Reliance
Office User Guide

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Introduction

Reliance field asset management tools provide managers with reliable, accurate positioning for more cost-effective control over their assets. Ashtech's superior technology offers software that is easier to use and positional accuracy down to the centimeter level for the first time in a GIS mapping system.

The Reliance System

The Reliance system utilizes the Global Positioning System (GPS) to tag positions of field assets with extensive feature and attribute information. These feature positions and attributes are made available in formats that allow you to easily update GIS databases. The Reliance system comes in three packages differentiated by the level of accuracy they can achieve.

The Ashtech Reliance Submeter™ package comprises of a GPS receiver capable of providing submeter accuracy, a backpack, a GPS antenna, interconnecting cables, handheld controller with data collection software for the field, and Reliance software for the office.

The Ashtech Reliance Decimeter™ package includes the same equipment as the standard package, except that its GPS receiver is capable of providing one to two decimeter accuracy.

The Ashtech Reliance Precision package includes the same equipment as the standard package, except the receiver provides 1-3 centimeter accuracy for point features after 30 minutes of stationary occupation. It provides 1-3 decimeter accuracy for all other features.

The difference between these systems is that the Submeter GPS receiver logs only L1 C/A code phase measurements. For the Decimeter product, the GPS receiver logs both L1 C/A code and carrier phase data. The Precision System™ also logs code and carrier data, but in such a way that special post-processing software can provide point feature accuracy in the centimeter range.

Main Components

Reliance is a Windows software application used to determine accurate geographic positions of a number of features, assign attributes for these features, and export these features to several well-known GIS Software packages. Reliance provides the ability to view and filter feature and attribute data before exporting.

Reliance field systems centers around an SCA-12™ GPS receiver and a handheld controller, to gather GPS data for features of interest in the field and tag the features with

appropriate attribute values. This system utilizes Feature Files pre-defined using Reliance. The Feature File is a hierarchical structure of features, attributes, and attribute values defined by the user prior to the field session. Feature files provide five levels of data:

1. Feature types:
   - points
   - lines
   - areas
2. Feature names such as:
   - pole
   - road
   - lake
3. Attribute names such as:
   - height
   - weight
   - species
4. Attribute values:
   - alphanumeric
   - numeric
   - menus
5. Attribute submenus:

   Allowing user to further describe the condition of your feature.

Advantages

Automatic Base File Download From The Internet

Reliance provides the ability to automatically download base files from Internet CORS sites.

Compatibility

Reliance offers compatibility with other GIS software packages from manufacturer's such as Autodesk, E.S.R.I, Intergraph and MapInfo.

Batch Processing

Reliance provides the ability to transfer, process, and export project data automatically.

Join Files/Interpolation

The Join Files feature allows you to concatenate several consecutive Base Station files into one file.

The Interpolation feature (for RINEX data files) allows you to create a new RINEX O-file with a faster data interval. For example, this program will help you to match the 30-second Reference Station data from the CORS sites to your 2-second Rover data files by creating a 2-second Base file.

Types of Reliance Surveying

The Reliance system is very versatile, cost effective tool that allow several levels of accuracy during a single surveying session. The following tables list the different requirements, possible applications, and published accuracies.

Table 1.1: Reliance Requirements

Submeter	Decimeter	Precision
• Corresponding epoch between base and rover • Minimum of 5 satellites common between base and remote continuously tracked for at least 5 minutes. • less than 500km baseline • PDOP < 6	• P option installed in SCA-12 • Corresponding epoch between base & rover. • Minimum of 5 satellites common between base and remote continuously tracked for at least 15 minutes. • Baselines less than 100km • PDOP < 3.5	• P & V options installed in the SCA-12 • Minimum of 5 satellites common between base and remote, continuously tracked for at least 30 minutes. • Static occupation of point for prescribed time period. • Less than 10 km baseline. • PDOP less than 3.5

Table 1.2: Reliance System Applications

Submeter	Decimeter	Precision

• Utility mapping (power poles)
• Road signs
• Lamp poles
• Fire Hydrants, man hole covers, water mains
• Parks and recreation assets (picnic tables, benches, grills)
• Wetland and forest management
• Crop scouting, weed management
• Lease boundaries (not legally binding)
	• Projects with specifications requiring better than 50 cm control including:
	  • Utility mapping (power poles)
	  • Road signs
	  • Lamp poles
	  • Fire Hydrants, man hole covers, water mains
	  • Parks and recreation assets (picnic tables, benches, grills)
	  • Wetland and forest management
	  • Crop scouting, weed management
	  • Lease boundaries (not legally binding)
	• Updating existing maps to higher level of accuracy or larger scale
	• Registration of map to known published control points
		• Single points with high level of accuracy.

Table 1.3: Reliance System Accuracies

Submeter	Decimeter	Precision
• 35 cm, static or dynamic, 67% probability, post-processed • 75 cm, static or dynamic, 95% probability, post-processed • 45 cm, 2-sec RTCM latency, 67% probability, real-time correction	• 10 cm, tracking satellites for 20 min, static or dynamic, 67% probability, post-processed • 15 cm, tracking satellites for 20 min, static or dynamic, 95% probability, post-processed • 15 cm, tracking satellites for 10 min, static or dynamic, 67% probability, post-processed • 30 cm, tracking satellites for 10 min, static or dynamic, 95% probability, post-processed • 15 cm, tracking satellites for 10 min, static or dynamic, 67% probability, post-processed • 35 cm, instantaneous, static or dynamic, 67% probability, post-processed • 75 cm, instantaneous, static or dynamic, 95% probability, post-processed • 45 cm, 2-sec RTCM latency, 67% probability, real-time correction	• 1 cm, static only, tracking satellites for > 30 min, 67% probability • 1.5 cm, static only, tracking satellites for > 30 min, 95% probability • Same accuracy as Decimeter system for occupation times <30 minutes or when moving • 45 cm, 2-sec RTCM latency, 67% probability, real-time correction

Reliance Submeter System

The Reliance Submeter System provides the most economical method of asset position acquisition with the fewest limitations on field methods. Submeter positions can be achieved static or moving, for baselines up to 500 km provided only that 5 common satellites are tracked by base and rover for at least 5 min, and PDOP is less than 6.0. Submeter RTCM differential operation can also easily be achieved by the use of a private, or public reference station.

The Reliance Submeter System offers optimal economy of field collection time while producing position accuracies adequate for most GIS and FAM applications.

Reliance Decimeter System

For applications where the accuracy requirements are 1-3 decimeters, Reliance offers the total feature asset management (FAM) solution. The Reliance Decimeter system uses the same carrier phase measurements as the centimeter system, yet important differences allow a static or moving rover to attain results as good as one decimeter in as little as 20 minutes.

In order to achieve results as good as one decimeter for baselines up to 100 km, only a few basic criteria must be met. At least five satellites common to base and remote receivers must be tracked continuously for a minimum of 20 minutes. The PDOP index should remain below 3.5 for the duration the session. Rover antenna setup, and reference coordinate errors add directly to resulting position errors, but with careful field procedures they can be virtually eliminated. If satellite obstruction becomes a problem at some point during feature collection, field operatives can simply continue work in the open for 20 minutes to ensure the continuity of decimeter results.

Without sacrificing accuracy for economy the Reliance Decimeter Processor provides the best of both worlds for precision GIS and FAM applications.

Reliance Precision System

In order to achieve accuracies as good as 1 cm, the Reliance Processor resolves inherent ambiguities in the carrier phase measurements made by the receiver. This sensitive process requires that certain minimum criteria be met. At least five satellites common to base and remote receivers must be tracked continuously for a minimum of 30 minutes. The base and rover receivers must remain static (no movement) for the duration of each cm occupancy. The geometric distribution of the satellites (measured by PDOP index) should remain below 3.5 for the duration of each cm occupancy. Due to distance dependent errors which adversely affect Reliance Processor’s ability to resolve carrier phase ambiguities, cm processed points should be no farther than 10 km from the base location.

In spite of Reliance's ability to provide precise positions of logged features, external error sources such as faulty antenna height measurement or centering can significantly degrade results. Errors in measured rover antenna position and errors in the known base station coordinates apply directly to position uncertainty of logged features. With careful field procedures, errors resulting from these sources can be practically eliminated. If for some reason, the Reliance Processor cannot successfully resolve measurement ambiguities, the system will automatically revert to Decimeter processed results.

Although data collection for cm processing can be time consuming, it is very rewarding in terms of accuracy. There simply is no faster, easier way to achieve precise, GIS ready asset positioning than with Reliance CM Processor.

Office Software Installation

Reliance uses **Install Shield** to load files on your computer. The following section describes the **Install Shield** process.

To install Reliance:

1. Insert the **Reliance CD 1** into your CD-ROM drive.

Exit all Windows applications before installing Reliance.

2. From the Windows File Manager, select **Run** from the **File** menu. The **Run** dialog box opens (Figure 1.1).

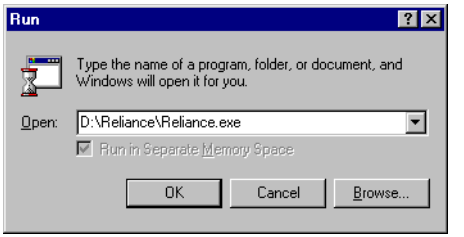

Figure 1.1: Run Dialog Box

3. Browse for the file SETUP.EXE in the DISK1 directory on the CD-ROM.

4. Click **OK** to launch the **Reliance** Install Shield. Once Install Shield determines your computer is properly configured for installation, the software license agreement opens (Figure 1.2).

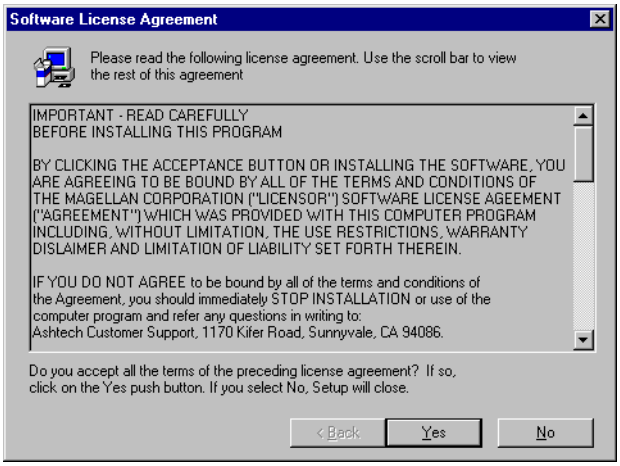

Figure 1.2: Software License Agreement

5. Read the text thoroughly before accepting.
6. Click **Yes**.

   The **Welcome** window opens (Figure 1.3).

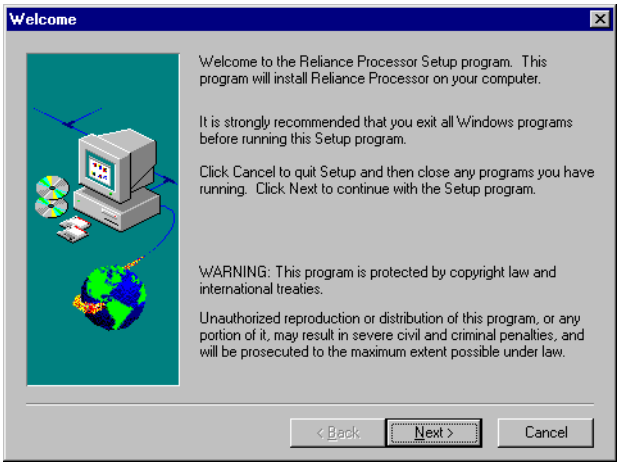

Figure 1.3: Welcome window

7. Read the text thoroughly before accepting and click **Next**.

   The **Choose Destination Location** window opens (Figure 1.4).

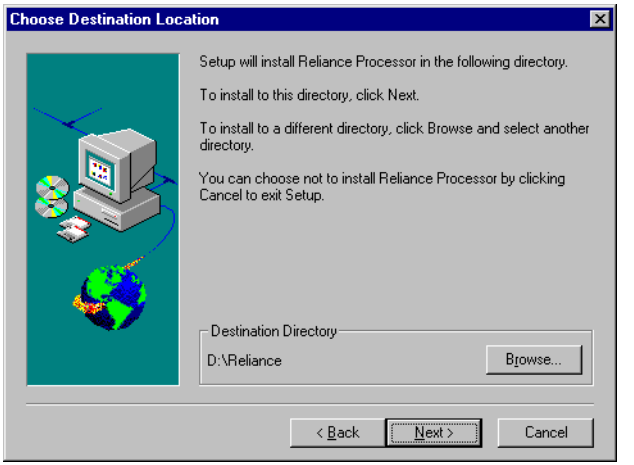

Figure 1.4: Choose Destination Location window

8. The default directory is `c:\Reliance`. Click **OK** to install **Reliance** into this directory.
9. If you wish to install **Reliance** into a different directory, click **Browse**. The **Choose Directory** window opens (Figure 1.5).

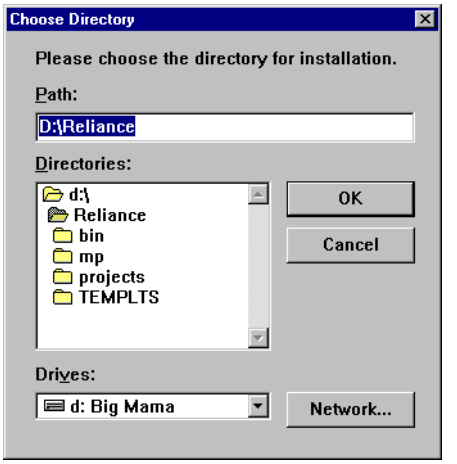

Figure 1.5: Choose Directory window

10. Select a target directory and click **OK**. The **Choose Directory** window closes, and the **Choose Destination Directory** window opens with the selected directory listed.

    If you typed in a directory that does not exist, a dialog box opens asking if you wish to create the directory. Click **Yes** to create the directory.

11. Click **Next**.

    The **Options Selection** window opens (Figure 1.6).

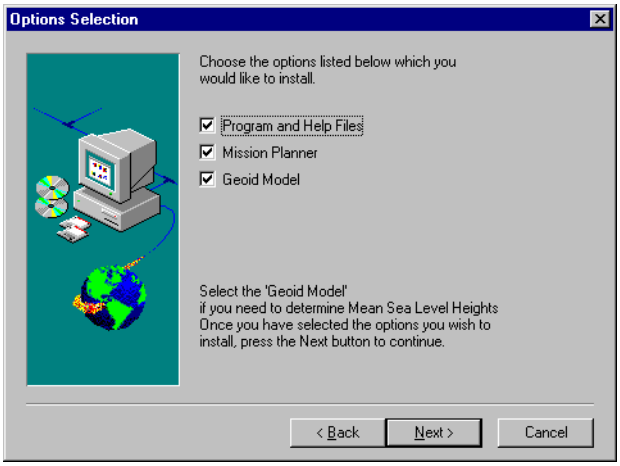

Figure 1.6: Options window

12. Select which files you wish to have installed on your computer.

    If you select **Geoid Model**, Install Shield requires considerable additional hard disk space in order to copy all the files.

13. Click **Next** once you have selected the files for installation.

    The **Start Copying Files** window opens (Figure 1.7).

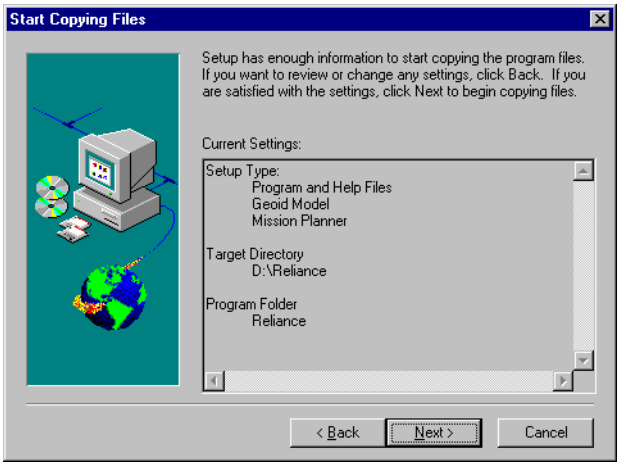

Figure 1.7: Start Copying Files window

14. Should you find the settings appropriate, click **Next**. If you wish to change any of them, click **Back**.

    The Installation process begins installing **Reliance** into the specified directory. The **Installation Progress** dialogs open displaying the percentage of the installation completed (Figure 1.8).

