; the options are **Base/Rover**

BPS period .... this field displays the time interval for broadcasting the base positional information

DBEN period......................... this field displays the interval for a message from the base receiver to the rover receiver

Reference elev mask (degree) .... the angle of a satellite above the horizon; directly overhead equals 90° elevation

Antenna type .... this field identifies the antenna type to be used; the options are **User** and several predefined types

Antenna meas method .... this field allows selection of the measurement method for antenna height, which is to be directly input; the options are **Vertical/Slant**

Vertical offset (mm) .... the measurement from the antenna mount to the phase center of the antenna in millimeters

Radius (mm) .... this field specifies the value used to define the radius of the antenna

StoreOBS .... this field determines if raw observables are stored in the receiver's memory; the options are **Yes/No**

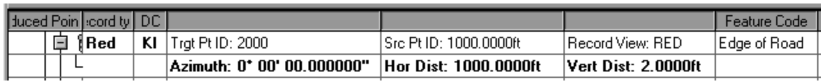
8.2.13 GRED - GPS/RTK reduced measurements

GPS/RTK reduced record. These fields define a point to point vector. Source point name, target point name, azimuth, horizontal distance, vertical distance, and a descriptive code are listed.

If the GRED record is being used to calculate coordinates for a subsequent station record, that station record reverts to existing coordinates, if available. If coordinates are not available for the station record, ProLINK will notify the user, the station record will display NULL coordinates and any GRED records based off of the station record will calculate NULL coordinates.

This record can be inserted after a GSTN record; it can be deleted.

The fields that correspond with this record are as follows:



Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Source point ID .... the name of the base receiver point

Target point ID .... the name of the point being observed

Azimuth .... a horizontal angle measured clockwise from a references source; the reference, typically north, is defined as zero

Horizontal distance............. the horizontal distance between the source and target point IDs

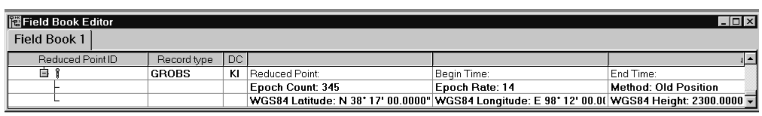
Vertical distance .... the vertical distance between the source and target point elevations

Feature code .... an alphanumeric code that describes an observed point

Record view........................... this field allows the record to be reduced as another record type

8.2.14 GROBS

This record is generated during static/kinematic surveys and displays observation details.



The GROBS record includes the following information:

Begin Time .... This field indicates the time the GPS observation began

End Time .... This field indicates the end of the observation period.

Epoch Count .... This field represents the number of epochs or recorded satellite measurements.

Epoch Rate .... This field represents the rate at which measurements on the receiver (epochs) are taken.

Method .... This field represents the solution method - the type of GPS process used in creating the record.

WGS84 LLH .... This field represents the observation as WGS84 latitude, longitude and height.

This record can be inserted after a GSTN record; it can be deleted.

8.2.15 GSTN - GPS/RTK station

GPS/RTK station record. This contains a point name, point coordinates, antenna height set up on the point, and a descriptive code. A station record is entered in the database whenever you set up on a different point.

For records containing a source point ID field, the point ID of the GSTN record is inserted into the source point ID of subsequent records until the next STN record is found.

Any GOBS records following the deleted GSTN can be deleted or retained. If retained, the previous GSTN point ID is used for the source point ID of the GOBS records. If no previous GSTN record exists, the GOBS records are deleted.

This record can be inserted in the field book; it can be deleted.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC				Feature Code
	GPS Station	KI	PointID: 1000	Antenna Height: 5.0000ft		Edge of Road
			North: 1000.0000ft	East: 1000.0000ft	Elev: 1000.0000ft	
			Horiz Dist Offset: 1000.0000ft	Horiz Angle Offset: + 0° 00' 00.0000"	Height Offset: 1000.0000ft	

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Point ID .... the name of the point being observed

Northing................................ this field provides the Northing coordinate

Easting .... this field provides the Easting coordinate

Elevation .... this field provides the elevation coordinate

Horizontal **distance (offset)** .... enter the distance the base receiver is from the desired point

Horizontal **angle (offset)** .... enter the direction the base receiver is from the desired point

Height (offset)....................... enter the elevation difference between the base receiver position and the desired point

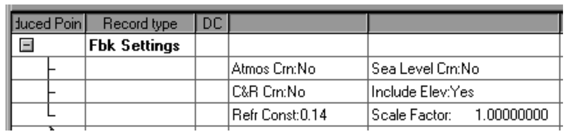
Antenna height..................... the height of the antenna pole (defined as the distance from the point on the ground to the center of the antenna)

Feature code .... an alphanumeric field that describes the GSTN point

8.2.16 HEADER

Header record. This record contains the field book settings. It is automatically placed at the beginning of each job that is imported or received into the current field book. The HEADER record can only be deleted by selecting the **Remove Field Book** option from the *Field Book* menu. This record has no editable fields.

The fields that correspond with this record are as follows:



Field Book Settings.............. the settings that are currently selected in the ***Field Book Settings*** dialog

Atmospheric Correction.......................... Atmospheric corrections (ppm) based on supplied temperature and pressure values are applied to the recorded data.

Sea Level Correction........... The horizontal distance at the elevation of the instrument station is reduced to the corresponding sea-level chord when generating coordinates

Curvature and Refraction....................... This correction allows for the curvature of the Earth and refraction on the EDM beam through the atmosphere. It is applied to the vertical angle upon reduction. The refraction constant is the coefficient of refraction.

Include Elevation .... This option applies an elevation measurement to all recorded data.

Scale Factor........................... The scale factor is applied to the horizontal component during reduction.

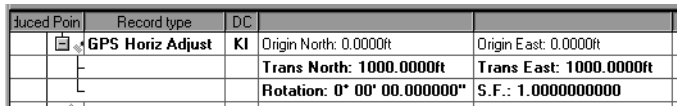
Refraction Constant............. coefficient of terrestrial refraction.

8.2.17 HORZ ADJ - GPS horizontal adjustment

Horizontal adjustment record. This record contains values for a horizontal calibration.

This record can only be added to the end of the current field book; it can be deleted. Inserting or deleting adjustment values affects the reduction of the current field book.

The fields that correspond with this record are as follows:



Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Origin north .... the north coordinate of the first GSTN in a file

Origin east .... the east coordinate of the first GSTN in a file

Translation north .... the north shift parameter moves the GPS origin north to coincide with the locally-defined coordinate system

Translation east .... the east shift parameter moves the GPS origin east to coincide with the locally-defined coordinate system

Rotation .... a rotation about the vertical axis (rotation of the azimuth), which moves the GPS north axis to coincide with the local system's north axis

Scale Factor .... a uniform scale in all directions that relates the GPS coordinate system to the local defined system

8.2.18 HORZ ALIGN - Horizontal align

Horizontal alignment record. This record marks the start of a road's horizontal alignment definition.

This record can be inserted after a ROAD NAME record; it can be deleted from the current field book.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC		
	Horizontal Align	**KI**	Start Station: 1000.0000ft	Start Azimuth: 0° 00' 00.000000"
			Start Northing: 1000.0000ft	**Start Easting: 1000.0000ft**

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Start station .... distance along the road where alignment begins

Start azimuth......................... direction in which the road alignment begins

Start northing........................ the north coordinate where the road alignment begins

Start easting........................... the east coordinate where the road alignment begins

8.2.19 HORZ ARC - Horizontal arc

Horizontal arc record. This record is part of a road's horizontal alignment; it defines an arc.

This record can be inserted after a ROAD NAME record; it can be deleted from the current field book.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC		
	Horizontal Arc	**KI**	Distance: 1000.0000ft	Radius: 1000.0000ft

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Distance .... this field displays the distance along the arc

Radius.................................... this field specifies the value used to define the radius of an arc

8.2.20 HORZ POINT - Horizontal point

Horizontal point record. This record is part of the road's horizontal alignment and specifies the coordinates of a point the alignment passes through.

This record can be inserted after a ROAD NAME record; it can be deleted from the current field book.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC		
	Horizontal Point	**KI**	North: 1000.0000ft	East: 1000.0000ft

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Northing................................ this field provides the Northing coordinate

Easting.................................... this field provides the Easting coordinate

8.2.21 HORZ SPIRAL - Horizontal spiral

Horizontal spiral record. This record is part of a road's horizontal alignment; it defines a portion of a spiral.

This record can be inserted after a ROAD NAME record; it can be deleted from the current field book.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC		
├	**Horizontal Spiral**	**KI**	Distance: 1000.0000ft	Radius: <Null>

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Distance .... this field displays the distance along the spiral

Radius.................................... this field specifies the value used to define the beginning or ending radius of a spiral

8.2.22 HORZ STRAIGHT - Horizontal straight

Horizontal straight record. This record is part of a road's horizontal alignment; it defines a straight section.

This record can be inserted after a ROAD NAME record; it can be deleted from the current field book.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC		
├	**Horizontal Straight**	**KI**	Azimuth: 0° 00' 00.000000"	Distance: 1000.0000ft

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Azimuth .... a horizontal angle measured clockwise from a reference source; the reference, typically north, is defined as zero

Distance .... this field displays the distance along the alignment to the next piece of the alignment

8.2.23 INSTR - Instrument details

Instrument record. The fields describe the type of instrument and various instrument parameters.

Some of the fields, such as the prism constant, are not editable.

This record can only be added to the end of the current field book; it can be deleted.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC			
	Instr	KI	EDM Type: SET 2-way		
			EDM Ser #: 0	EDM Desc:	Mntg Type: Telescope
			Theo Ser #: 0	Theo Desc:	Vert Ang Ref: Zenith
			EDM Offset: <Null>	Refl Offset: <Null>	Prism Const: -30.0000

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

EDM type.............................. this field provides the model of instrument based on the selected type; the information is stored as part of the instrument record

EDM description .... (*display only*) this field displays the type of EDM; the information is transmitted as part of the instrument record

EDM serial number .... (*display only*) this field displays the six-digit numeric field for the EDM serial number; it is transmitted as part of the instrument record

Theodolite description........ this field provides the model of instrument based on the selected type; the information is stored as part of the instrument record

Theodolite serial number ... (*display only*) this field displays the six-digit numeric field for the EDM serial number; it is transmitted as part of the instrument record

Mounting type .... this field allows the mounting type of external EDM to be specified

Vertical angle option .... this field allows the selection of where 0° occurs on the vertical circle; 0° zenith and 0° horizontal

EDM offset .... this field allows the vertical offset from the optical theodolite center to the EDM center

Reflector offset .... this field allows the vertical offset from the optical target to the EDM target

Prism constant .... (*display only*) the optical distance from the plumb line to the reflective surface of the prism; it is always entered in millimeters, regardless of the current distance unit; the default value is 0mm

8.2.24 JOB

Job record. This record type appears once at the start of a job. It defines the name of the job and which corrections the SDR33 applied.

The file uses the JOB record contained in the SDR format.

This record cannot be inserted but can be deleted.

The fields that correspond with this record are as follows:

Reduced Point ID	Record type	DC		
	Job	NM	Job ID: LAKE MEAD	C:\WIN95\Desktop\SDR Data\Lakemead.sdr
	Job Settings			

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Job identifier........................ this field holds the name of a new job; enter a name with any combination of letters and numbers, up to 16 characters long; ***Do not*** use a period (.) within a job name

Path.. the location of the job file on the hard drive

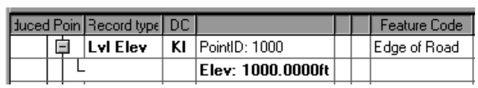
Note: If you choose to use alphanumeric point names, verify that your office software will process them correctly. (The output formats differ from the SDR2x formats.)

8.2.25 LEVEL ELEVATION

Level elevation record. This record specifies the elevation only of a point.

This record can be inserted anywhere in the current field book; it can be deleted.

The fields that correspond with this record are as follows:



duced Poin	Record type	DC				Feature Code
	Lvl Elev	Kl	PointID: 1000			Edge of Road
			Elev: 1000.0000ft			

Derivation code................... a two-character code describing how the record was generated and which part of the SDR software generated the record

Point ID................................ the name of the point being observed

Feature code......................... an alphanumeric code describing an observed point

Elevation............................... this field provides the elevation of the point observed

8.2.26 LEVEL INSTR - Level instrument

Level instrument record. This record contains the information specifying the instrument type and description.

This record can only be added to the end of the current field book; it can be deleted.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC			
	Lvl Inst	KI	Level: Manual		
			Ser #: 0	Description:	Stadia: 100.0000ft

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Level type .... this field provides the model of instrument based on the selected type; the information is stored as part of the instrument record

Serial number .... a six-digit serial number can be entered to track the receiver used

Stadia .... this field provides the stadia ratio used for the level observations

Description .... this field provides a description of the instrument

8.2.27 LEVEL OBSERVATION

Level observation record. This record contains information for an observation using a level.

If the LOBS1W/LOBS3W record is used to calculate elevation for a subsequent station record, that station record reverts to existing coordinates, if available. If coordinates are not available for the station record, ProLINK will notify the user, the station record will display NULL coordinates and any LOBS1W/LOBS3W records based on the station record will calculate NULL coordinates.

This record can be inserted after a LEVEL STATION record; it can be deleted.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC				Feature Code
	Lvl Obs3	**KI**	PointID: 1000	Stn Number: 0		Edge of Road
			Distance: 1000.0000ft		**Vert Offset: 0.0000ft**	
			Low Wire: 4.0000ft	**Mid Wire: 5.0000ft**	**Top Wire: 6.0000ft**	
			IsABs: 0	**IsATP: 0**		

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Reduced point ID .... the name of the point being observed

Distance .... this field displays the distance along the line (including the start distance) to the perpendicular intersection

Middle wire reading .... this field displays the value on the rod from a single or three wire reading

Low wire reading .... this field displays the value on the rod of the lowest stadia level reading

Top wire reading .... this field displays the value on the rod of the highest stadia level reading

Feature code .... an alphanumeric code describing an observed point

Station number .... this field contains the station setup number

IsAbs .... this field displays the turning point that was observed as a backsight

IsATP .... this field displays the turning point that was observed and used as a new setup

Vertical offset .... the measurement from the bottom of the rod to the point where the elevation is of interest, directly above or below the point

8.2.28 LEVEL OFFSET

Level offset record. This record contains the vertical distance the rod is offset. The OFFSET record contains the value used for the offset.

This record can be inserted after a LEVEL OBSERVATION record; it can be deleted.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC	
	Lvl Offset	**KI**	Vert Offset: 2.0000ft

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Vertical offset .... the measurement from the bottom of the rod point directly above or below the rod

8.2.29 LEVEL STATION

Level station record. This record contains information for the set-up of a level instrument.

For records containing a source point ID field, the point ID of the STN record is inserted into the source point ID of subsequent records until the next STN record is found. This record can be deleted.

Any LOBS records following the deleted LSTN can be deleted or retained. If retained, the previous LSTN point ID is used for the source point ID of the LOBS records. If no previous LSTN record exists, the LOBS records are deleted.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC		
	Lvl Stn	**KI**	Stn Number: 2	
			BS Pt ID: 1000	**TP Count: 0**

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Station number .... this field contains the station setup number

BS Point ID .... this field contains the backsight point ID

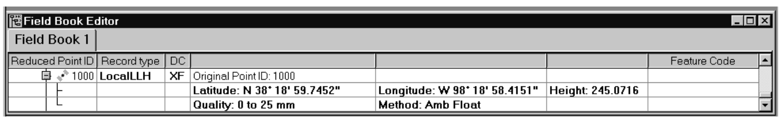
TP count .... turning point count

8.2.30 LLH Stn

This record is generated when ellipsoidal coordinates are selected for a job. Stn ID, latitude, longitude, altitude and theodolite height values are included.

8.2.31 Local LLH

This record includes latitude, longitude, height and altitude values when a Datum transformation type, other than WGS84, is utilized.



8.2.32 NOTE

Note record. This record type can appear anywhere in a job and contains a 60-character description that you enter with the keyboard. It is for informative purposes only and does not affect calculations. The contents of a note may be edited at any time.

This record can be inserted anywhere within a file; it can be deleted.

Certain derivation codes, such as JS, can only be inserted by the software. NOTE records with certain derivation codes, such as JS, cannot be deleted.

The fields that correspond with this record are as follows:

duced Poin	ecord ty	DC	
	Note		Note: User Entered Note

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Alphanumeric note .... up to 60 characters for description or information

8.2.33 NOTE AR - Note area calculation

Note record showing area calculation.

The fields that correspond with this record are as follows:

duced Poin	ecord ty	DC	
	Note	**AR**	Note: Area 5.435 Acres

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Alphanumeric note .... up to 60 characters for description or information

8.2.34 NOTE CP - Note correction parameters

Note record showing correction parameters. Possible corrections are atmospheric, curvature and refraction, and sea level.

The fields that correspond with this record are as follows:

Reduced Point ID	Record type	DC	
	Note	**CP**	Note: Sea Lvl Corr: No
	Note	**CP**	Note: C&R Corr: No
	Note	**CP**	Note: Atmos Corr: No

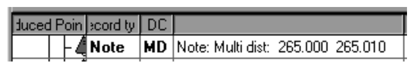
Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Alphanumeric note .... up to 60 characters for description or information

8.2.35 NOTE MD - Note multidistance observation

Note record showing the individual distance measurements from a multidistance observation is made using set collection. It is followed by an OBS record containing the average distance.

The fields that correspond with this record are as follows:



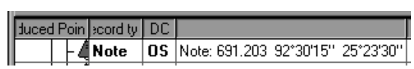
Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Alphanumeric note .... up to 60 characters for description or information

8.2.36 NOTE OS - Note offset observation

Note record generated by an offset observation. It contains the raw observation details and offset direction. It is generated before the observation record that contains measurements adjusted for the offset.

The fields that correspond with this record are as follows:



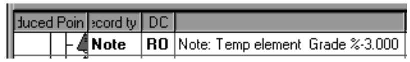
Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Alphanumeric note .... up to 60 characters for description or information

8.2.37 NOTE RO - Note roading

Note record generated in roading.

The fields that correspond with this record are as follows:



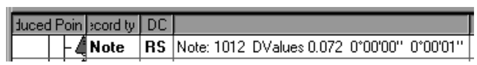
Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Alphanumeric note .... up to 60 characters for description or information

8.2.38 NOTE RS - Note resection calculation

Note record generated by the resection calculation.

The fields that correspond with this record are as follows:



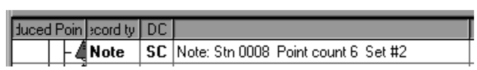
Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Alphanumeric note .... up to 60 characters for description or information

8.2.39 NOTE SC - Note set collection

Note record generated by the set collection procedure.

The fields that correspond with this record are as follows:



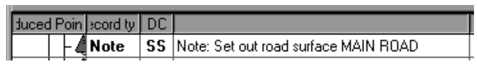
Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Alphanumeric note .... up to 60 characters for description or information

8.2.40 NOTE SS - Note road surface

Note record generated when setting out road surface.

The fields that correspond with this record are as follows:



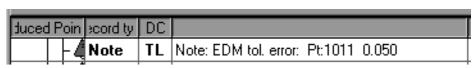
Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Alphanumeric note .... up to 60 characters for description or information

8.2.41 NOTE TL - Note tolerance error

Note record generated whenever a tolerance error message is displayed, and the error is accepted.

The fields that correspond with this record are as follows:



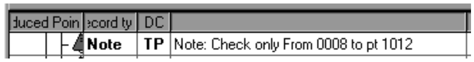
Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Alphanumeric note .... up to 60 characters for description or information

8.2.42 NOTE TP - Note topography

Note record generated in topography.

The fields that correspond with this record are as follows:



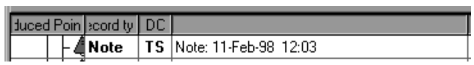
Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Alphanumeric note .... up to 60 characters for description or information

8.2.43 NOTE TS - Note timestamp

Note record with a timestamp. It contains the date and time of the note creation.

The fields that correspond with this record are as follows:



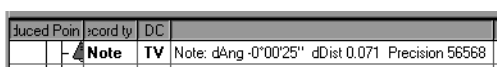
Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Alphanumeric note .... up to 60 characters for description or information

8.2.44 NOTE TV - Note traverse calculations

Note record generated by the traverse calculations. It lists information about how the calculation was performed.

The fields that correspond with this record are as follows:



Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

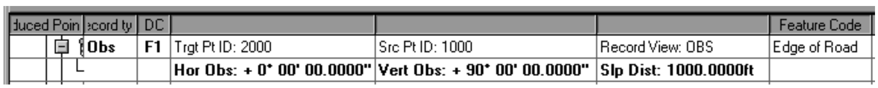
Alphanumeric note .... up to 60 characters for description or information

8.2.45 OBS F1 - Observation face one

Observation record measured on instrument face one. This record contains a source point name, target point name, horizontal observation, vertical observation, slope distance, and descriptive code. The vertical observation (zenith or horizontal) depends on the type specified in the most recent instrument record.

This record can only be inserted after a STN record; it can be deleted.

The fields that correspond with this record are as follows:



duced Poin	ecord ty	DC				Feature Code
	Obs	F1	Trgt Pt ID: 2000	Src Pt ID: 1000	Record View: OBS	Edge of Road
			Hor Obs: + 0° 00' 00.0000"	Vert Obs: + 90° 00' 00.0000"	Slp Dist: 1000.0000ft	

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Source point ID .... the name of the point the instrument occupies

Target point ID .... the name of the point being observed

Slope distance .... this field displays the slope distance

Vertical observation .... this field displays the vertical observation

Horizontal

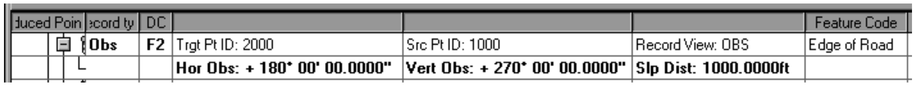
observation .... this field displays the horizontal azimuth

Feature Code .... an alphanumeric code that describes an observed point

8.2.46 OBS F2 - Observation face two

Observation record measured on instrument face two (see **OBS F1** above).

The fields that correspond with this record are as follows:



Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Source point ID .... the name of the point the instrument occupies

Target point ID .... the name of the point being observed

Slope distance .... this field displays the slope distance

Vertical angle .... this field displays the vertical observation

Horizontal observation .... this field displays the horizontal azimuth

Feature code .... an alphanumeric code that describes an observed point

Record view .... this field allows the record to be reduced as another record type

8.2.47 OBS MC - Observation measured and corrected

Measured and corrected observation record. It defines a point-to-point vector from one point to another. This distance has had environmental corrections applied, such as target and instrument height, and atmospheric or other corrections.

This record can only be inserted after a STN record; it can be deleted.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC				Feature Code
	Obs MC	KI	Trgt Pt ID:	Src Pt ID: 1000	Record View: OBS MC	Edge of Road
			Horizontal Azimuth: 0° 00' 00.000000"	**Vertical Angle: + 90° 00' 00.0000"**	**Slp Dist: 1000.0000ft**	

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Source point ID .... the name of the point the instrument occupies

Target point ID .... the name of the point being observed

Slope distance .... this field displays the slope distance

Vertical angle .... this field displays the vertical observation

Horizontal azimuth .... this field displays the horizontal azimuth

Feature code .... an alphanumeric code that describes an observed point

8.2.48 PARABOLIC VC - Vertical parabolic

Parabolic vertical curve record. This record is part of a road's vertical alignment; it defines a parabolic vertical curve.

This record can be inserted after a ROAD NAME record; it can be deleted from the current field book.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC			
	Parabolic VC	**KI**	Station: 1000.0000ft	Elev: 1000.0000ft	Length: <Null>

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Station .... this field is the distance along the road alignment where the VIP occurs

Elevation .... the angle of a satellite above the horizon; directly overhead equals 90° elevation

Length.................................. this field specifies the horizontal distance covered by the curve

8.2.49 POS - Coordinates

Position record. This record contains a point name, the point's coordinates, and a descriptive code.

This record can be inserted; it can be deleted.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC				Feature Code
	Pos	KI	PointID: 1000			Edge of Road
			North: 1000.0000ft	**East: 1000.0000ft**	**Elev: 1000.0000ft**	

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Point ID .... the name of the point being observed

Northing................................ this field provides the Northing coordinate

Easting .... this field provides the Easting coordinate

Elevation .... this field provides the elevation coordinate

Feature code .... an alphanumeric code that describes an observed point

8.2.50 PROJ - Projection

Projection record. This record contains the base station latitude, longitude, height, and coordinates of the original GSTN.

This record cannot be inserted or deleted.

The fields that correspond with this record are as follows:

educed Point II	Record type	DC			
	GPS Projection	RK	Proj Method: Plane		
			Origin Latitude: N 34° 39' 17.7612"	Origin Longitude: W 98° 55' 52.1058"	Origin Height: 901.0720ft
			Origin North: 32808.3333ft	Origin East: 32808.3333ft	Origin Elevation: 1017.0583ft
			S.F.: 1.0000000000	Orientation 1: <Null>	Orientation 2: <Null>

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Projection method .... currently one method "plane"

Origin latitude .... the latitude of the first GSTN in a file

Origin longitude .... the longitude of the first GSTN in a file

Origin height .... the height of the first GSTN in a file

Origin north .... the north coordinate of the first GSTN in a file

Origin east .... the east coordinate of the first GSTN in a file

Origin elevation .... the elevation of the first GSTN in a file

Scale factor .... a uniform scale in all directions that relates the GPS coordinate system to the local defined system

Orientation 1 .... currently not used

Orientation 2 .... currently not used

8.2.51 RCHK - Road check

Road check. This record defines a point on a road by station and offset, not coordinates. It also contains fields showing the difference between the station and offset set out and the design point's station and offset.

This record can be inserted after a RSTN record; it can be deleted from the current field book.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC				Feature Code
	Road Check	KI	PointID: 1000			Edge of Road
			Station: 1000.0000ft	Offset: 0.0000ft	Elev: 10.0000ft	
			Delta Station: 0.0000ft	Delta Offset: 0.0000ft	Delta Elevation: 0.0000ft	

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Point ID .... the name of the point being observed

Station .... this field displays the distance along the road alignment

Offset .... this field displays the perpendicular offset to the road alignment

Elevation .... the elevation of the point that is observed

Delta station .... the distance between the station of the point observed and the design point

Delta offset .... the distance between the offset of the point observed and the design point

Delta elevation .... the difference in elevation between the point observed and the design point

Theodolite height .... this field displays the instrument’s height above the ground point

Feature code .... an alphanumeric code that describes an observed point

8.2.52 RED - Reduced measurements

Reduced record. These fields define a point-to-point vector. Source point name, target point name, azimuth, horizontal distance, vertical distance, and a descriptive code are listed.

The source point field ID is automatically updated with the station point ID preceding the RED record. The exception is a RED record with IN as a derivation code.

If the RED record is used to calculate coordinates for a subsequent station record, that station record reverts to existing coordinates, if available. If coordinates are not available for the station record, ProLINK will notify the user, the station record will display NULL coordinates, and any RED records based off of the station record will calculate NULL coordinates. The exception is a RED record with IN as a derivation code.

This record can be inserted after an STN record; it can be deleted.

The fields that correspond with this record are as follows:

duced Poin	cord ty	DC				Feature Code
	Red	KI	Trgt Pt ID: 2000	Src Pt ID: 1000.0000ft	Record View: RED	Edge of Road
			Azimuth: 0° 00' 00.000000"	**Hor Dist: 1000.0000ft**	**Vert Dist: 2.0000ft**	

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Source point ID .... the name of the point the instrument occupies

Target point ID .... the name of the point being observed

Azimuth .... a horizontal angle measured clockwise from a reference source; the reference, typically north, is defined as zero

Horizontal distance............. the distance from the source point to the target point

Vertical distance .... the difference in elevation from source point to target point

Feature code .... an alphanumeric code that describes an observed point

Record view........................... this field allows the record to be reduced as another record type

8.2.53 ROAD NAME

Road name record. This record marks the start of a road definition. It contains the name of the road.

This record can only be added to the end of the current field book; it can be deleted from the current field book.

The fields that correspond with this record are as follows:

Reduced Point ID	Record type	DC		
├	**Road Name**	**KI**	Road Name: ROAD1	Pt Type: Length 14

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Road name .... this record, containing the name of the road, marks the start of a road definition

Pt type .... describes whether the road files were downloaded in SDR33 format (14) or SDR20 format (4)

8.2.54 RPOS - Road position

Road position record. Like a position record, this record defines the position of a point but also includes the station and offset of the point relative to the current road definition.

This record can be inserted anywhere in the current field book; it can be deleted from the current field book.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC				Feature Code
⊟	**Road Pos**	**KI**	PointID: 1000			Edge of Road
├			**North: 1000.0000ft**	**East: 1000.0000ft**	**Elev: 1000.0000ft**	
└			**Station: 1000.0000ft**	**Offset: 0.0000ft**		

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Point ID ....the name of the point being observed

Northing................................this field provides the Northing coordinate

Easting ....this field provides the Easting coordinate

Elevation ....this field provides the elevation coordinate

Station ....this field displays the distance along the road alignment

Offset ....this field displays the perpendicular distance from road alignment

Feature code ....an alphanumeric code that describes an observed point

8.2.55 RSTN - Road station

Road station record. This record defines the position on which the instrument was set up (similar to a station record). In addition to the standard station fields, it lists the station and offset of the point relative to the current road definition. This record can be deleted.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC				Feature Code
	Road Stn	**KI**	PointID: 1000	Theo Ht: 5.0000ft	Road Name:	Edge of Road
			North: 1000.0000ft	**East: 1000.0000ft**	**Elev: 1000.0000ft**	
			Station: 1000.0000ft	**Offset: 0.0000ft**		

Derivation code ....a two-character code describing how the record was generated and which part of the SDR software generated the record

Point ID ....the name of the point being observed

Northing................................this field provides the Northing coordinate

Easting ....this field provides the Easting coordinate

Elevation .... this field provides the elevation coordinate

Station .... this field displays the distance along the road alignment

Offset .... this field displays the perpendicular distance to the road alignment

Road name .... this record, containing the name of the road, marks the start of road definition

Feature code .... an alphanumeric code that describes an observed point

8.2.56 SCALE - Scale factor

Scale factor record. The field specifies a plane scale factor. Only one scale factor record is generated per job.

This record cannot be inserted or deleted.

The fields that correspond with this record are as follows:

	educed Point II	ecord typ	DC	
		S.F.	NM	S.F.: 1.0000000000

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Scale factor .... this field specifies a plane scale factor

8.2.57 SET - Set of observations

Set of observations record. Fields indicate the start of a group of observations measured using the set collection procedure. The fields in the record define the station point name, set identification number (unique for the station), and a count of observations. Another field in this record is the word *BAD*, which you can use to indicate an inaccurate set of data.

This record defines sets of data and requires the user to insert it at the proper field book position for later use in the SDR.

This record can be inserted in the current field book; it can be deleted.

The fields that correspond with this record are as follows:

educed Point I	cord ty	DC			
⊟	Set	SC	Src Pt ID: 0014	Obs Cnt: 2	Set #: 0
			Bad Marker: Not Bad	Return Sight: No	Obs Order: 1-2-3,3-2-1

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Source point ID .... displays the station point IDs from where the set is taken

Set number .... displays the number of sets for the station

Obs order .... specifies the order in which points were collected

Return sight........................... indicates the option to reobserve the backsight for points in the set

Bad marker .... indicates an inaccurate set of data

8.2.58 STN - Station details

Station record. This contains a point name, point coordinates, height of the instrument set up on the point, and a descriptive code. A station record is entered in the database whenever you set up on a different point.

This record can be inserted anywhere in the field book; it can be deleted.

For records containing a source point ID field, the point ID of the STN record is inserted into the source point ID of subsequent records until a station record is found.

Any OBS records subsequent to the deleted STN can be deleted or retained. If retained, the previous STN point ID is used for the source point ID of the OBS records. If no previous STN record exists, the OBS records are deleted.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC				Feature Code
	Stn	**KI**	PointID: 1000	Theo Ht: 5.0000ft	Calc: No	Edge of Road
			North: 1000.0000ft	**East: 1000.0000ft**	**Elev: 1000.0000ft**	

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Point ID .... the name of the point being observed

Northing................................ this field provides the Northing coordinate

Easting .... this field provides the Easting coordinate

Elevation .... this field provides the elevation coordinate

Theodolite height................. this field displays the instrument's height above the ground point

Feature code .... an alphanumeric code that describes an observed point

Calc .... indicates the option to recalculate from a previous point. For more information, see Section 5.2.5, *Calculate station*, page 5-8

8.2.59 TEMP - Template

Template record. This record marks the start of the definition of a road cross-sectional template. The template definition is independent of any specific road.

This record can only be added to the end of the current field book; it can be deleted.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC		
├	**Template**	**KI**	Template Name: Temp1	Pt Type: Length 14

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Template name...................... this field allows you to name the template

Pt type.................................... describes whether the road files were downloaded in SDR33 format (14) or SDR20 format (4)

8.2.60 TEMP-OFS/HTDIFF - Template offset

Template offset/height record. This record can be inserted after a TEMP record; it can be deleted.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC		
├	**Template Offset**	**KI**	Offset: 10.0000ft	Height Difference: 0.2000ft

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Offset...................................... the horizontal offset distance from the center of the road alignment

Height difference .... the difference in elevation from the road alignment and the template node

8.2.61 TEMP-GRADE/DIST - Template grade

Template grade/distance record. This record can be inserted after a TEMP record; it can be deleted.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC		
├	**Template Grade**	**KI**	Grade: <Null>	Horizontal Distance: 10.0000ft

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Grade .... the grade/slope from template node to next template node

Horizontal distance.............. horizontal distance from template node to next template node

8.2.62 TEMP-ELEMENT - Template element

Template element record. This record is part of a road template, it defines a point on the cross-section.

This record can be inserted after a TEMP record; it can be deleted.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC				Feature Code
⊟	**Template Element**	**KI**	Grade: <Null>	Horizontal Distance: 10.0000ft	Vertical Distance: 0.2000ft	Edge of Road
├			**Offset: 10.0000ft**	**Height Difference: 0.2000ft**		
└			**Super Elevation: No**	**Widening: No**		

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Grade .... the grade/slope from template node to template node

Horizontal

distance .... the horizontal distance from template node to template node

Vertical distance .... the vertical distance from template node to template node

Offset .... the perpendicular distance from the center line of the road alignment and the template node

Height difference .... the difference in elevation from the center line of the road alignment and the template node

Superelevation .... indicates whether superelevation is to be applied to this template element by displaying YES or NO

Widening .... indicates whether widening will be applied to this template element by displaying YES or NO

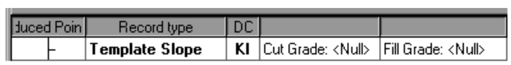
Feature code .... an alphanumeric code that describes an observed point

8.2.63 TEMP-SIDESLOPE - Template sideslope

Template sideslope record. This record is part of a road template; it defines the grades for sideslopes at the edge of the road.

This record can be inserted after a TEMP record; it can be deleted.

The fields that correspond with this record are as follows:



duced Poin	Record type	DC		
├	**Template Slope**	**KI**	Cut Grade: <Null>	Fill Grade: <Null>

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Cut slope .... the grade of the cut slope

Fill slope .... the grade of the fill slope

8.2.64 TRGT HT - Target height

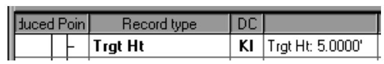
Target height record. This record specifies the height of the target pole (defined as the distance from the point on the ground to the center of the prism).

The new target record value is used until another target record is encountered. If no target record is encountered, the target height is assumed to be zero (0).

The previous target record value is used until another target record is encountered. If no target record is encountered, the target height is assumed to be zero (0).

This record can be added anywhere in the current field book; it can be deleted.

The fields that correspond with this record are as follows:



Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Target height .... this record specifies the height of the target pole (defined as the distance from the point on the ground to the center of the prism)

8.2.65 VERT ADJ - GPS vertical adjustment

Vertical adjustment record. This record contains the information for a vertical calibration. This record contains the values calculated to adjust vertically the GPS records to POS records.

This record can only be added to the end of the current field book; it can be deleted.