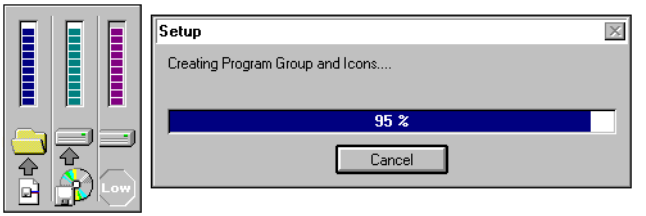

Figure 1.8: Installation Progress Dialogs

The status bar in the Setup dialog box indicates the progress of the total installation, and Table 1.4 defines the progress icons.

Table 1.4: Installation Progress Icons

Icon	Definition
	This progress bar indicates the percentage the current file has completed in loading.
	This progress bar indicates the percentage the current disk has completed in loading.
	This progress bar indicates the percentage of disk space available on the Target Drive.

15. Install Shield creates a **Reliance** program group and places **Reliance**, **UnInstall Reliance**, **Reliance Help**, **Mission Planning** and **Readme** icons into it.

    If you are running Windows95 or Windows NT 4.0, **Install Shield** creates a **Reliance** menu item in the **Program** menu accessible by clicking **Start**.

16. Upon completion of installation, **Install Shield** opens an Information dialog box informing you that the setup is complete.

17. Before running **Reliance**, your computer must reboot. Verify that the **Yes, I want to restart my computer** radio button is checked, and click **Finish**.

    After you computer has rebooted, **Reliance** is ready to run.

Double click on the "Release Notes" icon in the Reliance program group. This file contains the latest release information and changes that have not been captured in this User's Guide.

In addition to the Reliance and the Read Me File, the installation includes a DOS program called Mission Planning. For information about Mission Planning and Survey planning, refer to Chapter 2, **Planning a Field Session**.

Planning a Field Session

Background

Taking the time to properly plan a Field Session is just as important as data quality. A well-planned session saves valuable field time and costs while getting the most accurate results. A poorly planned session costs time and money and results could be poor enough that you'll have to revisit the mapped features. Although this chapter covers the planning required to utilize the Reliance system, it does not cover the specifics for planning mapping mechanics.

When planning a GPS/GIS Field Session, the first thing you need to do is ask yourself the following questions:

1. What is the proper "target" accuracy needed to provide a sufficient confidence that the accuracy specified for the project will be achieved.
2. How great is the benefit of positional accuracy versus the cost of data collection.
3. What is the positional accuracy requirement of the GIS or BASE map for which the data is being collected?
4. What is the scale of the final map product; at a scale of 1:24000, the dot on this letter "i" is over 5 meters wide.

Your answers to these questions will determine the time and effort needed to complete the survey.

For example, if you want to update telephone pole locations on an existing map at a scale of 1:10,000 so repair men can go out and easily locate poles, the Reliance Submeter system can provide the solution. If the telephone poles are typically 50m apart, submeter accuracy positioning of the poles would be more than adequate. Workers could revisit pole locations by means of RTCM waypoint navigation or large scale map products generated by the GIS.

If you are planning to map property corners for legal or tax purposes Reliance precision system can meet your needs with proper planning and field procedures accuracies of 1.5cm can be achieved. Refer to "Types of Reliance Surveying" on page 3 for more application examples.

After determining the level of accuracy required, planning for the field work to begin should include these additional steps:

- Reconnaissance and observation scheduling
- Create the project file
- Create the feature and waypoint files
- Transfer the feature and waypoint files to the handheld controller.

GPS Availability

Completing pre-survey reconnaissance and scheduling data collection are important steps for efficient use of project resources.

GPS survey planning requires verifying satellite coverage ensure accurate results. GPS availability is particularly important with the Reliance Precision System which requires 30 minutes of continual tracking of at least six satellites. If the number of satellites drops below six, the results may be compromised.

We provided *Mission Planning* as a means of determining satellite availability. *Mission Planning* gives you the ability to determine visibility and dilution of precision (PDOP, HDOP, etc.) using information transmitted from the satellites. An easy to use interface allows you to determine the best “time window” of availability for data collection anywhere on earth.

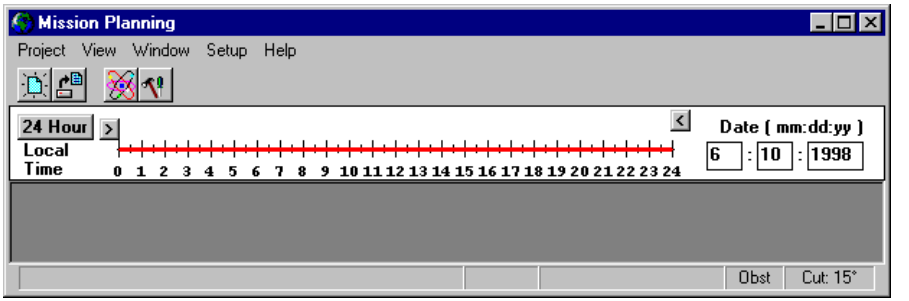

Figure 2.1: Mission Planning Program (main window)

Refer to the *Mission Planning* manual for details.

Project Creation

Once the reconnaissance and planning has been completed, creating the project and downloading associated files into the handheld can begin. Chapter 4, **Getting Started** provides information necessary for:

- creating a project
- creating a feature file
- defining attributes
- setting up a project
- transferring files to the handheld
- transferring data from a receiver
- loading a project
- viewing data
- filtering data
- processing data
- exporting data

Conducting the Survey

After you have created a project, established a feature file with attributes, and transferred this file to the handheld controller, you can travel to the survey area and begin data collection. We have provided a *Reliance Field Operations Manual* which describes the following:

- the accuracy levels of the three Reliance systems
- system setup
- logging feature and attribute data
- waypoint navigation
- troubleshooting

Refer to this manual when conducting field operations.

Data Analysis

Having successfully conducted a field operation using Reliance, you are now ready to analyze the data. This activity consists of the following tasks:

- transferring files
- loading files into sessions
- viewing data in a Time view and/or in a Map view
- data manipulation
  - filtering
  - hiding/unhiding
  - joining/unjoining
  - processing
  - exporting

Chapter 4, **Getting Started** describes these tasks in their basic form. Subsequent chapters explain each task in greater detail.

Final Thoughts

The Reliance system is a powerful tool for productivity. Reliance, like any tool, requires its users to invest time to learn proper operating procedures. Learning procedures for both office and field systems will ensure that productivity and quality assurance are maximized.

Fundamentals

A Brief Description of *Reliance*

Reliance is a field-to-finish Field Asset Management (FAM) tool that runs on the Microsoft Windows95/NT operating system. Reliance automates your FAM tasks and provides robust data that can be loaded into the front end of database, CAD, and GIS programs. Reliance combines the following functions into one asset management tool:

- FAM database management system
- Geographical data viewer
- Chronological data viewer
- GPS post-processor
- Project data filter utility
- Map System coordinate transformation
- GIS export utility

Understanding the functional components of Reliance will help you use the system effectively.

Features and Attributes

Reliance names categories of assets encountered in the field, called “features,” classify observable properties of these features, called “attributes.” A feature can be any physical object, such as the following:

- fire hydrant
- tree
- road
- lake

An attribute can be any physical property associated with a feature, such as the following:

- color
- dimension
- condition
- weight

For example, a field worker encounters a *Utility Pole* (a feature) that has an *estimated height* (a numeric attribute) to be entered as a *number* (an attribute type) and which bears a *Serial Number* (a second attribute) that is *alpha-numeric* text (its attribute type). The field worker estimates the utility pole to be nine meters high, determines the serial number as

"120438," and enters both of these attribute values into the handheld controller. The GPS receiver automatically records the position of the utility pole so the worker can concentrate on describing the pole.

Prior the the field sessions, a project manager determines the feature names and types (point, line, and area), plus the attribute names and types (alpha, numeric, and menu), in the **Feature Editor**. They are entered and stored in a hierarchical database called the **Feature File**. The name of each feature, and its associated attributes, are defined in the course of building a Feature File.

Reliance Work Units

There are three work units within Reliance:

- Projects
- Sessions
- Occupancies

The primary work unit is the Project. There can be several projects going at once, each in various stages of completion, but the Reliance only one project is allowed to be active at any one time. You save projects to your hard disk using unique names for each, and open one at a time as you need to work on it.

The secondary work unit is the Session. A session begins when a field worker turns on the Rover receiver and ends when the field worker turns the receiver off. Sessions may overlap in time when there are several field workers taking data simultaneously for the same project.

The tertiary work unit is the Occupancy. A field worker *occupies* a site when recording an asset's attribute data. A session will consist of many occupancies and there will be an occupancy associated with each asset recorded.

Waypoints

Reliance also allows the creation of geographic markers, *Waypoints*, prior to field work. A waypoint can be any location significant to field operations:

- starting point
- ending point
- route points
- observation points

The waypoint list is saved in a file called the **Waypoint File**. This file will be transferred to the handheld in order to perform waypoint navigation in the field.

Data Transfer Utility

Reliance performs the following types of data transfer:

- **Uploading** - Connect a field handheld system controller to Reliance prior to a trip to transfer the **Waypoint** and **Feature Files** into the controller. This provides information for the field workers so they know what to look for, where to look, and what to record.
- **Downloading** - The SCA-12 connects to Reliance after field operations to download the gathered rover data.
- **Remote Data Transfer** - Reliance provides a direct link to a selected remote communications application for transfer of data over a modem from a field site. This application is selected in the Directories dialog in the Project Setup Tab dialog.

Graphical Viewer/Editors

Reliance provides two methods for viewing and editing gathered data:

- Geographically
- Chronologically

The Geographical view (Map View) displays the gathered data in the form of a map with symbols of the gathered data shown at each position. The Chronological view (or Time View) shows the features, their order of acquisition, and the duration of the position measurement in a bar-graph form.

The data displayed in these views comprises all the data in the project and may contain many sessions. If a project contains several sessions (for information about sessions, refer to “Reliance Work Units” on page 18), Reliance displays all of these views. Reliance also provides the ability to edit various aspects of the gathered data. Data may be viewed and edited at any time. Reliance’s Time View makes no distinction between unprocessed and processed data other than that the accuracy estimates of the recorded positions greatly increases after processing.

Reliance provides a Project Data Filter Utility which filters the data displayed in these views. This lets you view just point features, just features recorded on a particular day or by a particular worker, just houses and roads, all line features but only trees taller than 10 meters, etc.

Project Data Filter Utility

The Data Filter selectively hides or displays a project's sessions and features from the two graphical viewers. Data may also be filtered by session, processing status and a feature's attribute value (refer to Chapter 9, **Filtering Collected Data**).

Data that is hidden by a filter setting does not appear in Map View, Time View, or exported.

The Data Filter utility, Map View, and Time View interact. The project's filter setting may be repeatedly modified while the Map View or Time View are open. The filter also controls what features and/or sessions are exported from the project.

When you wish to retain a filter for future use you may save it to a file which can be loaded at any time with any project - this way the same filter may be applied to many projects. The flexibility of the filter is its ability to filter by feature, session, or attribute value.

GPS Post-Processor

The GPS Post-Processor analyzes the gathered data and computes accurate positions. Data correction is often necessary because the stand-alone GPS position data is accurate to only 100 meters about 95% of the time. Reliance utilizes proprietary algorithms to provide optimum accuracy of 10 centimeters (0.1 meters). This is accomplished through the use of a second receiver recording data at a known location during the time of field data gathering. This second receiver is known as a *Reference Station*. Reliance applies these algorithms to the GPS Reference Station data and performs *Differential Correction.* Differential Correction is the process of analyzing and comparing the autonomous base position with its known position. The difference can be applied to any rover within about 500 km.

Alternatively, Radio Technical Commission for Maritime Services (RTCM) corrections may be used to eliminate the need for post-processing when accuracy to less than one meter is all that is required. RTCM is a method by which the Rover data is corrected at the time of collection. This is accomplished by the Rover GPS receiver obtaining correction data transmitted from a GPS base station by radio modem. This type of data does not require additional processing as long as the accuracy requirement is only around one meter.

In some applications, 100 meter accuracy is sufficient for the task at hand. In this case, the rover data does not require differential correction (you might still want to process it in Map View for quality control). For improved accuracy, unprocessed stationary point positions are averaged (lines and areas are not averaged).

Export Utility

An Export Utility is provided so you may transfer data database, CAD, and GIS applications. Reliance can export feature positions and descriptions in a variety of data formats that are read by software programs offered by such companies as Autodesk, E.S.R.I, Intergraph, MapInfo, Microsoft, and others. Virtually all GIS applications accept one of these formats.

Batch Processing

Reliance now has the ability to perform the following tasks automatically:

- Data Transfer
- Processing
- Exporting

Refer to Chapter 12, **Batch Processing** for instructions on how to perform these tasks automatically.

Project Setup Utility

Project directories automatically set up when Reliance is installed. The defaults are set up for storage and retrieval of various data files. For example:

- Rover files are stored in a **ROVER** subdirectory
- Base station GPS data files are stored in a **BASE** subdirectory

While this is the default installation of the Reliance software, organization of your projects can be done any way you like. Reliance **Project Setup** allows you to put the various project data files anywhere you choose.

Reliance Data Files

Reliance utilizes several distinct data file types. Each plays its role in providing convenient Field Asset Management with highly reliable position accuracy.

Project Files

Project files contain all project specific information such as the window positions, session definitions, and so forth. These text files (***.PRJ**) are in Microsoft Windows

INI file format. They may be viewed and edited manually without loss of data; however, it is best to maintain them in Reliance.

Filter Files

Filter files specify the features to display or hide in a project. These files are created/ modified in the Filter Data dialog box and loaded when the project is open. Any filter file works with any project. Reliance filters have a safeguard when a feature is not contained in the filter file: it is hidden during exporting (it will pass through the filter).

Feature Files

Features are classifications for field assets (“Utility Pole,” “Traffic Sign,” “Fence,” “Lake,” etc.). Attributes are definitions of what is to be recorded about a feature (“Height,” “Condition,” “Type of Sign,” “Surface Material,” etc.). Each feature generally has several attributes. Attributes are assigned to the feature they are associated with and cannot be shared between features (a utility pole may have a condition and a fence may have a condition, but these two “Conditions” are separate, one associated with “Utility Pole” and one associated with “Fence”).

Waypoint Files

Waypoint files contain a list of positions to which you wish to navigate to while in the field. Waypoints are created in the Map View, saved to a file, uploaded to the handheld controller for use. Waypoint files may be shared across sessions, and even projects.

Rover Files

Though the Rover File appears to be a single file stored in the GPS receiver, it is actually divided into three parts within Reliance and stored in the default Rover Data Directory:

- GPS Data
- Feature Data
- Ephemeris Data

These three files are not directly referenced by Reliance. Their names are stored in a “stub” file. The person performing the upload refers to the Rover File by the session name assigned to it during field operations the stub file name is the same as the session name.

GPS Data Files

The major share of GPS receiver data is stored in the GPS Data File. The GPS Data File (also called the “B-File”) is the raw GPS satellite measurement data for the

period of time the receiver was switched on. The number of entries in the GPS Data File is determined by the length of time the GPS receiver was on and the time intervals at which data was recorded

Alternatively, this file may be a C-File, which contains position-only data. The C-File is useful because it has less data storage requirements in the GPS receiver. However, since this file cannot be diferentially corrected by Reliance, if you want better than 100m accuracy these positions should be corrected in real-time using and RTCM differential radio link.

Feature Data File

The Feature Data File (also called the “D-File”) contains a list of all the features and their attributes that were recorded in the field. Its contents, coupled with the GPS Data File (B-File) and the Ephemeris Data File (E-File), provide data essential to the proper operation of Reliance.

Ephemeris Data File

The Ephemeris Data file (also called the “E-File”) contains information on GPS satellites’ positions in space for the period of time the rover receiver is switched on and is automatically collected by the receiver. GPS is fundamentally a system of time measurements, By multiplying the speed of radio waves by the amount of time between transmission by the satellites as receptacle the receiver, you can calculate the distance between the satellites and the receiver. You need the ephemeris data information on the satellite positions in space to determine the receiver’s position on earth.

Reference Station Files

Like rover data, base station data also consists of a GPS data file (B-File), and an ephemeris data file (E-File) to which is added the reference station data file. Reference station data files must be collected from a stationary GPS receiver at a known location. During GPS post-processing, Reliance uses the Rover’s GPS and ephemeris data together with the reference station’s GPS and ephemeris data to correct the positions of features. The site identification name for the base must not be changed during a session.

Almanac Files

The Almanac file is broadcast by GPS satellites to the receiver and then downloaded to the Mission Planning program (Mission Planning uses almanac data) to calculate the positions of GPS satellites and their health. Using the Mission Planning program, you can plan the best time to log features that have limited satellite visibility, such as features between buildings. The almanac data changes from time to time as satellites become unhealthy, as satellites are moved to new orbits, or when new satellites are

launched and put into service. Mission Planning displays a warning message if the almanac file is more than 60 days old. If this occurs, download a new almanac file from the receiver to the Reliance/MP directory.

Change Files

A Change file creates automatically when a session loads. The Change file contains feature, attribute, and position information from the rover files which allows Reliance to quickly load, display, filter, and export the collected data. If the session is processed, the feature positions in the Change file are updated with the differentially corrected positions. There is only one Change file per session.

More on Features and Attributes

Features

Each feature in the Feature file is defined by two database fields:

- Name
- Type
  - Point
  - Line
  - Area

You choose from among these three feature types each time you define a new feature. Features cannot be changed in the handheld controller. They are defined in Reliance operations and uploaded to the handheld system controller prior to field work. Field operations may add points, lines, and areas from a “generic” list of standard entities in case they which to map a feature not defined in the Feature file. For example, the field worker may decide it is important to map in a road that is not on his map. If he believes that all roads were already mapped, there may not be a “road” feature in the Feature file. By selecting, “Generic Line”, the field worker can give it an attribute name such as “unpaved road, or single lane road.”

Attributes

Each attribute is defined by two database fields: Type and Name. An attribute type may be one of the following:

- **Alpha**-text entered by field worker into handheld
- **Numeric**-numbers entered by field worker into handheld
- **Menu**-a special attribute that produces a selection menu, or “pick-list” in the handheld.

The types and names for attributes cannot be changed in the handheld controller. They are defined in the Feature Editor module within Reliance and uploaded to the handheld prior to field work. Values specified as attributes may be entered into the handheld controller in the field. In fact, the objective of field work is to enter the values specified as an attribute whenever a field worker encounters an asset.

Every failure file contains three default features:

- Generic Point
- Generic Line
- Generic Area

They cannot be changed or deleted and should be used to record unanticipated objects in the field. Each of these three default features has two default attributes: a text attribute named “Description” and a numeric attribute named “Value.” These default attributes cannot be changed, added to, or deleted. Any new features created do not have default attributes preassigned to them and are fully editable.

Reliance provides the flexibility to add new features and attributes and to delete existing features and attributes from the Feature File at any time in the office. You can also edit feature name, attribute names, the size of text attributes, the range and measurement units of numeric attributes, the structure of menu attributes, and even the data type of attributes.

The design of the Feature File database is entirely up to you, but as can be inferred from the preceding paragraph, poorly structured, vague, or restrictive feature and attribute definitions can be very hard to work with. To obtain the greatest flexibility, features should not be overly specific. For example, rather than defining four features:

- Barbed Wire On Wood Fence
- Barbed Wire On Steel Fence
- Split Rail Fence
- Wood Lath On Steel Fence

You might consider naming the feature “Fence” and assigning to it an attribute named “Composition.” Composition could then have four menu items:

- Barbed Wire On Wood
- Barbed Wire On Steel
- Split Rail
- Wood Lath On Steel

The field worker would choose from these menu items. The objective is to minimize the size of selection lists by adding hierarchical menu choices so that data entry is simplified. On the other hand, it would not be reasonable to expect a whale survey crew to have to select “Whale” from a menu each time one is encountered when that is the only type of animal they are collecting data on. Feature File design is an ongoing enterprise and Reliance has the tools you need to make the job as painless as possible, provided an upfront logical design is incorporated.

When designing Feature Files, there are few points to keep in mind:

1. Comprehensiveness (do these features and attributes adequately describe the assets?)
2. Ease of use (can feature lists be condensed or be presented more compactly as menus?)
3. Lifetime (is this a set of features for a single project or could it evolve into a standard to be used for a long time to come?)

You may wish to make backups of old Feature Files for use as templates in the future and document their structures and objectives for ready reference.

Getting Started

This chapter explains how to use the Reliance Processor's basic features with step-by-step procedures. These procedures use the example files shipped with Reliance so you are not required to gather any data. For information concerning transfer of data into the Reliance, refer to Chapter 6, **Data Collection**.

Starting Reliance

Start the Reliance by double clicking the Reliance icon in the Program Manager. When Reliance begins, it occupies the entire screen and contains the following:

- The Reliance Title
- A system menu bar across the top
- A **Minimize/Maximize** button pair at the upper right

Figure 4.1: Reliance Main Window

The Reliance defaults to a maximized window and clicking on the minimize button restores Reliance to its normal state: a small window across the top of the screen. When this is done, applications behind Reliance are accessible (you do not need to switch between applications to access them). This is referred to as an *unbounded* interface. Reliance windows appear as separate applications running side by side; however, they are actually all part of the same application. This interface yields organizational benefits and provides simple access to other applications while Reliance is running. For example, you might run your Windows GIS program alongside Reliance so you can verify your exported results. Choose the display with which you feel most comfortable. The Reliance automatically saves your choice for future projects.

Creating a Project

1. With Reliance running, select New from the Project menu. The choices on this menu deal with project creation and maintenance.
2. The **Create a New Reliance Project** dialog opens (Figure 4.2).

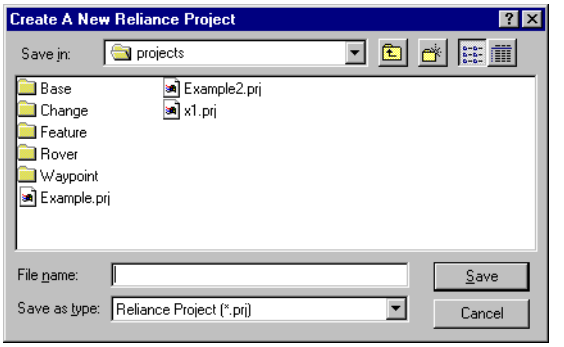

Figure 4.2: Create a New Reliance Project dialog

3. Enter the name of new project into the File Name: field. For this example, enter **MAINST.PRJ** (Main Street) as a sample project.

The selected directory is the project's directory installed by the Reliance installer and the file type defaults to the Reliance Project (*.PRJ) file type. You do not need to enter the ".PRJ" extension.

4. Click **OK**.

5. Reliance creates the project file and displays the Project Control tool box (Figure 4.3), and lists the project file name in the Reliance title bar.

Figure 4.3: Project Control Tool Box

Creating a Feature File

Before gathering data, you must know what kinds of features you are intending to record. You must define the feature attributes (the information about a feature you wish to obtain) in a Feature File and subsequently transfer that file to the handheld controller before entering the field.

In the Main Street project, you will record information about the objects along the sidewalk of a fictional Main Street. You need to create several features to accomplish this. The kinds of features you might find along a typical downtown sidewalk are trees, light poles, power poles, newspaper dispensers, various parking zones, sewer drains, fire hydrants, bus stops, and public parking areas. Others might include the businesses along the sidewalk, driveways, and so forth. You need to know what features you want to gather before going into the field. In this example we create three features:

- Light poles
- Parking zones
- Public parking lots

These features were chosen because they illustrate the three types of features:

- Points-light poles
- Lines-the sidewalk itself and the parking zones alongside
- Areas-the public parking lots

Feature File creating and editing are accomplished in the Feature Editor. In this example begin by creating the feature file **MAINST.FDF**.

1. Click the **Feature Editor** button in the Project Control tool box to open the Feature Editor (Figure 4.4).

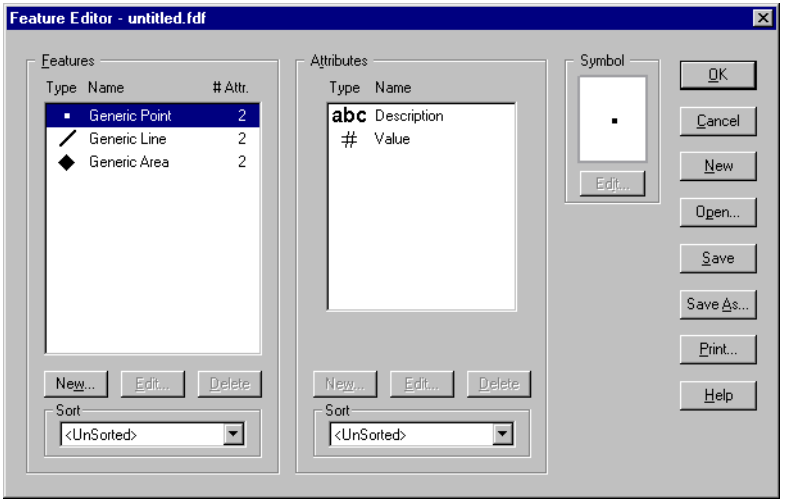

Figure 4.4: Feature Editor

2. In the Features listbox there are three “Generic” features. Use these features to enter data about unanticipated objects during the field trip.

   The title bar indicates the file **UNTITLED.FDF** is open or a new feature file has been created in memory but not yet saved to the disk. There are two group boxes titled “Features” and “Attributes”. Features are created and edited in the “Features” group and their attributes are created and edited in the “Attributes” group.

3. To create the first feature, click **New...** in the Features group to open the Feature dialog (Figure 4.5).

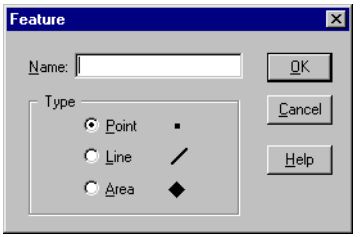

Figure 4.5: Feature dialog

4. Enter the name of the first feature, light pole, in the Name field. Use the option buttons to indicate a type of feature. A light pole feature is a point feature because it occupies a single point.
5. Click **OK** to close the dialog and return to the Feature Editor.

   This screen shows a new feature added to the features list box with no attributes, because attribute definitions have not been assigned.
6. Highlight light pole and click **New...** in the Attributes group to open the New Attribute dialog (Figure 4.6).

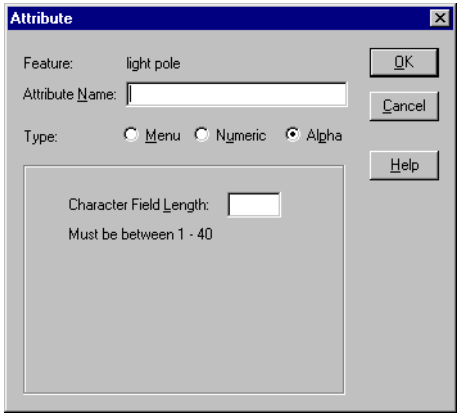

Figure 4.6: Attribute-Alpha dialog

The New Attribute dialog takes one of three forms depending upon the setting of the **Type** option buttons as shown by the illustrations above. They all have an attribute name field and the three option buttons.

- **Alpha** option button - this attribute accepts alpha-numeric text. The amount of alpha-numeric characters that may be entered in the field is specified in the "character field length" edit field (up to 40 characters are allowed).
- **Numeric** option button - this attribute accepts numeric values between the **Minimum** and **Maximum** ranges specified and defaults to the value specified in the Default Value field. Numeric data display precision is controlled by the number of decimals set in the Digits After Decimal Point

field and is in the unit of measure selected in the “Measurement Unit” combo box.

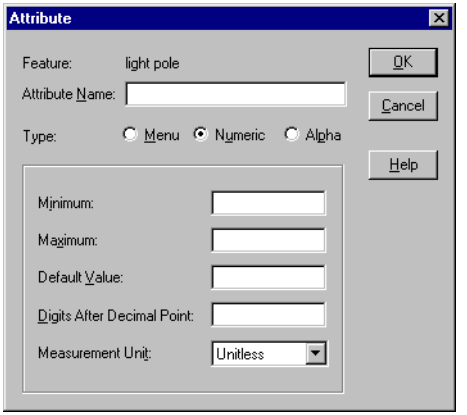

Figure 4.7: Attribute-Numeric dialog

- **Menu** option button (Figure 4.8) - this attribute provides the list of choices specified in the **Menu Items** list. Menu items may also have a submenu which is specified by highlighting the menu item to contain the submenu and clicking the **Submenu** button. The default menu or submenu item can be selected by highlighting the item and clicking **Set Default**.

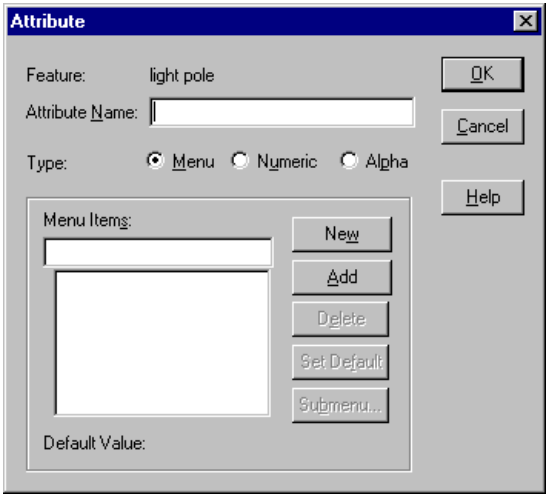

Figure 4.8: Attribute-Menu dialog

A Point Feature

In this example, we want to record the light pole's condition, its illumination type and an estimated height. This means we need to add three new attributes to the Light Pole feature.

Creating Line or Area feature is accomplished in the same manner as a Point feature.

Alpha Attributes

The light pole's condition is going to be a subjective evaluation of the overall condition of the light pole so it should be of type Alpha.

1. Specify the attribute name by typing `Condition` in the `Attribute Name` field.
2. Click **Alpha** to select the attribute.
3. Specify the maximum amount of text for the Condition attribute. Enter `40` in the **Character Field Length** edit field.
4. Click **OK**, to add the attribute to the Light Pole feature and to return to the Feature Editor.

Numeric Attributes

Now create a numeric attribute for the "light pole" feature called "Height".

1. Click **New...** in the Attribute area.
2. Enter `Height` in the Attribute Name field and click on the **Numeric** radio button.
3. Enter a **Minimum** value of `0` and a **Maximum** value of `50`. The **Maximum** value is the largest valid value expected for the height of a light pole.
4. Enter `30` in the **Default Value** field (assume that most of the light poles are about `30` feet high).
5. Enter `1` in the **Digits After Decimal Place** field (it is probable that the field worker's estimation accuracy is no better than 1/10 foot).
6. Select **US Survey Foot** in the **Measurement Units** drop down list box.
7. Click **OK** to add this attribute to the Light Pole feature and to return to the Feature Editor.

Menu Attributes

Now create another attribute for the Light Pole feature to indicate the type of illumination used in the light pole.

1. Click **New...** in the Attribute area.

2. Enter `Illumination Type` in the **Attribute Name** field, and click **Menu**.
3. In the Menu Items field, type `Mercury Vapor` and press **<Enter>** (or click **Add**).
4. Add the menu items `Filament` and `Fluorescent` to the Menu Items list.
5. When complete, click on the **Mercury Vapor** item in the "Menu Items" list and click **Set Default**.

   This action identifies "Mercury Vapor" as the default value for this menu attribute.
6. Click **OK** to return to the Feature Editor.

Feature Symbol Selection

To select a symbol for the Light Pole feature:

1. In the **Symbol** area, click Edit to display the Feature Symbol dialog (Figure 4.9).

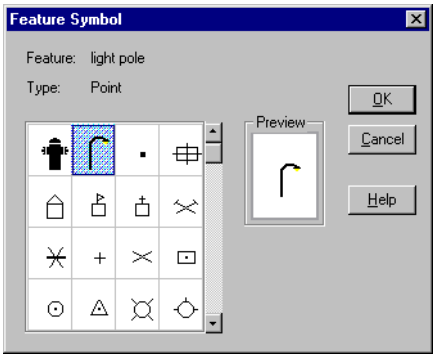

Figure 4.9: Feature Symbol dialog

2. Select a symbol to represent the Light Pole feature by scrolling the list box, and clicking on the symbol.

You can add more point feature icons to the ones displayed in Figure 4.9. Simply put the *.ICO files you have in the RELIANCE\BIN\ICONS directory.

3. Click **OK** to return to the Feature Editor dialog.

Symbols for line features include different line types and colors. Symbols for area features include different fill patterns and colors.

The Light Pole feature is fully defined. It has three attributes:

- Condition an alpha-numeric field
- Height a numeric field)
- Illumination Type (a menu)
- light pole symbol for map display.

You can use any number and combination of attributes and attribute types, to define a feature.

Completing the Process

1. Try creating the following three features by repeating the steps outlined previously:
   - Sidewalk: a line feature
   - Parking Zone: a line feature
   - Parking Lot: an area feature

   Think about the types of information (attributes) you want to obtain for these features in the field and add them as attributes.
2. When you have completed setting up the remaining features, save the feature file by clicking **Save** and entering the name of this new feature file.
3. Click **OK** to save the file and return to the Feature Editor.