Inserting adjustment values affects the reduction of the current field book. Deleting adjustment values affects the reduction of the current field book.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC			
	GPS Vert Adjust	**KI**	Origin North: 0.0000ft	Origin East: 0.0000ft	Vert Adjust Type: Inc. Plane
			Height Constant: 0.0000ft	**Slope North: 0.0000000000**	**Slope East: 0.0000000000**

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Adjustment type .... currently one option “inclined phase”

Origin north .... the north coordinate of the first GSTN in a file

Origin east .... the east coordinate of the first GSTN in a file

Height constant .... the constant value applied to the elevation of all points

Slope north .... this field indicates the slope along the north axis, which indicates how the geoid changes in the northerly direction; since it is a slope (or ratio), it has no units

Slope east .... this field indicates the slope along the east axis, which indicates how the geoid changes in the easterly direction; since it is a slope (or ratio), it has no units

8.2.66 VERT ALIGN - Vertical align

Vertical alignment record. This record marks the start of a road's vertical alignment definition.

This record can be inserted after a ROAD NAME record; it can be deleted.

The fields that correspond with this record are as follows:

duced Poin	Record type	DC		
	Vertical Align	**KI**	Station: 1000.0000ft	Elev: 1000.0000ft

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Start station .... the distance along the road alignment where vertical alignment starts

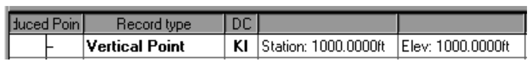
Start elevation .... the elevation of the starting point for the vertical alignment

8.2.67 VERT POINT

Vertical point record. This record is part of a road's vertical alignment and specifies the station and elevation of a point that the alignment passes through.

This record can be inserted after a ROAD NAME record; it can be deleted.

The fields that correspond with this record are as follows:



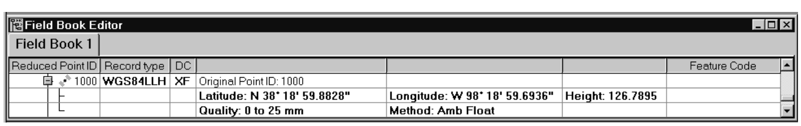
Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Station .... this field specifies the station so that the vertical alignment can be related to the horizontal alignment

Elevation .... this field displays the point elevation

8.2.68 WGS84LLH

This record displays the initial reading from the GStn as WGS84 latitude, longitude, and height. Point numbers and quality indicators are also included.



The LLH Stn, Local LLH, and WGS84 LLH records include the following information:

Origin Point ID.................... This field displays the identification number for the observed point.

Latitude, Longitude, and Height This field displays the point's latitude, longitude and height.

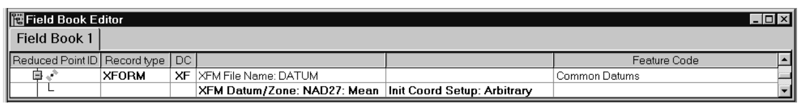
Quality .... This field displays the quality range within which the data was collected.

Method .... This field represents the solution method - the type of GPS process used in creating the record.

> **Note:** Local LLH and WGS84 LLH records are view records only. These records will not be reduced when contained in the field book.

8.2.69 XFORM

This record, which displays transformation types, is generated when a transformation sequence ends with a projected coordinate system.



The XFORM record includes the following information:

XFM File Name..................... This field indicates the type of transformation applied to the observation.

XFM Datum/Zone .... This field represents the local zone to which the transformation will be applied.

Init Coord Setup................... This field indicates whether the starting position of the initial coordinate is a known or unknown starting position.

8.2.70 XSEC - Cross-section

Cross-section record. This record is part of a road definition; it defines which cross-sectional templates to use from a particular station along the road.

This record can be inserted after a ROAD NAME record; it can be deleted.

The fields that correspond with this record are as follows:

duced Point	Record type	DC		
	Cross Section	KI	Station: 1000.0000ft	
			Left Template: Temp1	Right Template: Temp2

Derivation code .... a two-character code describing how the record was generated and which part of the SDR software generated the record

Station .... this field displays the distance along the road alignment where a template will be inserted

Left template .... the name of the template to be inserted at this station on the left side of the road alignment

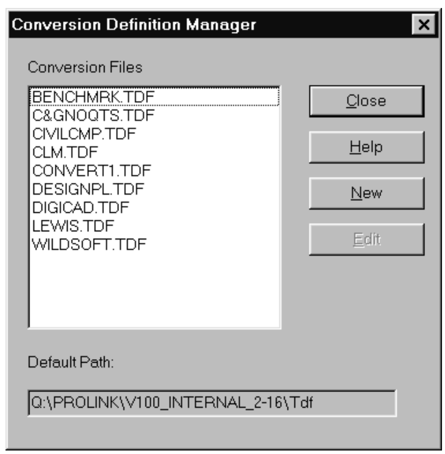
Right template .... the name of the template to be inserted at this station on the right side of the road alignment

Chapter 9 Conversion Definition Manager

In addition to providing several predefined conversion, ProLINK lets you define your own file conversions for importing and exporting ASCII data — for both raw and coordinate data. The ***Conversion Definition Manager*** is a comprehensive tool for creating conversion files to meet a wide variety of file formats.

9.1 Understanding the Conversion Definition Process

The ***Conversion Definition Manager*** -- accessed from the ***Options*** menu -- allows you to define and manage file conversions for importing and exporting ASCII data. You can specify how data is recognized and handled by ProLINK whenever you import or export data. The conversions can be defined to incorporate live records, make multiple passes through the data and apply equations to fields. To establish a systematic method for converting data imported to and exported from ProLINK, you determine the rules by which ProLINK can recognize and handle the data.



Defining a file conversion is a multi-step process in which you will:

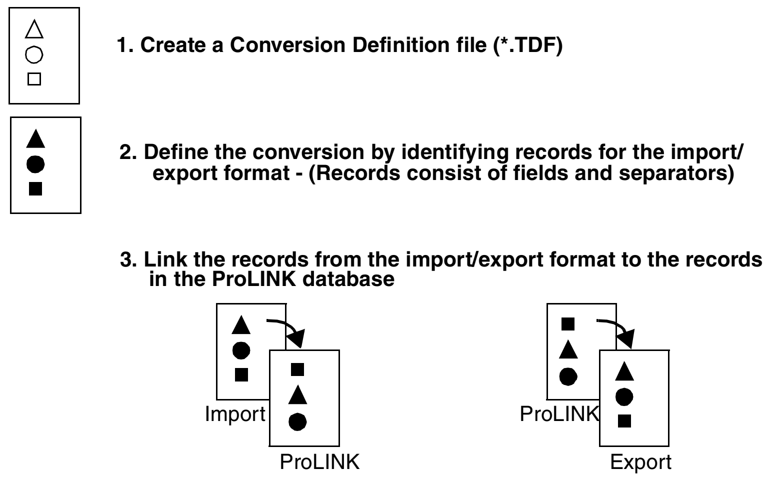


Figure 12: Steps to define a conversion

To perform this process, you must manage data files and their components:

- **Records** - Records consist of various fields and separators. Records can be considered "live" in which the information is retained until a new, similar record is encountered. When establishing records, you will define fields and separators to be used in the record layout. For more information, see Section 9.5.3, *Managing and defining data records*, page 9-14.

  Header and footer records are defined, managed and linked in the same manner as other records. Since these record types often contain textual entries, the main portion of the definition occurs in the linking phase. For more information, see Section 9.7.1.1, *Linking ProLINK records to the export format*, page 9-54.

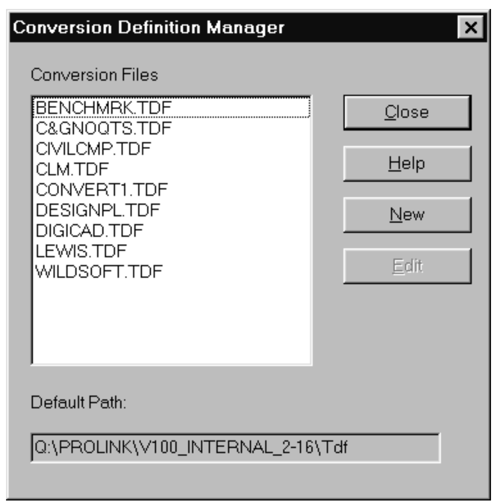
- **Fields** - Fields consist of various data, which include such information as point ID, antenna height, angles, distance and so on. Fields can be distinguished from one another by separators or they can be of fixed length. For more information, see Section 9.5.3.5, *Defining and managing fields*, page 9-26.

- **Separators** - Separators consist of user-defined alphanumeric ASCII characters, which identify the beginning and end of a discrete part of the data, the field information. Separators can be defined individually or in groups, where any separator in a group is used to evaluate imported data. For more information, see Section 9.5.3.6, *Defining separators*, page 9-32.

Other functionality included in the ***Conversion Definition Manager*** allows you to determine how records correspond to one another. This may include specifying whether live records are available for use throughout the conversion process. Also, the ***Conversion Definition Manager*** enables you to make multiple passes through the data and, as well, allows you to apply equations to individual fields.

9.2 Reviewing the Conversion Definition Manager's Main Screen

The ***Conversion Definition Manager*** is a tool for managing conversion files. It displays all conversion files that are available in the default directory. Each conversion is a file with a *.TDF extension. From the ***Conversion Definition Manager***, you can create a new conversion, copy an existing conversion to a new file or edit an existing conversion. The conversion files (*.TDF) are stored in the default path.



Buttons

The buttons in the ***Conversion Definition Manager*** access the following:

<Close>.......... This button closes the dialog. Any new conversions or modifications of existing conversions are maintained.

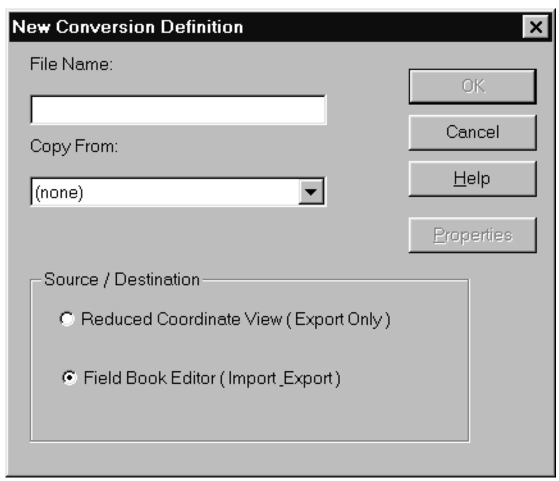
<Help>........... This button access the on-line Help.

<New>........... This button allows you to create a new conversion or copy an existing conversion (see 9.3 *Creating or Copying a New Conversion Definition*).

<Edit>............ This button allows you to modify a previously created conversion definition. Double clicking an existing conversion definition will open the file for editing (see 9.4 *Editing Conversion Definitions*).

9.3 Creating or Copying a New Conversion Definition

You can create a new conversion definition or copy an existing conversion definition. Copying a conversion definition creates a template that includes the existing conversion's definition parameters. The new file (*.TDF) will be stored in the ***Default Path*** identified in the ***Conversion Definition Manager***.



An important step in defining the conversion is to identify the ***Source/Destination*** of the file. Once this determination is accepted for a new conversion, it cannot be changed.

Reduced Coordinates View ... This option indicates that the project's results will be converted from the ***Reduced Coordinates View*** to the output format.

⌧ **Note:** The ***Reduced Coordinates View*** option works only with export file types. Data cannot be imported directly to the ***Reduced Coordinates View***.

Field Book Editor .... This option indicates that data can be imported to or exported from the raw data displaying in the ***Field Book Editor***.

Warning: This selection cannot be changed after the conversion is created.

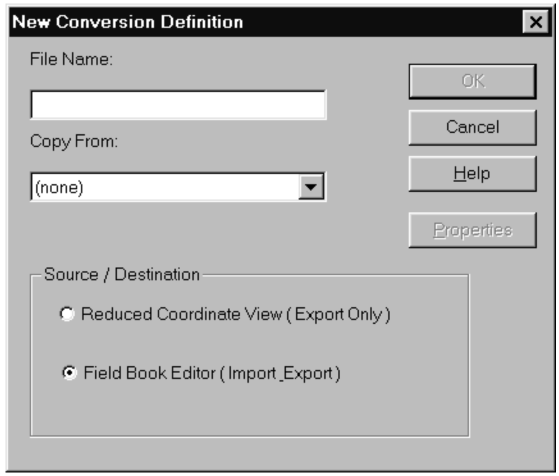
You can review or modify additional global properties for records and fields by pressing **<Properties>**. You can also access these properties from within the ***Conversion Definition Editor***. You cannot modified the associated properties after a record or field has been defined.

After the *.TDF file is created, the ***Conversion Definition Editor*** is opened with the new conversion and is ready to be defined. For more information, see Section 9.5, *Defining the Conversion*, page 9-8.

Steps to create or copy a conversion

1. Access the ***Conversion Definition Manager*** from the *Options* menu.

2. Select <**New**>.



3. Accept the default name or enter a conversion definition name in the ***File Name*** field.

Note: The name you assign to the definition is automatically given a file extension of *.TDF.

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4. (*Optional*) Determine if you want to use another *.TDF file as a template. If so, use the <**Copy from**> field. This field allows the selection of an existing *.TDF file that resides in the default directory to be used as a template for the new *.TDF file. If this option is used, you have access to all the records, fields and separators that reside in the existing *.TDF file. To cancel an entry in this field, select **<None>**.

5. Select the ***Source/Destination Type*** to determine whether the data will be imported to and/or exported from the ***Field Book Editor***, or the data is exported from the ***Reduced Coordinate View***.

✉ **Note:** This selection cannot be changed after the conversion is created.

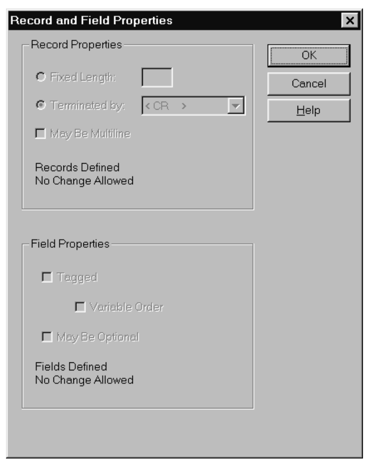
6. (*Optional*) Select **<Properties>** to define the general properties of the records and fields in the file. For more information, see Section 9.5.2, *Establishing record and field properties*, page 9-11.

7. Press **<OK>**. The ***Conversion Definition Editor*** is opened with the new library and is ready for data entry. For more information, see Section 9.5, *Defining the Conversion*, page 9-8.

9.4 Editing Conversion Definitions

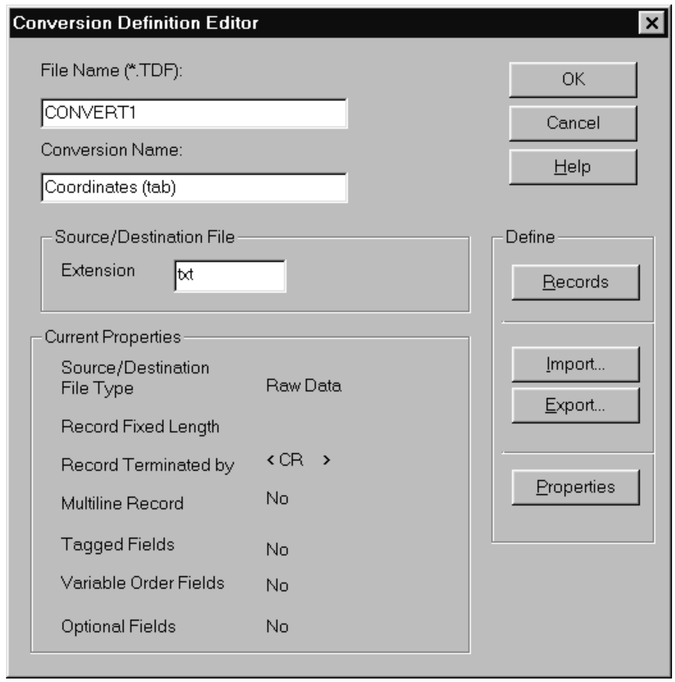
Once a conversion definition has been created, you can access and modify its properties. In the ***Conversion Definition Manager*** dialog, select the conversion definition you want to modify and press the **<Edit>** button.

✉ **Note:** You cannot edit the record and field properties of a conversion definition *if a record and/or field has been created*. Set these properties before creating records or fields. When you press the **<Properties>** button, the previously entered information will be displayed, but you cannot modify the information.



9.5 Defining the Conversion

The ***Conversion Definition Editor*** is a powerful tool that serves as a starting point for defining the conversion. It allows you to assign the definition a descriptive name and specify the extension of the file that you import or export. From the ***Conversion Definition Editor*** you can also define records, including fields and separators. After the records are defined, the Editor also allows you to link records for import and export.



The fields in the ***Conversion Definition Editor*** allow you to define the following aspects of the conversion:

File Name .... Edit the name of the conversion file (*.TDF) as required. The name will be updated in the ***Conversion File*** list once the ***Conversion Definition Manager*** dialog is closed.

Conversion Name....... Enter a descriptive name for the conversion definition file (*TDF), identifying the kind of conversion you want to perform. The Conversion Name is displayed in the ***Import Conversion*** list and ***Export Conversion*** list when you select the **Import** or **Export** options from the ***File*** menu.

Source/
Destination File .... Enter the file extension for the type of data imported into or exported from ProLINK.

Current Properties...... *(display only)* The Source/Destination of the conversion and the Record and Field properties are displayed. If you elected to define Properties in the ***New Conversion Definition*** dialog, your selections will be displayed; otherwise, the defaults will be displayed. To change the properties before a field or record is created, see Section 9.5.2, *Establishing record and field properties*, page 9-11.

☒ **Note:** The ***Source/Destination*** selection in **Current Properties** cannot be changed after the conversion is created.

☒ **Note:** You cannot change the entries in **Current Properties** fields after a field or record has been created.

Buttons

The buttons in the ***Conversion Definition Editor*** provide access to further define the conversion.

<Record>............................ This button accesses the ***Define Records*** dialog to setup the various records, fields and separators. For more information, see Section 9.5.3, *Managing and defining data records*, page 9-14.

<Import> .... This button accesses a dialog to link records and fields created in the ***Conversion Definition Manager*** to ProLINK records so they can be imported to a field book. For more information, see Section 9.6, *Linking Records to Import*, page 9-41.

<Export> .... This button accesses a dialog to link ProLINK records and fields to records created in the ***Conversion Definition Manager*** so they can be exported from either a field book or the ***Reduced Coordinate View*** in a different file format. For more information, see Section 9.7, *Linking Records to Export*, page 9-50.

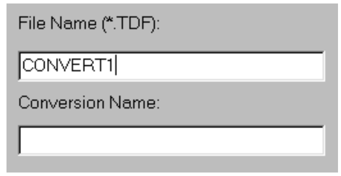
<Properties> .... Select **<Properties>** to define the general properties of the records and fields in the file before a field or record is created. For more information, see Section 9.5.2, *Establishing record and field properties*, page 9-11.

Note: You cannot change the values in the Current Properties fields after a field or record has been created.

9.5.1 Renaming the conversion

You can rename the conversion file (*.TDF) from within the ***Conversion Definition Editor***. You can also rename the descriptive conversion name that displays in the ***Import Conversion*** and ***Export Conversion*** fields in the **Import** or **Export** options.

To rename a conversion, edit the following field(s) at the top of the ***Conversion Definition Editor***.



File Name............................ Edit the name of the conversion definition file (*.TDF) as required, using up to eight characters. The *.TDF extension will be used.

Conversion Name............. Enter a descriptive name for the conversion definition file (*.TDF). This name displays in the ***Import Conversion*** and ***Export Conversion*** fields in the **Import** or **Export** options.

When finished, press **<OK>**. The names will be updated in the appropriate lists.

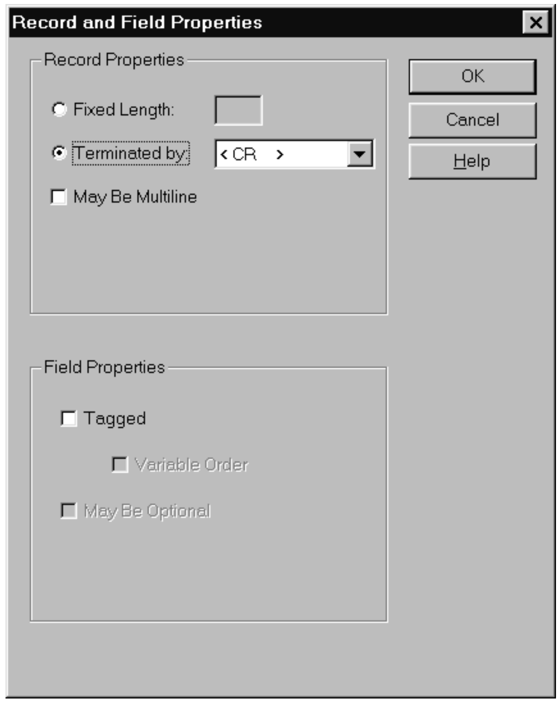
9.5.2 Establishing record and field properties

Certain properties for records and fields must be established when creating the conversion. These properties apply to all records and fields that are created in the conversion. *These properties cannot be modified after a field or record has been created.*

Note: When you press the **<Properties>** button after a record or field has been created, the previously entered information will be displayed, but you cannot modify the information.

Data records may vary in length and format. A record's length and format are two characteristics that identify a record as a specific type. For ProLINK to identify a record's type, you must define the record's properties. Properties are general characteristics that let ProLINK identify whether the record has a fixed or variable length and if the record is in a multi-line format. For more information, see Section 9.5.3.4, *Defining a record*, page 9-19.

Within data records, fields may be arranged in a particular order, variable order, or may be optional. Fields also may be tagged; that is to say, identified by specific, initial characters. (For more information, see Section 9.5.3.5, *Defining and managing fields*, page 9-26.



The fields in this dialog reflect the following:

Record Options..........Indicate the type of format the data record adheres to by selecting the appropriate option.

Fixed Length — If the record length is fixed, select this option and enter the value indicating the number of characters for this record.

Terminated by — If the record length is variable, select this option and choose whether the record is terminated by line feed **<LF>**, carriage return **<CR>,** or carriage return and line feed **<CR><LF>**.

May be multi-line — If the record format is multi-line, select this option. Such record formats require the initial characters of the first line to contain the record type identifier. (For more information, see Section 9.5.3.4, *Defining a record*, page 9-19.

Field Options .... Indicate the type of fields contained in the records.

Tagged — If the fields are identified by specific, initial characters, select this option. Such fields require you to specify the initial characters. (For more information, see Section 9.5.3.5, *Defining and managing fields*, page 9-26).

Variable Order — If the fields are organized in no particular order within the record, select this option.

May be Optional — If it is possible that fields are not found within the record, select this option.

9.5.3 Managing and defining data records

You can manage multiple records within the ***Define Record*** dialog. This dialog is accessed from the **<Records>** button in the ***Conversion Definition Editor***. The ***Define Records*** dialog lists the records you created for the current conversion definition. Options available in the dialog allow you to create, edit and delete records.

Within the ***Define Records*** dialog you use the buttons to perform the following actions:

<New> .... create or copy new records; for more information, see Section 9.5.3.1, *Creating or copying record*, page 9-15

<Edit> .... highlight an existing record and press this button to edit it. Double clicking with a mouse will also access the edit record dialog; for more information, see Section 9.5.3.4, *Defining a record*, page 9-19

<Delete>........ highlight an existing record and press this button to remove unneeded records

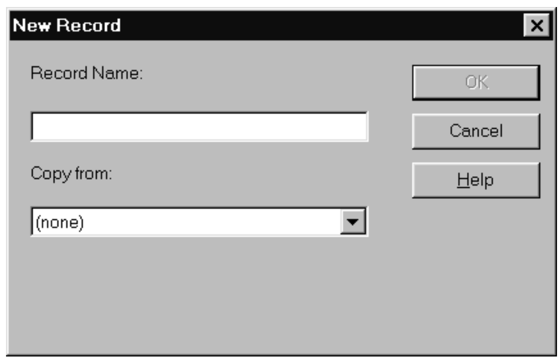
✉ **Note:** When defining a header or footer record for an export format that requires textual entries, the text will be defined with in the Export linking process (see Section 9.7.1.1, *Linking ProLINK records to the export format*, page 9-54)

9.5.3.1 Creating or copying record

You can create as many records as needed to define the conversion. You also can copy an existing record to use as a template for the new record. When you copy records, the fields and separators that were defined in this conversion for previous records are available for use to define the new record.

Steps to create or copy a record

1. Press **<New>** in the ***Define Records*** dialog; the ***New Record*** dialog is displayed.

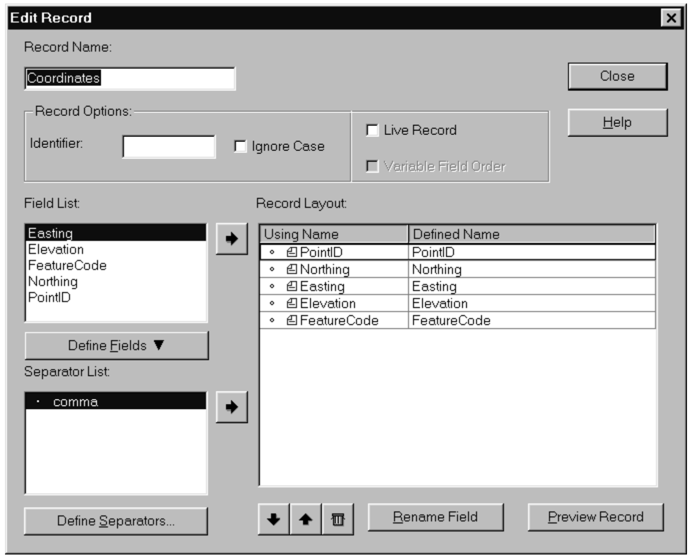


2. Enter information in the following fields:

Record Name .... Enter the name of the record.

Copy From .... The properties of previously created record definitions can be copied to the one you are currently creating; from the ***Copy From*** list, select the name of the record on which you want to base the new record.

3. Press **<OK>**; the ***Edit Record*** dialog displays, in which you can define the record. For more information, see Section 9.5.3.4, *Defining a record*, page 9-19.



4. After you complete the record definition, press **<OK>**. The ***Define Records*** dialog displays with the new record in the list of available records.

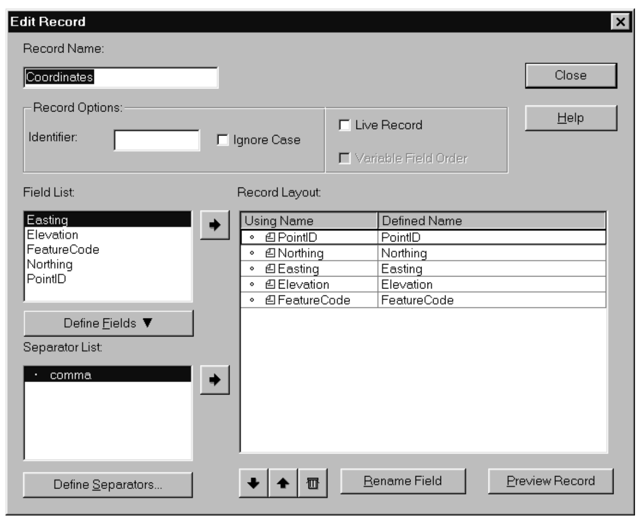
9.5.3.2 Editing a record

You can modify a record at any time during the define process for the conversion. Simply return to the ***Conversion Definition Editor*** and access the ***Define Records*** dialog with the **<Records>** button.

Steps to edit a record

1. Highlight the record to be modified and press **<Edit>**.

2. The ***Edit Record*** dialog is displayed, in which you can define the record. For more information, see Section 9.5.3.4, *Defining a record*, page 9-19.



3. When completed with the modifications, press **<OK>**. The ***Define Records*** dialog displays with the list of the available records.

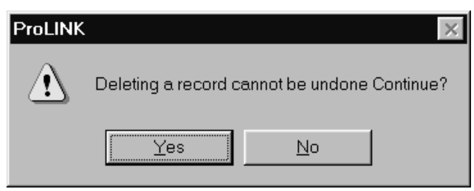
9.5.3.3 Deleting a record

You can delete a record at any time during the define process for the conversion. Simply return to the ***Conversion Definition Editor*** and access the ***Define Records*** dialog with the **<Records>** button.

Steps to delete a record

1. Highlight the record to be deleted and press **<Delete>**.

2. A confirmation message displays.



3. Press **<Yes>** to complete the deletion and **<No>** to discontinue.

4. The ***Define Records*** dialog displays with the updated list of the available records.

9.5.3.4 Defining a record

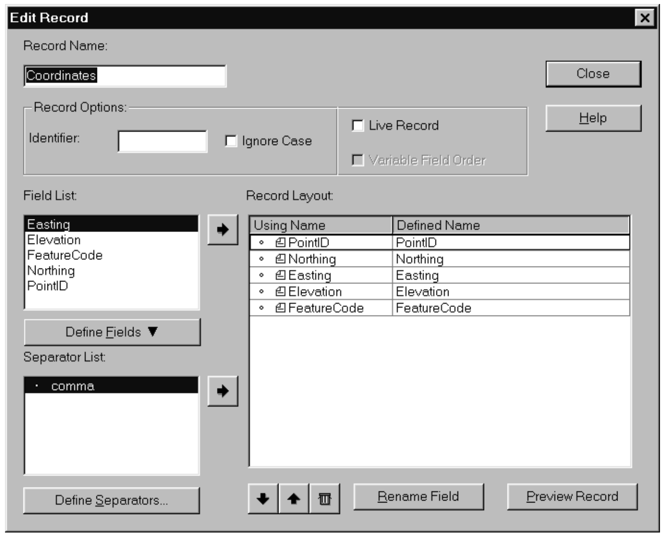
For ProLINK to recognize and use a record, you must define its characteristics. You define records when creating a new record or when editing an existing record. Defining records is a multi-step procedure in which you will:

1. Identify the record properties
2. Define the separators
3. Define the fields
4. Layout the record, using the field and separators

The ***New*** or ***Edit Record Definition*** dialog provides a comprehensive method to perform several actions that help define a record, including the following:

- rename the record
- establish record properties
- manage the list of fields (create, edit and delete)
- manage the list of separators (create, edit and delete)
- establish the layout of the record by adding fields and separators
- temporarily renaming a field
- viewing the record’s layout

Note: When defining a header or footer record for an export format that requires textual entries, the text will be defined with in the Export linking process (see Section 9.7.1.1, *Linking ProLINK records to the export format*, page 9-54).



The ***Edit Record*** dialog is divided into specific sections. Each of these sections is concerned with a particular aspect of defining the record:

Record Properties ....Several options allow you to indicate the properties of the current record. Properties determine how ProLINK is able to identify this particular record type. Select the appropriate options:

Identifier — Enter the unique characters that identify the current record type.

Ignore case — If the record is identified typographically, indicate whether the characters must be as they are displayed in the identifier field.

Live Record — A live record is a record that contains information which applies to subsequent records in the file. The values of a live record are applicable until the next occurrence of that record type. If the current record is a live record, select the ***Live Record*** check box.

Variable field order — The record may include field types that are organized in no particular order. If this is the case, select the ***Variable field order*** check box.

Field List .... Records consist of fields. To create new fields found within the current record, press **<Define Fields>**. For more information, see Section 9.5.3.5, *Defining and managing fields*, page 9-26.

Define Separators....... Separators are ASCII characters that identify where in the record a field ends. To define which characters are valid separators, press **<Define Separators>**. For more information, see Section 9.5.3.6, *Defining separators*, page 9-32.

Record Layout............. Specify the order in which the fields and separators are found within the current record. For more information, see Section 9.5.3.4.1, *Laying Out Records*, page 9-21.

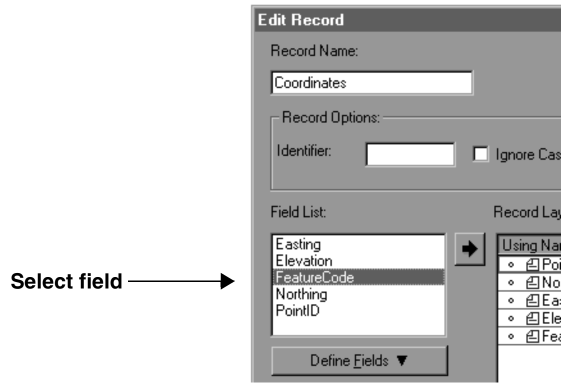
9.5.3.4.1 Laying Out Records

Once the fields and separators have been created, the record can be laid out to reflect the order in which fields and separators are found in the external format. The layout is organized and ordered from the top of the ***Record Layout*** section and down.

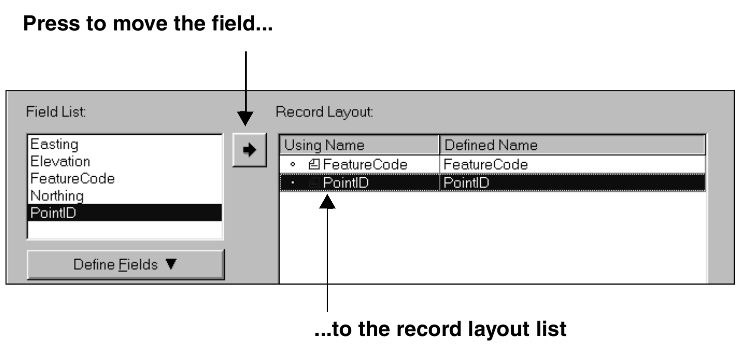
You can populate the ***Record Layout*** with the displayed fields and separators. You can rearrange the order of the layout with the buttons beneath the ***Record Layout*** section. You can use an existing field, but temporarily rename it for this instance in the record with **<Rename Field>**. When you are finished, you can preview the record layout with **<Preview Record>**.

Steps to laying out records

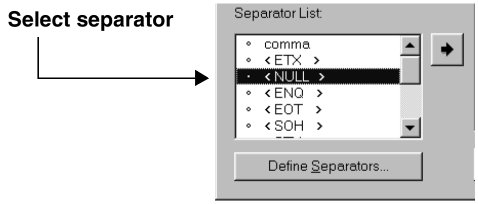
1. In the ***Edit Record*** dialog, select the field that will appear first in the record.



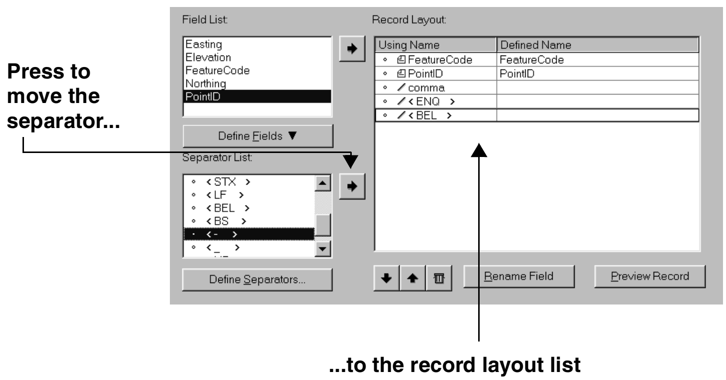
2. Press the right arrow button. Note the field is now displayed in the ***Record Layout*** list.



3. From the ***Separators*** list, select the separator that separates the fields.



4. Press the right arrow button. Note the separator is now displayed in the ***Record Layout*** list.

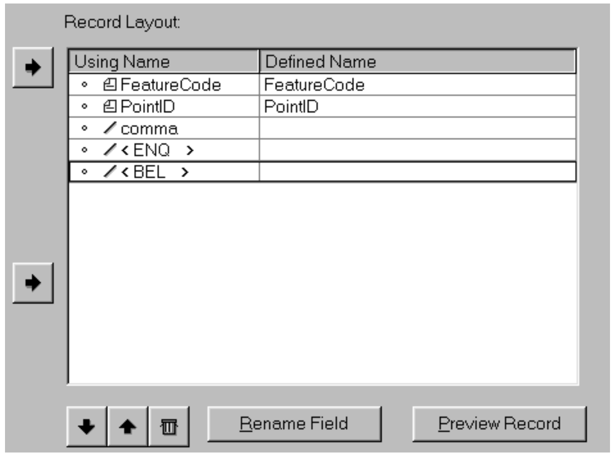


5. Repeat steps 2 through 4 until all the fields and separators are laid out in the current record.

6. To conclude laying out the record and complete the record definition process, press **<OK>**.

9.5.3.4.2 Modifying the Record Layout

The record layout can be modified in several ways, using buttons in the ***Edit Record*** dialog.