Copying Features and Attributes

Existing features, along with all their attributes, can be copied to a new feature by performing the following steps:

1. In the Features listbox of the Feature Editor dialog, highlight the feature you wish to copy and press <CTRL-C>.
2. Press <CTRL-V> to create a new feature. You will be prompted to enter a new feature name, since duplicate names are not allowed.

You can also copy attributes from one feature to another by performing the following steps:

1. In the Attributes listbox of the Feature Editor dialog, highlight the attribute from the feature you wish to copy and press <CTRL-C>.
2. Highlight the feature in the Features listbox you wish to add the attribute to.
3. Highlight an attribute in the Attributes listbox, for the feature you wish to add the attribute to and press <CTRL-V>.

You can also delete features and attributes by highlighting them and pressing <CTRL-X>.

Sorting Features and Attributes

In order to organize the features and attributes lists you have created, several types of sorting are available in the Feature Editor dialog.

Table 4.1: Feature and Attribute Sorting

Method	Description
By Name	Ascending or Descending - alphabetically.
By Type	Ascending or Descending: 1. Features: point, line, area 2. Attributes: alpha, numeric, menu

You can always revert back to your original unsorted lists of features and attributes by choosing "<Unsorted>".

Setting up the Project

After creating a feature file, a session must be created in the project. A session is the field data recorded from the time the receiver is turned on to when the receiver is turned off. In this example, we expect to only have one session.

Begin setting up the project as follows:

1. Click the **Project Setup** icon button in the Project Control tool box to open the Project Setup (Figure 4.10).

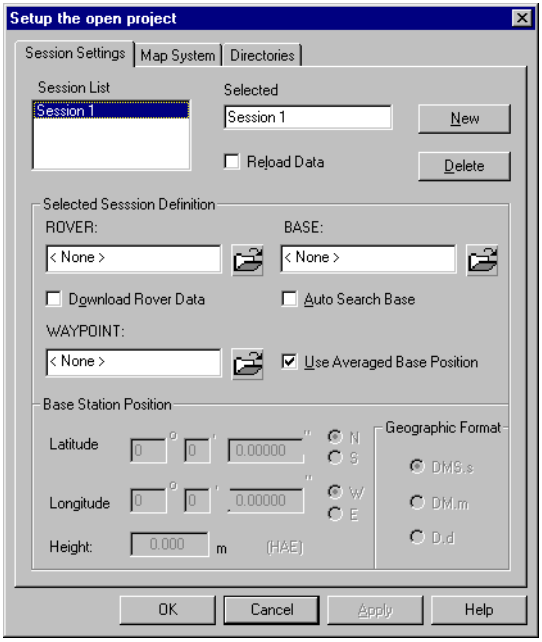

Figure 4.10: Set up the open project window

Session 1 is automatically created. This is done automatically when a new project is created.

2. Rename Session 1 Main Street by clicking in the **Selected** field and typing the new name.
3. Select Rover and Base Files after field operations are complete and the data has been downloaded to the PC.
4. Click on the Map System tab to choose the desired map system.
5. Click back on the session settings tab and enter the position of the base station.
6. Click OK and the project data will load.

Transferring Waypoint and Feature Files to the Handheld Computer

For the Main Street project we will transfer the feature file created to the handheld computer for use in our field data collection.

1. Connect the handheld controller to the PC using the supplied cable.
2. Click on the **Transfer Data** icon button in the Project Control tool box to open the Transfer Data dialog.

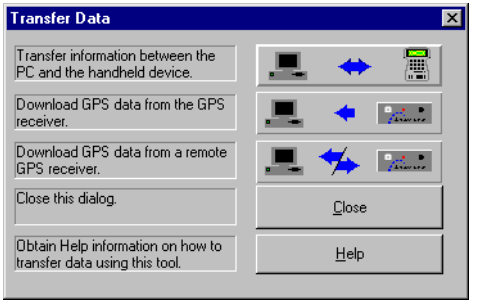

Figure 4.11: Transfer Data dialog

3. Click on the **Transfer information between the PC and the handheld device** button.
4. Click **OK** a dialog opens asking if the handheld is connected and HCOM is running (Figure 4.12).

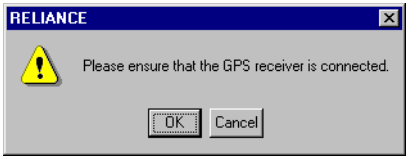

Figure 4.12: HCOM dialog

The lowest COM port that is inactive is utilized by Reliance the first time that a transfer is initiated. Once the user sets the COM port, the setting is saved and is used for each subsequent transfer operation. Verify HCOM is running on the handheld, and click OK.

If HCOM is not running, type HCOM at the handheld controller Dos prompt.

5. The Transfer Data Between PC and Handheld window (Figure 4.13) opens.

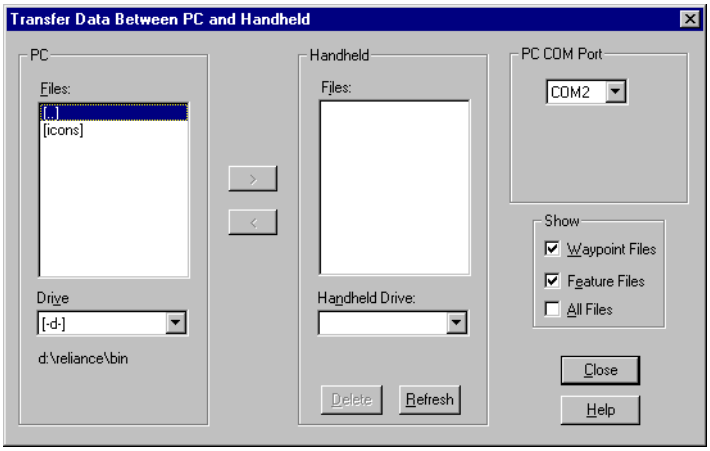

Figure 4.13: Handheld Transfer dialog

6. Click the boxes in the Show pane for the types of files to display in the PC and Handheld.
7. Highlight the file to transfer (either from the PC or Handheld listboxes).
8. Click the directional arrow indicating the direction of transfer. Reliance transfers the selected files to or from the handheld.
9. Click **Close** to close the Handheld Transfer dialog.

Transferring Collected Data from a Receiver

Since the example does not involve actual data gathering and the receiver does not contain any GPS data to transfer, this operation will not be detailed here. For information concerning transfer of collected data from a receiver, refer to Chapter 7, **Transferring Field Data**.

Assume the data has been transferred from the GPS receiver to the Reliance and are ready to proceed to the next step, Loading a Sample Project.

Loading a Sample Project

A sample project has been included on the Reliance software installation disks. To open **EXAMPLE.PRJ**, perform the following steps:

1. Select open from the Project menu.
2. The Open File dialog opens (Figure 4.14).
3. Select the project called **EXAMPLE.PRJ**.

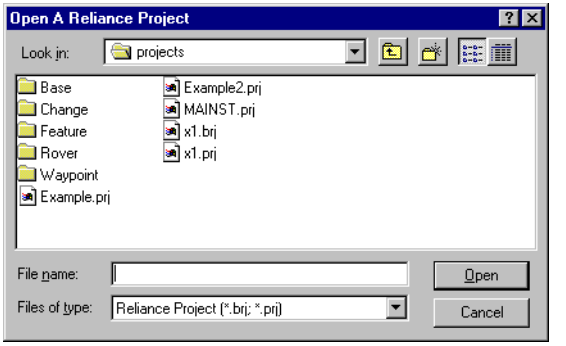

Figure 4.14: Open a Reliance Project dialog

4. Click **OK**.

The open Reliance Project dialog closes as the selected file.

Viewing Collected Data in Map View

Once **EXAMPLE.PRJ** is loaded, we can view the unprocessed data.

To examine the topographical data view, "Map View":

1. Select **Tools** from the Reliance Main Menu and click on the "Map View" menu item (you may also open Map View by selecting **View Data** from Project Control).

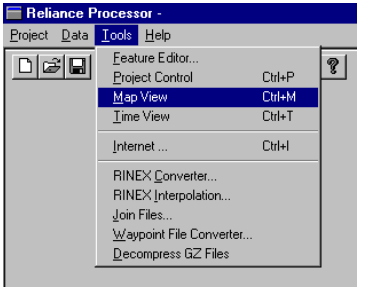

Figure 4.15: Map View Selection

The Map View window (Figure 4.16) opens and displays the collected data.

Map View may initially display positions that are not accurate because the GPS positions have not been updated by processing (also called Differential Correction).

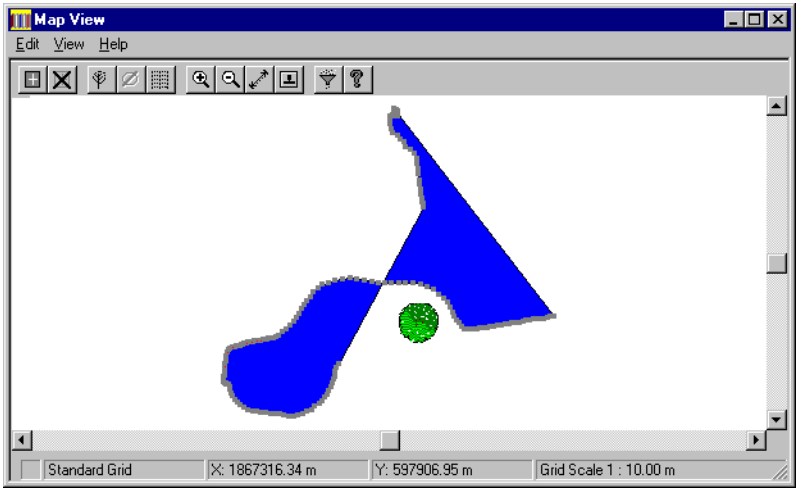

Figure 4.16: Map View Window

Figure 4.16 displays the features recorded on the example field trip. They are identified by the symbols specified in the Feature Editor where the feature file was created. Features are displayed as follows:

2. Uncheck Symbol in the View pull down menu. The tree feature symbol is now a gray dot: **Position Identifier**. It identifies the position of the point feature.
3. Click once on the position identifier for the tree feature.

   A red circle appears surrounding the position identifier indicating the feature is selected.
4. Double click on the position identifier. The Feature Information dialog (Figure 4.17) opens.

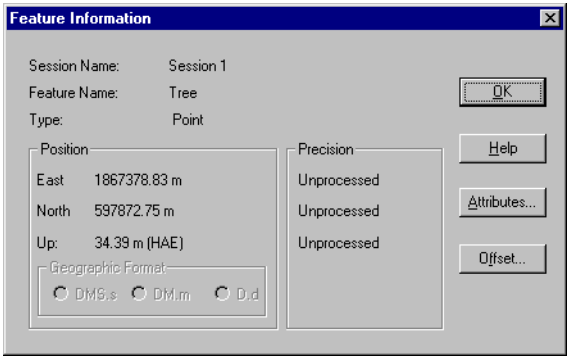

Figure 4.17: Feature Information dialog

The Feature Information dialog displays

- session name
- name and type of the feature.
- point-displays position and accuracy
- line-displays length
- area-displays the perimeter and area

The accuracy of a point is unavailable until the data has been processed.

5. Click **Attributes** to open the Feature Attributes dialog (Figure 4.18). This dialog is not available for base data files.

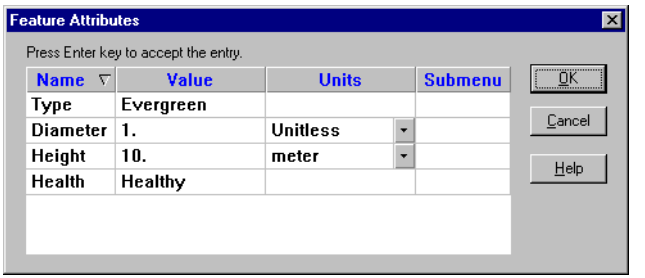

Figure 4.18: Feature Attributes dialog

The Feature Attributes dialog indicates the attributes of the feature recorded in the field. For example, a “tree” feature shows values entered for the following attribute names:

- Type
- Diameter
- Height
- Health

You can edit the attribute information in the Feature Attributes dialog. Highlight the value you wish to change, modify it, press the Return key, then press the OK button.

6. Click **OK** to return to the Feature Information dialog.
7. Click on **OK** or **Cancel** in the Feature Information dialog to return to the Map View Window.

Filtering Data

1. In the Map View window, select **Filter** from the **View** menu. The Project Data Filter dialog opens (Figure 4.19). Filter can also be selected from the View menu in Time View or Project Control.

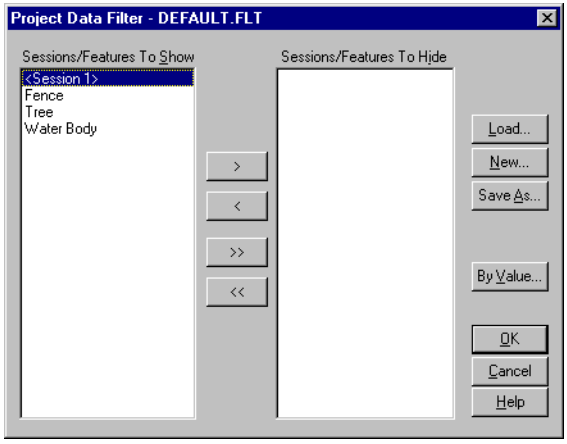

Figure 4.19: Project Data Filter dialog

Table 4.2 describes the components of the Project Data Filter dialog:

Table 4.2: Project Data Filter dialog

Name	Function
Session/Features to Show	Select item(s) to show when data is filtered.
Session/Feature to Hide	Select item(s) to hide when data is filtered.
• > or <	• Moves the highlighted item in one list to the other list. Double clicking an item will also move it.
• >> or <<	• Moves all the items in the one list to the other list.

If a session is in the Show list, all the features not in the Hide list are displayed in the Map View. If a session is in the Hide list, all its features will not be displayed in the Map View.

2. To hide everything but the tree feature.
   a. Move each feature to the **Hide** list box by double clicking on the item (or moving them all at once).
   b. Make sure Session 1 and "Tree" is still in the **Show** list box.
3. Click **OK** to accept the parameters and return to the Map View.

Viewing Collected Data Chronologically

Another way to view collected data is chronologically. In the **Time View**, feature occupations (the period of time for which a feature was logged) are shown in a bar graph display with the horizontal axis representing elapsed time increasing to the right, and the vertical axis showing the receiver which recorded the GPS data.

1. Select **Time View** from the **Tools menu** (Figure 4.20) (you can also open Time View by selecting **View Data** from Project Control).

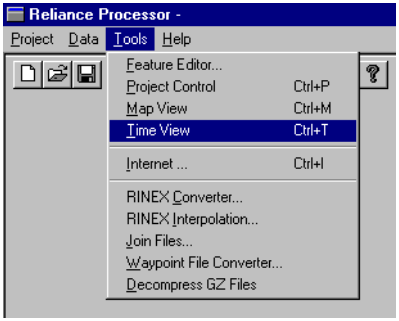

Figure 4.20: Time View Selection

The Time View window opens (Figure 4.21 Overview Mode, Figure 4.22 Receiver Mode).

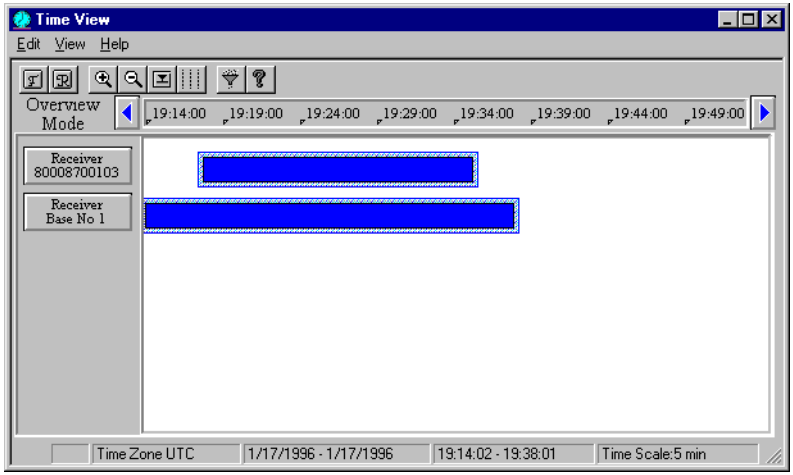

Figure 4.21: Time View Window-Overview Mode

In the Time View window, the collected features collected are represented by the time and duration of occupation as a bar for each feature.

You do not need to close the Map View window to display to Time View window. The two windows may be open at the same time.

2. Click on one of the bars and the color-coded features appear.

   The colored bands represent the actual time of occupation at the feature. Table 4.3 contains the meaning of the color bands.

Table 4.3: Color Meanings

Color	Meaning
Green	Point Features
Red	Line Features
Yellow	Area Features
Blue	Base Station

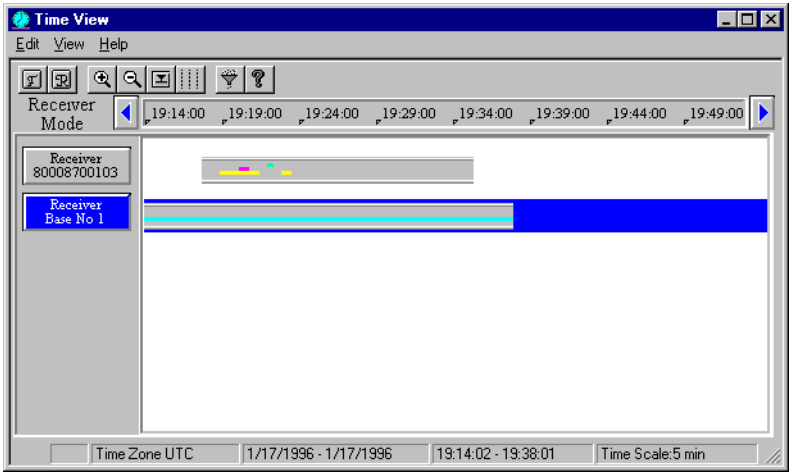

Figure 4.22: Time View Window-Receiver Mode

Overlapping bands indicate nested features. Sections of the bar that do not have any colored bands are Trajectory data, indicating that GPS data have been collected for that period of time, but no features were recorded. Trajectory data are not displayed in Map View or exported.

   To the left of the bar is a button with the name of the receiver. By default, the name of a receiver is its serial number but it can be assigned a familiar name such as “Field Worker 1”.

3. Select Receiver info from View Menu to open the Receiver Information dialog (Figure 4.23)

You can bring up receiver info this way, but it brings up a different dialog than is shown in Figure 4.23.

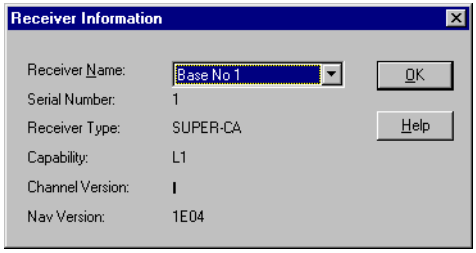

Figure 4.23: Receiver Information dialog

The receiver information dialog displays information about the receiver used to collect the data.

4. Click **OK** to return to the Time View window.
5. Double click on one of the time bands Feature Information dialog (Figure 4.24).

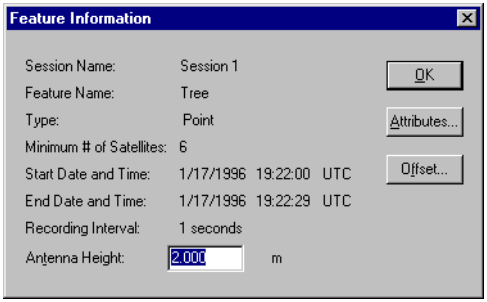

Figure 4.24: Feature Information dialog

The Feature Information dialog the information about the feature on which you double clicked is displayed. The fields adjacent to the “Start Date and Time” and “End Date and Time” labels indicate the actual occupancy information for that feature.

6. Click **Offset** to display the Offsets dialog for the Tree feature.

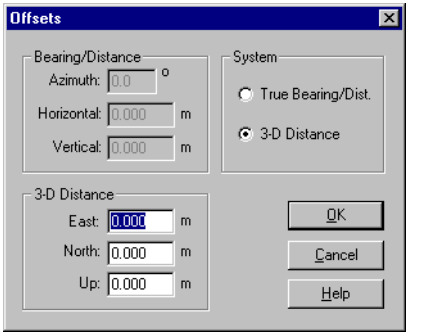

Figure 4.25: Offsets dialog

This dialog displays the offset information about the feature (if an offset was entered in the field). Offsets are used when a feature is in an inaccessible place. The distance to the feature can be determined in the same manner. For example, suppose we are recording sewer caps along our fictional street Main Street. If the sewer cap is located in the middle of a busy street, we could use offsets to record the feature safely from the sidewalk.

Offsets are also available for line and area features, but it is restricted to one offset per feature, and they are not editable.

7. Click **OK** to return to the Feature Information dialog.
8. Click **OK** to return to the Time View window.
9. Select Filter from the **View** menu to display the Project Data Filter dialog.
10. Highlight the "Tree" and click [>] to hide the tree.
11. Click **OK** to return to the Time View window.

    The point feature (green band) has disappeared. This is because the Tree feature is the only point feature in the data set and it has been hidden by the filter. The filter automatically updates the Time View and Map View windows.

Processing Collected Data

To this point, we have been examining unprocessed data. That is, the position of the features we collected are accurate within 100 meters. By processing collected data with the base station data as a reference, Reliance can obtain an optimum accuracy of about 0.1 meters.

To process collected data:

1. Click the **Process Data** button in the Project Control toolbox to open the Process Selection dialog (Figure 4.26).

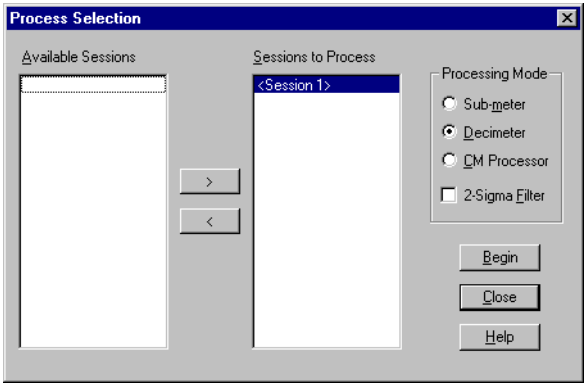

Figure 4.26: Process Selection dialog

   Two list boxes are provided in order to choose which session to process. The buttons between the two lists move the sessions back and forth, depending on which ones you want to process.

2. Choose Submeter, Decimeter, or CM Processor by clicking the corresponding radio button.
3. Click the 2-Sigma accuracy filter radio button if necessary.

   The 2-Sigma filter automatically calculates the standard deviation of a collection of positions that were recorded at a single point feature. They are automatically averaged. This filter deletes any of the positions that are more than two standard deviations away from the average position. The average position is then recalculated.
4. Click **Begin** to start processing data for the selected sessions.

The Processing Data dialog opens indicating the progress of the data processing.

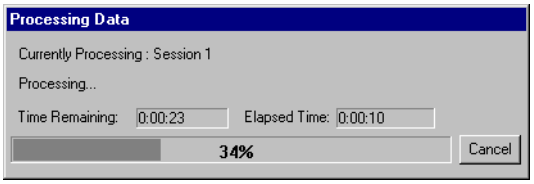

Figure 4.27: Processing Data dialog

After processing, the sessions processed are indicated with an asterisk (*).

5. Click on **CLOSE** and again open the Map View. The feature positions in Map View are updated (Figure 4.28).

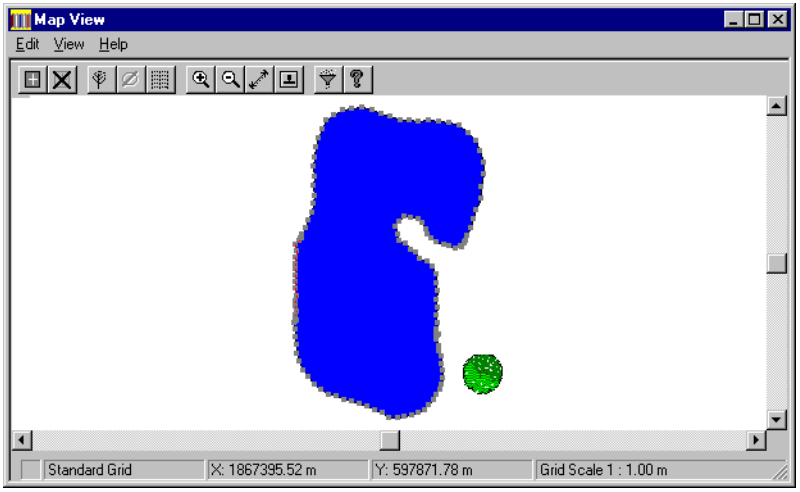

Figure 4.28: Map View With Processed Data

Approximate accuracies of the corrected point features are listed in the Feature Information dialog in Map View.

Exporting Collected Data to a GIS

Reliance exports and processed collected feature and attribute data to database, CAD, and GIS software applications, from such manufacturers as Autodesk, E.S.R.I., Intergraph, MapInfo, and Microsoft. Reliance provides this with its Export Data feature. To export collected data, perform the following steps:

1. Set the Project Data Filter to show only the features you want to export (refer to “Filtering Data” on page 43).
2. Click the **Export Data** button in the Project Control toolbox to open the **Export Data** dialog (Figure 4.29).

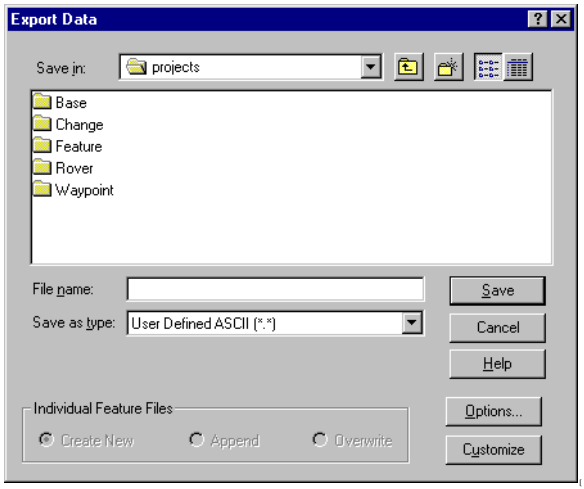

Figure 4.29: Export Data dialog

This screen is the same as the File Open dialog used to open the project with one important difference. The selection in the “Save File As Type” combo box determines the file format to which Reliance exports the data. The choice of file format depends upon the target application. For Autocad, choose from two file types (Binary and ASCII). For ArcView, choose “Shape.” For Intergraph, choose “Intergraph.” For Arc Info, select “Generate.” For Map Info, choose Map Info.

3. Select a format in the “Export Format” drop down list box and enter a file name in the **File Name** edit field (select a different drive and directory if necessary).

4. Click **Options** to open the Export Data Types dialog (Figure 4.30).

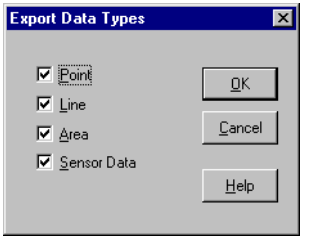

Figure 4.30: Export Data Types dialog

5. Select the data type(s) to export and click **OK**.
6. Click **OK** in the Export Data dialog to accept the parameters and begin exporting the data to a file of the selected format.
7. When the progress dialog reached 100%, you have successfully exported the data.
8. Start the target application and use the data you have exported from Reliance.

Setting Up a Project

This chapter explains how to setup a Reliance Processor project in preparation for field operations. These procedures are more detailed than those in Chapter 4, **Getting Started**.

Creating a New Project File

To create a new Reliance Processor Project:

Existing project may be opened by selecting Open**... from the** Project **menu.**

1. Select **New...** to create a new project.

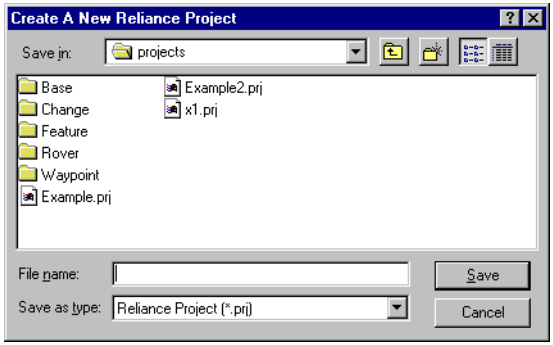

Figure 5.1: Create A New Reliance Processor Project dialog

2. Select a drive and a directory for the project files and enter in a name for the project file in the File Name field.

Project files have a ".PRJ" extension.

3. Click **OK** to accept the parameters and create the Project File.

Project Control Toolbox

The Project Control Toolbox (Figure 5.2) lists all main software functions as buttons. While the Project Control toolbox opens each time you open a project, you may close the toolbox by clicking on the close box. The project remains open.

Figure 5.2: Project Control

Table 5.1 describes the software functions of the Project Control Toolbox.

Table 5.1: Project Control Toolbox Functions

Function	Description
Project Setup	Brings up a tab dialog that allows you to: • Set up Sessions of Rover and Base Files • Set up the Map System and units • Set up the Default Directories and other miscellaneous items
Feature Editor	Allows you to set up the features and their attributes into a Feature File.
Transfer Data	Allows you to transfer data to and from Reliance to the Handheld and transfer data from the GPS receiver.
Filter Data	Allows you to filter collected data by Session, Feature Name, and/or Attribute Value.
View Data	Brings up two windows that allow you to see the collected features in a Time View and a Map View.
Process Data	Allows you to process the collected data in sub-meter, decimeter, or CM processor modes.
Export Data	Allows you to export the collected features to several popular GIS file formats.

Project Setup

Click the **Project Setup** icon button on Project Control to open the “Project Setup” dialog.

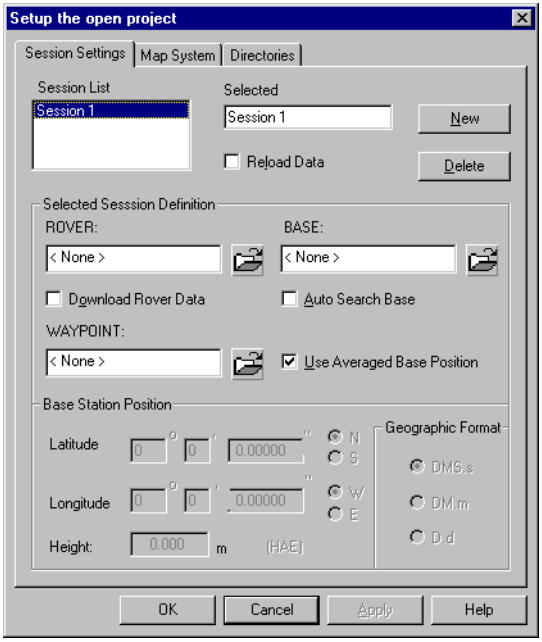

Figure 5.3: Project Setup dialog / Session Settings tab

The following procedure creates a new project.

Sessions

1. When the **Project Setup** dialog opens, the tab with Session Settings is displayed.

   An initial session titled “Session 1” appears in the “Defined Settings” list box and also in the “Name:” edit box. Additional sessions are created by clicking **New** (this adds a new entry into the “Sessions” list box titled “UnNamed001”).

2. Give the initial session a distinctive name by replacing “Session 1” in the “Name:” edit box.

Selected Sessions Definition

3. If you wish to download a rover file from your receiver, click on the Download Rover Data check box.

Before downloading rover files, make sure correct com ports are selected in "Settings" under the "Tool" dropdown menu.

This will inactivate the file name text box and a Receiver File Selection tab will appear.

If you download a rover file from your receiver, perform the following steps (otherwise continue with Step 4).

a. Click on the Receiver File Selection tab.

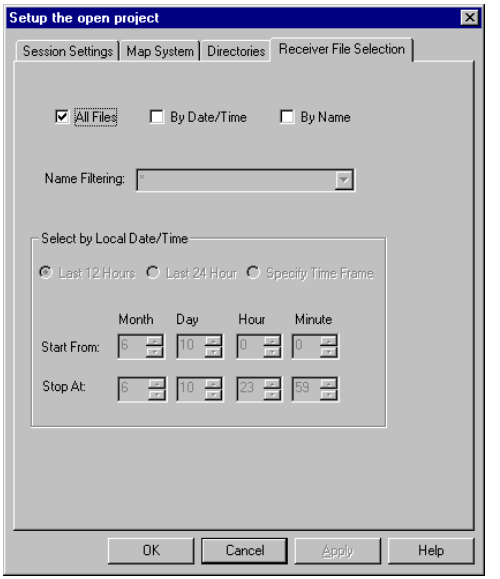

Figure 5.4: Project Setup dialog / Receiver File Selection tab

b. You can select files using four different methods:

Table 5.2: Receiver File Selection Methods

Method	Description		
All Files	All rover files would be downloaded		
Date/Time	Last 12 hours	Last 24 hours	Specify Time Frame

Table 5.2: Receiver File Selection Methods

Method	Description
Name	Rover files with specified name would be downloaded
Date/Time & Name	Rover files with specified name and within time frame would be downloaded

When you specify the Start and Stop times to download data, the files in the receiver that begin at a time between these two times will be downloaded.

c. Once you have selected the appropriate File Selection parameters, continue with the next step.