<↓> .... To reposition a field or separator below the subsequent field or separator, select the field or separator you want to reposition and press the arrow DOWN button.

<↑>................................ To reposition a field or separator above the previous field or separator, select the field or separator you want to reposition and press the arrow UP button.

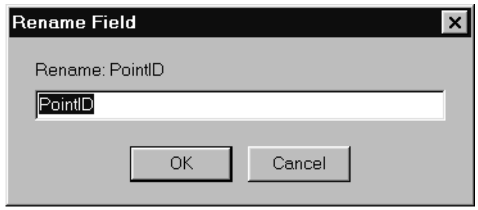
<Trash icon>................ To remove a field or separator from the record layout, select the field or separator and press the Trash icon.

<Rename Field>.......... To temporarily assign a new name to a field, select this button. For more information, see Section 9.5.3.4.3, *Rename Field*, page 9-24.

9.5.3.4.3 Rename Field

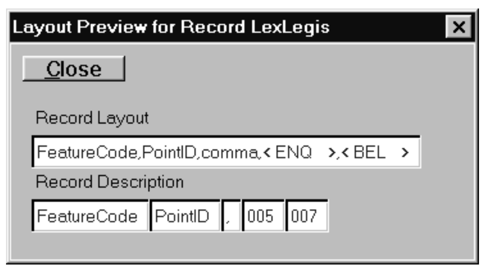
ProLINK allows you to rename a field in the ***Record Layout*** list. This name is changed only for this instance in this record. By renaming a field, ProLINK provides an easy way to distinguish when a field is used for a special purpose and when it is used as it was originally defined. This feature is extremely useful in attaching equations to fields for a single use.

To rename a field, select the field and press **<Rename Field>**. The ***Rename Field*** dialog is displayed. In the **New name for** field, enter the new name for the field and press **<OK>**.



9.5.3.4.4 Preview Record

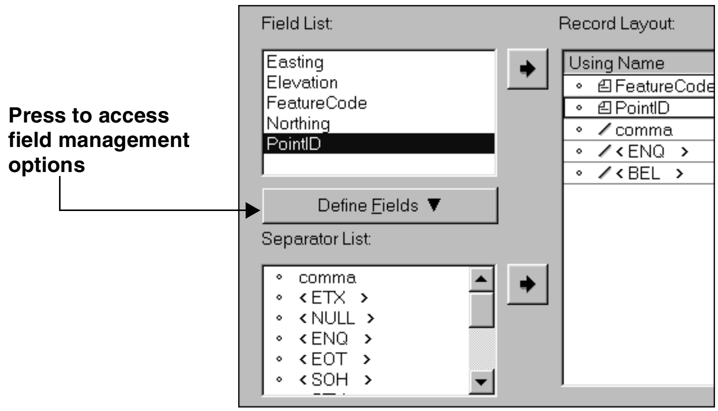
Once the record has been laid out to your satisfaction, you can preview it by pressing **<Preview Record>** in the ***Edit Record Definition*** dialog. After viewing the record layout, press **<Close>**.



9.5.3.5 Defining and managing fields

Records are defined with fields that you create. Consequently, you must identify and define the fields that are found within the current record.

You can manage fields from with the ***Edit Record*** dialog. A list of all available fields displays in the middle of this dialog. The **<Define Fields>** button, access three field management options:



New field ...... Select this option to create a new field or to copy an existing field as a template for the new field (see Section 9.5.3.5.1, *Creating a field*, page 9-27).

Edit field .... Highlight an existing field, then select this option to modify that field (See Section 5.2.4, *Modifying values*, page 5-7).

Delete field ... Highlight an existing field, then select this option to delete that field (See Section 5.4, *Deleting records*, page 5-22).

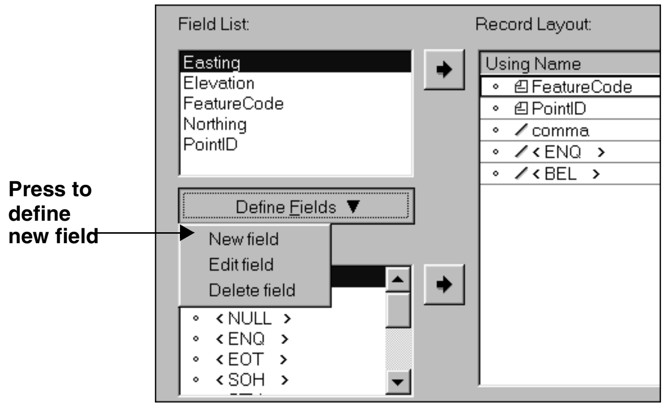
Note: Any editing and/or deleting of field(s) from within a record definition affects the field(s) for all records within the current conversion. You cannot delete a field if it is defined for use in another record or if it is displayed in the record layout.

9.5.3.5.1 Creating a field

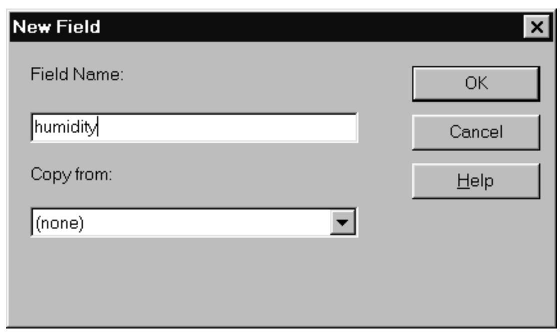
You can create as many fields as required to define the record. The fields that are created within this conversion are available to all records residing within the conversion.

Steps to create a field

1. From within the ***Edit Record*** dialog, press the **<Define Fields>** button and choose **New Field**.



2. The ***New Field*** dialog is displayed.

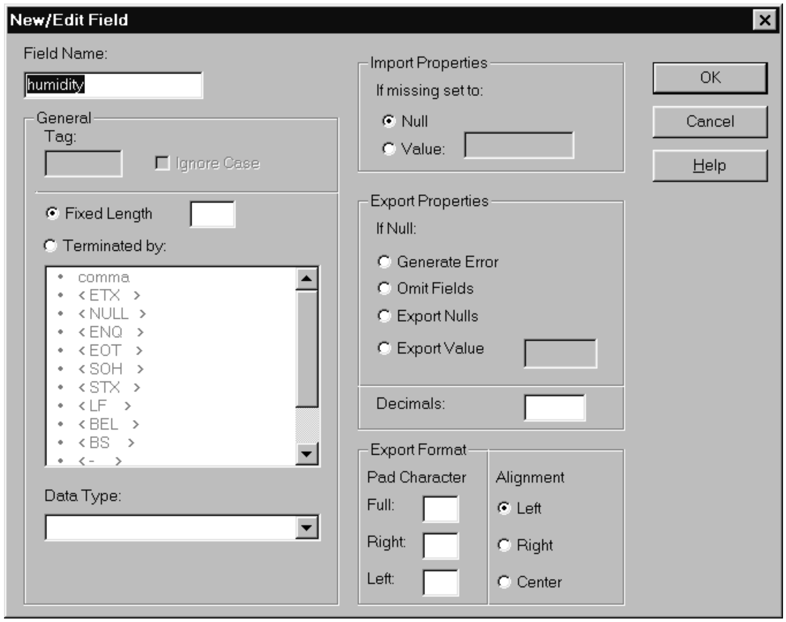


3. Enter information in the following fields, then press **<OK>.**

Field Name ....Enter the name of the field.

Copy From ....The properties of previously created fields can be copied to the one you are currently creating; from the ***Copy From*** list, select the name of the field on which you want to base the new field.

4. In the ***New/Edit Field*** dialog, various characteristics of the field must be established.



General ....Several options allow you to indicate the general characteristics of the current field. These general characteristics determine how ProLINK is able to identify this particular field within the context of the record and the current conversion definition. Select the appropriate options:

Field Name — The previously entered field name is displayed in this field. Confirm the name of the current field, changing it as required.

Tag — If you established that the current conversion definition consists of tagged fields in the ***Record and Field Properties*** dialog (see page 9-19), enter the unique characters that identify the current field.

Ignore Case — If the field is identified typographically, indicate whether the characters must be as they are entered in the identifier field.

Fixed Length — If the field is a particular length, select this option and enter the value indicating the number of characters for this field.

Terminated by — If the field length is variable, select this option and press on the appropriate option, indicating whether the field is terminated by a defined separator.

Data Type .... Select the appropriate description of the type of data that is allowed within the field.

Import Properties .... Specify what should appear in the field in place of missing data when importing a file using the current conversion definition. If the field should remain blank, select **Null**. If the field should contain particular characters, select **Value** and enter the characters that will identify the current field (a maximum of 11 characters is possible).

Export Properties .... Specify the action taken by ProLINK when it encounters a null value in the field upon export.

Generate error — ProLINK displays a system message and halts the export process.

Omit fields — If the field is optional and no value is assigned to it for the export, ProLINK omits the field from the export.

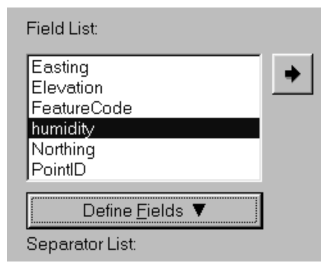
Export Nulls —ProLINK exports the null value.

Export Value — ProLINK exports a value which you enter in the field.

Decimals — If the field's data is a real number, you can enter the number of decimal places ProLINK will export.

Export Format............. Select the field alignment (**Left**/**Right**/**Center**) and if a specific character is used to offset data that does not fill the entire field, enter the character in the field associated with the position of the character in relation to the data (**Full**/**Right**/**Left**).

5. Verify the characteristics of the field and press **<OK>**. The ***Edit Record*** dialog is displayed with the new field displayed in the ***Field List***.



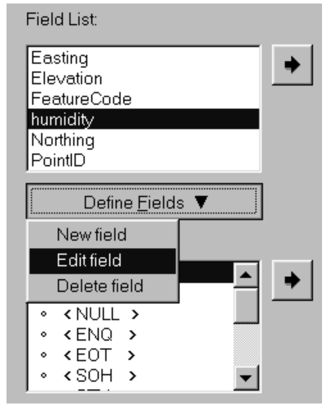
9.5.3.5.2 Editing a field

You can edit the fields that display in the *Field* ***list*** in the ***Edit Record***.

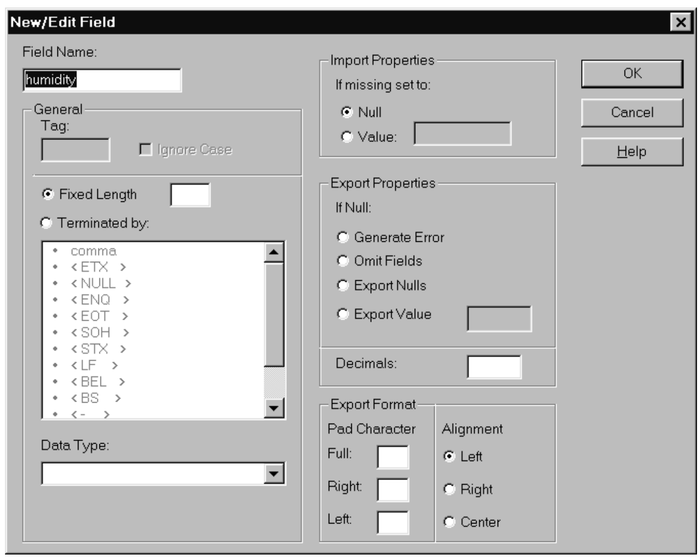
Note: The modifications made to a field in the record definition affect the same field for all records within the conversion.

Steps to edit a field

1. From within the ***Edit Record*** dialog, highlight the field to be edited. Press the **<Define Fields>** button and choose **Edit Field**.



2. In the ***New/Edit Field*** dialog, various characteristics of the field must be established. For a description of the fields in this dialog, see Section 9.5.3.5.1, *Creating a field*, page 9-27.



3. Verify the characteristics of the field and press **<OK>**. The ***Edit Record*** dialog is displayed.

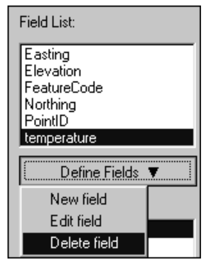
9.5.3.5.3 Deleting a field

You can delete the fields that display in the *Field* ***list*** in the ***Edit Record*** dialog.

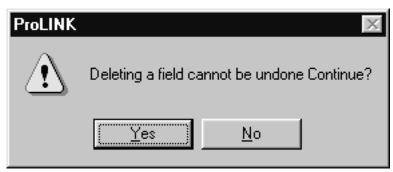
☒ **Note:** Fields that are deleted in the record definition affect the same field for all records within the conversion.

Steps to delete a field

1. From within the ***New*** or ***Edit Record*** dialog, highlight the field to be deleted. Press the **<Define Fields>** button and choose **Delete Field**.



2. A verification message displays.



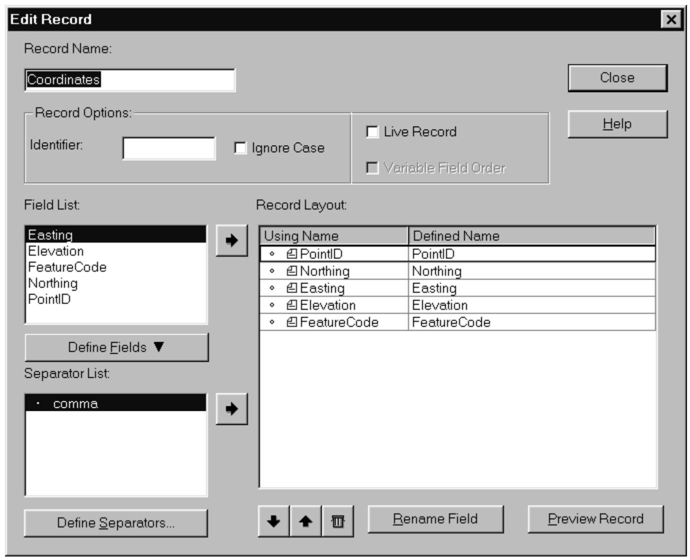
3. Press **<Yes>** to complete the deletion.

9.5.3.6 Defining separators

Fields are distinguished from one another by separators. Separators consist of user-defined alphanumeric ASCII characters, which identify the beginning and end of a discrete part of the data, the field information. Separators can be defined individually or in groups, where any separator in a group is used to evaluate imported data. To define separators you:

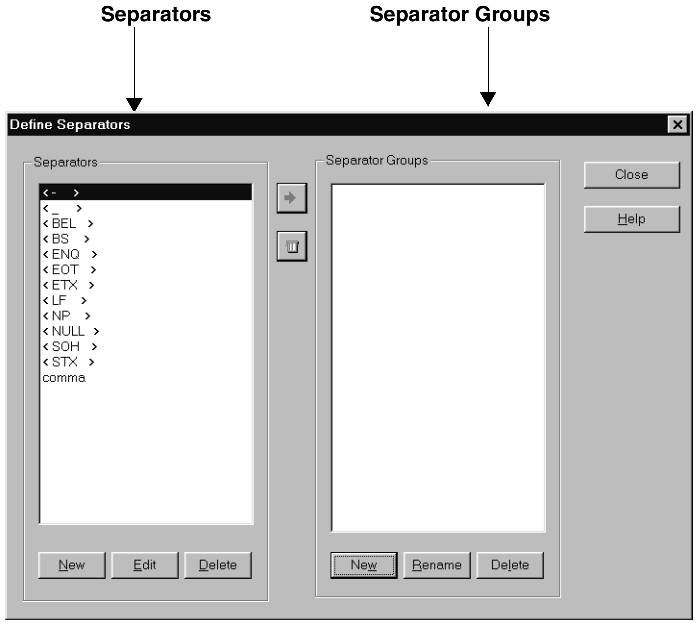
- Create separators
- Create separator groups
- Match the separators with the appropriate separator group

To define separators, press the **<Define Separators>** button from within the ***Edit Record Definition*** dialog.



Press to define separators

The *Define Separators* dialog is displayed. The dialog consists of two easily distinguishable sections: Separators and Separator Groups.



9.5.3.6.1 Creating individual separators

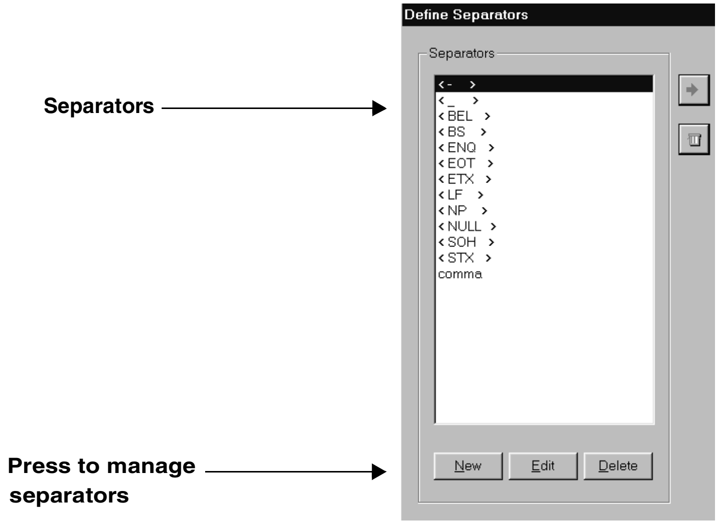
The separators section allows you to create, edit and delete separators, which are single ASCII characters. You can create Separators using two methods.

- You can manually enter a name describing the separator and the ASCII characters used for the separator

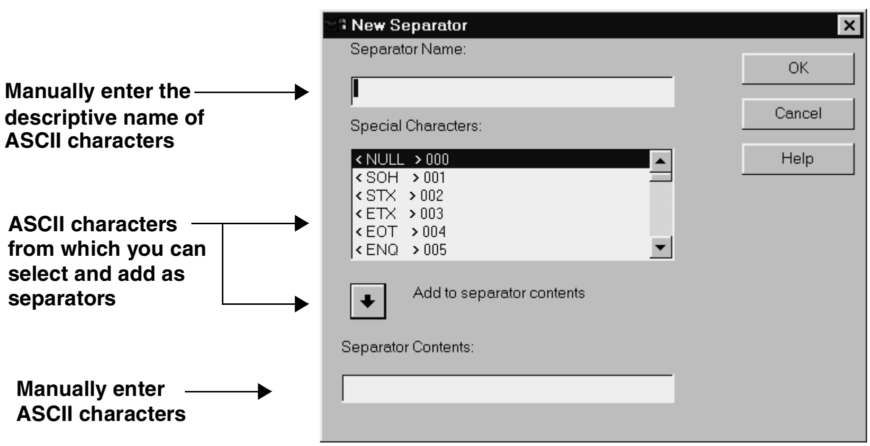
- You can select from the list of special characters, which consists of all the ASCII characters

Steps to create a new separator

1. From the ***Define Separator*** dialog, press **<New>** in the ***Separator*** group. The ***New Separator*** dialog is display.



2. In the ***New Separator*** dialog, either manually enter a descriptive name for the separator and its contents, or choose the appropriate characters from the ***Special characters*** list and press the <↓>***Add to separator contents*** button.



Separator names .... This field contains a descriptive name of the separator. It may or may not be the descriptive name of the ASCII characters you want to use as a field separator, for example, Comma. You can manually enter a descriptive name.

Special characters .... Scroll through and select ASCII characters from the list individually and press the **<↓>** button. By adding the characters to the separator contents, the ASCII character name and the character itself are entered in both the ***Separator names*** and ***Separator contents*** fields automatically.

Separator contents...... This field contains the ASCII characters you want to use as a field separator. You can manually enter a character or it will be entered automatically when you select special characters.

3. When you have created the separator, press **<OK>**. The ***Define Separators*** dialog is displayed with the new separator in the list.

9.5.3.6.2 Editing separators

Once separators have been created they will be displayed in the ***Separators*** list of the ***Define Separators*** dialog. If a separator needs to be modified, highlight it and press **<Edit>** to display the ***Edit Separator*** dialog. The dialog is identical to the ***New Separator*** dialog and functions as described in Section 9.5.3.6.1, *Creating individual separators*, page 9-34.

9.5.3.6.3 Deleting separators

Separators listed in the ***Define Separators*** dialog can be deleted as required. To delete a separator, highlight it and press **<Delete>**. A confirmation message is displayed.

☒ **Note**: If a separator is used within another record or displayed in the ***Record Layout***, the separator cannot be deleted.

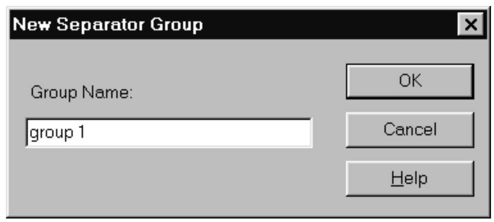
9.5.3.6.4 Creating separator groups

The Separator Groups section allows you to create a uniquely named group to which various separators are matched. Selection of a Separator Group allows you to indicate that, within a record, fields may be separated by any of the group's multiple separators.

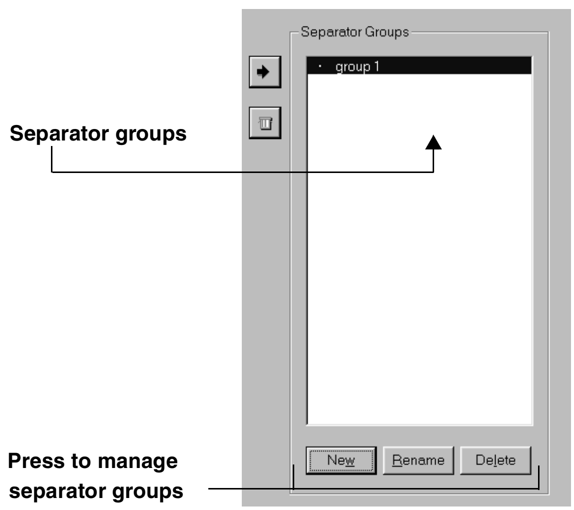
Steps to create a new separator group

1. To create a new separator group, press **<New>**. The ***New Separator Group*** dialog is displayed.

2. In the ***New Separator Group*** dialog, enter the name of the group and press **<OK>**.



3. New separator groups will be displayed in the Separator Groups list of the ***Define Separators*** dialog.

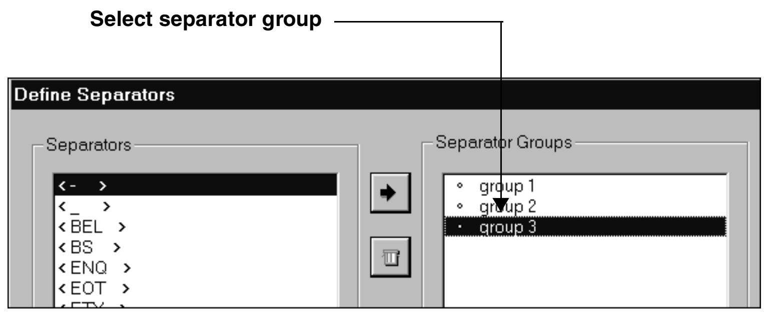


9.5.3.6.5 Matching separators to separator groups

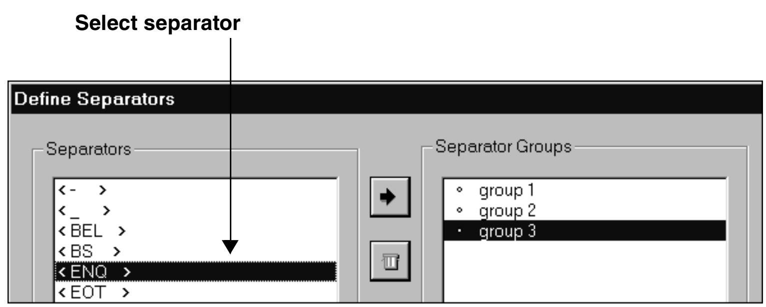
Separator Groups allow you to indicate that, within a record, fields may be separated by any of the group’s separators. Once the individual separators and separator groups have been created, you must match them together.

Steps to matching separators to separator groups

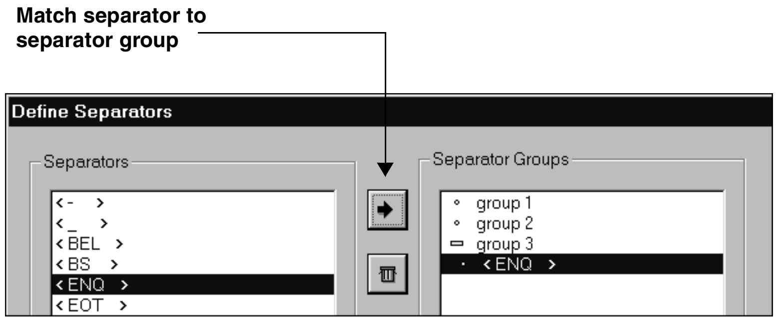
1. Select the particular separator group to which the separator is matched.



2. Select the particular separator to match to the group.



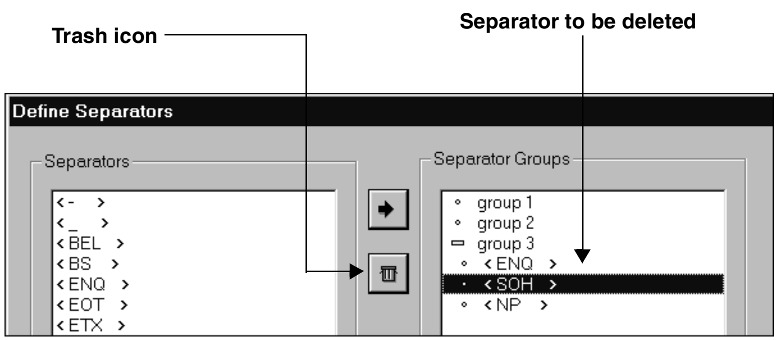
3. Press the right arrow button to match the separator to the separator group. Note the separator name is now displayed beneath the separator group.



4. Repeat steps 2 and 3 for each of the separators you want to include in the separator group.

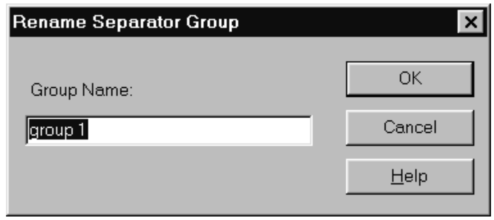
5. Press **<OK>** when you have matched all separators to the separator group.

✉ **Note:** You can delete separators from a separator group by selecting the separator and pressing the trash can icon.



9.5.3.6.6 Renaming separator groups

Once separator groups have been created they will be displayed in the ***Separator Groups*** list of the ***Define Separators*** dialog. If a separator group needs to be renamed, press **<Rename>** to display the ***Rename Separate Group*** dialog. Enter a new name and press **<OK>**.



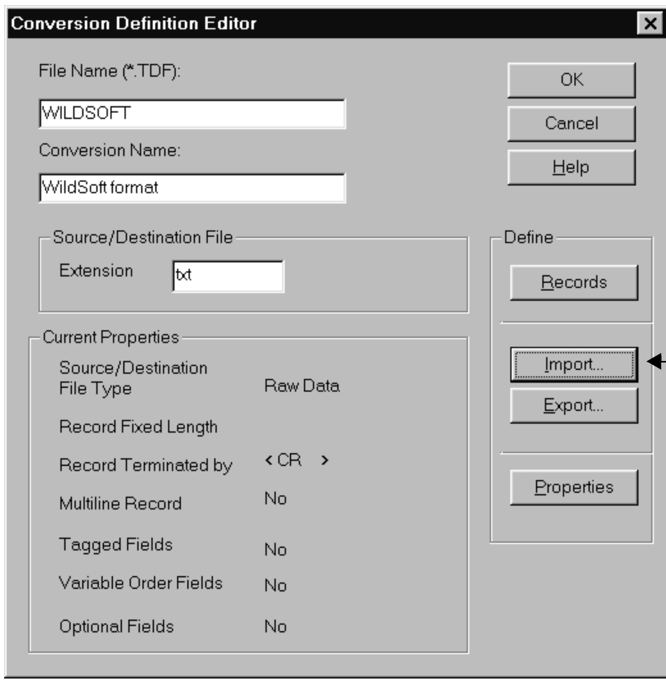
9.5.3.6.7 Deleting separator groups

Separator groups listed in the ***Define Separators*** dialog can be deleted as required. To delete a separator group, highlight it and press **<Delete>**.

☒ **Note**: If separators are matched to a separator group, the group cannot be deleted.

9.6 Linking Records to Import

The ***Conversion Definition Manager*** allows you to import various record types to ProLINK. To accomplish this task, you must associate each of the records previously defined in the conversion definition with a known ProLINK record. Additionally, you must associate the record's fields with the fields in the ProLINK record. This process is referred to as linking records, and must be done to successfully import records to ProLINK.



Press to link import records to ProLINK records

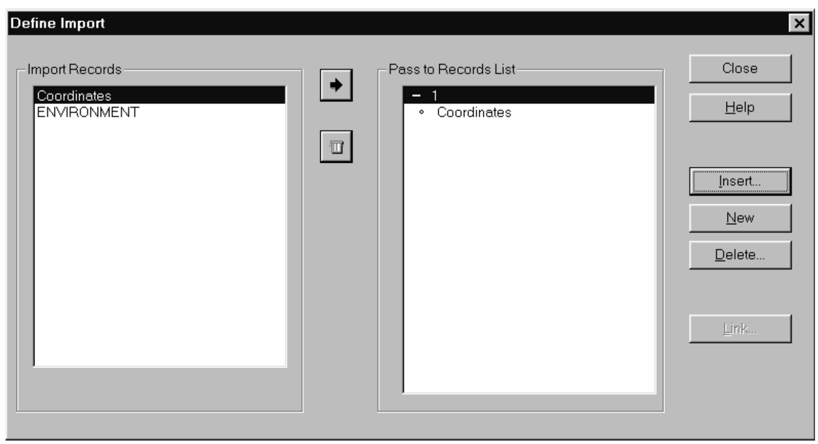
To link records, you must have already defined and laid out the records in the conversion definition. In the ***Conversion Definition Editor*** dialog, press **<Import>**. The ***Define Import*** dialog is displayed.

> **Note:** If you specified the ***Source/Destination*** of the conversion as the ***Reduced Coordinates View***, the **<Import>** will be disabled. This option is used for export conversions only. You can verify your selection in the ***Current Properties*** of the ***Conversion Definition Editor***. For more information, see Section 9.3, *Creating or Copying a New Conversion Definition*, page 9-4.

9.6.1 Defining an import conversion

During the import process, ProLINK reads a file and extracts the records you have defined in the conversion definition. By default, ProLINK reads a file once. You can indicate that the file should be read multiple times, and specify which records are extracted each time the file is read. The reading of the file is referred to as a pass. Each pass that ProLINK makes, ProLINK will extract the specified records from the imported file and add them into the current field book.

In the ***Define Import*** dialog, select the records you want to import and indicate on which pass ProLINK will extract the record from the file and import it into the current field book. Multiple records can be identified within a pass. You can specify multiple passes.



Import Records .... This list consists of all records that were created for the conversion definition.

Pass to Record List ..... This list contains the pass steps used during the import process. Each pass can contain one or more records which will be imported during that pass.

Buttons

<Insert> .... Select this button to insert a pass below the currently selected pass. It allows you to insert a pass between pre-existing passes.

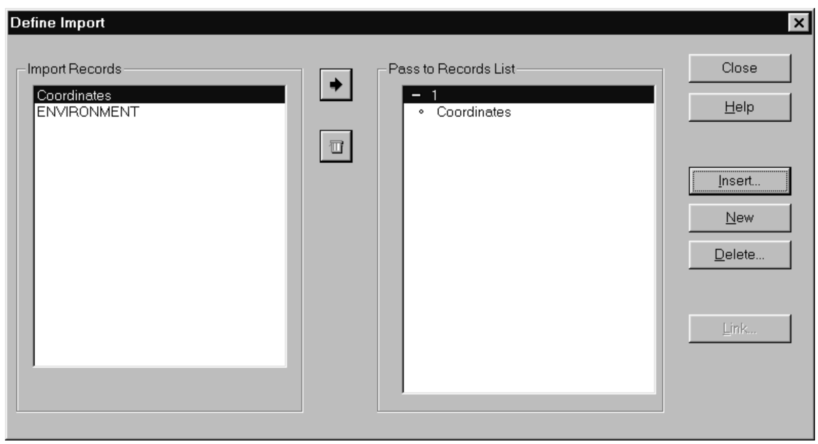
<New> .... Select this button to add a pass to the end of the list.

<Delete> .... Select this button to remove a pass and the associated records from the list.

<Link> .... Highlight a record and select this button to associate the selected import record and its respective fields to ProLINK records and fields.

Steps to establish passes and define the import conversion

1. Access the ***Define Import*** dialog by pressing **<Import>** in the ***Conversion Definition Editor***.



2. Press **<Insert>** or **<New>** to add a pass to the list.

3. Highlight a pass and assign records to it. Select a record in the ***Import Records*** list and press <→>.

4. Highlight the record in the ***Pass to records list*** and press **<Link>** to associate the record and its fields to ProLINK records and fields. For more information, see Section 9.6.1.1, *Linking the imported records to the ProLINK database*, page 9-44.

5. Repeat Steps 2 through 4 until the import conversion process has been defined.

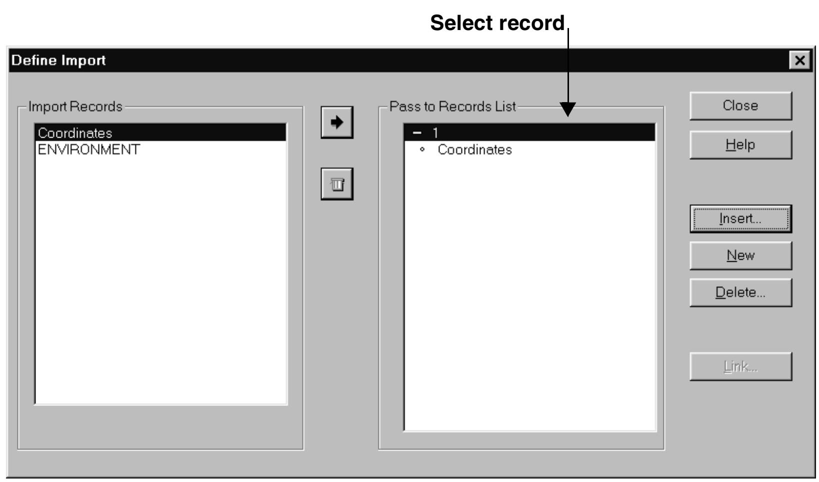
6. Press **<Close>** when completed.

9.6.1.1 Linking the imported records to the ProLINK database

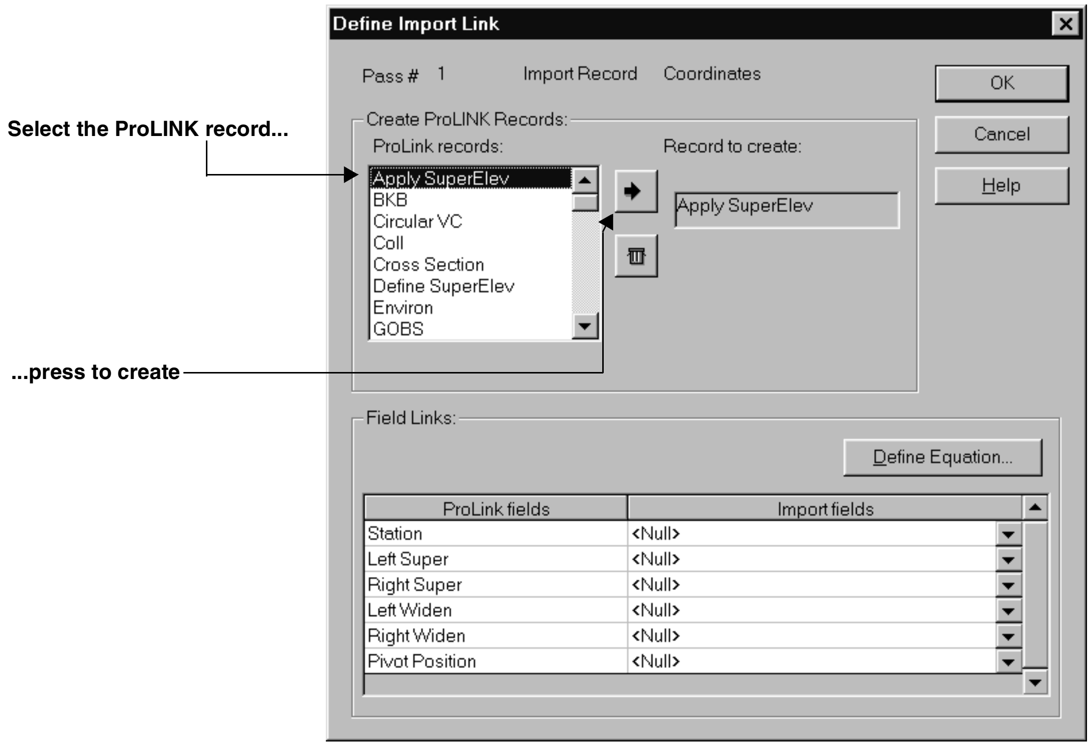
Once the number of passes ProLINK makes through the file is determined, and the records to be extracted are identified, you can link the records and fields created in the conversion definition to ProLINK.