4. If you wish to select a rover file which already has been downloaded to a local drive, browse and select the appropriate file.

   The Rover File will be in the format of "*aaaaaaaa*.S*xx*".

   - *aaaaaaaa* is the session name you entered in the handheld computer
   - *xx* is a number between "00" and "99"

5. If you want Reliance to Auto Search a Base file, click on the Auto Search Base check box.

   Reliance searches for a Base File automatically by looking in all directories specified in the Base File Path section of the Directories dialog.

   This will inactivate the file name text box.

6. If you wish to select a Base file which already exists on a local drive, browse and select the appropriate file.

   The Base file will be in the format of "Bssssayy.ddd".

   - ssss is the four character site name of the base station
   - *a* is a letter
   - *yy* is the year
   - *ddd* is the day of the year

7. If you wish to select a Waypoint file which already exists on a local drive, browse and select the appropriate file. If you are creating a new Waypoint file, type in an appropriate name here.

Base Station Position

8. If you know the coordinates of the base station, specify these coordinates of the base station for which the Base File data was collected in the Map System being used (the default is WGS-84).

   You can enter these coordinates as degrees/minutes/seconds, degrees/minutes, or degrees by selecting the proper menu button on the display.

This is only available for Geographic display systems.

These coordinates will be used along with the data in the Base File by the Differential Correction processing technique to provide accurate positions for the features in the Rover File.

9. If you do not know the coordinates of the base station, check the **Use Averaged Base Position** checkbox. The Base Station Position fields will be inactive.

You should always attempt to use the exact base station coordinates. If you must use the averaged base position, the processing precision will not be guaranteed.

10. If you are auto-searching the CORS sites for Base files, you should check the **Use Average Base Position** checkbox. Reliance will automatically fill in the known position of the CORS site that is selected.

Map System

To select a map system and its parameters, click the **Map System** tab of the **Project Setup** dialog.

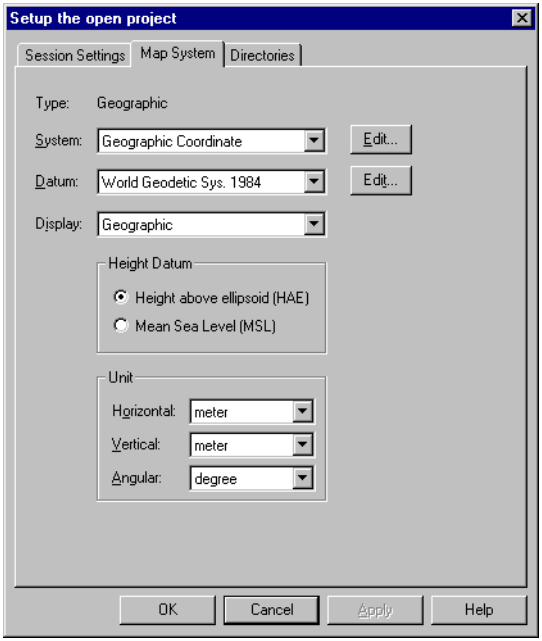

Figure 5.5: Project Setup dialog / Map System tab

Reliance defaults to a Map System of WGS84. If you need to change the system before entering the base position, click on the Map System tab.

11. Pick a map system appropriate to your project in the “System” dropdown list box.

    If you wish to create a new map system or to edit an existing map system, refer to Chapter 13, **Setting Up a Map System**.

12. Select a Datum or Zone from the dropdown list or choose “< Create New >” to define a new zone. The zones for predefined map systems are not editable, but the names of predefined systems can be changed.
13. Choose a display coordinate system, either Geographic, Standard, or Local Grid.

14. Choose the Height Datum either Height Above Ellipsoid (HAE) or Mean Sea Level (MSL).

By choosing MSL, the GEOID 96 model will automatically be used for data in North America. Otherwise, the OSU91, model will used. Also when choosing MSL, the height accuracies are labelled "N/A" after processing due to the limited knowledge of how accurate these model are.

15. The units that you want your position data to be displayed and exported in may be selected here as well. Choose from several different units including the following:
    - feet (both US Survey and International)
    - meters
    - degrees
    - radians

If you had to display a different Map System on the Map System tab, changing the Map System on this dialog will automatically change the Base Position Parameters on the Session Settings tab.

Directories

16. Click on the **Directories** tab of the **Project Setup** dialog.

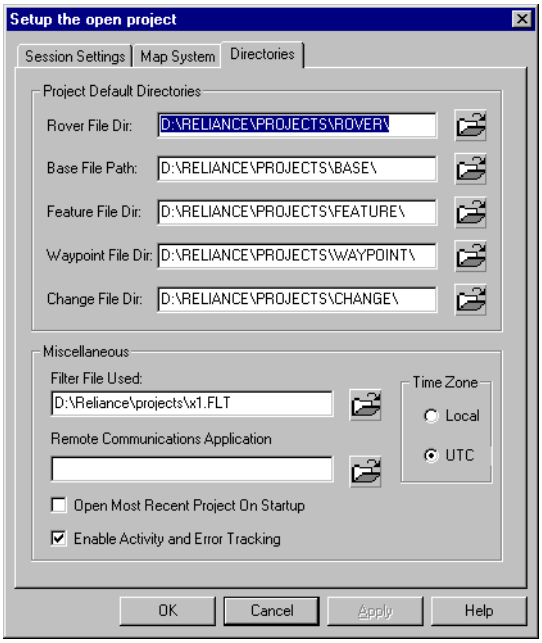

Figure 5.6: Project Setup dialog / Directories tab

Project Default Directories

The **Directories** tab defines the directories in which Reliance Processor stores and retrieves the project's data files. Reliance Processor uses these directories in the Project Session Setup to file the various data file combo boxes and to find the files during project load. Transfer Data uses them to determine where to find files to upload and where to put files for download. The Feature Editor uses these directories to determine where to find feature files.

17. To enter a default directory, you can manually enter the disk drive and path of each by directly typing the path into the edit field below its title or you can click on **Browse** (the button with the picture of the open folder) adjacent to its edit field to open the Directory Browser dialog.
18. In the Directory Browser dialog you can select the desired directory and click **OK** to return to the Default Directory Setup dialog.

Upon returning, the edit field adjacent to the browse button contains the selected directory or the original directory if **Cancel** was used to exit the Directory Browser dialog. Paths to the following files may can be changed:

- The Default Rover Files Directory defines the directory which contains the Rover data.
- The Default Base File Path defines the list of directories (separated by commas) containing the base station files to use when processing the Rover data.
- The Default Feature File Directory defines the directory for the Feature Definition Files and their associated icon files.
- The Default Waypoint File Directory defines the directory for the Waypoint files created in the project or to be used by the project.
- The Default Change File Directory defines the directory for the Change files created by Reliance Processor when a position is edited or a session processed.

19. If you selected to download rover files from your receiver, the "Receiver File Dir" indicates where the files will be saved on your local drive.
20. If you select Auto Search Base in the Session Setting tab, Reliance will search all directories listed in the Default Base File Path for a base file that completely covers the rover file time span.
21. In order to access the Internet CORS sites, you must add its FTP address to the Base File Path by typing in "**,FTP://CORS**". Files downloaded from the CORS sites will be saved in the first directory specified in the Base File Path.

For Rover files that are greater than 30 days old, the CORS FTP site will not be searched for Base files. (Base files that are greater than 30 days are archived and are still available by request to CORS.)

If you have selected a specific rover and base file in the Session Settings dialog, the directories displayed in the Directories dialog have no relevance.

CAUTION
If you are accessing data from the Internet, make sure your Internet connection settings are correct under Settings in the Tools menu. See Chapter 14, Tools for details.

Miscellaneous

22. If you wish to select a filter file which already exists on a local drive, browse and select the appropriate file or type in the name and directory path in the **Filter File Used** textbox.
23. If you wish to select a a remote communications application, browse and select the appropriate file or type in the name and directory path in the **Receiver Communications Application** textbox.
24. Select the appropriate time zone for use with the open project, Local or UTC.
25. If you click on the Enable Activity and Error Tracking checkbox, Reliance will track each button or control accessed. This history is stored in ACTIVITY.LOG in the...\Reliance\bin directory. This is useful if technical support is required to resolve a problem.

Loading a Project

26. Click **OK** on the Project Setup dialog once everything is set up the way you want it.

    A progress dialog will appear while the project is being loaded.

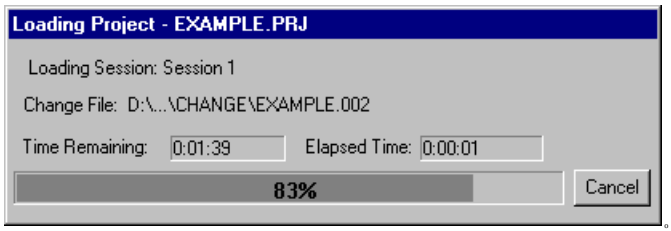

Figure 5.7: Project Load Progress dialog

27. If you are getting data from the Internet, an additional progress dialog is when while loading the project.

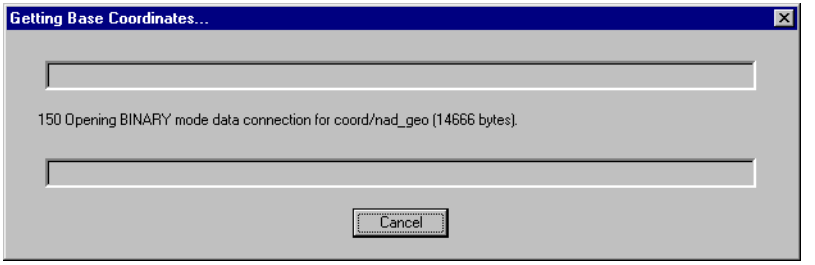

Figure 5.8: Internet Download Progress dialog

Moving a Project

From the Project pull-down menu, you can choose Move to move an existing project.

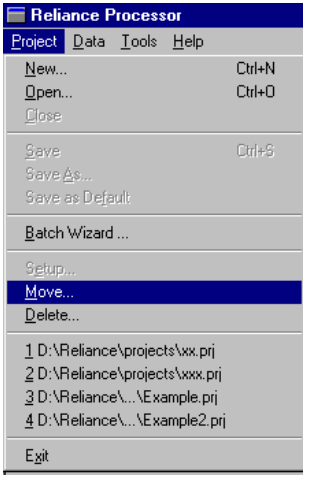

Figure 5.9: Move Project Menu Selection

In order to use the Move function, you must close all projects.

Once you have selected Move, the **Move a Reliance Project** dialog is displayed.

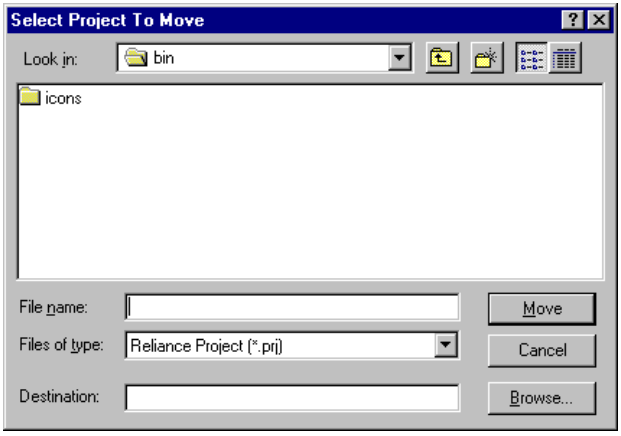

Figure 5.10: Move a Reliance Project dialog

When moving a selected project, you need to specify which directory you wish to move it to in the Destination field of this dialog. The directory will become the root (or archive) directory where the project file is saved. Move Project will perform the following functions:

1. Create base, rover, feature, waypoint, and change subdirectories under the specified root directory.
2. Move the Base, Rover and Change files into the base, rover and change subdirectories.
3. Copy the Feature and Waypoint files into the feature and waypoint subdirectories.
4. Copy the Filter file into the specified root directory.
5. Move the Project file into the specified root directory.
6. Modify the Project file to reflect the new directory structure of the files.

   After a project has been moved, you can more easily archive it using applications such as WinZip™.

Deleting a Project

From the Project pull-down menu, you can choose **Delete** to delete an existing project.

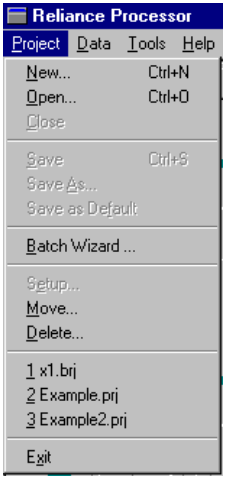

Figure 5.11: Delete Project Menu Selection

In order to use the Delete function, you must close all projects.

Once you have selected **Delete**, the **Delete a Reliance Project** dialog is displayed.

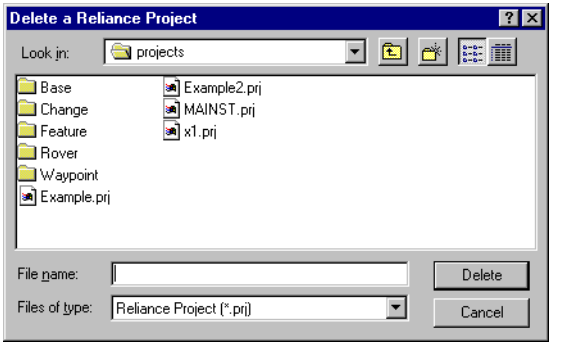

Figure 5.12: Delete a Reliance Project dialog

When deleting a selected project, all files associated with that project are deleted except feature and waypoint files.

WARNING
This deletion also includes the raw GPS data file you collected in the field specified in that project.

Deleting a project that contains a given dataset will also delete that particular data from any other project it appears in. If a deleted dataset (including base data) is used in any other project, it will be lost. One way to prevent this is to create discrete directories for each project. Keeping all base data and rover data in the default directories could compromise data integrity when project deletion is used.

The files that are deleted are put in the Windows Recycle Bin. This way, if a mistake is made, you can recover the files that were deleted.

"Save As" Defaults

You can save several project settings as defaults for when new projects are created by clicking on **Save As Default** in the project pull-down menu.

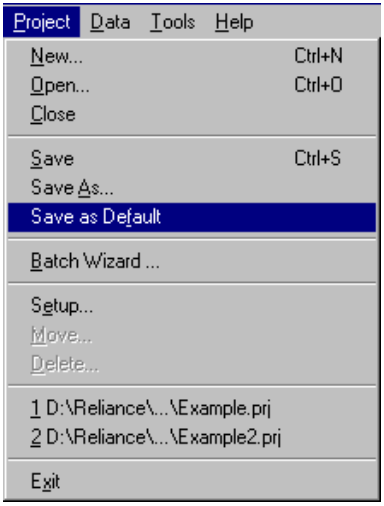

Figure 5.13: Save As Default Menu Selection

Default settings include the following:

- All window positions and sizes
- Default directories
- Map System setup

Session setup is not saved as part of the project default setup.

Data Collection

Before performing field data collections with a Reliance system, you must first set up a Feature File with a list of all the features and their appropriate attributes you may need to log in the field. Features can be one of three types: points, lines, or areas. Attributes can be character fields, number ranges, menus, and submenus. The Feature File is created using the Feature Editor. For details refer to “Creating a Feature File” on page 29 in Chapter 4, **Getting Started**.

Along with the Feature File, you can also create a Waypoint File to be used in the field for waypoint navigation. The Waypoint File is optional; it is not necessary to create this file in order to do your field work. Use Map View to add waypoints to a Waypoint File.

After these files are created, they must be uploaded to the handheld. This is accomplished in Transfer Data.

Collecting data with the Reliance Rover System by itself (in autonomous mode) can only provide 100 meter position accuracy. To improve this accuracy, you must also be collecting data from a GPS base station. Reliance performs a technique called “differential correction” on these two data sets can improve your accuracy to submeter, decimeter, or even centimeter level. Refer to Chapter 10, **Processing Collected Data**, for more information.

You can set up your own GPS base station or you may be able to use data from an existing GPS base station in your area, including data from CORS sites on the Internet.

Transferring Feature Files and Waypoint Files to the Handheld

To transfer files to the handheld, use the following steps:

1. Turn on the handheld and connect it to one of the COM ports on your PC using the cable provided.

2. Bring up the Transfer Data dialog from the Tools pull-down menu of the Reliance main menu.

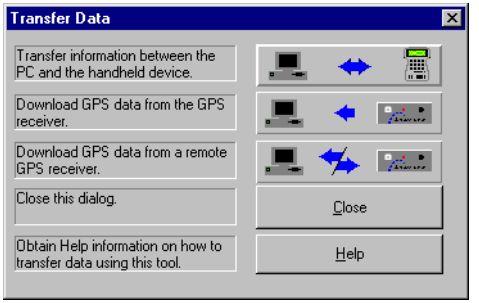

Figure 6.1: Transfer Data dialog

3. After clicking on the icon representing **Transfer information between the PC and handheld device**, a reminder message appears.

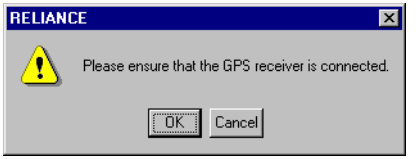

Figure 6.2: HCOM Reminder dialog

4. After making sure that your handheld is on and running HCOM, click **OK** and the Transfer Data Between PC and Handheld dialog appears.

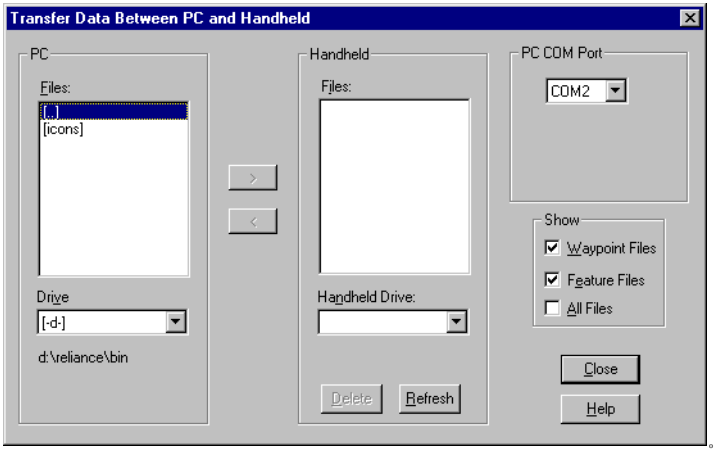

Figure 6.3: Transfer Data Between PC and Handheld dialog

Table 6.1 describes the components of this dialog.

Table 6.1: Transfer Data Between PC and Handheld

Name	Meaning
PC	
• Files	• A list of all files in the current directory. You may select one by clicking on it or by using the arrow keys on your keyboard to traverse the list and pressing the space bar.
• Drive	• Selects which drive to use on the PC.
Handheld	
• Files	• A list of files of all the sub directories and files in the current directory on the handheld. You may select a file by clicking on it or using the arrow keys on your keyboard an pressing the space bar. You may change directories by double-clicking on the desired directory. The parent directory is denoted by [...]. As you change the path, the current path is displayed as static text about the View group.
• Handheld Drive	• A list of all the drives available on the handheld controller. You may select a new drive by clicking on the arrow and selecting a drive from the dropdown list. The directory listing will be updated.
• **Delete**	• Deletes selected files on the handheld controller.
• **Refresh**	• Allows you to query the handheld controller and update the display in the handheld listbox.

Table 6.1: Transfer Data Between PC and Handheld (Continued)

Name	Meaning
PC COM Port	Allows selection of PC serial port to which the handheld is connected to.
Show • Waypoint Files • Feature Files • All Files	 • Displays only Waypoint files in the PC and the handheld. • Displays only Feature files in the PC and the handheld. • Displays all files in the PC and the handheld.
Close	Closes the dialog.
Help	Displays Help menu.

You may also transfer Waypoint and Feature Files back from the handheld if you wish.

Error Sources of GPS

Position data collected with the Reliance Rover System by itself is only accurate to within 100 meters 95% of the time. This can be dramatically improved to submeter, decimeter, or even centimeter accuracy with Reliance using a technique called “differential correction”. Differential correction requires data from a GPS base station to be collected at the same time the Rover system was collecting its field data. Therefore, Reliance is a DGPS (Differential GPS) system. Described below are several error sources that affect the accuracy of DGPS.

GPS Signal Multipath

Multipath is the most unpredictable source of errors in GPS position accuracy. It affects the rover and base stations differently and cannot be canceled out by differential processes. Multipath errors can be large, (greater than 5m) and small (less than 2m). To avoid large multipath errors, do not place the GPS antenna near any metal objects, or other solid surfaces because satellite signals reflect off these objects easily. Also, try to mount the antenna as high as possible, (at least 2m) to reduce the effect of ground multipath reflections.

Satellite Geometry

Satellite geometry is the strength of satellite coverage for a given area and is measured by an index called PDOP (Position Dilution of Precision). PDOP is affected by the quantity of satellites visible and their relative positions in the sky. When there are many (5-8) widely spaced satellites visible at a location, the PDOP is 4 or less. When there are less satellites visible, or they are unevenly spaced in the sky, PDOP

values can be 6 or higher. Fortunately, the PDOP in an open sky is typically around 3, and quoted Reliance system accuracies assume this norm.

Maintaining Lock to Satellites

The number of satellites tracked is very important, and can affect GPS measurements in two ways. As mentioned above, the greater number of satellites tracked, the better the PDOP will be. More importantly, the number of satellites tracked dictates what kind of position solution can be computed with GPS. Three satellites will enable the receiver to compute a two-dimensional position (X,Y) and four will enable a unique solution in three dimensions (X,Y,Z). The Reliance system can compute positions with three or four satellites, but it will achieve optimum results with 5 or more tracked. Objects that obstruct the direct path from satellite to antenna will affect tracking and therefore, accuracy.

Selective Availability

Selective availability (SA) is the intentional degradation of the GPS satellite signal by the US Department of Defense. Like multipath, it is hard to predict, but unlike multipath, it affects the base and rover receivers the same, and can by removed by a Differential GPS system (such as Reliance). Small SA degradation will still exist in real-time systems such as RTCM due to the unpredictability of SA, and the time delay of the radio link. This is one reason why post-processed DGPS yields better accuracy than real-time DGPS.

Although there are many and varied error sources affecting GPS position accuracy, utilizing the proper planning and field procedures can greatly reduce the risk of degraded positions. The Reliance system uses a combination of powerful receiver technology and robust processing techniques to insure that even novice users can easily meet or exceed their positioning needs.

Setting Up a Base Station

For a high degree of accuracy, the Reliance system depends on data collected from a GPS reference station as well as the Reliance Rover system. If you are setting up your own Ashtech Reliance base station, refer to the *Field Operation Manual*.

You may have access to data from an existing GPS base station in your area. Typically, this data is provided to you in RINEX format. The Reliance RINEX Converter can convert the RINEX data format into the Ashtech data format, which is necessary to use this data in Reliance software. For more information about converting RINEX data into Ashtech data please refer to Chapter 14, **Tools**.

Transferring Field Data

After the field work is complete, you must transfer data from the Reliance Rover system back to your PC. You may also have to transfer GPS Base Station (sometimes known as reference station) data to your PC.

If the field data was corrected to submeter accuracy in real-time (using a radio link to obtain the RTCM differential corrections), you may not require any base station data. But to process the data in the Reliance , base station data is required. To perform the processing correctly, base station data must be collected at the same time as the Rover data.

Data sets can be transferred from the Rover system: the data from the GPS receiver. The GPS receiver should be connected to one of the COM ports on your PC to download the GPS data.

Base Station data may be transferred to your PC from a GPS receiver connected either directly to your PC, remotely using a modem and a remote communications software application, or even from the Internet - as with the CORS sites.

If you are using data from another brand of GPS receiver as base station data, you must first convert the files (which are in a proprietary format) to RINEX. Refer to Chapter 14, Tools.

Downloading Collected Data From the Reliance Rover System

Perform the following steps to transfer data from the Reliance Rover System:

1. Connect the SCA-12 GPS receiver to one of the COM ports on your PC using the provided interface cable with the cable labelled “Port C / PC Data.”

2. Bring up the Transfer Data dialog.

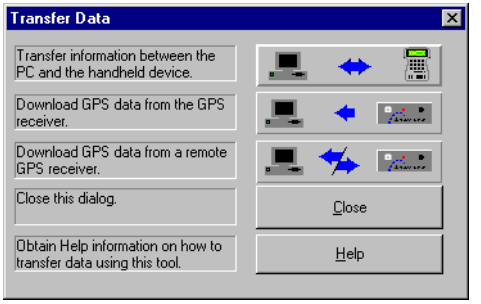

Figure 7.1: Transfer dialog

You must open a project or create a new project to make the Transfer Data dialog active.

3. Click on the icon representing **Download GPS data from GPS receiver**.
   A reminder message appears indicating to connect the receiver to the PC.

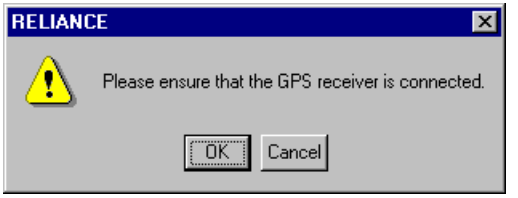

Figure 7.2: GPS Receiver Transfer Reminder dialog

Make sure the GPS receivers cable and battery are connected and the receiver is turned on before proceeding.

4. Click **OK**.
   The Download dialog appears:

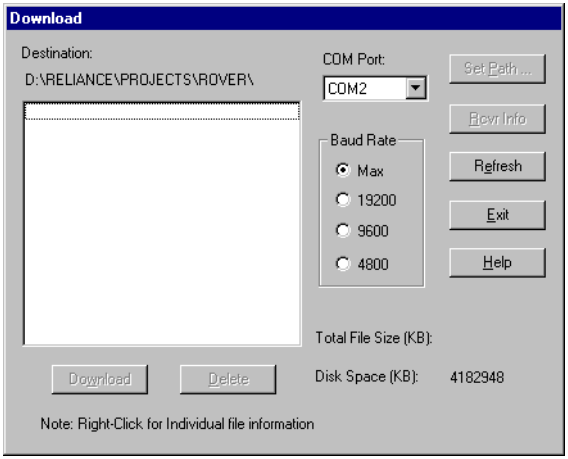

Figure 7.3: Download dialog

Table 7.1 explains the various components of this dialog:

Table 7.1: Download dialog

Name	Meaning
Destination	This text indicates the download destination of the files.
Available Files	This listbox displays available files from the connected receiver. The listbox shows the filename with file date and size (in kilobytes). All possible files displayed in this listbox include user-defined eight-character session names with index extension, and an almanac file. An asterisk next to a filename indicates that the file has been successfully downloaded.
COM Port	Lists all PC COM ports available for communication. The default is set to the first COM port from the COM port combo box the first time you use the Download dialog. If the connected receiver is not responding to the default COM port, you can select another COM port from the combo box and retry establishing communication. The selected port is saved before exiting the Download dialog. For the next download, the Download dialog uses whichever COM port that was last selected as its default.
Baud Rate	Sets the baud rate of the serial port to what is desired to communicate with the GPS receiver. Default is “Max”, which is 38,400 baud.

Table 7.1: Download dialog (Continued)

Name	Meaning
Set Path...	Displays the Set Path dialog. This button is disabled until there are file(s) in the Selected Files listbox. Select this button to set a destination directory for downloading files. The selected directory applies to all highlighted files. Refer to “Set Path Dialog” on page 79.
Rcvr info	Displays the Receiver Information dialog (refer to “Receiver Information Dialog” on page 81). This button is always enabled after successful connection to a receiver.
Refresh	• This button is enabled after the connection process is completed. Allows you to reload the listbox with receiver files from the connected receiver or retry connection in case of communication error. When you select Refresh, the Download module tries to establish communication with the receiver.
Exit	• Disconnects communication with the connected receiver, saves the COM port setting in the Reliance .INI file, and closes the Download dialog. Disabled during the connection process. • The Rover receiver is automatically turned off.
Help	Displays help on the Download dialog.
Download	• This button is disabled until there is a file(s) highlighted in the listbox. It starts the transfer of receiver files to selected directory. • Sufficient disk space must also be checked prior to downloading the selected files. When Reliance detects insufficient disk space available to download the files, a warning message will appear. When this happens, select another destination or free up some disk space before proceeding to download. • In the case of duplicate files during the download process, an error dialog appears to warn you that the file to be downloaded already exists in the destination directory and asks you if you want to overwrite the existing file. Respond Yes, to overwrite that file; Yes To All, to overwrite all future duplicate files; No, not to overwrite that file; Cancel, to cancel the download process. • A Progress dialog shows the status during the download process. The status shows which file is being downloaded and what percentage of the files have been downloaded so far. Select Cancel at any time to stop the download process. • When a file is successfully downloaded, an asterisk appears in front of the file in the Available Files listbox. This helps keep track of which file(s) have already been downloaded.
Delete	• Deletes files from the receiver that are highlighted in the listbox. This will allow more space in the receiver for future missions. A warning dialog confirms deletion. • A Progress dialog shows status if you respond Yes to the confirmation. The status shows which file is being deleted. You can select Cancel at any time to stop the file deletion process. The cancel takes effect only after a complete deletion of the file currently shown to be deleted. It will not stop immediately in the middle of a file deletion.

Table 7.1: Download dialog (Continued)

Name	Meaning
Approx. Total File Size (KB)	Displays the approximate size of all the files selected.
Available Disk Space (KB)	Displays the approximate space available for the disk selected under **Set Path**.

In the Download dialog, an hourglass appears as Reliance tries to establish communication with the connected receiver on a default COM port, which is the first choice from the available COM ports. If the connection is successful, GPS receiver files are displayed in the listbox. Otherwise, an error dialog appears indicating communication failure and a troubleshooting tip.

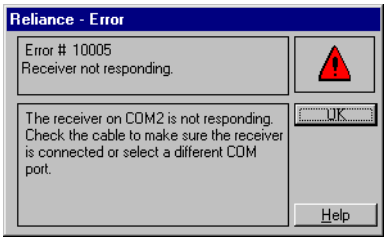

Figure 7.4: Download Error dialog

Set Path Dialog

The Set Path dialog selects the destination directory and drive in which to download the selected receiver files. The selected directory affects all highlighted files in the listbox.

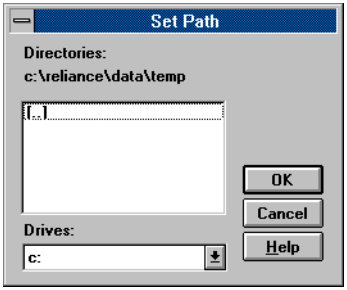

Figure 7.5: Set Path dialog

Table 7.2 explains the various components of this dialog.

Table 7.2: Set Path dialog

Name	Meaning
Directories	This field displays the current directory. If the length of the directory path is longer than the space allocated for it, the directory path is automatically shortened to fit in the text.
Directories Listbox	A box is displayed below the directories field that lists all available subdirectories that exist under the directory or drive specified. Double click on a subdirectory to select it. The Directories Text is updated accordingly.
Drives:	• This box displays the current drive. Click on the drop-down arrow to select another drive from the available drives listed in this combo box. The Directories Text and the Directories Listbox are updated accordingly. • If you select a disk drive that does not have a floppy disk or is not formatted, a warning message appears. Click **Retry** after verifying what the warning message suggested or **Cancel** to select another drive.
OK	This button accepts the directory and/or drive selected, closes the Set Path dialog, returns to the Download dialog, and tags the destination directory to all files in the Selected Files listbox.
Cancel	This button closes the Set Path dialog and aborts the path selection. It returns to the Download dialog.
Help	This button displays help on the Set Path dialog.

File Information Dialog

Clicking the right mouse button on a filename in the listbox, brings up the File Information dialog.

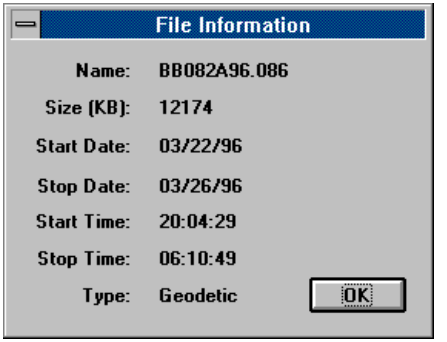

Figure 7.6: File Information dialog

Table 7.3 explains the various components of this dialog:

Table 7.3: File Information dialog

Field	Meaning
Name:	Displays the file name.
Size:	Displays the approximate file size in kilobytes.
Start Date:	Displays file start date in month-day-year.
Stop Date:	Displays file stop date in month-day-year.
Start Time:	Displays the file start time in hours:minutes. Hours range from 0 to 23.
Stop Time:	Displays the file stop time in hours:minutes. Hours range from 0 to 23.
Type:	Displays file type: • Geodetic (L1 C/A code and carrier, positions) • Position Only
OK	Closes File Information dialog and returns to the Download dialog.