Steps to link imported records to ProLINK database

1. In the ***Define Import*** dialog, highlight a record in the ***Pass to records list*** and press **<Link>**. The ***Define Import Link*** dialog is displayed.

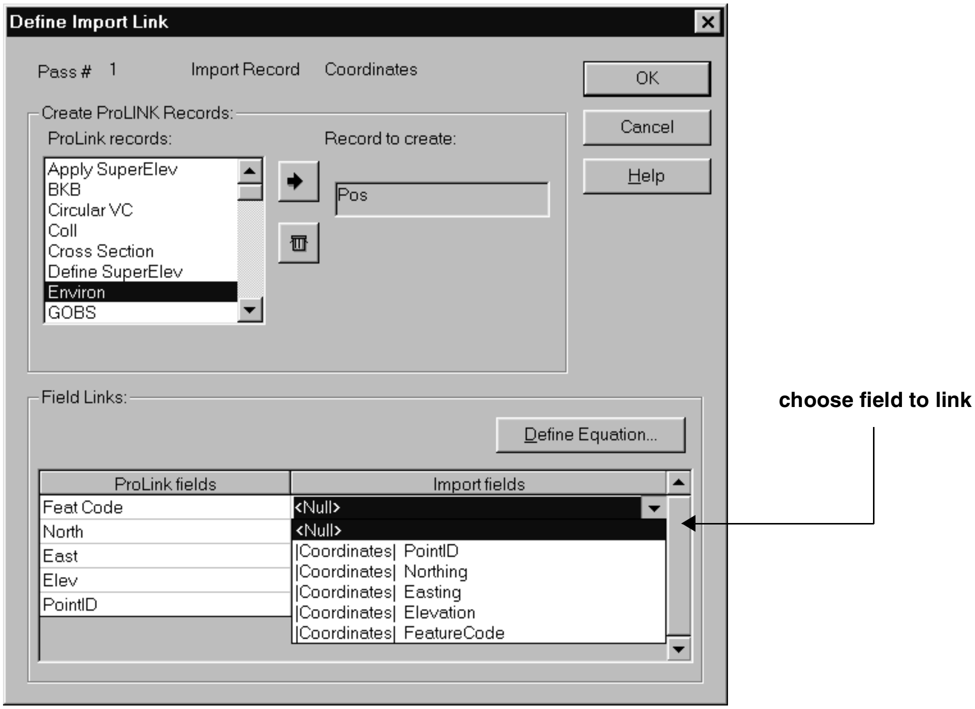


2. In the ***Define Import Link*** dialog, select a ProLINK record and press the right arrow button. Note the record is now displayed in the ***Records to create*** list.



3. Next, link the ProLINK fields to the field that were created in the import record. The fields associated with the selected ProLINK record are displayed in the ***Field Links*** list. Select each appropriate fields and match it to the fields that you defined for this conversion. Alternatively, you can use the

<Define Equation> button to apply an equation to define the field (see Section 9.6.1.2, *Defining field equations for import links*, page 9-46).



4. Repeat the above steps for each record to be imported to ProLINK.

5. Press **<OK>** when you have linked all the records and their respective fields created in the ***Conversion Definition Manager*** to an associated ProLINK record and field.

9.6.1.2 Defining field equations for import links

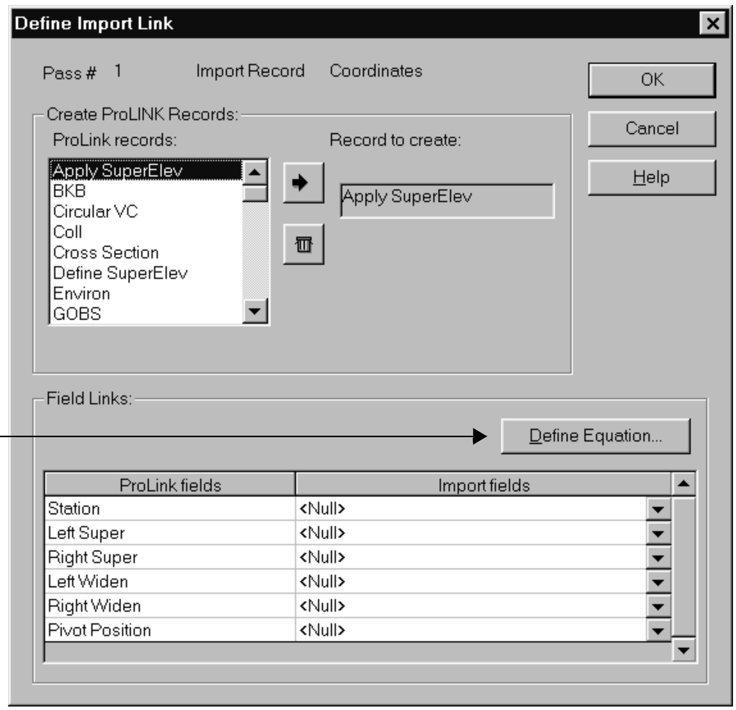
ProLINK's flexibility allows you to define mathematical equations in fields. For example, if you want to convert coordinates to distance, you would select the field name for which the conversion was applicable and the functions required to carry out the calculation.

When ProLINK reads the field during the import process, it interprets the instruction to calculate the field value using the specified functions. Upon display in the field book, the value will have been calculated and converted from coordinates to distance.

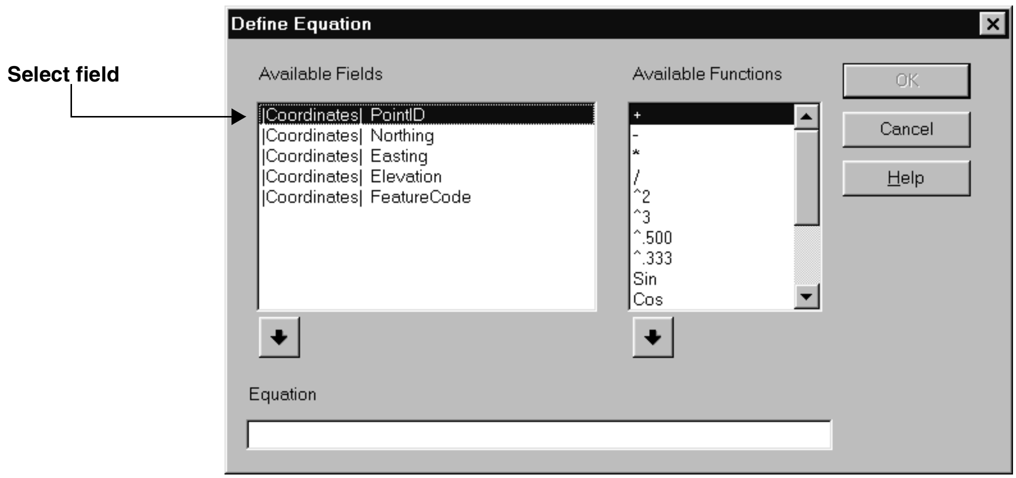
Steps to define equations

1. In the ***Define Import Link*** dialog, highlight a record in the ***Records to create*** list; its associated fields are displayed in the ***Field Links*** list. Select each appropriate field and press the **<Define Equation>** button to apply an equation to define the field

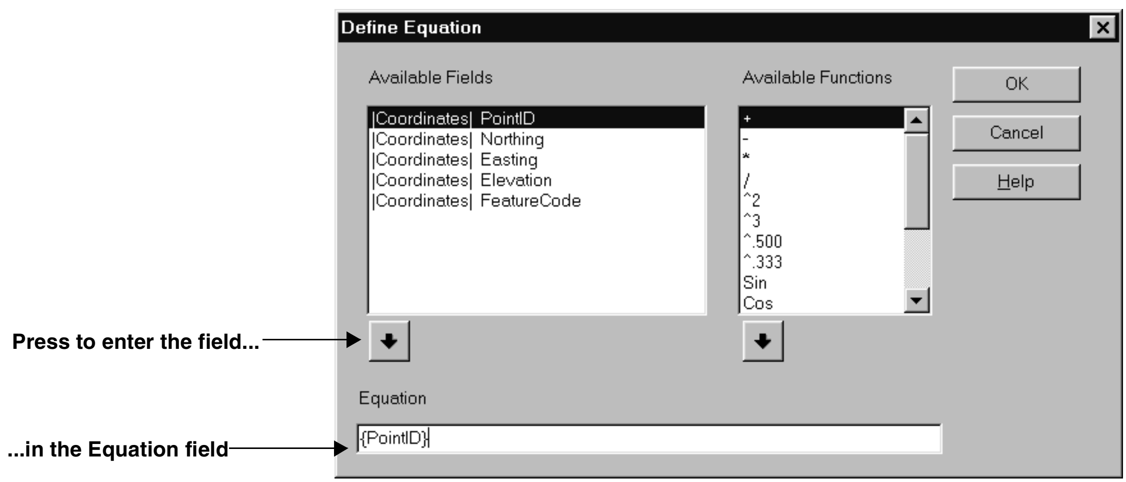
Press to define equation



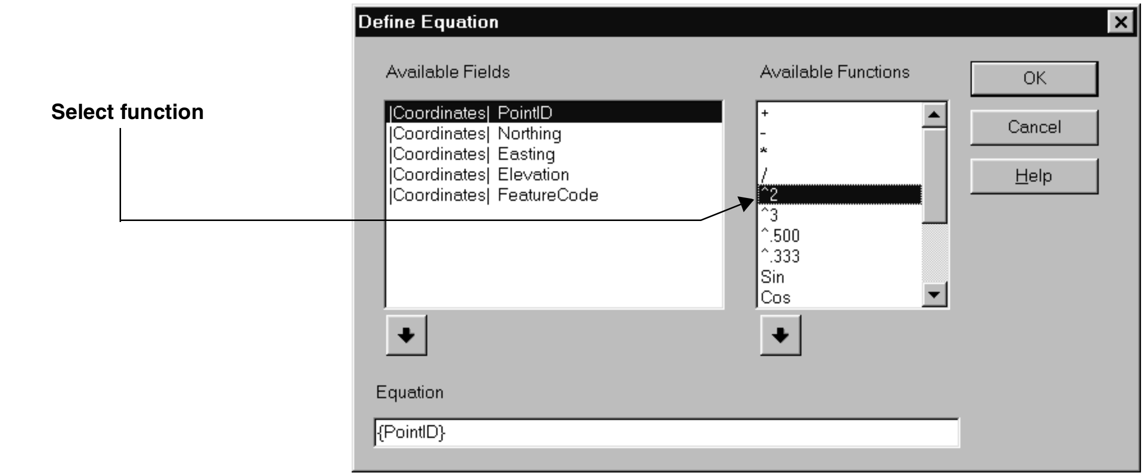
2. The ***Define Equation*** dialog is displayed. From the ***Available Fields*** list, select the field whose value is to be converted.



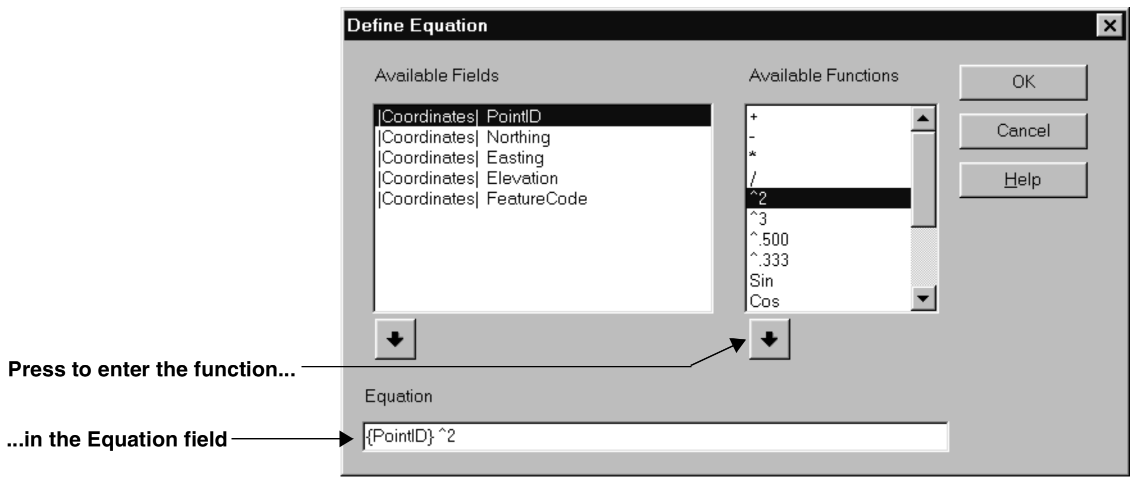
3. Press the arrow DOWN button to enter the selected field in the ***Equation*** field.



4. From the ***Available Functions*** list, select the appropriate function.



5. Press the arrow DOWN button to enter the function in the ***Equation*** field.

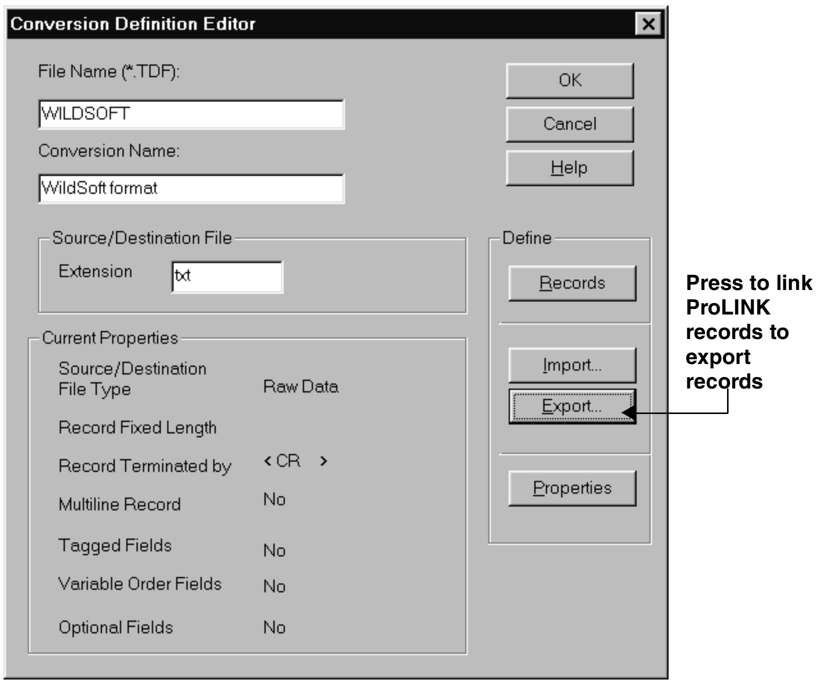


6. Manually enter additional numeric information and repeat steps 2 through 5 as required.

7. When the equation is complete, press **<OK>**. The ***Define Import Link*** dialog is displayed with the equation in the selected field.

9.7 Linking Records to Export

ProLINK allows you to export raw data and reduced coordinate data in various file formats. To accomplish this task, the ***Conversion Definition Manager*** allows you to associate ProLINK records with records previously defined in the conversion definition ProLINK. Additionally, you must associate the record's fields with the fields in the ProLINK record. This process is referred to as linking records, and must be done to successfully export records from ProLINK for use in a different format.



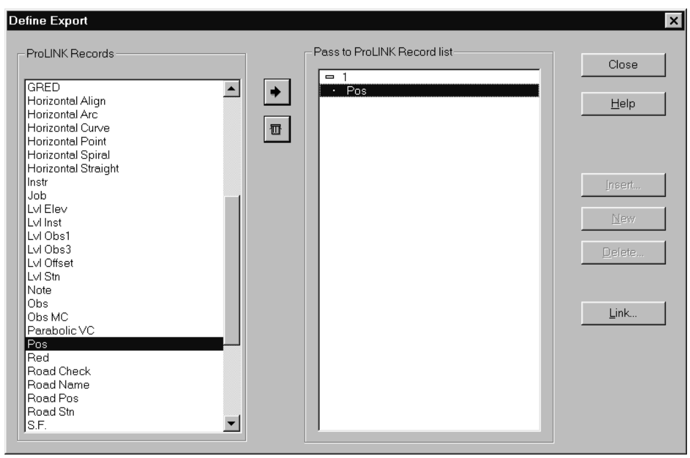
To link records, you must have already defined and laid out the records in the conversion definition. In the ***Conversion Definition Editor*** dialog, press **<Export>**. The ***Define Export*** dialog is displayed.

Note: The **Source/Destination** of the conversion that you specified when creating the conversion indicates the source of the export data. The options were the ***Field Book Editor*** or the ***Reduced Coordinates View***. You can verify your selection in the ***Current Properties*** of the ***Conversion Definition Editor***. For more information, see Section 9.3, *Creating or Copying a New Conversion Definition*, page 9-4.

9.7.1 Defining the export conversion

During the export process, ProLINK reads a file and extracts the records you have defined in the conversion definition. By default, ProLINK reads a file once. You can however indicate that the file should be read multiple times, and specify which records are converted each time the file is read. The reading of the file is referred to as a pass. Each pass that ProLINK makes, ProLINK will convert the specified records and export them in the appropriate format.

In the ***Define Export*** dialog, select the records you want to export and indicate on which pass ProLINK will extract the record from the field book or ***Reduced Coordinate View*** and export it to a location on the local drive. Multiple records can be identified within a pass. You can specify multiple passes.



ProLINK Records .... The list consists of all ProLINK records for either the ***Field Book Editor*** (raw data) or the ***Reduced Coordinate View*** (coordinate data).

Pass to ProLINK Record List .... This list contains the pass steps used during the export process. Each pass can contain one or more records which will be imported during that pass.

Buttons

<Insert> .... Select this button to insert a pass below the currently selected pass. It allows you to insert a pass between pre-existing passes.

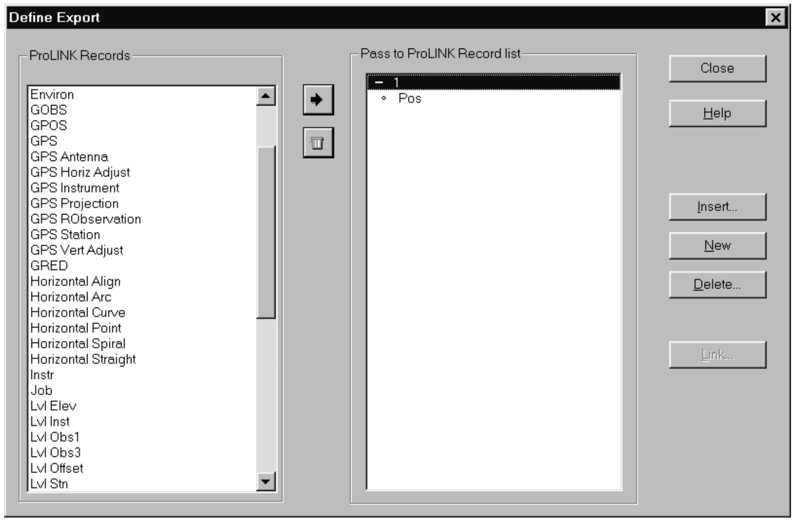
<New> .... Select this button to add a pass to the end of the list.

<Delete> .... Select this button to remove a pass and the associated records from the list.

<Link> .... Highlight a record and select this button to associate the selected ProLINK record and its respective fields to the export's records and fields.

Steps to establish passes and define the export conversion

1. Access the ***Define Export*** dialog by pressing **<Export>** in the ***Conversion Definition Editor***.



2. Press **<Insert>** or **<New>** to add a pass to the list.

3. Highlight a pass and assign records to it. Select a record in the ***ProLINK Records*** list and press <→>.

⌧ **Note:** The User-Defined record type can be used to support textual entries for export records, such as headers and footers (see Section 9.7.1.2, *Defining text field for export*, page 9-57).

4. Highlight the record in the ***Pass to ProLINK records list*** and press **<Link>** to associate the ProLINK record and its fields to the export's records and fields. For more information, see Section 9.7.1.1, *Linking ProLINK records to the export format*, page 9-54.

5. Repeat Steps 2 through 4 until the import conversion process has been defined.

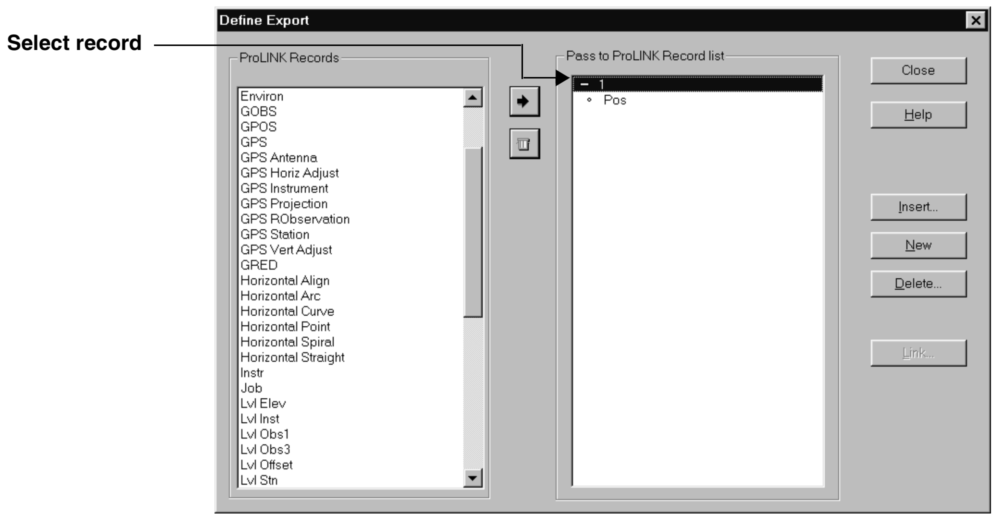
6. Press **<Close>** when completed.

9.7.1.1 Linking ProLINK records to the export format

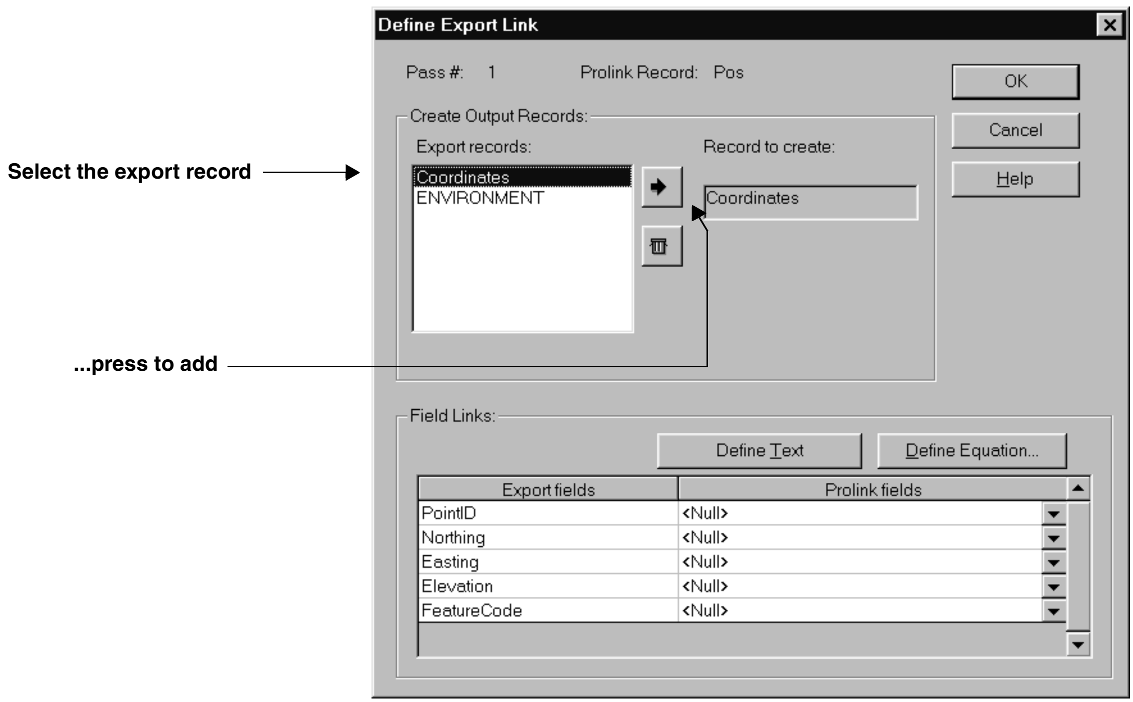
Once the number of passes ProLINK makes through the file is determined, and the records to be converted are identified, you can link the ProLINK records and fields to the records and fields created in the conversion definition.

Steps to link ProLINK records to the export format

1. In the ***Define Export*** dialog, highlight a record in the ***Pass to ProLINK records list*** and press **<Link>**. The ***Define Export Link*** dialog is displayed.

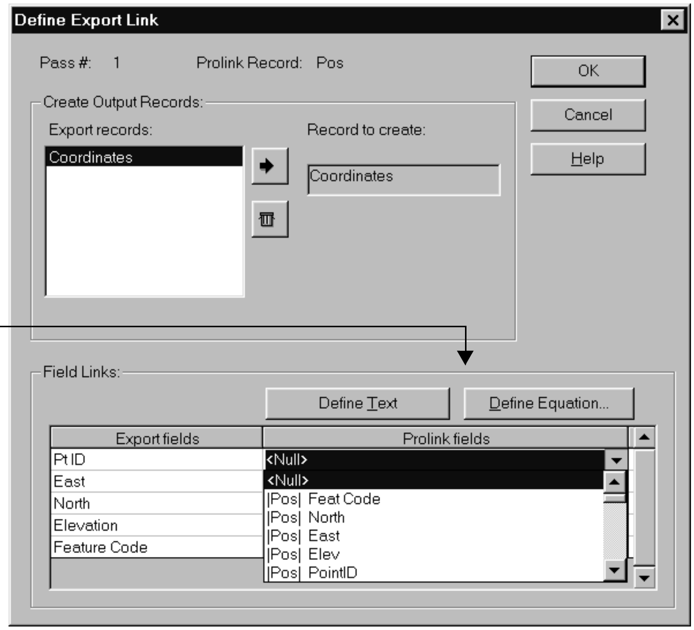


2. In the ***Define Export Link*** dialog, select the export record and press the right arrow button. Note the record is now displayed in the ***Record to create*** list.



3. Next, link the fields that were created in the export record to the ProLINK fields. The fields associated with the selected record are displayed in the ***ProLINK fields*** list. Select the appropriate field in the ***ProLINK fields*** and choose the field to which the export field should be linked.

Choose field to link



Alternatively, you can assign user-defined text to the exported field, which is useful for defining header and footer records. For more information, see Section 9.7.1.2, *Defining text field for export*, page 9-57. You also can define and apply an equation to the field. For more information, see Section 9.7.1.3, *Defining field equations for export*, page 9-58.

4. Repeat the above steps for each record to be exported from ProLINK.

5. Press **<OK>** when you have linked all the ProLINK records and their respective fields to the records and fields created in the ***Conversion Definition Manager***.

9.7.1.2 Defining text field for export

ProLINK’s flexibility allows you to establish textual information in fields. For example, if your export’s header record requires ten lines of text, you would enter it here. When ProLINK reads the field during the export process, it places the text in the export file.

Within the list of ProLINK records is a User-Defined record. This record allows you to add free-form text to the exported file. This record type is useful for Header and Footer records. Alternately, you can define fields in a record that can hold a combination of ProLINK data and free-form text.

The text area can be populated by manually entering text or by using standard cut, copy and paste functions. The text can contain up to 4KB of information. Should you need more space, simply insert a new pass and a new user-defined record to hold the additional text.

Steps to define text

1. In the ***Define Export Link*** dialog, press **<Define Text>**. The ***Define Text*** dialog is displayed.

2. Manually enter text or use the shortcut keys to copy and paste text from other sources.

   <Ctrl>+<C> — Copy
   <Ctrl>+<X> — Cut
   <Ctrl>+<V> — Paste

3. Press **<OK>** to complete the task.

9.7.1.3 Defining field equations for export

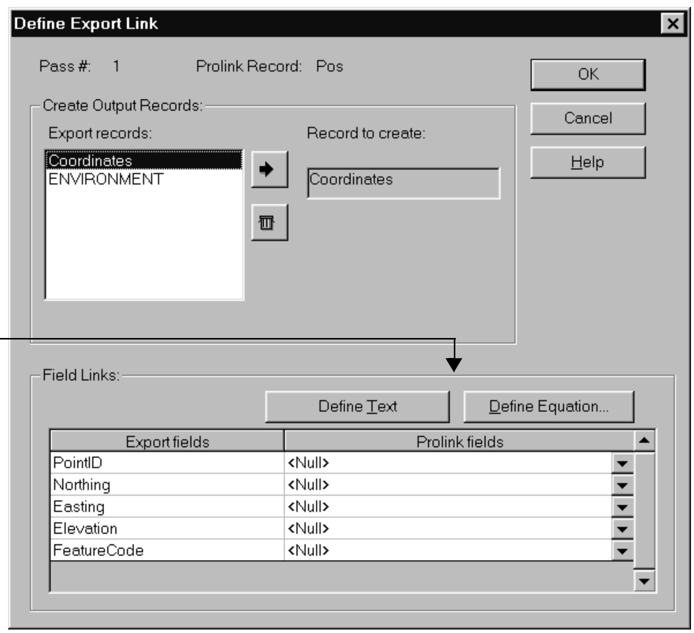
ProLINK's flexibility allows you to define mathematical equations in fields. For example, if you want to convert degrees to radians, you would entry of the field name for which the conversion was applicable and the functions required to carry out the calculation.

When ProLINK reads the field during the export process, it interprets the instruction to calculate the field value using the specified functions. Upon display in the field book, the value will have been calculated and converted from degrees to radians.

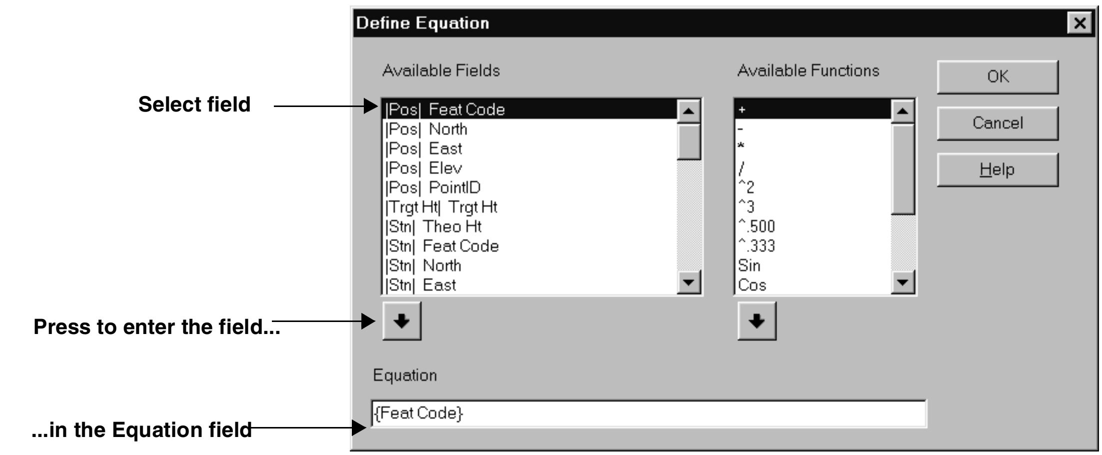
Steps to define equations

1. In the ***Define Export Link*** dialog, highlight a record in the ***Records to create*** list; its associated fields are displayed in the ***Field Links*** list. Select each appropriate field and press the **<Define Equation>** button to apply an equation to define the field.

Press to define equation

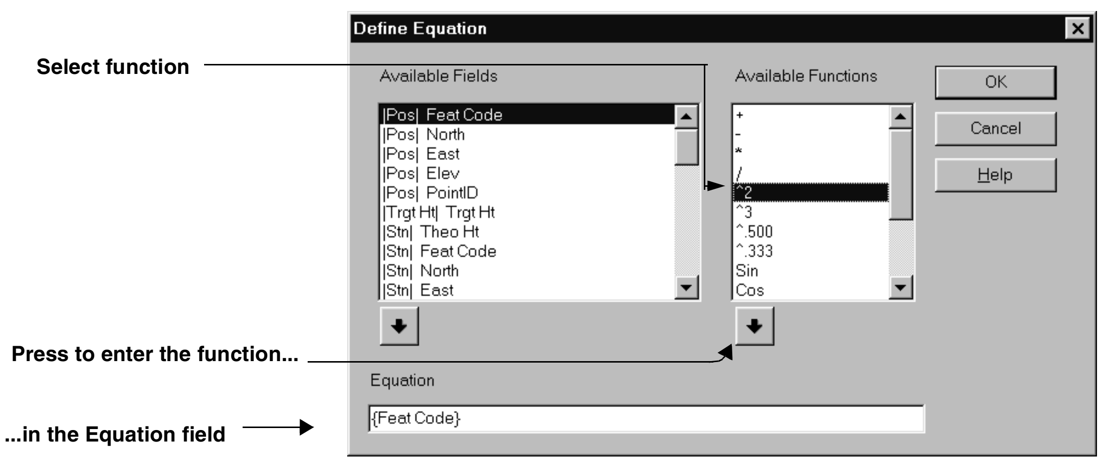


2. The ***Define Equation*** dialog is displayed. From the ***Available Fields*** list, select the field whose value is to be converted.



3. Press the arrow DOWN button to enter the selected field in the ***Equation*** field.

4. From the ***Available Functions*** list, select the appropriate function.



5. Press <↓> to enter the function in the ***Equation*** field.

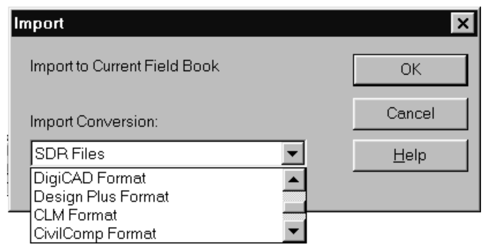
6. Manually enter additional numeric information and repeat steps 2 through 5 as required.

7. When the equation is complete, press **<OK>**. The ***Define Export Link*** dialog is displayed with the equation in the selected field.

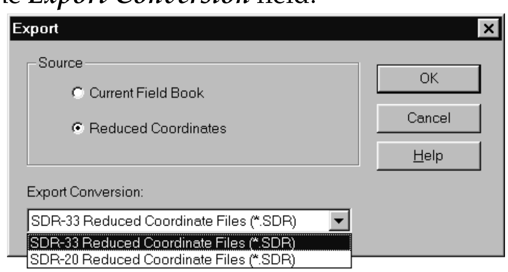
9.8 Using Conversion Definitions

The ***Conversion Definition Manager*** allows you create conversion that import and export various ASCII file formats to and from ProLINK. The conversion definition you create will be available for you to choose whenever you select the **Import** or **Export** or the **Send** and **Receive** option from the ***File*** menu.

For example, when you select **Import** from the ***File*** menu, the conversion definition will be available in the ***Import Conversion*** field.



Similarly, the newly created conversion definition also will be available in the ***Export Conversion*** field.



Selection of the conversion definition will convert the selected file from its native format to the format specified in the ***Conversion Definition Manager***.

Chapter 10 Communications

You can communicate with Sokkia survey devices to download or upload files from your PC.

10.1 General Information

ProLINK communicates with the entire line of Sokkia devices. You can download and upload data with most devices.

The following table lists the devices you can use with ProLINK and their import/export capabilities.

Sokkia Device	Select in ProLINK:	File Formats Supported	Card Reader	Export	Import	Save to Disk
SDR Devices						
SDR33/31 SDR 8100 DAP 5320	SDR33/31(SDR format) SDR33/31(Z-Bin format) SDR33/31FCodes(Binary)	*.sdr, *.xfm, *.fcs		X	X	X
Total Stations						
PowerSET	POWERSET Memory	*.sdr, *.lib	SCR1	X	X	X
SET 5F/5W	SET5F/5W	*.set		X	X	X
SET series 100	SET Series 100	*.sdr, *.lib		X	X	X
SET series 300, 500	SDR33/31 (SDR format)	*.sdr		X	X	X
SETC series	SCR1 Card Reader	*.scr	SCR1	X		X
SETCII series	SCR1 Card Reader	*.scr	SCR1	X		X
SET BII series	SETBII/SETE Total Station	*.set		X		X
SET E series	SETBII/SETE Total Station	*.set		X		X
SET 6F	SET6F	*.set		X		X
GPS Receivers						
Radian	Radian	*.pdc				X
Radian IS	Radian IS	*.pdc				X
POWERGPS	POWERGPS	*.gs3				X
SDR33 for GIS (Packer)	Packer	*.raw, *.wpt, *.lib, *.xfm				X
GSS1A receiver	GSS1A	*.gss	SCR2			X
GSS1A	GSS1A	*.gss				X
GSS2 receiver	GSS2	*.gs2	SCR2			X
GSS2	GSS2	*.gs2				X
GSR series	GSR-Series Receivers	*.gsr				X
Card Readers						
SCR1 Card Reader	SCR1 Card Reader	*.scr	SCR1		X	X
SCR2 Card Reader	SCR2 Card Reader	*.gss, *.gs2	SCR2		X	X

*X represents a device feature.
*the name of the card reader is listed if the device uses data cards to record information.

10.1.1 Save files to a Disk or Device

To save files to a disk or device with ProLINK, you must use the export/import feature. Follow the ProLINK import/export general workflow below:

1. Device: Connect your device with its COM cable to your PC.

2. Turn on the device and open ProLINK on your PC.

3. ProLINK: Select **File | Send Receive...** from the main menu. The ***Download/Upload*** dialog box will open.

4. ProLINK: Select the your device from the icon list in the **Device** window. (If this icon does not by default appear in this window, you can select your device from the **Look in** drop down list. The icon for the file type will appear in the **Device** window.)

5. ProLINK: Double-click on the device icon. The icon will disappear. You should see the words **Device is not connected** in the **Device** window.

6. ProLINK: Press <**Connect**> at the bottom of the ***Download/Upload*** dialog box.

7. ProLINK: You now have the option to transfer data to or from your device. Use the <←>and <→> arrow keys to transfer data to or from your device.

Each device communicates differently with a PC. Please refer to your device manual for its communication operations.

10.1.2 Transfer Settings

You can specify the following ProLINK settings:

- COM port
- parity
- stop bit
- baud rate
- data bits

Steps to define communication settings

1. From the ***Download/Upload*** dialog box, press the **<Settings>** button.
2. The ***Communications Device Settings*** dialog displays.

3. Choose the appropriate settings in each field.
4. Click on **<OK>**.

10.2 Specific Device Transfer Information

Each device transfers data differently. This section covers specific device information that may be helpful when you transfer data.

☒ Please refer to your device manual for its communication operations.

10.2.1 SDR Devices

SDR devices can transfer data to and from a PC. The following formats can be used:

SDR formats..................SDR jobs, roads and templates
Z-Bin formats.................SDR jobs, feature code libraries, roads and templates

☒ **Note**: Before transferring data, ensure your device is connect to ProLINK. See section 10.1.2, *Transfer Settings*, page 10-3 for more information.

10.2.1.1 SDR formats

To transfer SDR formats between your SDR device and ProLINK, you must do the following:

☒ To transfer data to or from your device through ProLINK, your device must by connected with ProLINK. See section 10.1.1, *Save files to a Disk or Device*, page 10-3.

1. ProLINK: Click the <**Connect**> button at the bottom of the ***Import/Export*** dialog box. The **Use Job Name.SDR** icon will appear in the ***Device*** window.

2. ProLINK: From the ***Local Machine*** window, select a path to store your imported data.

3. ProLINK: Highlight the **Use Job Name.SDR** icon and click on the <←> key. The **Receiving** pop-up box will appear. At this point, you must pick up your SDR device to finish the data transfer process.

4. Device: From the **Func** menu, tap **Communications**.

5. Device: From the ***Data format*** drop down list tap **SDR**.

6. Device: Tap the <**Send>** button at the bottom of the touch screen. A screen with the following options will appear: **Select jobs**, **Select roads**, **Select templates**, and **Select all data**. Choose the type of data you want to transfer to your PC.

   When you choose one of the four options, a new window will open with file names listed on the left of the screen and buttons titled **No** to their right.

To export a file, you must toggle the **No** button to **Yes**. Use the left or right arrow key on your keypad to do this.

7. SDR: Tap <**Send**> on your touch screen to export your files to your PC.

8. SDR: When the files have been successfully exported to your PC, a message box will appear with the message **Complete** on it.

Transfer data from PC to SDR device

6. SDR: Tap the <**Receive**> button at the bottom of the touch screen. A **Waiting for input...** dialog box will appear. You must now finish the transfer with ProLINK.

7. ProLINK: In the **Local Machine** window, select the files you want to transfer to your SDR device.

8. ProLINK: Click on the <**Connect**> button at the bottom of the window. The **Use Job Name.SDR** icon will appear in the **Device** window.

9. ProLINK: Click on the <→> key. The **SDR Send** message box will appear. Click on the <**OK**> button. The **Sending** message box will appear. Click on the <**OK**> button to finish the data transfer.

10.2.1.2 Z-Bin formats

To transfer Z-Bin information to or from your SDR device, you must do the following:

1. Connect your SDR device with its COM cable to your PC.

2. Turn on the SDR device and open ProLINK on your PC.

3. SDR: From the **Func** menu, tap **Communications**.

4. SDR: From the ***Data format*** drop down list select **Z-Bin** and tap the <**Start**> button on your touch screen. A **Working** message box will appear. You must now go back to ProLINK to finish the transfer.

5. ProLINK: Select **File | Send Receive...** from the main menu. The ***Download/Upload*** dialog box will open.

6. ProLINK: Select the **SDR33/31 (Z-Bin Format)** icon in the **Device** window. (If this icon does not by default appear in this window, you can select this format from the **Look in** drop down list. The icon for the file type will appear in the window above.)

7. ProLINK: Double-click on the **SDR33/31 (Z-bin Format)** icon. The icon will disappear. You should see the words **Device is not connected** in the **Device** window.

8. ProLINK: Click on the <**Connect**> button at the bottom of the dialog box. After a couple of moments, your files will appear in the **Device** window.

9. ProLINK: To toggle through files, use the **File types** drop down list (below the **Local Machine** window) to view specific file types.

10. ProLINK: From the **Local Machine** window, select a path to which you will store your imported data.

11. ProLINK: Highlight the files in the **Device** window you wish to transfer to your PC and click on the <←> key. Highlight the files in the **Local Machine** window you wish to transfer to your SDR device and click on the <→> key.

10.2.2 Total Stations

Total Station data files can be stored to the hard drive for later use or imported directly to your device.

Each device sends data to and from a PC differently. Please refer to your device manual for its communication operations.

☒ **Note**: Your communications settings on your SDR device must mirror those in ProLINK. See section 10.1.2, *Transfer Settings*, page 10-3 for more information.

PowerSET .... With PowerSET, you can export and import individual SDR jobs to your PC through ProLINK. ProLINK can communicate with the PowerSET memory card directly through PowerSET or with a SCR1 card reader.

It is recommended that you use a SCR1 card reader to transfer data.

See section 10.2.3, *Memory Card Readers*, page 10-9 for card reader information.

SET 5F/5W .... ProLINK can receive SDR files from a SET 5F/5W total station. The files can be saved to disk for storage and used later, or they can be directly imported to the field book using an import conversion.

ProLINK can send a coordinate file from a current project to a SET 5F/5W total station using an export conversion. You can also transfer files from a local drive directly to the SET5F/5W.

SET 100............................ The SET series 100 stores data in its internal memory. Files can be sent and received from the SET series 100's memory. The file transfer then occurs as it does with an SDR33.

SET 300 and 500............. With the SET 300 and 500 series, you can export and import data to your PC through ProLINK.

SET C/ SETCII .... Data can only be exported from your SETC and SETCII total stations. You can communicate with ProLINK directly with your total station or through a SCR1 memory card.

When receiving the coordinate information collected in a SETC total station's memory card, ProLINK copies the file in its native comma-delimited format to the hard drive.

See section 10.2.3, *Memory Card Readers*, page 10-9 for card reader information.

SET BII .... Files can be sent to, not received from, the SETB total station's memory.

Only coordinates may be loaded into a SETBII total station's memory. Up to 100 position records may be sent. Point ID's must be numeric in the range 1 to 99999999.

☒ **Note**: The total station's memory will be cleared before loading coordinates.

SET E .... Files can be sent to, not received from, the SETE total station's memory.

You can transfer coordinates to the memory of the SETE series total station.

SET 6F .... Files can be sent to, not received from, the SET6F total station's memory.

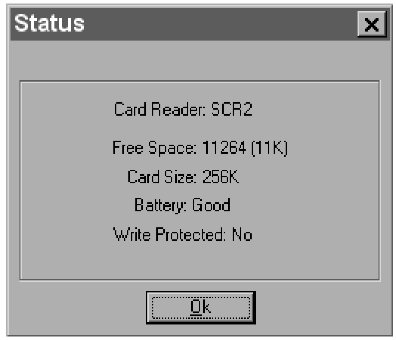
You can transfer coordinates to the memory of the SET6F series total station.

10.2.3 Memory Card Readers

Data may be stored on a memory card using a GSS1A or GSS2 receiver or an SETC, SETCII, or PowerSET total station. ProLINK can receive the data from a card in an SCR1 or SCR2 card reader or from a card local to a GSS1A or GSS2 receiver or an SETC/SETCII total station.

10.2.3.1 Card status

To review the status of your data card, you must insert it into a card reader to communicate with ProLINK. See section 10.1.1, *Save files to a Disk or Device*, page 10-3. When the card reader is connected to ProLINK, select <**Status**> in the ***Download/Upload*** dialog box.



Card status displays the following non-editable card information:

Card Reader....................indicates the card reader ProLINK is communicating with.

Free Space.......................indicates the amount of space available on your data card.

Card Size.........................indicates the amount of space that can be utilized on the data card.

Battery ....monitors the battery power available to the card reader.

Warning: If you see **BATTERY: LOW**, you should immediately transmit all data from the card to the computer. Keep in mind the battery is used to maintain card memory only when the card is not in the card reader or total station. You can replace the battery in SDC3 and higher cards.

Write Protected ....indicates if the data card is write protected.

10.2.3.2 Card settings

ProLINK can adjust three settings available for your data card. To adjust these settings, connect your data card reader to ProLINK (see section 10.1.1, *Save files to a Disk or Device*, page 10-3) and select <**Disk/Memory**> in the ***Download/Upload*** dialog box. A drop down list will appear with the following adjustment options:

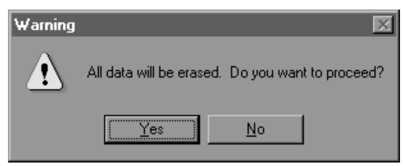
Write Enable.................. allows users to write data files to your data card.

Write Protect.................. write protects your card so users cannot transfer data files to the data card.

Format Card.................... formats your data card.

When selected, a confirmation to format message box appears on screen. If you select <**Yes**>, the card will be SCR2 and DOS formatted and files will be accessible to a PowerSET. If you select <**No**>, the card will be SCR2 formatted only and accessible to a GSS1A receiver or a SETCII total station via an SCR2 card reader.

Remember that formatting erases all the data currently on the card. The program will display a warning message and give you a chance to reconsider.



WARNING: Formatting a card that contains data will result in a loss of all data on that card.

10.3 Transmission Problems

When transmitting data, Sokkia devices respond to both hardware and software flow control. The receiving computer may periodically use either or both of these techniques. You may see either the **Xon/Xoff Detected** (software control) or **CTS/RTS Detected** (hardware control) messages appear on the device's display. If these messages do not disappear within a few seconds, the receiving computer may have stopped transmitting. Press **<ESC>** on the device to resume transmission. To abort transmission and begin again (perhaps at a lower baud rate), press **<ESC>** twice.

Chapter 11 Coordinate Systems

ProLINK allows you to define and use local coordinate systems, thereby transforming WGS84 data to your specifications. Within the program, the converted coordinates will be displayed in all instances rather than the WGS84 coordinates. Many standard coordinate systems, such as the US State Plane Coordinates, have been previously defined and are available for your use.

The coordinate systems (transformation sequences) are stored in transformation files with *.XFM extensions. Each transformation file stores one or more coordinate system(s). ProLINK provides a quick and easy method to generate and maintain coordinate systems and transformation files with the ***Coordinate System Manager*** accessed from the ***Options*** menu.

ProLINK's coordinate system transformation

In ProLINK, a coordinate system is defined by the transformation sequence that will convert a WGS84 coordinate into the desired coordinate. A transformation sequence is simply a collection of various mathematical components. For example, if GPS coordinates are to be converted into the US State Plane 1983, Kansas North zone, two mathematical operations must be performed:

- the WGS84 (ellipsoidal) coordinate must be converted into a NAD83 (ellipsoidal) coordinate

- the NAD83 coordinate must be projected to planar coordinates using a specific type of projection called Lambert 2 Parallel

ProLINK will display the transformation that accomplishes this task:

Starting the sequence from the WGS84 datum, the NAD83 and Lambert2Parallel nodes represent the datum transformation and projection components of the transformation sequence. The components of a transformation sequence are called *nodes*.

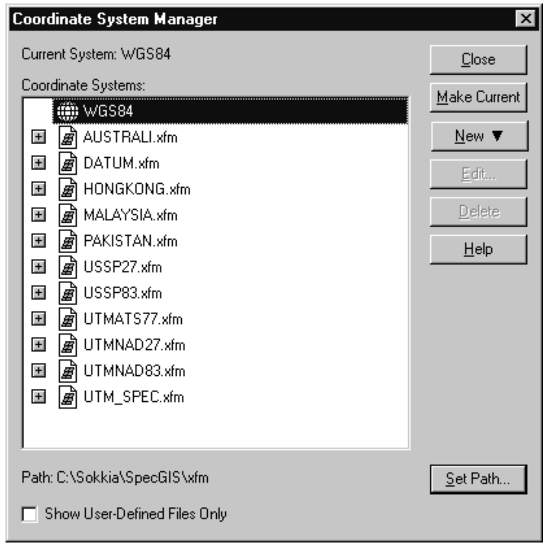
This coordinate system's transformation sequence is stored in a file called USSP83.XFM which resides in the installation directory.

11.1 Understanding Coordinate System Manager's Main Screen

The ***Coordinate System Manager*** is a tool for managing transformation files and their associated coordinate systems. It displays all transformation files and their coordinate systems available in the selected directory. Each transformation file has an *.XFM extension. From the ***Coordinate System Manager***, you can create transformation files and coordinate systems, copy existing files and coordinate systems or edit an existing coordinate system.

To access a different directory containing coordinate systems, select the **<Set Path>** button.

✉ **Note:** To transfer a transformation file to a SDR data collector, close the ***Coordinate System Manager*** and select **Send** from the ***File*** menu.



The buttons in the ***Coordinate System Manager*** access the following:

<Close> .... This button closes the dialog. Any new lists or modifications of existing coordinate systems are maintained.

<New>............................ This button creates a blank transformation file, or coordinate system, or copies an existing file or coordinate system.

<Edit>............................. This button allows editing and printing of the highlighted coordinate system.

<Delete> .... This button will delete the highlighted user-defined coordinate system. It is not available for predefined coordinate systems or transformation files.

<Help> .... This button accesses online Help.

<Set Path> .... This button determines the path for the coordinate systems.

✉ **Note:** The **<Make Current>** button will appear greyed out. This feature is not implemented in this version.

11.1.1 Establishing the path

The default path is the selected directory for storing coordinate systems. The program initially uses a default path. However, you can change this path at any time by selecting the **<Set Path>** button.

✉ **Note:** Generally, you will want to establish the default directory one time to see a complete listing of all coordinate system files.

Steps to establish the path

1. Open **Coordinate System Manager** from the ***Options*** menu.

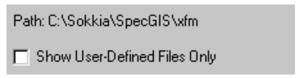
2. Select **<Set Path>**.

3. Select a directory.

4. Press **<OK>**. The ***Path*** field is updated in the ***Coordinate System Manager***.

11.1.2 Displaying only user-defined files

You can control what files display in the ***Coordinate System*** field by marking the ***Show User-Defined Files Only*** check box at the bottom of the main screen. This feature is convenient when you consistently apply the same few coordinate systems to your projects and you do not want to navigate through a long list of transformation files and coordinate systems.



You can display predefined systems with this option, by copying the predefined system into a user-defined transformation file. For more information, on copying coordinate systems, see Section 11.4, *Creating or Copying a Coordinate System*, page 11-6.

11.2 Applying a Coordinate System

ProLINK displays all coordinates in the program according to the chosen coordinate system. Selecting a new coordinate system does not change the way ProLINK stores coordinates. They are always stored as WGS84. Before displaying any coordinate on the screen or in a report, ProLINK will execute the operations described in the transformation sequence and convert the WGS84 coordinate into the appropriate coordinate.

The transformation sequence will also be stored in the ProLINK Project file (*.SGP). The next time the project is opened, the coordinates will be displayed in the proper coordinate system. The name of the currently applied system displays in ProLINK's status bar and will display on printed output.

11.3 Creating or Copying a Transformation File

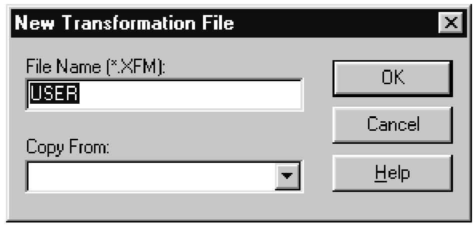
You can create a transformation file or copy an existing transformation file. Copying a transformation file includes all associated coordinate systems. The new file (*.XFM) will be stored in the ***Default Directory*** identified in the ***Coordinate System Manager***.

Steps to create or copy a transformation file

1. Select **Coordinate System Manager** from the ***Options*** menu.

2. Review the ***Default Path***. If a new directory is required, use **<Set Path>**.

3. Select **<New>,** then **File**.



4. Enter information in the appropriate fields:

   File Name .... Enter a name for the transformation file.

   Copy From .... Select from the series of coordinate systems in the default directory. If a file is selected, then the new file will contain the coordinate systems from the copied file. To cancel a selection in this field, choose **<None>**.

5. Press **<OK>**. The file displays in the ***Coordinate System Manager*** and is ready for defining associated coordinate systems.

11.4 Creating or Copying a Coordinate System

You can create a blank coordinate system or copy an existing coordinate system. Copying a coordinate system creates a template that includes the existing coordinate system's defined nodes for transforming. The new coordinate system will be stored in the Transformation file (*.XFM) that was highlighted in the ***Coordinate System Manager.*** The transformation file is located in the ***Default Directory*** identified in the ***Coordinate System Manager***.

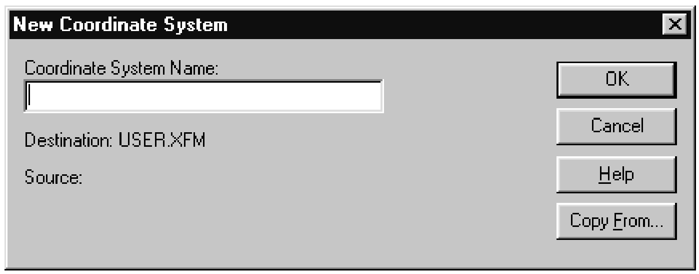
Steps to create or copy a coordinate system

1. Select **Coordinate System Manager** from the ***Options*** menu.

2. Review the ***Default Path***. If a new directory is required, use **<Set Path>**.

3. Highlight a user-defined transformation file (*.XFM). To define a new transformation file, follow steps in Section 11.3, *Creating or Copying a Transformation File*, page 11-5.

4. Select **<New>**, then **System**. The ***New Coordinate System*** dialog displays:



5. Enter information in the appropriate fields:

File Name .... Enter a name with up to 36 characters.

Destination..................... *(display only)* This field indicates the transformation file in which the coordinate system will be located.

Source.............................. Use the **<Copy From>** button to select from the series of coordinate systems in the default directory. If a coordinate system is selected, the new coordinate system will contain the transformation definition from the copied coordinate system. To cancel a selection in this field, choose **<None>**.

6. Press **<OK>**. The ***Coordinate System Editor*** is opened with the new coordinate system, and is ready for definition. For more information, see Section 11.7, *Editing a Coordinate System*, page 11-10.

7. When editing is completed, select **<OK>**. The new coordinate system will display in the ***Coordinate System Editor***.

11.5 Transferring a Coordinate System

You can transfer transformation files (*.XFM) containing coordinate systems to and from a SDR RTK data collector. The transformation files are transferred and saved on a local drive. After a coordinate system has been transferred to a local drive, it can be accessed from the ***Coordinate System Manager***.

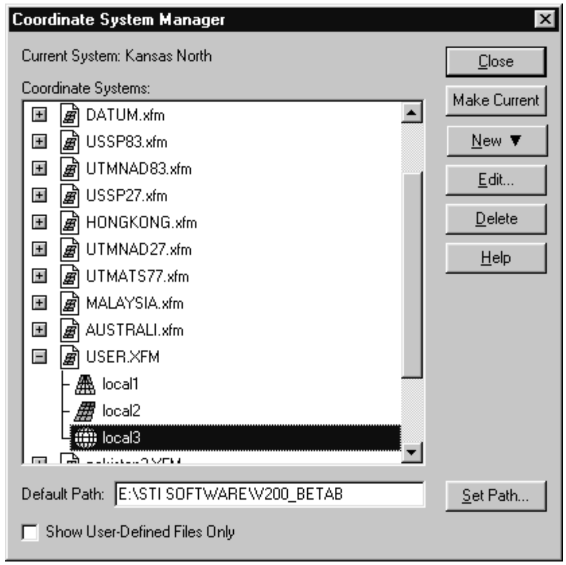
☒ **Note:** When receiving transformation files, they should be stored in the default path for easy access within the ***Coordinate System Manager***.

The **Send** and **Receive** options are accessed from ProLINK's ***File*** menu.

☒ **Note:** To transfer a coordinate system, the ***Coordinate System Manager*** must be closed.

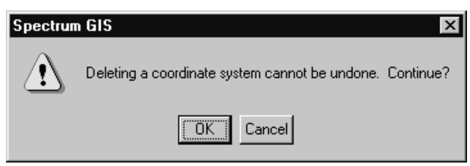
11.6 Deleting a Coordinate System Definition

You can delete coordinate systems from user-defined files in the ***Coordinate System Manager***. You cannot delete transformation files or predefined coordinate systems.



Note: The **<Make Current>** button in ***Coordinate System Manager*** will appear dimmed. This feature is not implemented in this version.

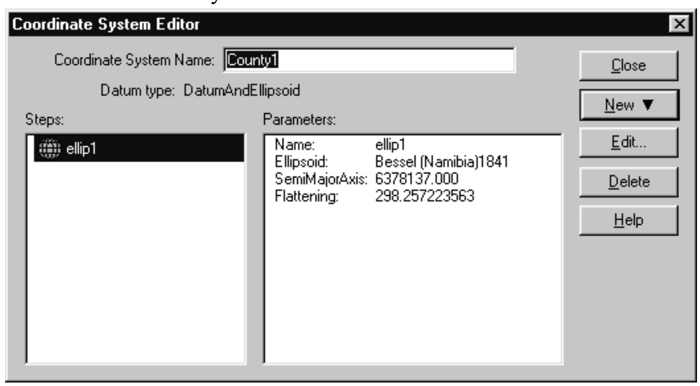
To remove a user-defined coordinate system, highlight the appropriate system and press **<Delete>**. A verification message will display.



11.7 Editing a Coordinate System

The ***Coordinate System Editor*** is a comprehensive tool designed to assist you in developing new and existing coordinate systems. The Editor is accessed by highlighting an existing node in the ***Coordinate System Manager*** and pressing **<Edit>** or automatically by creating a new coordinate system.

ProLINK defines a coordinate system as a transformation sequence. The individual transformations in the sequence, called nodes, may be customized to provide the specific transformations necessary to describe a coordinate system.



The ***Coordinate System Editor*** dialog provides a format to facilitate quick and easy data entry. Each node is represented in the ***Steps*** field on the left with the corresponding settings for the highlighted node in the ***Parameters*** field on the right.

Note: The displayed units and the values entered are based on the unit parameters selected in the ***Unit Settings*** dialog accessed from the ***Options*** menu.

Buttons

The buttons in the ***Coordinate System Editor*** access the following:

<Close> .... This button accepts the modification(s) and closes the dialog; returns to the ***Coordinate System Manager's*** main screen.

<Add> .... This button inserts a node of the selected category and type.

<Edit>............................ This button displays a dialog in which to edit the parameters of the node.

<Delete> .... This button deletes the selected node.

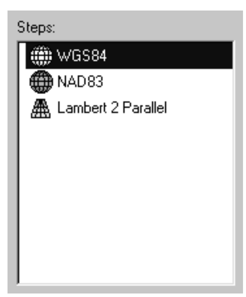
<Help> .... This button accesses online Help.

11.7.1 Renaming a coordinate system

You can rename a coordinate system in the ***Coordinate System Editor***. Enter a new name in the ***Coordinate System Name*** field at the top of the dialog. The name can contain up to 36 characters.

11.7.2 Adding transformation nodes

Defining a coordinate system is performed by adding specific nodes. Each node contains specific parameters for a type of transformation. All coordinate systems start with WGS84. The nodes for the transformation display in order in the ***Steps*** field of the ***Coordinate System Editor***.



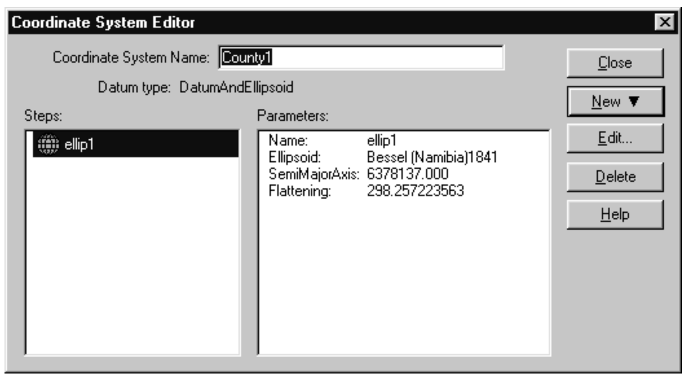
You can use up to two transformation nodes to define the current coordinate system. You can choose from several types of nodes in two categories of transformations:

Ellipsoid to Ellipsoid Category	Projection Category
Ellipsoid	UTM
Ellipsoid: Shift	Stereo Graphic Double
Ellipsoid: Shift-Rotate	Lambert 2 Parallel
Ellipsoid: Shift-Rotate-Scale	Oblique Mercator
Ellipsoid: User-Defined	Transverse Mercator
Ellipsoid: Calculated Parameters	

Note: The two-node limit is a rule. You will not be able to add a node to a coordinate system which already has two nodes. You must either delete one node first or reconsider the setup. The last node added becomes the first node available for deletion.

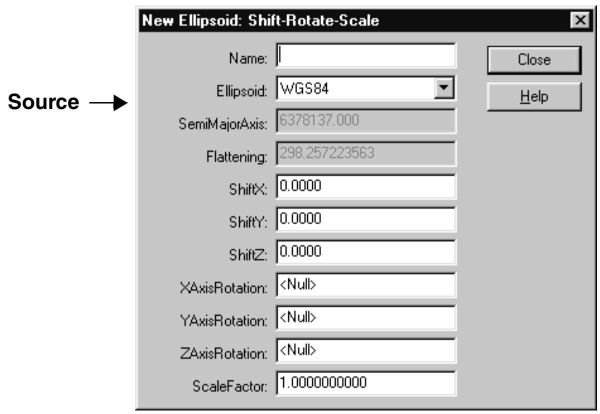
Steps to add a node

1. To add a node, press **<Add>** in the ***Coordinate System Editor***. Then from the pull-down menus select the appropriate category and type of node to meet your requirement.



Note: Only the types of nodes that make sense will be enabled on this menu. For example, after adding a node from the projection category, you cannot add a node from the ellipsoid category because the latter node would require ellipsoid not planar coordinates. Therefore, the Ellipsoid pull-down menu is not available for selection.

2. Fill in the parameters in the corresponding new node dialog. Some node types (such as in the Ellipsoid category) allow you to select a source from which to start this portion of the transformation.

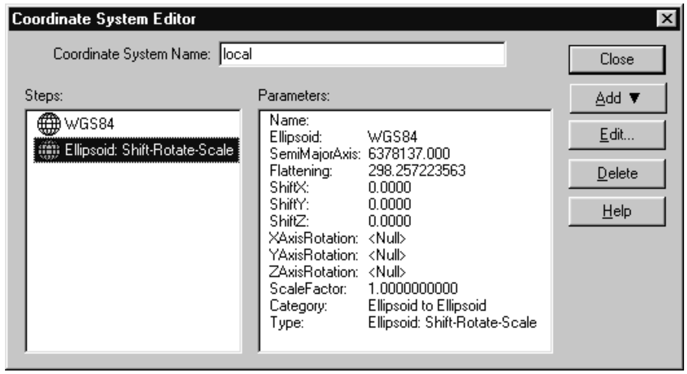


Two node types — Ellipsoid: Calculated Parameters and Plane: Calculated Parameters — enable you to enter the coordinates of points within your survey to calculate the transformation.

Note: If the ***Name*** field is left blank, the default name is the category and type as seen in the dialog in the following step.

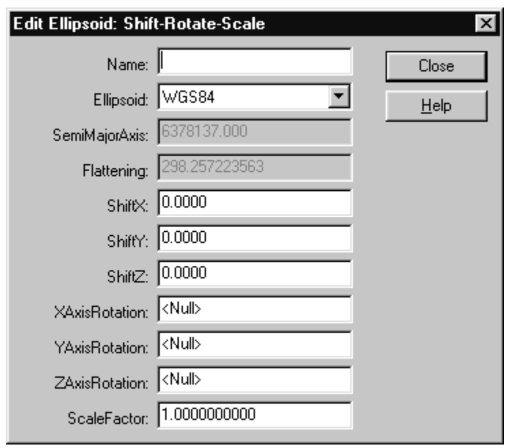
3. Press **<OK>** when finished entering the parameters.

4. The node will display in the ***Steps*** field as the next component of the transformation sequence. The new node will be placed in order.



11.7.3 Editing a transformation node

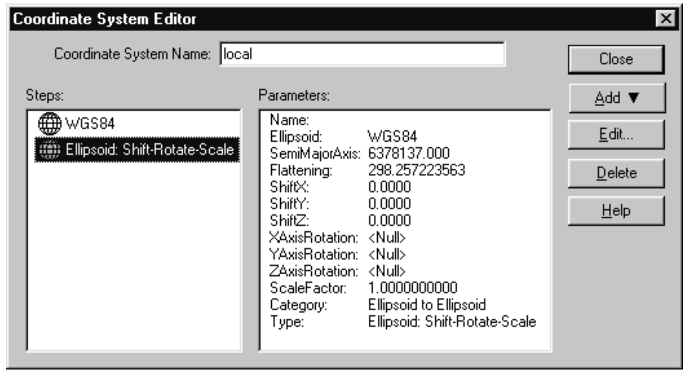
You can edit the parameters of a transformation node in the ***Coordinate System Editor*** by double clicking the node you wish to edit in the ***Steps*** field. You can also highlight the node and press **<Edit>**. A dialog displays in which you can modify the name and/or any parameters associated with the node.



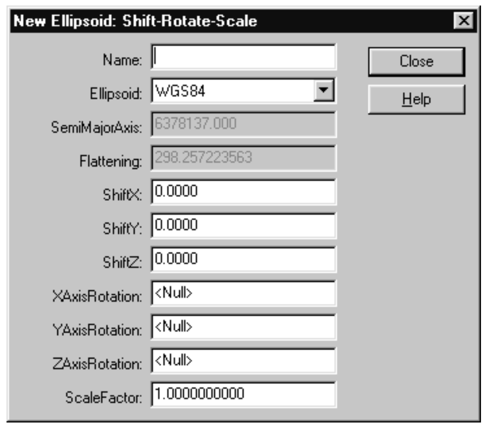
☒ **Note:** You cannot edit the initial WGS84 node listed at the top of the ***Steps*** field.

Steps to edit a node

1. To edit a node, highlight it and press **<Edit>** in the ***Coordinate System Editor***.

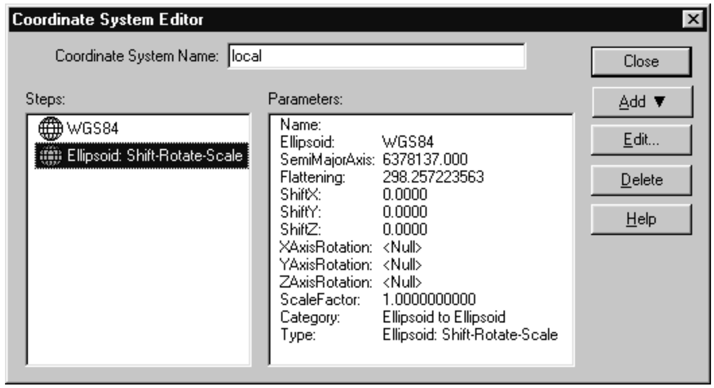


2. Fill in the parameters in the corresponding edit node dialog.



3. Press **<OK>** when finished.

4. The node will display in the ***Steps*** field and the corresponding settings (now modified) will display in the ***Parameters*** field.



11.7.4 Deleting a transformation node

An individual node can be deleted from the transformation sequence. Since deleting a node from the middle of a sequence could render sequences inoperable, you can delete only the last node in the sequence. For example; if a sequence contains an ellipsoid node, a projection node and a plane node; deleting the projection would leave a plane node following an ellipsoid node. Since the ellipsoid node provides ellipsoidal coordinates, and the plane node needs planar coordinates, deleting the projection node would render the transformation invalid.

Steps to delete a node

1. Highlight the last node in the sequence.

Note: Only the last node in the sequence can be deleted.

2. Press **<Delete>**.

3. A warning message displays requiring verification of the deleted node.

Appendix A System Messages

ProLINK displays messages to confirm commands or to indicate problems that can occur with entered data or unrecognized formats. The following sections help define the messages that may display.

A.1 ProLINK Messages

ProLINK Message	Meaning
Security error	This message is reported when ProLINK cannot detect a properly licensed Sokkia hardware security device for the product or version. Check the connections with the security device. If message continues, contact your Sokkia representative.
The security device was not found. The security device may be attached to a busy parallel port. The software will continue to search the port. If a security device is detected, this message will automatically disappear. If you want to cancel the search for the security device and run this program with limited functionality, press <Cancel>.	This message will display when starting ProLINK and the parallel port with a security device is busy (perhaps with a print job). When the parallel port is busy, ProLINK cannot detect a properly licensed Sokkia hardware security device for the product or version. If you press **<Cancel>**, ProLINK COMMS (limited ProLINK functionality) will open. ProLINK COMMS does not require a security device.
The parallel port where the security device is attached is busy. The software will continue to search the port. If a security device is detected, this message will automatically disappear. If you want to cancel the search for the security device, press <Cancel>. Note that this will close the program.	This message will display when ProLINK is running and the parallel port with a security device becomes busy (perhaps with a print job). When the parallel port is busy, ProLINK cannot detect a properly licensed Sokkia hardware security device for the product or version. You can wait for the port to become available, or press **<Cancel>** (ProLINK will close) and try running the program at a later time.

A.2 Project Messages

Project Message	Meaning
XXX is an illegal project name. Project names should only have extensions of *.SPP	The project name you entered has an incorrect extension. Enter a name with a *.SPP extension.
XXX is an Invalid pathname	The path you have identified is not a valid path. Enter an existing path.
Open project failed **Could not open project** **Could not open the project directory, corresponding to the project file**	The project file you are trying to open has been corrupted, or the project file is not a ProLINK project file.
Update project failed **Could not update the project**	A manual update or an automatic update could not be performed.
Backup file and the backup directory should be in sync to maintain stability. Closing the project!	The project's backup files have become unstable, forcing the project to become unstable.
Could not overwrite file	The user-specified file could not be overwritten while renaming, moving, or making a snapshot copy of a project.
Could not delete project **Could not delete the project directory corresponding to the project file**	The project and it's corresponding directory could not be deleted.
Could not rename/move project **Could not rename/move the project directory, which corresponds to the project file, to the destination directory**	A file system error occurred while trying to rename or move the project to the user-specified file.
Could not open project after rename/move	The destination project could not be opened after the rename/move.
Could not create project **Could not create the project directory which corresponds to the project file**	The user-specified file could not be created while making a new project or a snapshot copy.
Are you sure you want to abandon all changes made since the project was opened?	This confirmation message displays when invoking ***Project*/Abandon Changes**.

Project Message	Meaning
There is no backup file to restore. Do you want to keep the current file?	This confirmation message will occur if there is no backup file for the current project when invoking **Project/Abandon Changes**.
This file already exists. Replace existing file?	This error message can occur anytime a file is to be created by ProLINK.
Wrong file name or wrong datum/zone entered. Please try again.	This message will display when inserting a transformation file into the current Field Book if you have entered the transformation file name incorrectly, the transformation file does not exist on a local drive, or resides outside the ProLINK folder. When inserting transformation files, be sure to check the file name, the location of the file and verify the transformation file is stored in the xfm subfolder in inside the ProLINK folder.
Only one XFM record allowed per Field Book	This message will display if you attempt to import two *.XFM files into the same Field Book.
Do you wish to save the records associated with this LLHSTN record	This message is a prompt to save data in the LLHSTN record type.
There is no open project	This prompt appears when an action is executed with no open project.

A.3 Field Book Messages

Field Book Message	Meaning
A file must be selected in the Field Book Editor	You must select a file in the Field Book Editor before attempting to remove it.
Do you wish to save the records associated with this STN record.	This message indicates that ProLINK is deleting a STN record. This record has associated records that can either be saved or deleted at this point.

Field Book Message	Meaning
This record type can only be inserted after an existing STN record. **This record type can only be inserted after an existing RSTN record.** **This record type can only be inserted after an existing ROAD NAME record.** **This record type can only be inserted after an existing TEMP record.** **This record type can only be inserted after an existing LEVEL STATION record.** **This record type can only be inserted after an existing LEVEL OBSERVATION record.** **This record type can only be inserted after an existing GSTN record.** **This record type must immediately follow an existing STN record.**	An attempt was made to insert a record contrary to the SDR search rules.
Search string not found	ProLINK has not found any occurrence of the search item in the current file.
No more occurrence of Search item	ProLINK has moved beyond the last occurrence of the Search item in the file.
Record not inserted, insert now?	This message displays when you select a new record type in the ***Insert Record*** dialog after a different record type has already been selected and data has been entered for that record.
Cannot insert into the Field Book or Job Headers	This message displays when you are attempting to insert records into the read only lines at the top of the Field Book.
Verify that the GPS Projection Origin coordinates match the initial GSTN coordinates.	This message displays when a GSTN or PROJ record has been modified.

A.4 Field Book Settings Messages

Field Book Settings Message	Meaning
Destination field book not found	You have selected a field book no longer available in the ***Destination Coordinates From*** field in the ***Select Transformation Points*** dialog. Choose a field book that is available.
Destination field book already loaded. Do you want to discard all changes?	This message appears if modifications are made that associate the current field book with a previously selected field book.

A.5 Reduction Processing Messages

Reduction Processing Message	Meaning
BKB Azimuth with source point ____ is set to <Null>. It will be set to 0.0 **BKB HObs with source point ____ is set to <Null>. It will be set to 0.0**	A <Null> field type is permitted in the field book but has no meaning for calculations. A <Null> value for these two field types will be converted so that calculations can be performed.
No Raw Data to read	This message displays when there are no records in the Raw Data List database table for a given field book (generally when the field book is empty or has no reducible records).
Unable to allocate memory for BKB Table **Unable to allocate memory for Leveling Table** **Unable to allocate memory for Point Table** **Unable to allocate memory for Target Table**	This message displays when the system is out of RAM memory. The reduction cannot proceed because memory cannot be reserved for temporary data buffers.
Unable to locate point ____ **Unable to locate source point ____ for target point ____** **Unable to locate source point ____ for calculated station**	This message displays when a dependent record has a Point ID, Target Point ID or Source Point ID value with no match elsewhere in the list.

A.6 Import / Export Messages

Import/Export Message	Meaning
Unable to locate tdf file	This message displays when a conversion manager import or export cannot find the selected conversion file.
File name ___ is not a valid tdf file	This message displays if a file with an extension of *.TDF is checked during the "get filter" process and is not a conversion manager file or is an incomplete conversion file.
Unable to locate tdf description **Unable to locate Record description** **Unable to locate Separator section** **Unable to locate Separator subsection** **Unable to locate Field description** **Unable to locate Import/Export description** **Unable to locate pass subsection** **No record list found** **Unable to locate Field subsection** **Unable to locate Separator group section**	The *.TDF file is corrupted or incomplete. The import/export process cannot continue.
No Import/Export Passes Found	The selected conversion definition file has no import or export passes defined.
Point ID ____ contains alpha characters export is canceled. Export Process Terminated.	The point ID contains alpha characters and is being exported to an sdr20 format file.
Point ID ____ is too large export is canceled. Export Process Terminated.	The point ID is longer than 4 characters and is being exported to an sdr20 format file.
Cannot open export file	This message displays when the exporter cannot open the destination file.
Error missing required field data	This message displays when the field in the ProLINK data base has no data and the conversion manager is set up to display an error for data missing on export.

Import/Export Message	Meaning
Export destination field ____ is smaller than source field. Export will lose precision. **— OR —** **Export destination field ____ is smaller than source field. Truncation will occur.**	Either of these messages can occur during a conversion manager export if the source field is larger than the destination field.
XFM file cannot change from previously specified file	The error is generated if the *.XFM file specified in a second or later import is different from that specified by the first import.
Specified datum cannot change from previously specified datum	This error occurs if the datum/coordinate system is different from the previous datum/coordinate system even if the *.XFM file specified has not changed.
This is not an XFM project	This message indicates the *.XFM is being imported into a non-XFM project.
Due to unforeseen error conditions this import has been backed out	This error message is generated when a fatal condition has been encountered and explained in a previous error dialog. This message informs you any data imported is being "backed out" to prevent corrupting the ProLINK Field Book.
Invalid XFM file specified on import	This error occurs if the transformation *.XFM file specified in the XFORM record is not valid or cannot be read.
This is not an XFORM file	This message displays when the file specified in the XFORM record is not an *.XFM file.

A.7 Conversion Manager Definition Messages

The following messages are grouped by dialog.

Conversion Manager Definition Message	Meaning
Unable to rename file. Please enter a different name.	This message displays if you click OK and the file name has been changed.
Error Closing File	If this message displays, a disk IO error occurred while closing file.
Get Section Name failed	An internal file error occurred while closing the window.

Conversion Manager Definition Message	Meaning
Record ident field is a duplicate	Upon closing the dialog, the record identifier is found to be a duplicate.
Deletion not allowed. Field is used in the following records...	The field cannot be deleted because it is used in the series of records listed.
Not an addable Item. This is descriptive data only.	This message displays if you attempt to add a member of a separator group to record layout.
Invalid move requested	This message displays if you attempt to move a separator group member item.
Delete not allowed for this entry	This message displays if you attempt to delete a separator group member item.
Rename allowed only for fields	This message displays if you attempt to rename a non-field within the record layout.
Total length of fields exceeds record	The length of all the fields in a record exceed the size indicated for the record as a whole. This only occurs for fixed length records with fixed length fields.
Tag is required	A tag (identifier) must be entered for a field that requires one.
Terminator Selection is required	A terminator must be selected for a field that requires one.
Import Replace value is required	A replacement value must be defined for a field. This value is used if data is missing during import or export.
Separator value must be one character or a 3 position ASCII value	Invalid data has been entered for a separator value.
Import link section build failed	An internal file error has occurred.
Duplicate Record Add	A record exists within a pass.
Unable to find record hdr section	This is an internal file error that the user shouldn't see.
The following record/records are Missing Identifiers	You have attempted to add a record or records without identifiers.
Export link section build failed	This is an internal file error that shouldn't be seen by the user.
Duplicate Record Add	As with Define Import, a record exists within a pass.
Type Mismatch	The fields in an equation are not of the same type.

Conversion Manager Definition Message	Meaning
Mismatched Brackets	The count of left brackets in an equation does not equal the count of right brackets.
Mismatched Parenthesis	The count of left parentheses in an equation does not equal the count of right parentheses.
Unknown Symbol	This message displays if the system encounters an unknown math symbol in an equation.
Syntax Error	This message displays if the system encounters invalid equation syntax.
Unknown field	This message displays if the equation references an unknown field name.

Appendix B PROLINK.INI

The PROLINK.INI file is used to store conditions and parameters of ProLINK. Many of the settings are accessible via menu options within ProLINK, such as which units display in distance measurements.

Those settings that are not accessible via user interfaces must be manually changed in the PROLINK.INI file. To modify this file, use any text editor, such as Microsoft Windows Notepad®. The file is located in the installation directory.

The following lines represent those settings that can be changed manually through editing of this INI file.

☒ **Note:** This is not a complete representation of the PROLINK.INI file. Settings that can be modified via user interface are not included.

INI Line	Description
[ReducedPoints] **ColumnSize=120,90,90,90,90,-1**	determines column width within the Reduced Coordinate View
[View] **ReducedPoints=517,314,946,629** **FieldBook=0,0,507,319**	determines the position of each view within the main screen
Visible=FieldBook,ReducedPoints,	determines which views are opened when the project is started
[FieldBook] FieldBookEdit= 92,100,26,320,284,189,104,	determines the column width for all field books
[AtlasApp] **ViewControlBar=yes**	determines if the tool bar displays (=yes) or not (=no)

INI Line	Description
ViewStatusBar=yes	determines if the status bar displays (=yes) or not (=no)
AutoUpdateDelta=30	determines the period of time, in seconds, of inactivity necessary to initiate an automatic save
[MainWindow] Position= L=159,T=145,W=961,H=733	determines the display position of the main window
[UnitSettings] **NorthFirst=Y**	determines the coordinate order. Y=North,East N=East,North
[UnitSettings::Real] **[UnitSettings::Flattening]** **[UnitSettings::ScaleFactor]** **[UnitSettings::Integer]** **HasSeparators=Y**	controls the use of a separator between groups of digits in a value
DigitGroupSize=3	determines the number of digits that comprise a group to be separated in a value
[UnitSettings::Distance] **[UnitSettings::HDistance]** **[UnitSettings::VDistance]** **[UnitSettings::SDistance]** **[UnitSettings::North]** **[UnitSettings::East]** **[UnitSettings::Elevation]** **[UnitSettings::TargHt]** **[UnitSettings::InstrHt]** **[UnitSettings::SemiMajorAxis]** **[UnitSettings::Chainage]** **HasSeparators=Y**	controls the use of a separator between groups of digits in a value
DigitGroupSize=3	determines the number of digits that comprise a group to be separated in a value

INI Line	Description
Unit=0	determines the unit in which distances will display 0 = Meters 1 = Feet 2 = Yard 3 = Inch 4 = Mile 5 = US Feet 6 = US Yard 7 = US Inch 8 = US Mile 9 = Centimeter 10 = Millimeter 11 = Kilometer 12 = Nautical Mile Note: Distances can be identified as Feet, US Feet or Meters within the *Unit Settings* dialog.
ShowSuffix=N	controls the display of the unit suffix with distance values
Suffix = m | ' | yrd | " | mi | ft | usy | in | umi | cm | mm | km | nm	controls the abbreviation of the unit suffix
[UnitSettings::Angle] **[UnitSettings::HAngle]** **[UnitSettings::VAngle]** **[UnitSettings::ElevationMask]** **PositiveChar=+**	indicates symbol used to indicate positive values
NegativeChar=-	indicates symbol used to indicate negative values
Unit=8	determines the unit in which distances will display 0 = Meters 1 = Feet 2 = Yard 3 = Inch 4 = Mile 5 = US Feet 6 = US Yard 7 = US Inch 8 = US Mile 9 = Centimeter 10 = Millimeter 11 = Kilometer 12 = Nautical Mile Note: Distances can be identified as Feet, US Feet or Meters within the *Unit Settings* dialog.
Precision=4	determines the precision of the values

INI Line	Description
[UnitSettings::Azimuth] **PositiveChar=+**	indicates symbol used to indicate positive values
NegativeChar=-	indicates symbol used to indicate negative values
Unit=8	determines the unit in which distances will display 0 = Meters 1 = Feet 2 = Yard 3 = Inch 4 = Mile 5 = US Feet 6 = US Yard 7 = US Inch 8 = US Mile 9 = Centimeter 10 = Millimeter 11 = Kilometer 12 = Nautical Mile Note: Distances can be identified as Feet, US Feet or Meters within the *Unit Settings* dialog.
Precision=4	determines the precision of the values
Style=0	determines the method of measuring azimuth 0=Azimuth (North zero) 1=Azimuth (South zero) 2=Quad bearing
[UnitSettings::Latitude] **[UnitSettings::Longitude]** **PositiveChar=N**	indicates symbol used to indicate positive values
NegativeChar=S	indicates symbol used to indicate negative values
Unit=8	determines the unit in which distances will display 0 = Meters 1 = Feet 2 = Yard 3 = Inch 4 = Mile 5 = US Feet 6 = US Yard 7 = US Inch 8 = US Mile 9 = Centimeter 10 = Millimeter 11 = Kilometer 12 = Nautical Mile Note: Distances can be identified as Feet, US Feet or Meters within the *Unit Settings* dialog.

INI Line	Description
Precision=4	determines the precision of the values
[UnitSettings::Integer] **HasSeparators=N**	controls the use of a separator between groups of digits in a value
DigitGroupSize=3	determines the number of digits that comprise a group to be separated in a value
[UnitSettings::Time] **Precision=0**	determines the precision of the values
[UnitSettings::Pressure] **HasSeparators=N**	controls the use of a separator between groups of digits in a value
DigitGroupSize=3	determines the number of digits that comprise a group to be separated in a value
Unit=0	determines the unit in which distances will display 0 = Meters 1 = Feet 2 = Yard 3 = Inch 4 = Mile 5 = US Feet 6 = US Yard 7 = US Inch 8 = US Mile 9 = Centimeter 10 = Millimeter 11 = Kilometer 12 = Nautical Mile Note: Distances can be identified as Feet, US Feet or Meters within the *Unit Settings* dialog.
ShowSuffix=N	controls the display of the unit suffix with distance values
Suffix=mmHg|InHg|Mbar|hPa	controls the abbreviation of the unit sufix
[UnitSettings::Temperature] **HasSeparators=N**	controls the use of a separator between groups of digits in a value
DigitGroupSize=3	determines the number of digits that comprise a group to be separated in a value

INI Line	Description
Unit=1	determines the unit in which distances will display 0 = Meters 1 = Feet 2 = Yard 3 = Inch 4 = Mile 5 = US Feet 6 = US Yard 7 = US Inch 8 = US Mile 9 = Centimeter 10 = Millimeter 11 = Kilometer 12 = Nautical Mile Note: Distances can be identified as Feet, US Feet or Meters within the *Unit Settings* dialog.
ShowSuf=N	controls the display of the unit suffix with distance values
Suffix=°F|°C	controls the abbreviation of the unit suffix
[UnitSettings::Humidity] **HasSeparators=N**	controls the use of a separator between groups of digits in a value
DigitGroupSize=3	determines the number of digits that comprise a group to be separated in a value
Suffix=%	controls the abbreviation of the unit suffix
[UnitSettings::Area] **HasSeparators=N**	controls the use of a separator between groups of digits in a value
DigitGroupSize=3	determines the number of digits that comprise a group to be separated in a value
Unit=0	determines the unit in which distances will display 0 = Meters 1 = Feet 2 = Yard 3 = Inch 4 = Mile 5 = US Feet 6 = US Yard 7 = US Inch 8 = US Mile 9 = Centimeter 10 = Millimeter 11 = Kilometer 12 = Nautical Mile Note: Distances can be identified as Feet, US Feet or Meters within the *Unit Settings* dialog.
ShowSuffix=N	controls the display of the unit with distance values
Suffix=m2|ha|acres	controls the abbreviation of the unit suffix

INI Line	Description
[UnitSettings::Volume] **HasSeparators=N**	controls the use of a separator between groups of digits in a value
DigitGroupSize=3	determines the number of digits that comprise a group to be separated in a value
Unit=0	determines the unit in which distances will display 0 = Meters 1 = Feet 2 = Yard 3 = Inch 4 = Mile 5 = US Feet 6 = US Yard 7 = US Inch 8 = US Mile 9 = Centimeter 10 = Millimeter 11 = Kilometer 12 = Nautical Mile **Note:** Distances can be identified as Feet, US Feet or Meters within the ***Unit Settings*** dialog.
ShowSuffix=N	controls the display of the unit with distance values
Suffix=m3|l|yd3|ft3	controls the abbreviation of the unit suffix
[UnitSettings::Grade] Unit=0	determines the unit in which distances will display 0 = Meters 1 = Feet 2 = Yard 3 = Inch 4 = Mile 5 = US Feet 6 = US Yard 7 = US Inch 8 = US Mile 9 = Centimeter 10 = Millimeter 11 = Kilometer 12 = Nautical Mile **Note:** Distances can be identified as Feet, US Feet or Meters within the ***Unit Settings*** dialog.
[Preferences] CalcStation=no	determines if ProLINK will use previous data about the station point and the back bearing point to calculate new coordinates for all station setups
WarnDup=yes	determines if you are warned of duplicate point conflicts when exporting data

INI Line	Description
FBReduction=Automatic	determines processing mode
[MRU] MRU0=c:\program files\sokkia\prolink\data\kansas city.spp MRU1=c:\program files\sokkia\prolink\data\xxx.spp MRU2=c:\program files\sokkia\prolink\data\aaa.spp	retains the ten most recently opened projects that display in the **Reopen** list on the ***File*** menu

Appendix C ProLINK Calculations

This section presents the formulas and constants used by ProLINK for calculations. In addition to this information, it is also important to understand the principles described in Section 6.1.3.1, *Using coordinate search logic*, page 6-6, because these principles can affect the outcome of coordinate calculations.

C.1 Types of Data

ProLINK can manage two types of collected data: total station and GPS/RTK. The data is corrected in a variety of ways, depending on the original type of data and the calculations needed to reduce the data to coordinates.

C.1.1 Total Station data

The total station data can be represented in several ways which also correspond to stages of the reduction process.

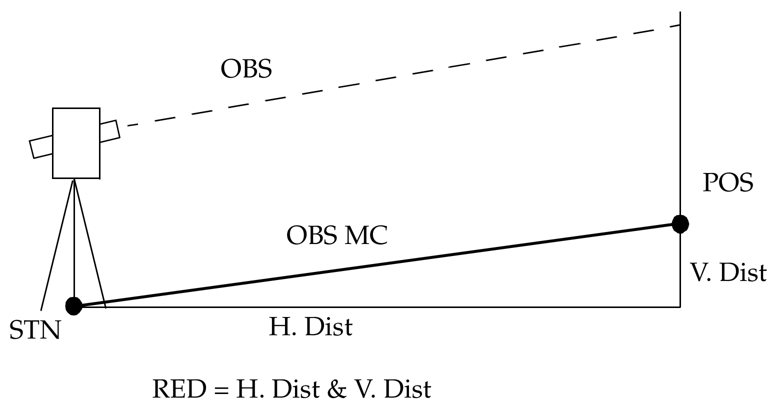


Figure 13: Config showing the OBS and OBS MC measurements

OBS .... The observation includes the horizontal angle, vertical angle and slope distance from the instrument to the target prism.

MC.................. The ground vector includes the azimuth, vertical angle and slope distance from the instrument ground point to the target ground point.

RED................ The horizontal and vertical components from the instrument ground point to the target ground point.

POS .... The coordinates of the target ground point.

ProLINK performs several corrections when it reduces raw data to coordinate data. These reduction calculations can be grouped into three general categories:

- **instrument, environmental and job-related corrections** -Instrument corrections include equipment configuration, Face1/Face2 observations, collimation and prism constant. Environmental corrections include pressure and temperature corrections. Job-related corrections include orientation, instrument height reduction, and target height reduction.
- **geometric reductions** - Geometric corrections include such things as curvature and refraction, slope reduction, sea level, and projection.
- **coordinate calculations** - Coordinate calculations involve adding an observation vector to the coordinates of its respective station coordinates to determine the target point coordinates.

C.1.1.1 Total Station Corrections sequence

ProLINK always applies corrections in a specific sequence as it converts a raw observation to coordinates. The instrument, environmental, and job-related corrections are applied first, followed by the geometric corrections. This sequence is shown in Figure 14.

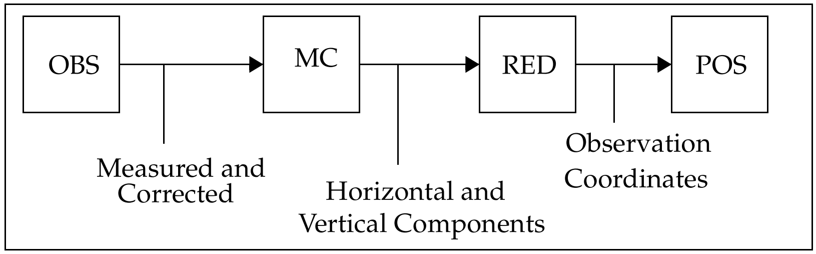


Figure 14: Corrections sequence

Note: The OBS-MC record view has been renamed to MC (measured and corrected) in the ProLINK corrections sequence.

→ **OBS** .... ProLINK assumes the prism constant and atmospheric parts per million (PPM) corrections have been applied to the slope distance before it is displayed in the field book. This slope distance can be from the instrument or it could be manually input from the keyboard. Adjustments to the slope distance of OBS records for prism constant and PPM can be applied by using ***Field Book Settings***.

OBS → **MC** ... ProLINK applies six different corrections when it converts an **OBS** record to a measured and corrected (**MC**) record. The order is face one/face two, instrument and target height, collimation, orientation, Earth curvature, and refraction. With manually entered OBS MC values, ProLINK will assume these corrections have been applied.

MC → **RED** ... ProLINK corrects for sea level, projection and scale when converting an MC record to an reduced (**RED**) record.

RED → POS.. The final step in arriving at coordinates (**POS** record) is a mathematical coordinate calculation.

C.1.1.2 Total Station data with a transformation selected

When you access a total station observation with a transformation for the current job, the record types begin with the OBS record. Like an observation with no transformation, this OBS record contains the prism constant (if applied), and applied atmospheric corrections.

OBS .... ProLINK assumes the prism constant and atmospheric parts per million (PPM) corrections have been applied to the slope distance before it is displayed in the field book. This slope distance can be from the instrument or could be manually entered from the keyboard. Adjustments can be applied by using ***Field Book Settings***.

WGS84 LLH.. This record shows the coordinates for the station converted to WGS84 ellipsoidal coordinates. latitude, longitude, and height.

DATUM......... This record displays the station local datum latitude, longitude, and height.

GPOS .... (GPS position) record. This record is the position of the point before any calibration or has occurred

POS .... (position) The **POS** record shows the observation coordinates relative to the station from which it was observed.

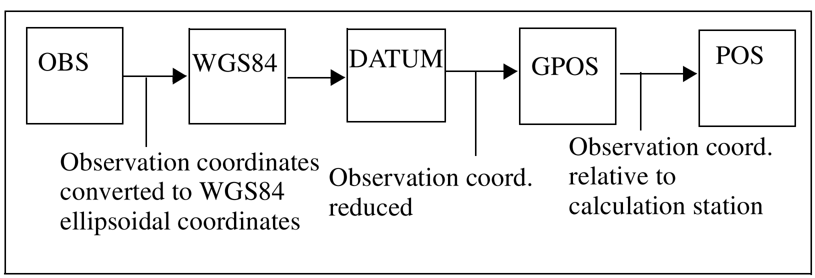


Figure 15: Corrections Sequence with Transformation

C.1.2 GPS/RTK data

The GPS/RTK data can be represented in several ways which also correspond to stages of the reduction process.

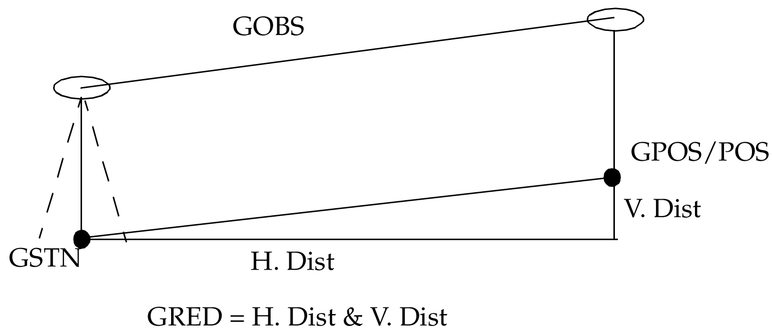


Figure 16: Config showing the GOBS and GPOS/POS measurements

GOBS............. The observation includes the azimuth, vertical angle and slope distance from the base antenna to the rover antenna.

GRED............. The observation includes the horizontal and vertical components from the base ground point to the rover ground point.

GPOS............. The observation includes the uncalibrated coordinate of the rover ground point.

POS................ The observation includes the transformed coordinate of the rover ground point based on the most recent calibration records.

ProLINK applies corrections when it reduces raw GPS/RTK vector data to coordinate data. This includes antenna height corrections, curvature correction and transformation.

C.1.2.1 GPS/RTK data with transformation selected

When you access a GPS observation record with a transformation, the record types begin with the GOBS record. Like observations with no transformation selected, the GOBS record contains the observation from the base receiver antenna to the rover receiver antenna.

GOBS............. (GPS observation) The **GOBS** record shows the observation from the base receiver antenna to the rover receiver antenna.

WGS84 LLH.. This record shows the original GOBS coordinates converted to WGS84 ellipsoidal coordinates. latitude, longitude, and height.

DATUM......... This record displays the GOBS as local datum latitude, longitude, and height.

GPOS............. (GPS position) The **GPOS** record shows you the observation reduced to coordinates relative to the GStn from which it was calculated. This observation includes the uncalibrated coordinate of the rover ground point.

POS .... (position) The **POS** record shows the observation relative to the station from which it was calculated. If the record is a GPS observation, the transformation determined from the most recent calibration will be applied, if available.

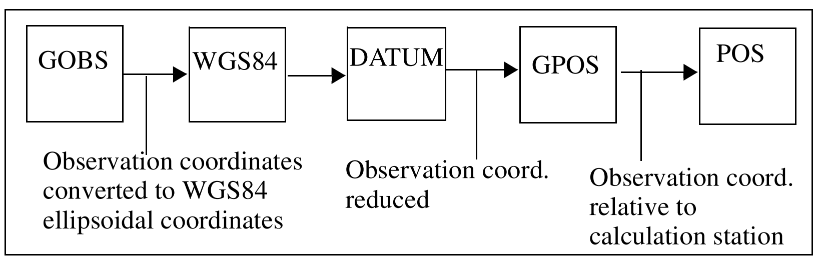


Figure 17: GPS/RTK Corrections Sequence with Transformation

> **Note:** If SDR files with transformations exist, reduction is computed from the GOBS and GPOS record views. Export options for files of this type are limited to its defined position at the end of the transformation sequence.

C.1.2.2 GPS/RTK Corrections sequence

GPS

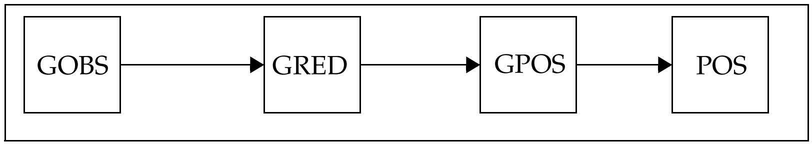


Figure 18: Corrections sequence

For GPS/RTK data, GOBS has the least importance and POS has the most importance.

GOBS $\rightarrow$ GRED The observation includes corrections for the base receiver antenna height and the rover antenna.

GRED $\rightarrow$ GPOS The observation includes a mathematical coordinate calculation.

GPOS $\rightarrow$ POS The observation includes a transformation based on the last calibration and a curvature correction is applied.

C.2 Instruments, Environmental and Job-related Corrections

This category of corrections includes the following:

- prism constant corrections
- pressure and temperature corrections
- face one/face two observations
- instrument and target height reductions
- collimation corrections
- orientation corrections

The equipment configuration for the following discussion of corrections is shown in Figure 19. This illustrations depicts an instrument configuration where the EDM is distinct from the theodolite, and the prism is distinct from the theodolite target.

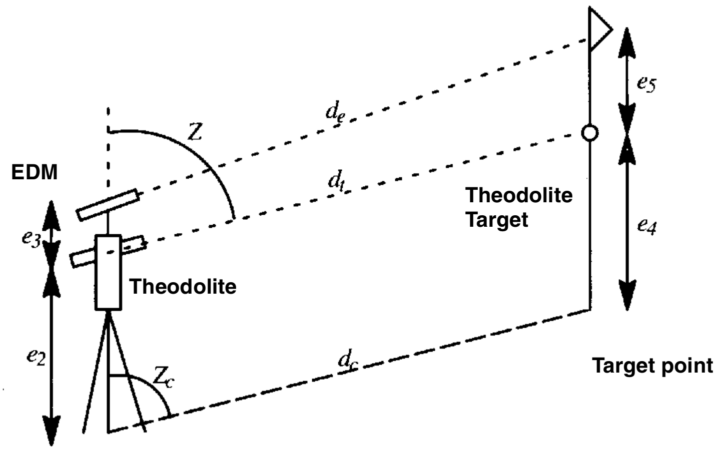


Figure 19: Config where EDM and prisim are distinct.

e_1	=	prism constant	d_e	=	EDM slope distance
e_2	=	theodolite height	d_t	=	theodolite slope distance
e_3	=	EDM offset	d_c	=	slope distance, source to target point
e_4	=	theodolite target	Z	=	theodolite vertical angle
e_5	=	EDM reflector offset	Z_c	=	corrected vertical angle

Using a total station with a simple prism on a pole, the EDM and theodolite are coincident; the prism and theodolite target are also coincident. In other words,

$$e_3 = 0$$
$$e_5 = 0$$
$$d_e = d_t$$

The same concept is used for GPS/RTK measurement with the exception of determining e_2 and e_4.

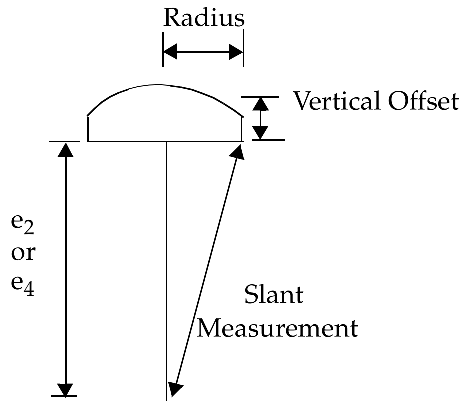


Figure 20: A diagram showing the GPS/RTK measurements.

The vertical offset between the phase center of the antenna and the measured height is used to determine e_2 and e_4 based on the entries in the GPS instrument record. If a slant measurement is used, the radius is used to determine the vertical distance.

C.2.1 Prism constant correction (total station only)

When this option in ***Field Book Settings*** is selected, this correction is applied to all slope distances:

$$S_2 = S_1 + e_1$$

S_1	=	measured slope distance
e_1	=	prism constant
S_2	=	resulting slope distance

C.2.2 PPM correction (total station only)

When this option in the ***Field Book Settings*** is selected, this correction is applied to all slope distances.

$$S = s_1 + \left(s_1 + \left(ppm \times \frac{1}{1million}\right)\right)$$

S	=	corrected slope distance
s_1	=	original slope distance

C.2.3 Face 1/Face 2 observations (total station only)

The vertical angle measurement (defined in the instrument record's ***V.obs*** field) is converted to an equivalent zenith angle. The derivation of the raw observation is determined as follows:

- If the vertical observation is in the range 0° to 180°, the derivation is **F1** (face one). If it is in the range 180° to 360°, the derivation is **F2** (face two).
- If the vertical angle observation is not present, the derivation is assumed to be **F1**.
- If the vertical observation falls outside the range 0° to 180°, it is converted to an equivalent angle within the range.
- If the derivation code is **F2,** it is assumed the telescope was reversed, so 180° is added to the horizontal observation for horizontal angle calculations.

C.2.4 Instrument, target and antenna height reduction

Corrections for instrument and target heights are applied to uncorrected measurements of vertical angle and slope distance. In the next equations, these variables represent the following:

e_z	=	theodolite/antenna height
e_4	=	theodolite/antenna target height
d_t	=	theodolite/antenna slope distance

The vertical angle from the source point to the target point (Z_c) is given by the following:

$$Z_c = \tan^{-1}\frac{d_t \sin Z}{d_t \cos Z + e_2 - e_4}$$

The slope distance from source point to target point (d_c) is given by the following:

$$d_c = \frac{d_t \sin Z}{\sin Z_c}$$

C.2.5 Collimation correction (total station only)

The instrument collimation error, determined from the last collimation record ProLINK finds in the field book, is applied in the following manner:

Face one:	$a_2 = a_1 + V_c$	$b_2 = b_1 + H_c$
Face two:	$a_2 = a_1 - V_c$	$b_2 = b_1 - H_c$

a_1	=	measured vertical angle
a_2	=	corrected vertical angle
b_1	=	measured horizontal angle
b_2	=	corrected horizontal angle
H_c	=	horizontal collimation correction
V_c	=	vertical collimation correction

☒ **Note**: In GPS/RTK data, the horizontal observation in a GOBS record is considered the same as the azimuth.

C.2.6 Orientation correction

If you have completed the normal procedure for establishing a back-sight, an orientation correction is applied to the horizontal angle observation:

$$A = H + BKB_{azmth} - BKB_{\ddot{h}obs}$$

A	=	azimuth of the observation
H	=	horizontal angle (circle reading) of the observation
BKB_{azmth}	=	azimuth field of the applicable back bearing record
$BKB_{h.obs}$	=	horizontal angle observation (circle reading) field of the applicable back bearing record

When using GPS/RTK data, the horizontal observation in a GOBS record is assumed to be the azimuth based on the selection with the ***Field Book Settings*** orientation.

C.3 Geometric Reductions

The following geometrical reductions and corrections may be applied to observations by ProLINK.

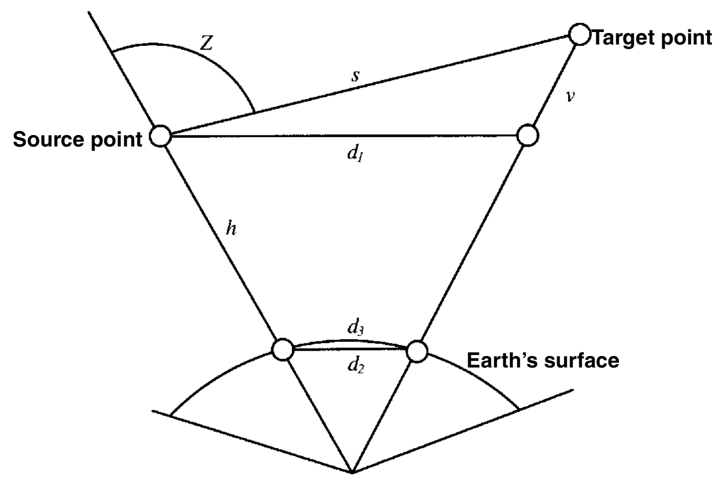


Figure 21: A reference figure for some of the reductions

Z	=	zenith angle
v	=	vertical distance
h	=	elevation of source point
s	=	slope distance
d_1	=	horizontal distance at elevation of source point

d_2 = sea level chord
d_3 = spheroidal arc
d_4 = projected distance (not shown)

C.3.1 Curvature and refraction correction (total station only)

The following correction is applied to vertical angles if the curvature and refraction correction options are active in ***Field Book Settings***.

$$a_3 = a_2 - \frac{(1-k)S_3}{2R} \times \frac{180}{\pi}$$

k = coefficient of terrestrial refraction (either 0.14 or 0.20 as selected when the job was created)
R = approximate spheroid radius of 6,370,000 (meters)
S_3 = slope distance from Section C.2.2, *PPM correction (total station only)*, page C-9
a_2 = vertical angle from Section C.2.5, *Collimation correction (total station only)*, page C-11
a_3 = corrected vertical angle (units=degrees)

C.3.2 Sea level correction (total station only)

If the sea level correction option is active in ***Field Book Settings***, the horizontal distance at the source point's elevation is reduced to the sea level chord (d_2) using the mean height of the vector:

$$d_2 = d_1 - \left[\frac{(h_1 + h_t)d_1}{2R}\right]$$

d_1 = horizontal distance at the elevation of the source point
h_1 = elevation of the source point
h_t = elevation of the target point
R = radius of the spheroid

Reduction of the sea level chord (d_2) to the spheroidal arc (d_3) involves a correction of the following:

$$\frac{d_2^3}{24R^2}$$

R = radius of the spheroid

This correction exceeds 1mm only on distances greater than 9.9km. Consequently, the correction term is ignored and the spheroidal arc is taken to be the sea level chord:

$$d_3 = d_2$$

C.3.3 Projection correction (total station only)

The correction of the spheroidal arc (d_3) to a projected distance (d_4) depends on the projection used. Because the locally used projection is not known by ProLINK, a simple scale factor is used. The value of the scale factor is entered and activated in the ***Field Book Settings***.

The projection correction is as follows:

$$d_4 = d_3 + sf$$

sf = scale factor in the ***Field Book Settings***

C.3.4 Slope reduction

Refer to Figure 21, to better understand this reduction. The horizontal and vertical components (d_1 and v) of an observation are found from the vertical angle (zenith distance) and slope distances by the following:

d_1 = $S\sin(Z)$
v_1 = $S\cos(Z)$
Z = the zenith angle
s = the slope distance

C.3.5 Plane curvature correction (GPS/RTK only)

The following correction is applied from the origin coordinates of the projection record within the field book if the plane curvature correction is active in ***Field Book Settings***.

$$a_3 = a_2 - \frac{S_3}{2R} \times \frac{180}{\pi}$$

R	=	approximate spheroid radius of 6,370,000 (meters)
S_3	=	slope distance from Section C.2.2, *PPM correction (total station only)*, page C-9
a_2	=	vertical angle from Section C.2.5, *Collimation correction (total station only)*, page C-11
a_3	=	corrected vertical angle (units=degrees)

✉ **Note:** Plane curvature corrections should be turned off in ***Field Book Settings*** when using transformations.

C.4 Coordinate Calculation

Coordinate calculation converts an **RED** record to a **POS** record and a **GRED** record to a **GPOS** record. The coordinates of a target point are calculated from observed measurements and the coordinates of the source point using the following:

$$N_2 = N_1 + d_4 \cos(A)$$

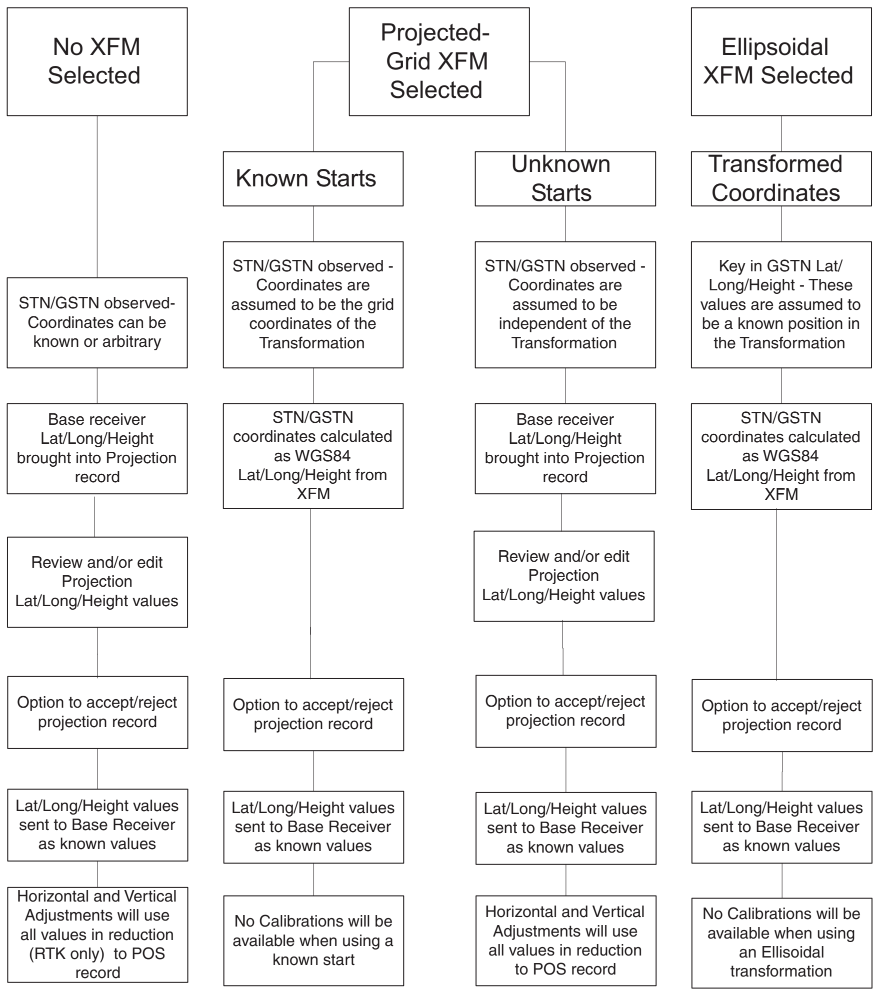
$$E_2 = E_1 + d_4 \sin(A)$$

$$Z_2 = Z_1 + v_4$$

N_1, E_1 & Z_1	=	coordinates of the source point
N_2, E_2 & Z_2	=	coordinates of the target
d_4	=	projected distance between the two points
A	=	azimuth
v_2	=	vertical distance

The calculation yields null results if the coordinates of the source point are unknown.

The final step in converting a GPOS to a POS record is applying a horizontal and vertical transformation based on the last RTK calibration in the field book. For more information, see Section 6.2, *Applying Reduction Parameters in Field Book Settings*, page 6-9.



C.5 Observational Calculation

If you have completed the normal procedure for establishing a backsight, an orientation correction is applied to the horizontal angle observation:

$$A = H + BKB_{azmth} - BKB_{h.obs}$$

A=azimuth of the observation

H=horizontal angle (circle reading) of the observation

BKB_{azmth}=azimuth field of the applicable backbearing record

$BKB_{h.obs}$=horizontal angle observation (circle reading) field of the applicable backbearing record

Note: The Backbearing (BKB) record is computed as geodetic when using projected grid coordinates.

C.6 Rules for STN/GSTN and projection records

The SDR33 handles observation data differently depending on your selected coordinate systems and whether or not you are working with know or unknown starting positions.

The transformation process flowchart on the next page details the SDR data collector workflow for the supported coordinate systems.

Appendix D Working with Memory Cards

Memory cards can be used with GSS1A and GSS2 receivers and SETC, SETCII, and PowerSET total stations. GPS receiver files can be transferred to and from a GSS1A and a GSS2 receiver. Coordinate data can be sent to and from the SETC/SETCII total stations via the memory cards. Entire SDR files can be sent to and from the PowerSet via the memory card.

This section discusses storing files on a card, the settings for the card, and the data which can be stored on the cards.

D.1 Determining Card Size

The two available card readers, SCR1 and SCR2, read different cards with varying capacities and capabilities as seen in the table below:

Card reader	Total station	Card type	Memory (K)	Number of files
SCR1	SETC	SDC2	32	All data contained in one job
SCR2	SETCII / PowerSET / GSS1A / GSS2	SDC3	32	Data can be stored in multiple jobs
		SDC4	64	
		SDC5	128	
		SDC6	256	

D.2 Using the Memory Card

This section discusses the types of data each total station stores on a card and how to use a card.

D.2.1 SETC/SETCII memory cards

If you are surveying more than one job in the same day on a SETC total station, you may want to use a different card for each job. This will help organize the data. After the data on the card has been read into ProLINK, you can append to the data on the card, reformat the card and continue using it for the same job, or use it for a new job.

Depending on the type of card and instrument you are using, you may be able to collect data for a single job or for multiple jobs. The SETC memory cards store data for a single job. The SETCII memory cards support multiple jobs through multiple job names. For additional information on card size, see Section D.1, *Determining Card Size*, page D-1.

Orientation

When you are recording N,E,Z or N,E,Z + S,V,H records in the total station, the horizontal angle in the total station is used as a north azimuth for calculation of northing and easting. You can key this azimuth directly into the instrument after pointing to the backsight, or enter the coordinates of the instrument and the backsight points and let the instrument calculate the azimuth.

Record types for SETC and SETCII card data

The following table shows record types which are stored on the SETC and SETCII memory cards.

Record types for SETC/CII cards

Record ID	Record Label	Description
00NM	SDR	Header record
01NM	INSTR	Instrument type
02IC	STN IC	Station details
03IC	TRGET	Target height
05IC	ATMOS	Temperature and pressure
08IC	POS IC	Position (N,E,Z)

Record types for SETC/CII cards

Record ID	Record Label	Description
09F1	OBS F1	Face 1 observation (SVH, VH Tilt)
09F2	OBS F2	Face 2 observation (SVH, VH Tilt)
10NM	JOB	Job record
13IC	NOTE IC	Notes
13TP	NOTE TP	Parts per million
13FC	NOTE FC	Feature code
13OS	NOTE OS	Offset data

D.2.2 PowerSET memory card

The PowerSET-formatted cards support multiple jobs by storing entire SDR Files. The PowerSET-formatted cards will access SDR files where the SETC- and SETCII-formatted cards will access only position records.

A PowerSET memory card is usually accessed via an SCR2 card reader. Any card that can be used on an SCR2 card reader can be formatted for a PowerSET.

The SDR files on the card also can be transferred between the PowerSET memory and the card when the card is local to the PowerSET (see *PowerSET SDR Software Reference Manual*).

Appendix E Understanding Coordinate Systems

The reference system for GPS is the World Geodetic System 1984 (WGS84). WGS84 defines the earth with a single geodetic, or ellipsoidal, coordinate system. In practical applications of GPS and other surveying methods, it may not be convenient or appropriate to use the WGS84 coordinate system. You may need to apply a local reference system, which might be an ellipsoidal coordinate system (latitude/longitude) or a rectangular coordinate system (northing/easting).

ProLINK allows you to define and use local coordinate systems, thereby transforming WGS84 data to your specifications. The coordinate systems (transformation sequences) are stored in transformation files with *.XFM extensions. Each transformation file stores one or more coordinate system(s).

This appendix describes the various coordinate systems and the basics of the transformations required to move between the systems.

E.1 Understanding Coordinate Systems

A coordinate system is a reference frame used to designate a position. The most common coordinate systems are ellipsoidal and rectangular.

E.1.1 Ellipsoidal coordinates

The earth can best be approximated as an oblate spheroid of revolution. Mathematically, it is expressed as an ellipsoid with the axis at the equator greater than the axis through the poles.

An ellipsoid can be made to describe the earth using two parameters:

- semi-major axis
- flattening

Different regions of the earth may use ellipsoid definitions that approximate that particular area very well. It is unlikely that an ellipsoid, which defines one region well, can accurately define another region elsewhere on the earth.

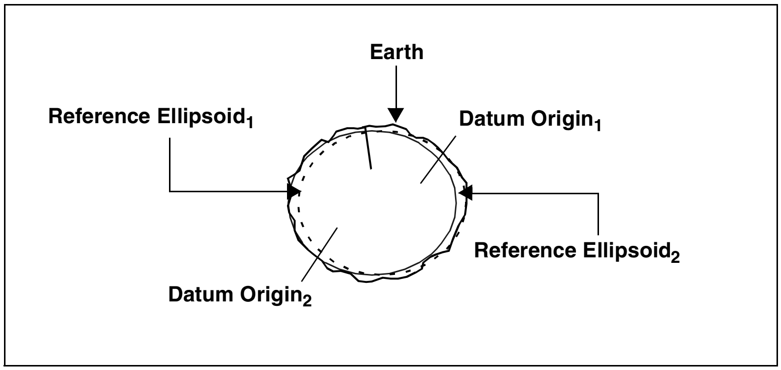


Figure 22: Reference ellipsoids

Each reference ellipsoid relates to an initial origin point on the surface to produce a datum. A datum requires the definition of the size, shape, orientation and location of an ellipsoid. A datum is usually defined to best fit a region of the Earth for which it is intended. A geocentric datum which aims to best fit the surface of the entire earth is the World Geodetic System 1984 (WGS84). WGS84 is a geocentric ellipsoid, or earth-centered; no initial origin point exists on the surface.

Positions within an ellipsoidal coordinate system are described by latitude, longitude and height. They are represented as follows:

ϕ .... latitude

λ .... longitude

h .... height

Latitude values start at zero at the equator and increase to 90° at the North Pole; decrease to -90° at the South Pole. Longitude values start at zero at the Greenwich meridian and increase to the east.

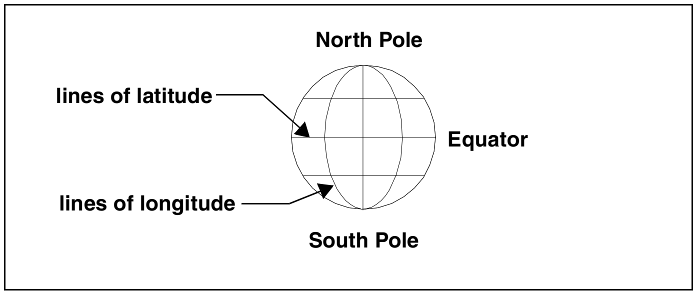


Figure 23: Latitude and longitude

The height is based on the surface of the ellipsoid. This height is not to be confused with orthometric heights, which are based on a level surface called the geoid.

The geoid is defined with its center corresponding to the true center of the earth; its surface is an equipotential surface. The geoid is the surface commonly chosen for leveling datums. Since it nearly corresponds with the average sea level value, it is often referred to as the sea level datum. The shape of this surface is related to the earth's mass distribution, and therefore, varies from point to point. The variation is know as the geoidal undulation..

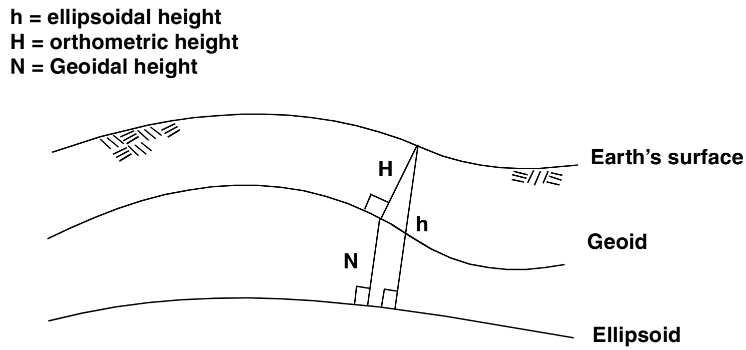


Figure 24: Geoidal undulation

E.1.2 Rectangular coordinates

Ellipsoidal coordinate systems, which attempt to take into account the true shape of the earth, are of high precision and generally extend over large areas. However, a far greater number of surveys will require the use of a rectangular coordinate system.

These systems consider the mean surface of the earth as a plane. With regards to horizontal distances and directions — a level line is considered as mathematically straight, the plumb line is considered to be the same direction at all points, and all angles are plane angles.

The US State Plane Coordinate system and the vast majority of local coordinate systems fall into this category.

E.2 Understanding Transformations

The use of any of the various coordinate systems requires a transformation of the data from one coordinate system to another. The transformation of one type of coordinate system to a coordinate system of the same type is defined as a *datum transformation* (ellipsoidal to ellipsoidal) or a *plane transformation* (rectangular to rectangular). A transformation between two different coordinate systems (ellipsoidal to rectangular) is defined as *projection*.

ProLINK provides two of the three categories of mathematical processes with which to accomplish the transformations:

Ellipsoid to Ellipsoid.........datum transformation

Projection............................ellipsoidal to rectangular

The entire transformation from one coordinate system to another may require a combination of any number of the three processes described above in a specific sequence. ProLINK uses the concept of a transformation sequence (simply called a transformation) to define the conversion from one coordinate system to another.

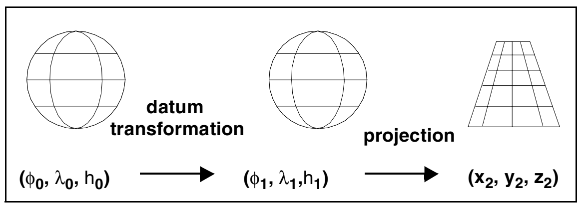


Figure 25: Typical transformation

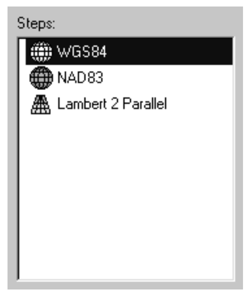
A typical transformation, like that in Figure E-25, will start with the WGS84 coordinate system. It may require a projection to get to a more specific ellipsoidal coordinate system. A projection may then be required to project the ellipsoidal coordinates onto a planar surface. ProLINK defines the coordinate system to be used by describing the individual transformations and their respective parameters in the proper sequence required to convert coordinates from one system to the other.

ProLINK contains many predefined transformations stored in files with an *.XFM extension. User-defined coordinate systems can be created and stored in transformation files for later use.

In ProLINK, a transformation sequence is simply a collection of various mathematical components as described in this appendix. For example, if GPS coordinates are to be converted into the US State Plane 1983, Kansas North zone, two mathematical operations must be performed:

- the WGS84 (ellipsoidal) coordinate must be converted into a NAD83 (ellipsoidal) coordinate
- the NAD83 coordinate must be projected to planar coordinates using a specific type of projection called Lambert 2 Parallel

ProLINK will display the transformation that accomplishes this task in the Steps field within the ***Coordinate System Editor***:



The NAD83 and Lambert2Parallel tiles represent the datum transformation and projection components of the transformation sequence. For brevity, the components of a transformation sequence are called *nodes*.

This coordinate system's transformation sequence is stored in a file called USSP83.XFM which resides in the installation directory.

E.2.1 Ellipsoid to ellipsoid transformation

ProLINK uses ellipsoid to ellipsoid transformations to describe the specific datum transformation from one ellipsoidal coordinate system to another ellipsoidal coordinate system. The ellipsoid to ellipsoid transformation is represented in Figure E-26.

An ellipsoid to ellipsoid transformation will convert one set of coordinates (ϕ_0,λ_0,h_0) into a different set of coordinates (ϕ_1,λ_1,h_1), or graphically:

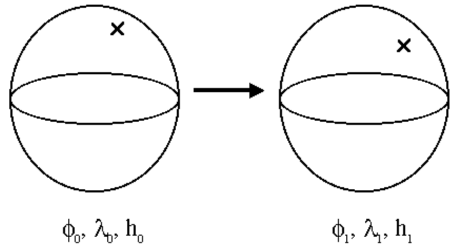


Figure 26: Ellipsoid To Ellipsoid Transformation

An ellipsoid can be converted to a cartesian (rectangular) coordinate system where its datum origin point can be directly related to the new ellipsoid's datum origin point (see Figure E-26). The translated cartesian coordinate system can then be converted to an ellipsoid using the new ellipsoid definition. The actual graphical representation is as follows:

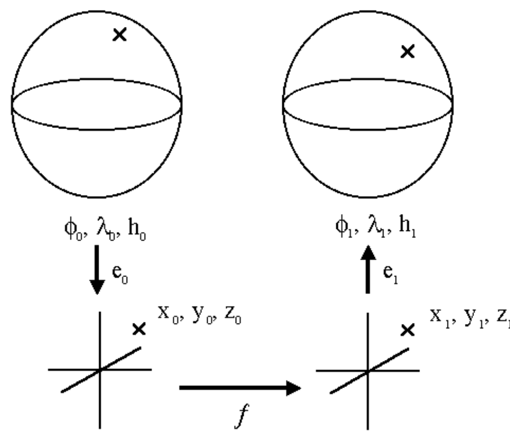


Figure 27: Datum Transformation with 3D transformation

ProLINK performs the conversion by first converting (ϕ_0,λ_0,h_0) into an *ellipsoid cartesian coordinate* (x_0,y_0,z_0) where the center of the ellipsoid is (0,0,0). The ellipsoid definitions, represented by $\mathbf{e_0}$ and $\mathbf{e_1}$, consist of the semi-major axis and flattening on which (ϕ_0, λ_0, h_0) and (ϕ_1, λ_1, h_1) are based.

Once a cartesian coordinate is derived, a 3D transformation can optionally be applied to convert from (x_0,y_0,z_0) to (x_1,y_1,z_1). This transformation is described by f, whose seven parameters are a translation along three cartesian axes, rotation about the three cartesian axes and a scale. The new cartesian coordinate may be based on the origin of the new datum, depending on the nature of the destination ellipsoid and the 3D transformation. With the new cartesian coordinate (x_1,y_1,z_1), a conversion is made to the destination ellipsoid to arrive at (ϕ_1,λ_1,h_1), see Figure E-27.

If the 3D transformation is omitted, the resulting conversion would resemble Figure E-28.

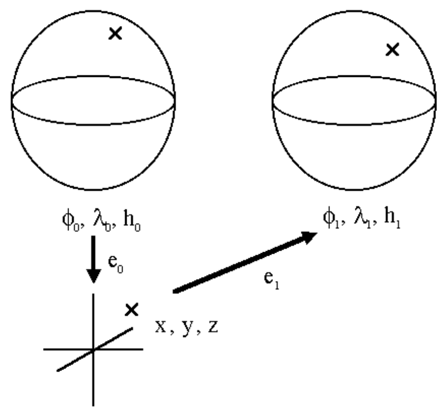


Figure 28: Datum Transformation without 3D transformation

E.2.1.1 Available ellipsoid to ellipsoid transformations

The six types of ellipsoid to ellipsoid transformations provided by ProLINK, from least to most general, are as follows:

Ellipsoid .... The simplest type of datum transformation; it allows a conversion between ellipsoids with matching cartesian systems.

Ellipsoid: Shift .... This transformation allows conversion between ellipsoids that have different origins.

Ellipsoid: Shift-Rotate .... This transformation can convert further between ellipsoids whose cartesian systems are rotated with respect to each other.

Ellipsoid: Shift-Rotate-Scale .... The most general type of datum transformation, it is similar to Ellipsoid: Shift-Rotate, but also provides a scale factor for converting between the cartesian coordinate systems.

Ellipsoid: User-Defined .... This transformation is equivalent to the Ellipsoid: Shift-Rotate-Scale, but the ellipsoid and the transformation parameters are provided by the user.

Ellipsoid: Calculated .... The user creates an ellipsoid definition by

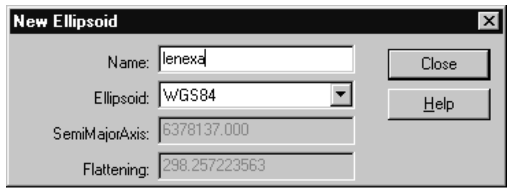
Parameters .... correlating at least three sets of coordinates from a defined ellipsoid to corresponding sets of coordinates from the new datum. The more matched sets of coordinates added to this, the more accurately the ellipsoid can be defined.

☒ **Note:** The first four datum types only allow selection from the provided list of ellipsoids. The ellipsoid parameters are displayed, but are not editable.

The most general datum transformation (Ellipsoid: Shift-Rotate-Scale) could always be used, eliminating the need for the first three datum transformation types. The primary reason for the first three, more restrictive, types is to reduce the amount of information required to convert between ellipsoids.

E.2.1.2 Ellipsoid

Ellipsoid is the simplest type of datum transformation; it allows a conversion between ellipsoids with matching cartesian systems (as shown in Figure E-28).



Name..................................Accept the default name or enter a new name.

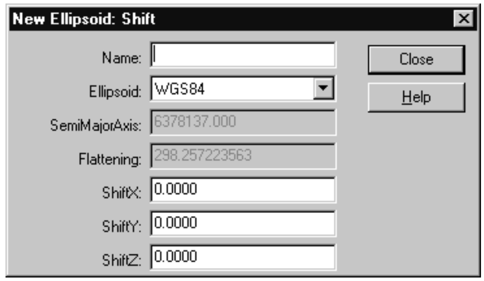
Ellipsoid..............................Select a common ellipsoid.

SemiMajorAxis..................The semi-major axis defines the size of the ellipsoid. The axis is the distance from the center of the ellipsoid to the surface of the ellipsoid, measured along the plane of the ellipsoid's equator.

Flattening............................Flattening is a form factor relating the semi-major to the semi-minor axis. The semi-minor axis is the distance from the center of the ellipsoid to the pole.

E.2.1.3 Ellipsoid: Shift

Ellipsoid: Shift enables conversion between ellipsoids that have different origins (in Figure E-27, f applies a Δx, Δy, Δz to the ellipsoid cartesian coordinate).



Name....................................Accept the default name or enter a new name.

Ellipsoid..............................Select a common ellipsoid.

SemiMajor Axis.................The semi-major axis defines the size of the ellipsoid. The axis is the distance from the center of the ellipsoid to the surface of the ellipsoid, measured along the plane of the ellipsoid's equator.

Flattening............................Flattening is a form factor relating the semi-major to the semi-minor axis. The semi-minor axis is the distance from the center of the ellipsoid to the pole.

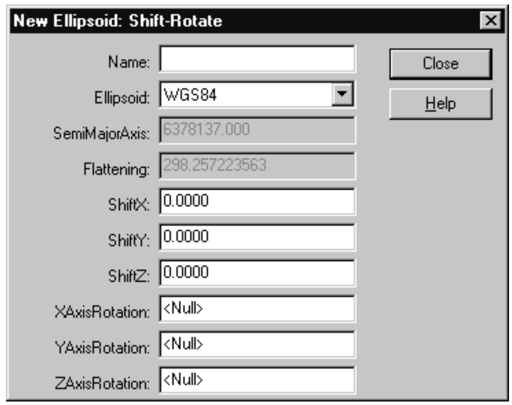
ShiftX..................................This field moves the origin of the projection a distance on the X axis, but maintains the azimuths of the data relative to the original position and the original distances between points.

ShiftY..................................This field moves the origin of the projection a distance on the Y axis, but maintains the azimuths of the data relative to the original position and the original distances between points.

ShiftZ.................................This field moves the origin of the projection a distance on the Z axis, but maintains the azimuths of the data relative to the original position and the original distances between points.

E.2.1.4 Ellipsoid: Shift-Rotate

Ellipsoid: Shift-Rotate can convert further between ellipsoids whose cartesian systems are rotated with respect to each other. That is, in Figure E-27, f will apply a (Δx, Δy, Δz) as well as a rotation (rx,ry,rz).



Name...................................Accept the default name or enter a new name.

Ellipsoid..............................Select a common ellipsoid.

SemiMajorAxis ....The semi-major axis defines the size of the ellipsoid. The axis is the distance from the center of the ellipsoid to the surface of the ellipsoid, measured along the plane of the ellipsoid's equator.

Flattening............................Flattening is a form factor relating the semi-major to the semi-minor axis. The semi-minor axis is the distance from the center of the ellipsoid to the pole.

ShiftX....................................This field moves the origin of the projection a distance on the X axis, but maintains the azimuths of the data relative to the original position and the original distances between points.

ShiftY....................................This field moves the origin of the projection a distance on the Y axis, but maintains the azimuths of the data relative to the original position and the original distances between points.

ShiftZ....................................This field moves the origin of the projection a distance on the Z axis, but maintains the azimuths of the data relative to the original position and the original distances between points.

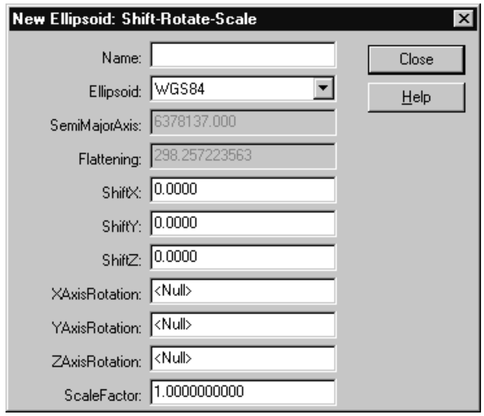
XAxisRotation.....................The origin of the projection on the X axis rotates relative to the original position.

YAxisRotation.....................The origin of the projection on the Y axis rotates relative to the original position.

ZAxisRotation.....................The origin of the projection on the Z axis rotates relative to the original position.

E.2.1.5 Ellipsoid: Shift-Rotate-Scale

Ellipsoid: Shift-Rotate-Scale the most general type of datum transformation, is similar to Ellipsoid: Shift-Rotate, but also provides a scale factor for converting between the cartesian coordinate systems.



Name....................................Accept the default name or enter a new name.

Ellipsoid..............................Select a common ellipsoid.

SemiMajorAxis..................The semi-major axis defines the size of the ellipsoid. The axis is the distance from the center of the ellipsoid to the surface of the ellipsoid, measured along the plane of the ellipsoid’s equator.

Flattening............................Flattening is a form factor relating the semi-major to the semi-minor axis. The semi-minor axis is the distance from the center of the ellipsoid to the pole.

ShiftX..................................This field moves the origin of the projection a distance on the X axis, but maintains the azimuths of the data relative to the original position and the original distances between points.

ShiftY.................................... This field moves the origin of the projection a distance on the Y axis, but maintains the azimuths of the data relative to the original position and the original distances between points.

ShiftZ.................................... This field moves the origin of the projection a distance on the Z axis, but maintains the azimuths of the data relative to the original position and the original distances between points.

XAxisRotation..................... The origin of the projection on the X axis rotates relative to the original position.

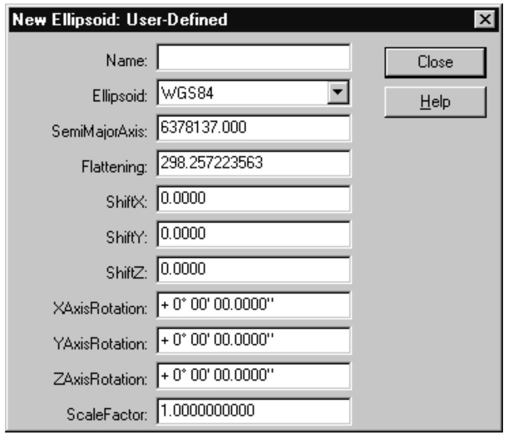
YAxisRotation..................... The origin of the projection on the Y axis rotates relative to the original position.

ZAxisRotation..................... The origin of the projection on the Z axis rotates relative to the original position.

ScaleFactor........................... This field changes the distance between data relative to the original position, but maintains the spatial relationship and relative distance between transformed data.

E.2.1.6 Ellipsoid: User-Defined

Ellipsoid: User-Defined is equivalent to the Ellipsoid: Shift-Rotate-Scale with one exception: you can modify the ellipsoid parameters.



Name.................................... Accept the default name or enter a new name.

Ellipsoid.............................. Select a common ellipsoid.

SemiMajorAxis.................. The semi-major axis defines the size of the ellipsoid. The axis is the distance from the center of the ellipsoid to the surface of the ellipsoid, measured along the plane of the ellipsoid's equator.

Flattening............................ Flattening is a form factor relating the semi-major to the semi-minor axis. The semi-minor axis is the distance from the center of the ellipsoid to the pole.

ShiftX.................................. This field moves the origin of the projection a distance on the X axis, but maintains the azimuths of the data relative to the original position and the original distances between points.

ShiftY..................................This field moves the origin of the projection a distance on the Y axis, but maintains the azimuths of the data relative to the original position and the original distances between points.

ShiftZ..................................This field moves the origin of the projection a distance on the Z axis, but maintains the azimuths of the data relative to the original position and the original distances between points.

XAxisRotation....................The origin of the projection on the X axis rotates relative to the original position.

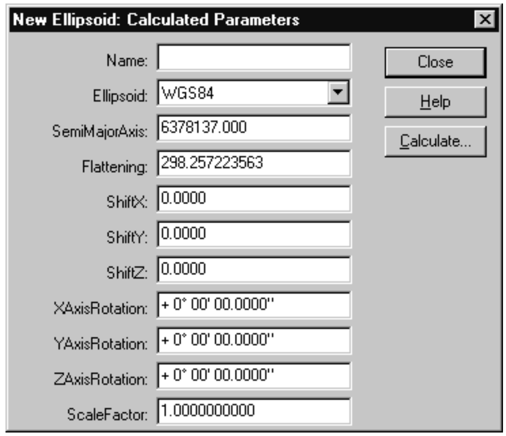
YAxisRotation....................The origin of the projection on the Y axis rotates relative to the original position.

ZAxisRotation....................The origin of the projection on the Z axis rotates relative to the original position.

ScaleFactor..........................This field changes the distance between data relative to the original position, but maintains the spatial relationship between transformed data.

E.2.1.7 Ellipsoid: Calculated Parameters

Ellipsoid: Calculated Parameters is equivalent to the Ellipsoid: Shift Rotate Scale, but the ellipsoid parameters are manually entered or calculated based on three sets of input coordinates.



ProLINK allows you to compute the datum transformation parameters given. The ellipsoid definition, WGS84 coordinates and local coordinates must be provided for at least three positions. The seven parameters that define the 3D transformation will be computed and copied into the current selected node of the transformation sequence.

Name....................................Accept the default name or enter a new name.

Ellipsoid..............................Select a common ellipsoid.

SemiMajorAxis..................The semi-major axis defines the size of the ellipsoid. The axis is the distance from the center of the ellipsoid to the surface of the ellipsoid, measured along the plane of the ellipsoid's equator.

Flattening............................Flattening is a form factor relating the semi-major to the semi-minor axis. The semi-minor axis is the distance from the center of the ellipsoid to the pole.

ShiftX.................................This field moves the origin of the projection a distance on the X axis, but maintains the azimuths of the data relative to the original position and the original distances between points.

ShiftY.................................This field moves the origin of the projection a distance on the Y axis, but maintains the azimuths of the data relative to the original position and the original distances between points.

ShiftZ.................................This field moves the origin of the projection a distance on the Z axis, but maintains the azimuths of the data relative to the original position and the original distances between points.

XAxisRotation....................The origin of the projection on the X axis rotates relative to the original position.

YAxisRotation....................The origin of the projection on the Y axis rotates relative to the original position.

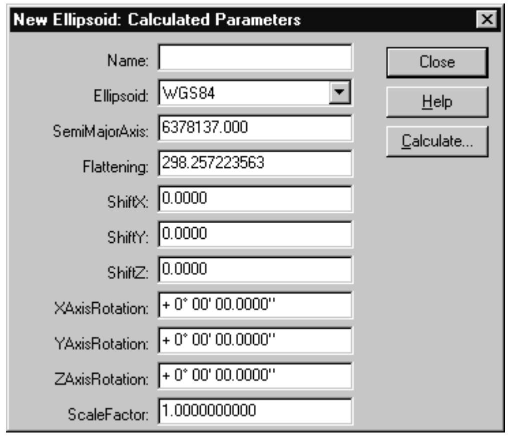
ZAxisRotation....................The origin of the projection on the Z axis rotates relative to the original position.

ScaleFactor..........................This field changes the distance between data relative to the original position. The spatial relationship is maintained.

Steps to calculate ellipsoid parameters

1. Create or edit a coordinate system. ProLINK allows you to compute the datum transformation parameters given. The ellipsoid definition, WGS84 coordinates and local coordinates must be provided for at least three positions. The seven parameters that define the 3D transformation will be computed and copied into the current selected node of the transformation sequence.

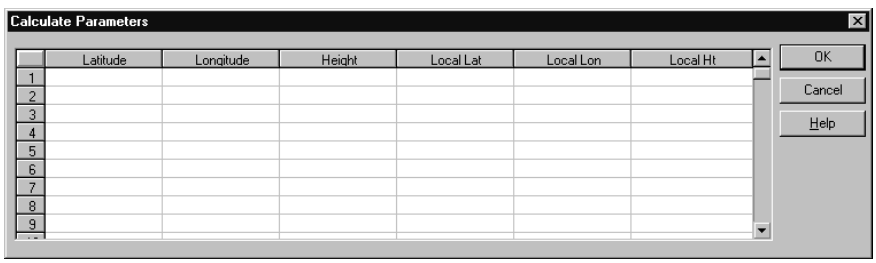
2. Press **<Add>**, then select **Ellipsoid/Ellipsoid:Calculated Parameters**.



3. The parameters can be manually entered in the appropriate fields. Skip to step 6.

— OR —

4. Press **<Calculate>** and ProLINK will automatically calculate the parameter values based in matching WGS84 coordinates to local coordinates.



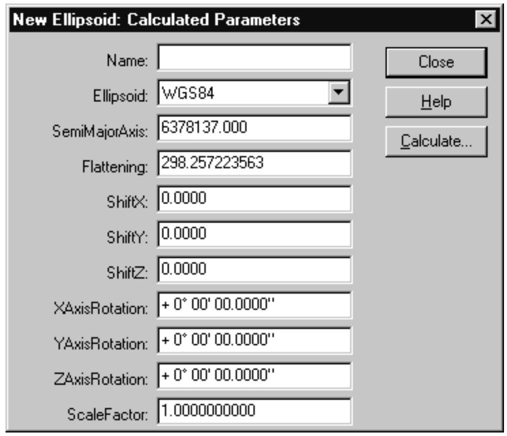
5. Enter the coordinates of at least three pairs of points (one per row, including values for both WGS84 and local coordinates.

   If problems occur with the data in the spreadsheet (a cell is empty or is not syntactically correct), you will be notified and the cell in question will be highlighted.

✉ **Note**: Points should be geographically spread.

---

6. Once all of the coordinates have been entered, press the **<OK>** button. The parameters will automatically be updated.



7. After the parameters have been entered, press **<OK>** to return to the ***Coordinate System Editor*** dialog. The calculated datum parameters will replace those of the selected datum.

✉ **Note:** The calculated results may be edited, but you should exercise caution when doing so.

E.2.2 Projection transformations

A projection is a systematic representation of curved surface on a plane. A curved surface cannot be mapped using plane coordinates without distorting angles, azimuths, distances, or area. However, projections can be defined to minimize certain types of distortion.

A projection is a specific type of coordinate transformation. In principle, a projection maps ellipsoidal coordinates to planar coordinates by projecting from the surface of the Earth to another 3D object that can be flattened, such as a cylinder or a cone (see Figure E-8).

A projection should be chosen based on the features you want to maintain. Several types of projections exist that emphasize different aspects of reduced distortion. A *conformal projection* minimizes the distortion of local angles: large areas may be distorted. An *equa-area* projection preserves areas but angles and distances will be distorted. An *azimuthal projection* maintains the correct direction, or azimuth from the center of the projection to every point in the map.

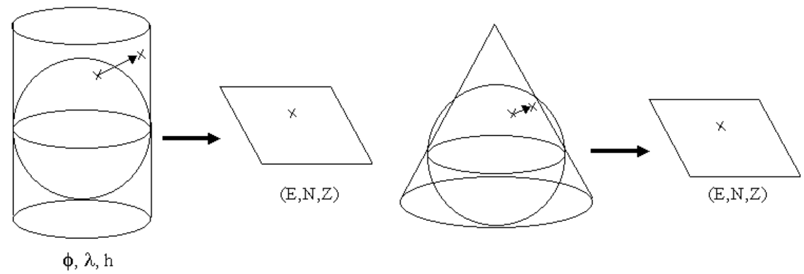


Figure 29: General Projections

Available projection transformation

The types of projections supported by ProLINK are:

Projection	Type
Lambert 2 Parallel	conformal
Transverse Mercator (or TM)	conformal
Universal Transverse Mercator (or UTM)	conformal
Oblique Mercator	conformal
Stereographic Double	conformal

Each different type of projection uses a set of parameters that define the mapping between ellipsoid and plane coordinates.

E.2.2.1 Lambert 2 Parallel

The Lambert projection transforms the ellipsoid into a cone, centering the apex of the cone to one of the ellipsoid's poles. Points on the cone's surface relate to the ellipsoid in a direct one to one relationship. The scale error can be decreased by moving the cone's apex further in to the ellipsoid, creating two parallels (also called standard parallels). You can obtain a plane by cutting the cone and opening it.

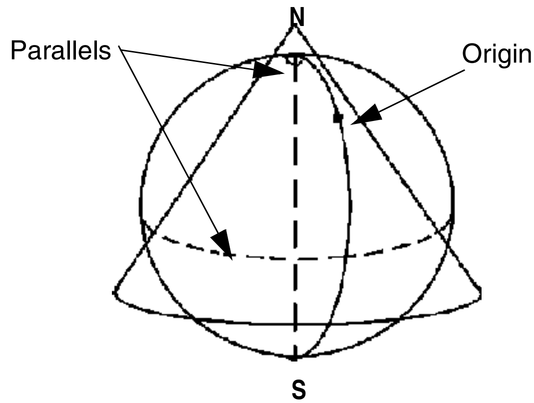
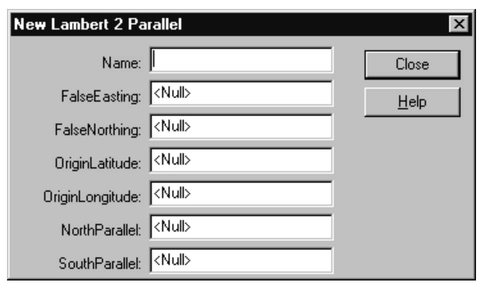


Figure 30: Lambert with two parallel projections



Name.................................... Accept the default name or enter a new name.

FalseEasting......................... A number added to the easting value, generally to ensure that all coordinates will have positive values.

FalseNorthing.....................A number added to the northing value, generally to ensure that all coordinates will have positive values.

OriginLatitude...................The latitude of the origin of the coordinate system.

OriginLongitude ....The longitude of the origin of the coordinate system.

NorthParallel.......................The northern parallel of latitude defining the projected area.

SouthParallel.......................The southern parallel of latitude defining the projected area.

E.2.2.2 Transverse Mercator (or TM)

The transverse mercator projection encloses the ellipsoid in a cylinder parallel to the ellipsoid's equator. Rotating the ellipsoid's origin point and intersecting the side of the cylinder creates a reference meridian. Each point is transferred to the cylinder by expanding the radius created from the center of the ellipsoid to the point.

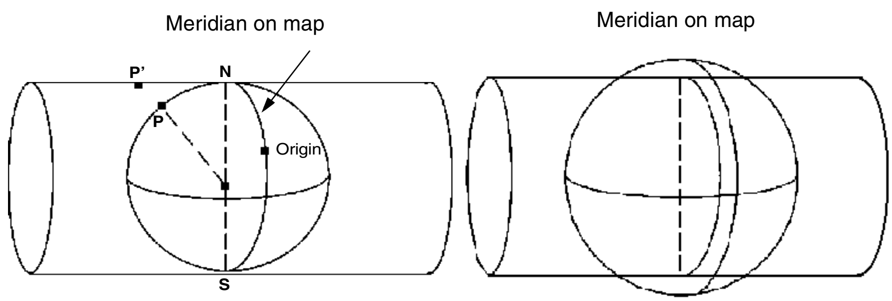
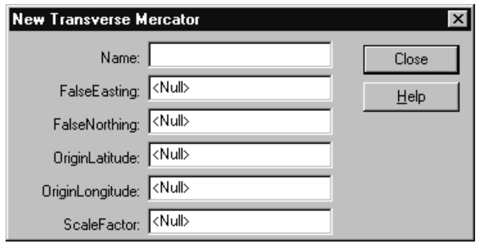


Figure 31: Transverse Mercator Projections with varying cylinder diameters

The ellipsoid's N axis corresponds to the reference meridian projected onto the plane, the E axis passes through the origin and is perpendicular to the N axis. The N, E coordinates can be offset to express all points as positive values.

If the diameter of the cylinder is reduced, the scale on the reference meridian becomes smaller than 1. This reduces the error between the distance on the plane and the ellipsoidal distance over a wider area. For example, the scale at the origin of the UTM (universal transverse mercator) coordinate system is set to “0.9996” so that this difference from the origin within the range 3 degrees East-West is limited to +4/ 10,000.



Name....................................Accept the default name or enter a new name.

FalseEasting.........................A number added to the easting value, generally to ensure that all coordinates will have positive values.

FalseNorthing ....A number added to the northing value, generally to ensure that all coordinates will have positive values.

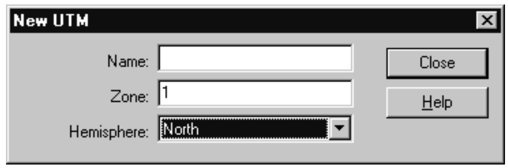
OriginLatitude....................The latitude of the origin of the coordinate system.

OriginLongitude ....The longitude of the origin of the coordinate system.

ScaleFactor...........................This value changes the distance between data relative to the original position, but maintains the spatial relationship and relative distance between transformed data.

E.2.2.3 Universal Transverse Mercator (or UTM)

The Universal Transverse Mercator (UTM) projection and grid were adopted by the U.S. Army in 1947 for designating rectangular coordinates on large-scale military maps of the entire world. The UTM is the Transverse Mercator to which specific parameters, such as central meridians, have been applied. The Earth, between lat. 84 °N and 80°S., is divided into 60 zones each generally 6° wide in longitude. Bounding meridians are evenly divisible by 6°, and zones are numbered from 1 to 60 proceeding east from the 180th meridian from Greenwich with minor exceptions.



Name.......................... Accept the default name or enter a new name.

Zone .... The grid zone designator; each zone is 6° of longitude wide.

Hemisphere .... North or South.

E.2.2.4 Oblique Mercator

The oblique mercator projection encloses an ellipsoid into a cylinder angled from the ellipsoid's polar axis. Rotating the ellipsoid's origin point and intersecting the side of the cylinder creates a reference meridian. Each point is transferred to the cylinder by expanding the radius created from the center of the ellipsoid to the point. The distance on the plane between two points on a circle touching both the ellipsoid and the cylinder equals the distance on the ellipsoid. Varying the diameter of the cylinder reduces the scale error for the target area in other projection methods.

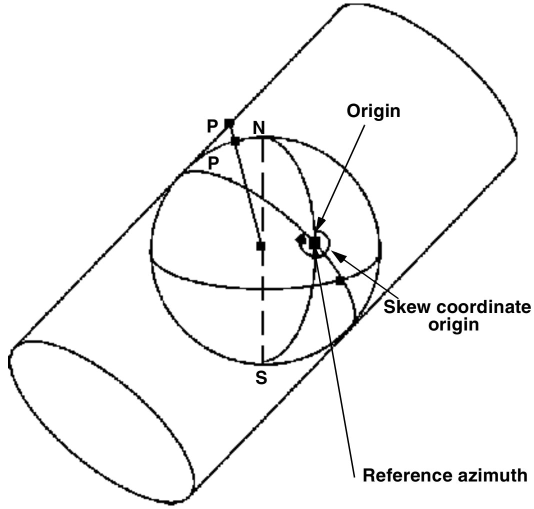
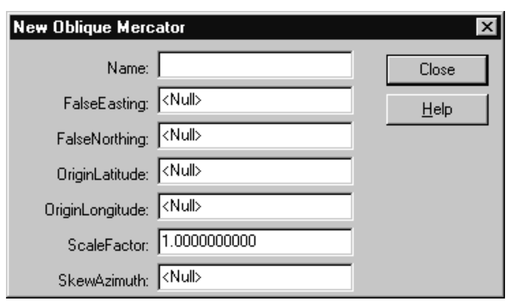


Figure 32: Oblique mercator

For ease in mapping, the N axis passes through the skew coordinate origin located near the equator. The N axis is parallel to the reference meridian created by the origin intersecting the ellipsoid and the cylinder.

The E axis also passes through the skew coordinate origin directly perpendicular to the N axis. However in some countries, the direction of the N axis is defined as the one parallel to the meridian at the skew origin projected on the plane.



Name....................................Accept the default name or enter a new name.

FalseEasting.........................A number added to the easting value, generally to ensure that all coordinates will have positive values.

FalseNorthing ....A number added to the northing value, generally to ensure that all coordinates will have positive values.

OriginLatitude ....The latitude of the origin of the coordinate system.

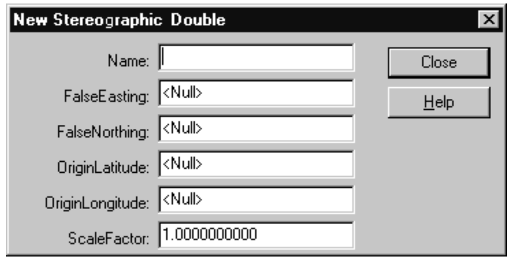
OriginLongitude ....The longitude of the origin of the coordinate system.

ScaleFactor...........................This field changes the distance between data relative to the original position, but maintains the spatial relationship and relative distance between transformed data.

SkewAzimuth ....This field indicates the angular deviation from polar North to the user-defined North.

E.2.2.5 Stereographic Double

The Stereographic Double projection was commissioned by the Canadian government in the mid 1970s. The Stereographic Double projection performs two transformations in one. The first transformation wraps an ellipsoid around a conformal sphere. The second step in the transformation is an oblique stereographic. The conformal sphere step simplifies the equations needs for the oblique stereographic step.



Name....................................Enter a name; if you leave this field blank, the name will match the node type.

FalseEasting.........................A number added to the easting value, generally to ensure that all coordinates will have positive values.

FalseNorthing ....A number added to the northing value, generally to ensure that all coordinates will have positive values.

OriginLatitude ....The latitude of the origin of the coordinate system.

OriginLongitude ....The longitude of the origin of the coordinate system.

ScaleFactor...........................This field changes the distance between data relative to the original position, but maintains the spatial relationship and relative distance between transformed data.

Glossary

*.INI format

File that stores various application preferences and options between sessions.

*.SDR format

File format containing data in the SDR format.

*.SDF format

Conversion files used in ProLINK COMMS to convert imported files to the ProLINK database and to convert the ProLINK database to exported files.

*.SPP format

File format for a ProLINK project in which data and reduction results are stored.

*.TDF format

Conversion file used to convert imported files to the ProLINK database and to convert the ProLINK database to an external file format on export.

azimuth

A horizontal angle measured clockwise from a reference source. The reference, typically north, is defined as zero.

back bearing

A record that contains the orientation correction for the current instrument setup.

calibration

A calculation allowing all GPS records in the current coordinate system to be translated, rotated, and scaled to match a known coordinate system.

cartesian coordinate system

Also known as rectangular. Based on three dimensions (x, y, z) and orientation axes.

collimation

The process to determine the angular error in the theodolite or Total Station.

coordinates

Linear or angular values describing a point's position relative to a specific reference frame.

coordinate system

A reference frame used to express a position, usually in the form of ellipsoidal coordinates or cartesian coordinates.

curvature correction

A vertical correction that accounts for the curvature of the Earth.

data files

Information collected on a device or contained on the computer.

derivation code

A two-character code describing how a record was generated and which part of the SDR software generated the record

EDM

Electronic distance meter

EDM offset

The distance from the optical center of the theodolite and the optical center of the EDM.

elevation mask

The lowest elevation (in degrees) at which a GPS receiver will track a satellite. Directly overhead equals 90° elevation.

Field Book Editor

An interactive view where data can be imported, edited, modified and exported. Within the Field Book Editor, each field book is displayed as a tabbed page to simplify survey data into sets that can be separated or combined into the reduced results. The Field Book Editor contains an intelligent data editor to insert and delete records, search and replace based on multiple parameters, apply settings and reorganize data to take advantage of the SDR search rules during the reduction process.

field book

A tabbed page in the Field Book Editor where data is shown in a hierarchical tree structure. Field books are displayed within the Field Book Editor.

Field Book Settings

A dialog in which reduction parameters are established for reduction settings, Helmert Transformations, job settings and duplicate point renumbering.

feature code

A descriptive code for any feature of the point being mapped.

GPS (Global Positioning System)

A ranging system from known positions of satellites in space to unknown positions. GPS, developed by DoD, was conceived to determine position, velocity, and time on or near the earth on a continuous basis. Ranging is accomplished by receiving and processing signals transmitted by satellites with a receiver at the latitude

GPS/RTK

see SDR GPS/RTK

GPS receiver

A device used for GPS signal collection and signal processing.

job settings

A group of fields within Field Book Settings where corrections, atmospheric, sea level, curvature and refraction, scale factor, elevations and plane curvature, can be defined. These settings will be used when a SDR format is sent or exported.

latitude

The angle measured at the center of the earth from the equator to the point of interest. The latitude is 0° at the equator and 90° at the North pole; -90° at the South pole.

link

The process to match user-defined records and fields to existing ProLINK records and fields, when defining conversions in Conversion Definition Manager.

longitude

The angle measured at the center of the earth from the Greenwich meridian to the meridian of interest. East longitudes are positive; west longitudes are negative.

pass

The process of extracting pieces of information in an order defined within the Conversion Definition Manager.

pivot

The point on the road template where the super-elevation is started.

plane curvature

A vertical correction to apply curvature to the plane calculated during a GPS calibration. The center point of the plane will be the original GSTN (base receiver) coordinates.

point

A specific location of interest.

point ID

The unique point identifier for a data point.

position

The coordinates of a point.

pressure

Measurement of atmospheric pressure, which varies primarily due to elevation.

project

A collection of data, settings and results in a single file location.

quad bearing

(quadrant bearings) A horizontal angle measurement using four quadrants of 90° within a full 360° circle.

raw point ID

The point ID of a record within the field book.

receiver

The device used for GPS signal collection and signal processing.

rectangular coordinate system

See cartesian coordinate system.

record

Information stored for a single point or other pertinent information concerning the survey data.

reduced coordinates view

The view in which the results of the reduction can be viewed and exported using conversion definitions.

refraction correction

Corrects for the amount that the EDM beam is changed as it travels through the atmosphere.

rover

The mobile GPS receiver used when collecting RTK data.

RTK

Real time kinematic. The process of using GPS receivers and radio broadcasts to collect accurate positions in the field.

station

A specific position from which measurements are taken.

stadia

The use of horizontal retical lines to determine distances with a transit or level.

SV

space vehicle (satellite)

satellite

A man made object orbiting the Earth that relays signals used in positioning calculations.

SDR33

Device used for collecting both terrestrial and GPS survey data.

SDR (software)

SDR software that includes functionality for collecting terrestrial survey data.

SDR GPS/RTK (software)

SDR software that includes functionality for collecting GPS/RTK and terrestrial survey data.

SDR33-S/K (software)

SDR software that includes functionality for collecting GPS static/ kinematic and terrestrial survey data.

source point

The label in a record in the field book pertaining to a specific position from which measurements are taken

target offset

The distance between the theodolite target and the EDM target.

target point

The label in a record, in the field book, for a point observed from the source point.

theodolite

An optical instrument used to measure vertical and horizontal angles.

transformation

The conversion of one type of coordinate system to another. The transformation of one type of coordinate system to a coordinate system of the same type is defined as a datum transformation (ellipsoidal to ellipsoidal) or a plane transformation (rectangular to rectangular). A transformation between two different coordinate systems (ellipsoidal to rectangular) is defined as a coordinate transformation which usually contains some variation of a projection.

vertical offset

The measurement from the antenna mount to the phase center of the antenna.

WGS84 coordinates

World Geodetic System (1984); the ellipsoidal coordinate system used by GPS.

Index

A

adding
    coordinate system
        transformation nodes, 11-11
angle, 2-18
antenna height, 2-17
    record, 8-9
applying
    coordinate system, 11-5
atmospheric corrections, 6-12
automatic reduction mode, 6-2, 6-3

B

back bearing record, 8-11
    calculate, 2-15, 5-8

C

calculations
    collimation correction, C-11
    coordinate calculation, C-15
    curvature and refraction correction, C-13
    environmental corrections, C-2
    face 1/face 2 corrections, C-10
    geometric corrections, C-2
    geometric reductions, C-12
    Helmert transformation, 6-18
    instrument and target height reduction, C-10
    instrument corrections, C-2
    job-related corrections, C-2
    orientation correction, C-11
    prism constant correction, C-9
    projection correction, C-14
    sea level correction, C-13
    slope reduction, C-14
card
    battery low, 10-10
card reader, D-1
    see also SCR1 and SCR2
    card size, D-1
    settings, 10-3
circular vertical curve record, 8-12
closing
    project, 3-10
    ProLINK, 3-10
    views, 3-10
collapsing records, 2-10
columns
    sizing, 2-13
Conversion Definition Editor, 9-8
Conversion Definition Manager, 9-1
    main screen, 9-3
conversions
    copying, 9-4
    creating, 9-4
    defining, 9-8
    defining records, 9-19
        copying record, 9-15
        creating record, 9-15
        editing record, 9-16
    editing, 9-7
    establishing record and field properties, 9-11
    fields, 9-2
    laying out records, 9-21
        modifying layout, 9-24
        preview record, 9-25
        renaming a field, 9-24
    records, 9-2
    renaming, 9-10
    separators, 9-3
coordinate system
    adding transformation nodes, 11-11
    applying, 11-5
    datum, E-2, E-7
    datum transformation, E-6, E-8

editing transformation node, 11-14
ellipsoidal, E-1, E-5, E-6
GPS reference frame, E-1
rectangular, E-4, E-7
removing transformation node, 11-16
renaming, 11-11
transformation, E-4
datum transformation, E-5
plane transformation, E-5
projection, E-5, E-21
transformation file
remove, 11-9
transformation sequences, 11-1, E-1, E-5, E-6
US State Plane, 11-1, E-4, E-6
user-defined transformations, E-5
WGS84, 11-1, E-1, E-2
Coordinate System Editor, 11-10
buttons, 11-10
editing, 11-10
Coordinate System Manager, 11-9
copying
transformation file, 11-5
creating
transformation file, 11-5
establishing a default path, 11-4
main screen, 11-2
transferring coordinate system, 11-8
coordinates
calculating, 6-6, C-15
reducing data to, 6-1
reduction results, 7-1
search rules, 6-6, 6-7
copying
coordinate system
transformation file, 11-5
creating
conversion, 9-4
coordinate system
transformation file, 11-5
field book, 4-2
project, 3-2
project backup file, 3-6
projects, 11-6
cross-section record, 8-59
curvature and refraction, 6-12

D

database, 8-1
see also *records*
deleting record, 8-2
exporting records guidelines, 8-2
inserting record, 8-2
overview of records, 8-2
using SDR search rules, 8-1
deleting
see also *removing*
duplicate point IDs in reduced coordinates, 5-6, 6-13, 7-6

E

editing, 5-1
see also *field books*
calculating STN/BKB records, 5-8
change record views, 5-8
coordinate system
transformation node, 11-14
Coordinate System Editor, 11-10
copy, 5-5
cut, 5-5
field book, 5-1
field values, 5-7
paste, 5-5
point IDs, 5-6
record, 5-2
undo, 5-4
ellipsoid, E-2
excluding points from output, 7-7
exiting ProLINK, 3-11
expanding records, 2-10, 2-11
expanding a branch, 2-12
expanding a level, 2-11
expanding all records in the database, 2-12
exporting
duplicate point conflict, 2-15, 7-6
files from disk, 7-8
raw data, 7-8
results, 7-8
rules for SDR format, 8-2
to an external device, 7-8
to an output file, 7-9

F

Field Book Editor, 2-4, 2-8, 3-1, 4-1, 4-2, 4-3, 5-1, 5-2
- deleting records, 5-22
- editing, 5-1, 5-2
- exporting raw data, 7-8
- inserting records, 5-18
- navigating tree structure, 2-9
- shortcut menus, 2-7, 5-4
- sizing columns, 2-13
- tree structures
  - accessing edit fields, 2-13
  - collapsing records, 2-10
  - expanding records, 2-10, 2-11
    - a branch, 2-12
    - a level, 2-11
    - all records in the database, 2-12

Field Book menu, 4-2, 4-3, 4-5
Field Book Settings, 4-1, 4-10, 5-6
field book usage, 7-3
field books, 4-1, 5-1
- deleting records, 5-1
- editing, 5-1
- exporting raw data, 7-8
- inserting records, 5-1
- making current, 4-3
- populating field books with files, 4-6
  - importing files from a local drive, 4-6
  - importing files from the hard drive, 4-7
  - receiving files from a device, 4-6, 4-7
- reduction mode, 2-15
- removing, 4-5
- renaming, 4-4
- settings, 4-10

fields, 1-3
file
- import, 4-7
- multiple files, 4-7
- type
  - *.BAK, 3-6
  - *.dir directory, 3-3, 3-7, 3-8
  - *.SPP, 3-7
  - *BAK, 3-6
  - *SPP, 3-3, 3-5, 3-6, 3-7, 3-8
  - PROLINK.INI, 3-6, B-1
- types
  - *.SSP, 11-5
  - *.XFM, 11-1, 11-2, E-1, E-5, E-6

File menu, 3-3, 3-4, 3-6, 3-10

G

geoid, E-3
glossary, G-1
GPS record, 8-17
- instrument, 8-18
- observation, 8-15
- position, 8-16
- projection, 8-43
- reduced, 8-19
- station, 8-21

H

hardware requirements, 2-1
header record, 8-23
helmert transformation
- see *transformation, helmert*

help
- accessing on-line, 2-24

horizontal angles, 6-10

I

icons, 2-4, 2-6, 3-3, 3-4
importing files, 4-7
- from a local drive, 4-6
- from the hard drive, 4-7
- import conversion, 4-8
- multiple files, 4-7, 4-9
- preferences, 2-15

including points in output, 7-7
installing ProLINK, 2-2
instrument record, 8-28

J

job record, 8-29
job settings, 6-11

K

key functionality, 1-3

L

latitude, 2-19
level record
elevation, 8-30
instrument, 8-30
observation, 8-31
offset, 8-33
station, 8-33
longitude, 2-19

M

manual reduction mode, 6-2, 6-3
menus, 1-3
Edit menu, 2-5
Field Book menu, 2-5
File menu, 2-5
Help menu, 2-5
main menu, 2-5
Menu bar, 2-3
Options menu, 2-5
Point menu, 2-5
View menu, 2-5
Window menu, 2-5
modifying
see also *editing*
moving a project, 3-8

N

new project, 3-2
note record, 8-34
correction parameters, 8-35
individual distance measurements from a multi-distance observation, 8-36
offset observation, 8-36
resection calculation, 8-37
roading, 8-37
set collection procedure, 8-37
setting out road surface, 8-38
showing area calculation, 8-35
time stamp, 8-39
tolerance error message, 8-38
topography, 8-38
traverse calculations, 8-39

O

observations
SDR search rules, 6-7
views, 6-7
position (POS), 5-14, C-6
offset record, 8-33
on-line help
accessing, 2-24
opening an existing project, 3-4
orientation, 2-20
orthometric height, E-3
output, 7-8
exporting (send) to an external device, 7-8
exporting to an output file format, 7-9
field book, 7-3
field book usage
all field books, 7-4
combination, 7-5
current field book, 7-4
point usage, 7-6
excluding points, 7-7
including points, 7-7
viewing results in Reduced Coordinate View, 7-1

P

parabolic vertical curve record, 8-42
plane curvature correction, 6-13
point
duplicate, 5-6, 6-13, 7-6
exclude from output, 7-7
include in output, 7-7
modifying ID, 5-6
raw point ID, 5-6
reduced point ID, 6-5
renumbering per field book, 5-6
show/hide excluded points, 7-7
populating field books with files, 4-6
POS, 5-14, C-6
POS record, 6-7, C-4

position record, 8-43
PowerSET total station
  card size, D-1
  memory card, D-3
  storing data files, D-1
PPM correction, 6-10
preferences
  calculate station, 2-15, 5-8
  export duplicate point conflict, 2-15
  field book reduction mode, 2-15
    automatic, 2-15
    manual, 2-15
  import records, 2-15
  saving defaults, 2-14
printing, 2-21
  printer setup, 2-23
  setting parameters, 2-23
prism constant, 6-10
project, 2-3, 2-9, 3-1
  abandoning changes, 3-11
  closing, 3-10
    abandoning changes, 3-10
    saving changes, 3-10
    saving changes while opening or creating another project, 3-10
  creating, 3-2, 4-2, 11-5, 11-6
    project directory, 3-3, 3-7, 3-8
    project file, 3-3, 3-7, 3-8
  making a snapshot copy, 3-7
  moving, 3-8
  opening, 3-4
  renaming, 3-8, 4-4
  reopening, 3-4
  saving, 3-5
    abandoning changes, 3-6
  updating backup file, 3-6
ProLINK, 1-1
  basic operations, 2-1
  exiting, 3-11
  hardware requirments, 2-1
  installing, 2-2
  main screen, 2-3
    Field Book Editor, 2-4, 2-8
    menu bar, 2-3
    Reduced Coordinate View, 2-4, 2-8
    status bar, 2-4
    title bar, 2-3
    toolbar, 2-4
  menu structure, 2-5
  printing, 2-21
  security device, 2-1
  shortcut keys, 1-4, 2-8
  shortcut menus, 2-7
  software requirements, 2-1
  using the toolbar, 2-6
  views, 2-8
ProLINK COMMS, 2-2
ProLINK database, 5-1, 5-2, 8-1

R

raw point ID, 6-13
receiving files, 4-6
  assessing transmission problems, 10-12
records, 8-9
  collapsing, 2-10
  converting OBS to POS, C-15
  deleting, 5-22
    general rules, 5-22
  derivation code, 8-9
  editing, 5-2, 5-4
  expanding, 2-10, 2-11
  import preferences, 2-15
  inserting, 5-18
    general rules, 5-19
  search logic, 6-6
  type, 8-9
    ANT HT, 8-9
    APPLY SUPER, 8-9
    ATMOS, 8-10
    BKB, 2-15, 8-11
      calculate, 5-8, 6-9
    CIRCULAR VC, 8-12
    COL, 8-13
    DEFINE SUPER, 8-13
    GOBS, 6-7, 8-15
    GPOS, 8-16
    GPS, 8-17
    GPS INSTR, 8-18
    GPS PROJ, 8-43
    GRED, 8-19
    GROBS, 8-14

GSTN, 6-6, 8-21
HEADER, 8-23
HORZ ADJ, 8-24
HORZ ALIGN, 8-25
HORZ ARC, 8-25
HORZ POINT, 8-26
HORZ SPIRAL, 8-26
HORZ STRAIGHT, 8-27
INSTR, 8-28
JOB, 8-29
LEVEL ELEVATION, 8-30
LEVEL INSTR, 8-30
LEVEL OBSERVATION, 8-31
LEVEL OFFSET, 8-33
LEVEL STATION, 8-33
MC, 6-7
NOTE, 8-34
NOTE AR, 8-35
NOTE CP, 8-35
NOTE MD, 8-36
NOTE OS, 8-36
NOTE RO, 8-37
NOTE RS, 8-37
NOTE SC, 8-37
NOTE SS, 8-38
NOTE TL, 8-38
NOTE TP, 8-38
NOTE TS, 8-39
NOTE TV, 8-39
OBS, 6-7, C-15
OBS F1, 8-40
OBS F2, 8-41
OBS MC, 8-41, C-3
PARABOLIC VC, 8-42
POS, 6-6, 8-43, C-15
RCHK, 8-44
RED, 6-7, 8-45, C-3
ROAD NAME, 8-47
RPOS, 8-47
RSTN, 8-48
SCALE, 8-49
SET, 8-49
STN, 2-15, 6-6, 8-50
  calculate, 5-8, 6-9, 8-50
TEMP, 8-51
TEMP-ELEMENT, 8-53
TEMP-GRADE/DIST, 8-52
TEMP-OFS/HDIFF, 8-52
TEMP-SIDESLOPE, 8-54
TRGT HT, 8-54
VERT ADJ, 8-55
VERT ALIGN, 8-56
XSEC, 8-59
Reduced Coordinate View, 2-4, 2-8, 3-1, 5-4, 7-1
  duplicate points, 2-15, 7-6
  exclude points from output, 7-7
  exporting results, 7-8
  field book usage, 7-3
  field descriptions, 7-2
  hide/show excluded points, 7-7
  include points in output, 7-7
  sizing columns, 2-13
Reduced Coordinates View, 7-1
reduced point ID, 6-13
reduction, 6-1, 6-6, 6-9
  field book settings, 6-9
    duplicate IDs in reduced coordinates, 6-13
      raw point ID, 6-13
      reduced point ID, 6-13
    helmert transformation parameters, 6-18
      calculating from manually entered coordinates, 6-21
      calculating from project coordinates, 6-25
      entering parameters, 6-20
      understanding the calculation of transformation parameters, 6-30
    job settings, 6-11
      atmospheric corrections, 6-12
      curvature and refraction, 6-12
      including elevations, 6-13
      plane curvature correction, 6-13
      scale factor, 6-12
      sea level corrections, 6-12
    reduction settings, 6-9
      adjusting PPM correction, 6-10
      adjusting prism constsnt, 6-10
      applying transformation parameters, 6-11
      horizontal angles, 6-10
      transformation, 6-11
    saving defaults, 6-17
  SDR search rules, 6-6
    understanding the search rules, 6-7

using coordinate search logic, 6-6
understanding processes, 6-1
multiple field book reduction, 6-4
duplicate point IDs, 6-5
selecting a processing mode, 6-4
viewing results for multiple field books, 6-4
reduction mode, 6-2
automatic, 6-2, 6-3
manual, 6-2, 6-3
reduction mode, 6-2
reduction settings, 6-9
removing
coordinate system
transformation node, 11-16
coordinate system definition, 11-9
field book, 4-5
point from output, 7-7
record from field book, 5-22
guidelines, 5-22
renaming
conversion, 9-10
coordinate system, 11-11
field books, 4-4
points, 6-5, 7-6
projects, 3-8
renumbering IDs, 6-15
reopening a project, 3-4
resolving duplicate point IDs across multiple field books, 6-5
results
field book usage, 7-3
all field books, 7-4
combination, 7-5
current field book, 7-4
generating output
exporting to an external device, 7-8
exporting to an output file, 7-9
output
generating output, 7-8
point usage, 7-6
excluding points from output, 7-7
including points in output, 7-7
showing excluded points, 7-7
viewing results in Reduced Coordinate View, 7-1

S

saving
defaults, 6-17
project, 3-5
scale factor, 6-12
SDR search rules, 4-9, 5-1, 6-6
sea level corrections, 6-12
security device, 2-2
set of observations record, 8-49
SETC total station, D-1
card size, D-1
memory card, D-2
orientation, D-2
record types, D-2
SETC memory card, D-1
storing data files, D-1
SETCII total station
card size, D-1
memory card, D-2
record types, D-2
shortcut keys, 1-4, 2-8
shortcut menus, 2-7
showing excluded points, 7-7
software requirements, 2-1
Sokkia Technical Support, 1-5
station record
calculate, 2-15, 5-8
status bar, 2-4
storing
database records, 8-9
survey data, 1-1
search logic, 6-6
search rules, 6-7
understanding SDR database records, 8-9
system messages, A-1
understanding, 2-24

T

target height, 2-17
technical support, 1-5
timestamp, 8-39
title bar, 2-3
tolerances, 8-38
toolbar, 2-4, 2-6

topography
note records, 8-38
transferring
coordinate system, 11-8
transformation parameters, 6-18, 6-19, 6-20
calculating, 6-30
calculating from entered parameters, 6-20
calculating from project's coordinates, 6-25
calculating manually entered coordinates, 6-21
Transformation reduction view
Datum, 5-13, C-4
GPOS, 5-13, C-4
POS, 5-13, C-4
transformation, helmert, 6-11, 6-18
applying to field book, 6-9
calculating from entered parameters, 6-20
calculating from manullay entered coordinates, 6-21
calculating from project's coordinates, 6-25
setting parameters, 6-20
understanding calculation of transformation parameters, 6-30
tree structures, 5-1
managing, 2-9
moving within, 2-9

U

unit formats, 2-15
angle units, 2-18
degree format, 2-18
unit, 2-18
general settings, 2-17
antenna/target height, 2-17
coordinate order, 2-17
distance unit, 2-17
pressure units, 2-17
show distance suffix, 2-17
show separators, 2-17
temperature unit, 2-17
latitude and longitude, 2-19
direction symbol, 2-19
format, 2-19
precision, 2-19
show direction, 2-19
orientation, 2-20
azimuth (north zero), 2-20
azimuth (south zero), 2-20
degree format, 2-20
quad bearing, 2-20
unit, 2-20
roading, 2-21
grades, 2-21
stationing, 2-21
updating a project's backup file, 3-6

V

vertical adjustment record, 8-55
vertical alignment record, 8-56
vertical point record, 8-57
viewing raw data, 5-1
viewing results for multiple field books, 6-4
views, 2-8
Field Book Editor, 2-8, 5-1
Reduced Coordinates View, 2-8, 7-1

W

WGS84, 11-1, E-1, E-2

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