Receiver Information Dialog

Clicking on the Rcvr Info button in the Download dialog brings up the Receiver Information dialog.

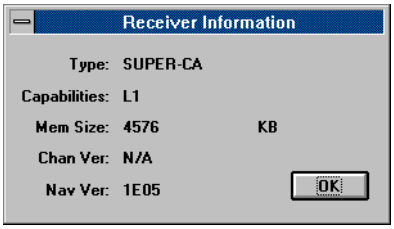

Figure 7.7: Receiver Information dialog

Table 7.4 explains the various components of this dialog:

Table 7.4: Receiver Information dialog

Field	Meaning
Type:	Displays the type of receiver: • Z-12 • SCA-12 • MD-12
Capabilities:	Displays what the receiver is capable of tracking: • L1 C/A-code • L1 C/A-code and carrier • L1/L2 P-code and carrier
Mem Size:	Displays the size of the RAM board in the receiver in kilobytes.
Chan Ver:	Displays the version number of the receiver Channel software.
Nav Ver:	Displays the version number of the receiver Nav software.
OK	Closes the Receiver Information dialog and returns to the Download dialog.

Transferring Reference Station Data From a Local Base Station

This operation is described in “Downloading Collected Data From the Reliance Rover System” on page 75.

Transferring Reference Station Data From a Remote Base Station

To download Base Station data from a remote site using a modem, Reliance provides a “hot-link” to a desired remote communications application. Perform the following steps:

1. Bring up the Project Setup dialog.

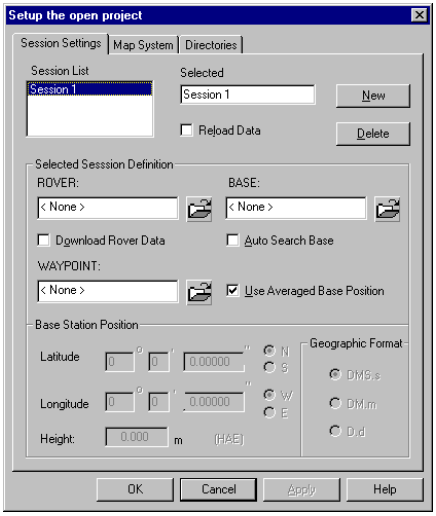

Figure 7.8: Project Setup dialog

2. Click on the Directories tab and notice the Miscellaneous section at the bottom.

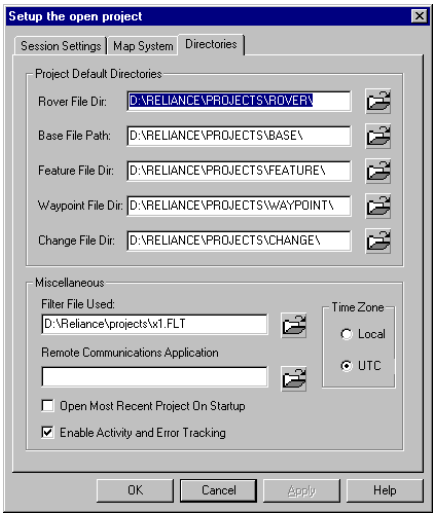

Figure 7.9: Project Setup dialog/Directories tab

The Remote Communications Application is not set by default. Select an application by clicking the **Folder** icon button. The Select a Communications Application dialog appears.

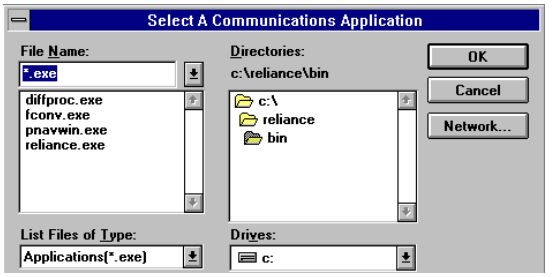

Figure 7.10: Select a Communications Application dialog

3. Browse through you current directories and drives to find the application you wish to use.
4. Select “Download GPS data from a remote GPS receiver” from the Transfer dialog once the proper remote communications application is set up (refer to Figure 7.1).

   Your selected application should appear.

Viewing and Editing

Once a project is loaded, rover and base station data can be displayed by one or both of Reliance's powerful viewers. The Time View display exhibits data chronologically over the course of minutes, days or months. Map view shows data by its position on the ground, creating a digital topographic map displayed in a user-selectable coordinate system. Reliance supports user-definable datums and projections in addition to common coordinate systems from around the world. Features will be displayed in Map View using the symbols, line types, colors and fill patterns as defined in the feature file with which they were collected. Fast attribute information is available by simply double-clicking the feature. All available data for the project will initially be scaled to fit into the current display window which can later be panned and zoomed for a "closer look".

Map View allows a full display zoom with user selectable origin and a point-and-drag area zoom for extra flexibility. Feature symbols and reference grid can be toggled and full filter access are provided from the toolbar. Waypoint production and editing are also accomplished from Map View. A toolbar icon toggles between "Normal" and "Waypoint" modes allowing the seamless manipulation of map and waypoint data in the same display. Other utilities such as the "Ruler", which can measure distances in user selectable units and "On-line" help, make Map View an potent tool for data analysis. While Reliance is not a GIS system, it provides a means for office personnel to view and edit field data in a user-friendly environment before the data is exported to GIS formats.

A key feature of these windows is when selecting one of the features in Time View, the Map View window will automatically select the same feature. This will allow you to easily see the relationship between the occupation times of the features and their positions/ accuracies.

Viewing Collected Data in Map View

To view collected feature data in geographical format, perform the following steps:

1. Load a project with a session containing features.

2. Select Map View from the Tools pull-down menu of the Reliance main window.

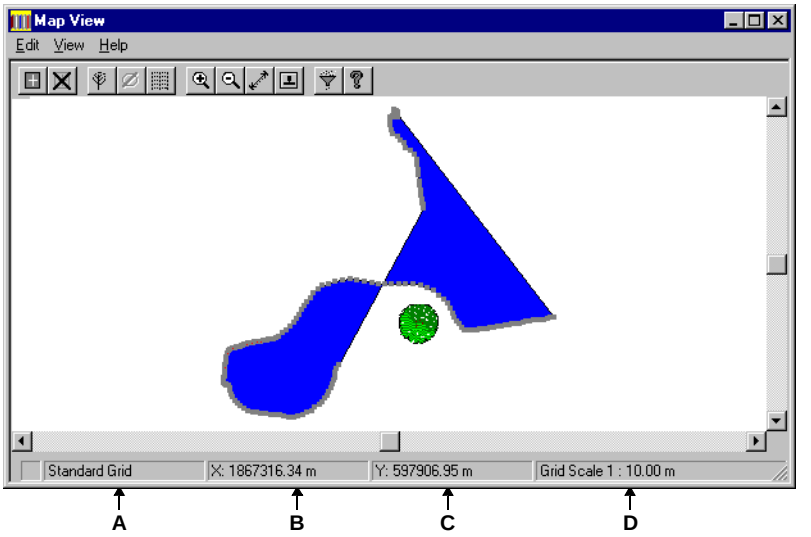

Figure 8.1: Map View window

The features of the collected data will appear in the display. If the data is unprocessed, each point making up the map will have an accuracy within 100m and so may have a jumbled appearance. After processing, the data on the display should look fine.

Table 8.1 explains the menu choices of this window:

Table 8.1: Map View Menu choices

Name	Meaning
Edit (pull-down menu)	
• Place Waypoint	• Turns on waypoint mode to allow placing of waypoints with the cursor on the display. Selecting again will toggle this command.
• Delete Waypoint	• Deletes a selected waypoint on the display.
Filter...	• Brings up the Project Filter Data dialog. For information on filtering, refer to Figure 9.1 on page 103.
• Join Points...	• Joins selected point features into a new line or area feature (hides original point features).
• Delete Join Feature	• Unjoins the line or area feature previously joined and the original point features will be visible again.
• Print...	• Allows printing of the current display in the Map View window.

Table 8.1: Map View Menu choices (Continued)

Name	Meaning
• Close	• Closes the Map View window.
View (pull-down menu) • Feature Info... • Undo Selection	 • Shows the Feature Information dialog for the last feature that was highlighted in the display. • Removes the red circle around a feature that was selected in the display.
• Hide Points • Unhide Points...	• Hides those points selected within Map View. Selection of points is by dragging the mouse from upper left to lower right. • Displays a list of those features currently hidden, which can be selected to return the feature to its original state.
• Ruler	• Turns on a mode where you can measure distance from any point in a feature to anywhere else on the display. Click and drag mouse from an existing point to show distances and azimuths as you move the mouse.
• Zoom In • Zoom Out • Normal Size View	• Zoom in one step closer to the object in the center of the display. At least three positions must be selected for zoom to function. • Zoom out one step further from the object in the center of the display. • Returns to the initial state of Map View which shows all the feature available in the display.
• Symbol • Grid	• Toggles the Toolbar on and off. • Toggles the Statusbar on and off.
• Toolbar • Status bar	• Toggles the point feature symbols on and off. • Toggles the grid lines on the display on and off.
Help	Displays the Help information for Map View.

Table 8.2 explains the Toolbar icon buttons of this window:

Table 8.2: Map View Toolbar Icon Buttons

Name	Meaning
Waypoint Mode	Turns waypoint mode on and off.
Delete Waypoint	Deletes the currently selected waypoint on the display.
Symbols	Toggles the point feature symbols on and off.
Undo Selection	Removes red circle highlight from the selected feature or waypoint.
Grid	Toggles the grid lines on and off.
Zoom In	Zooms the display closer.
Zoom Out	Zoom the display out.
Ruler	Turns on measurement mode in order to measure distance and azimuth from features.

Table 8.2: Map View Toolbar Icon Buttons

Name	Meaning
Normal View Size	Returns to the initial display state of the window.
Filter	Brings up the Project Filter Data Dialog.
Help	Brings up the Help menu.

Table 8.3 explains the Status Bar of this window (refer to Figure 8.1):

Table 8.3: Map View Status Bar

Label	Meaning
A	Gives the display mode of the Map System currently selected (Geographic, Standard Grid, or Local Grid).
B	Shows the current X cursor position on the display.
C	Shows the current Y cursor position on the display.
D	Shows the grid scale (1 Grid-xx meters) where xx varies depending on your display mode and how far zoomed in or out you are on the display.

Table 8.4 explains operations you can perform with the mouse buttons while in this window.

Table 8.4: Map View Mouse Button Operations

Action	Function
Single-Click, Left mouse button	Selects the feature the cursor is currently on (a red circle will appear on each point of the feature).
Clicking and Dragging the Mouse	Area zoom is activated. The cursor will change to a magnifying glass and a dashed box will appear as you move the mouse down and to the right of the display.
Double-Click, left mouse button	Shows the Feature Information dialog for the feature the cursor is on.
Double-Click, right mouse button	“Center-on-point” function. When doing this, the view of the map centers on the location of the cursor regardless of where it was at.

Feature Information Dialogs

The format of the Feature Information dialog is dependent on the feature type.

The following actions may be taken to obtain information about a feature:

- Click once on any point of a feature to highlight that feature by circling all its points in red. Click **View** from the menu bar and select **Feature Info...**
- Double-click on a highlighted feature to bring up the Feature Information dialog.

For point features, their position will be shown in the proper display mode for the Map System you have currently selected (refer to Chapter 13, **Setting Up a Map System**). If in Geographic display mode, you will see position displayed in Latitude, Longitude, and Height. For Standard and Local Grid display mode, you will see position displayed in East, North, and Height.

The following three figures are the Feature Information dialogs for a point, a line, and an area:

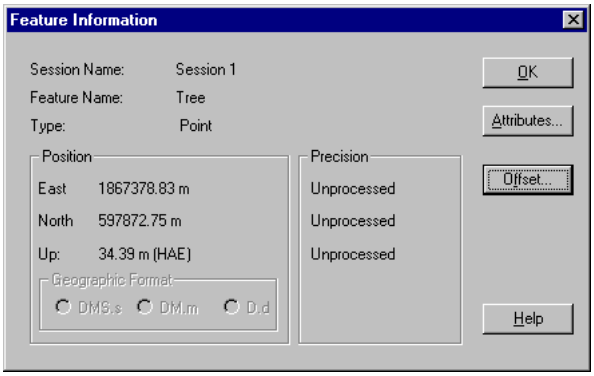

Figure 8.2: Feature Information dialog (point)

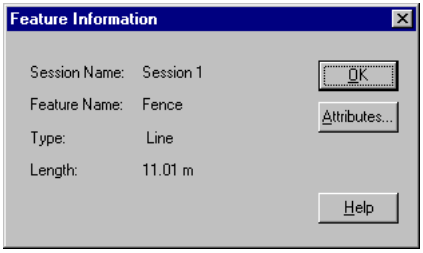

Figure 8.3: Feature Information dialog (line)

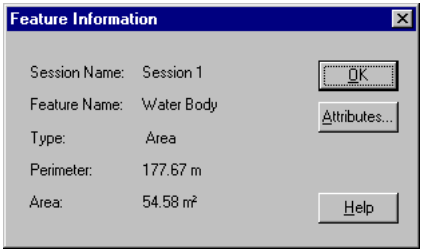

Figure 8.4: Feature Information dialog (area)

The Feature Information dialog has three formats which are dependent on the feature type:

Table 8.5: Feature Types

Feature Information Format	Displayed Information
Point	A feature's position and calculated precision are displayed.
Line	A features calculated distance (length).
Area	A feature's area and perimeter.

Attribute Information Dialog

For all three types of Feature Information dialogs, you can view the list of attribute names and values of the feature by clicking **Attributes**. These attributes were entered during the data collection process using the handheld controller and can be edited in Reliance.

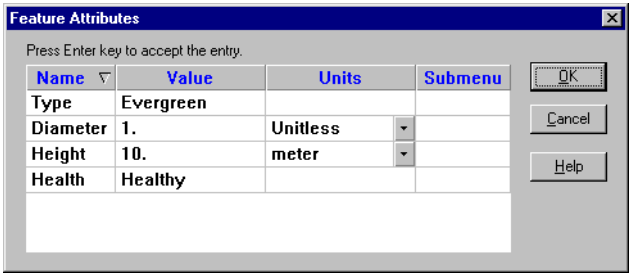

Figure 8.5: Feature Attributes dialog

To edit the attribute values in the Feature Attributes dialog, highlight the cell to change and type in the new text. Then press the ENTER key or click on another cell

in this dialog. After making all the necessary changes, press the OK button to return to the Feature Information dialog.

If two features overlap, use the filter to show the feature and its information dialog one at a time.

Map View in Waypoint Mode

Selecting Place Waypoint from the Edit menu pull-down enables a mode for creating and editing waypoints. The Waypoint Mode will be signified by a change to a “plus” sign in the pointer icon. When this mode is active, clicking on a point within the display area starts the waypoint creation process. Entry of a waypoint name and modifying its position values can then be done if needed.

To cancel Waypoint Mode without placing a waypoint, select **Place Waypoint** again from the **Edit pull**-down menu.

As soon as you place a waypoint on the Map View, the Waypoint dialog appears:

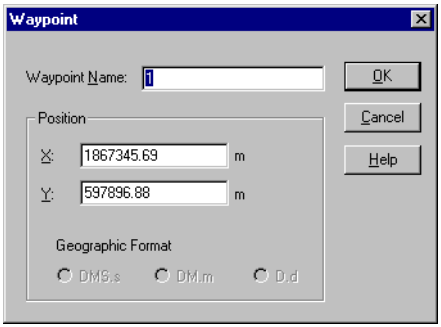

Figure 8.6: Waypoint dialog

If a waypoint file name has not been set up in the Session Settings tab dialog, a default file name called WPT00.WPT will be created to save your entered waypoints.

Table 8.6 explains the various components of this dialog:

Table 8.6: Waypoint dialog

Name	Meaning
Waypoint Name	Name given to Waypoint that can be edited. This name can be up to 20 characters long.
Position	For Geographic Map Systems • Latitude coordinates of the Waypoint. • Longitude coordinates of the Waypoint. For Grid Map Systems • X coordinate • Y coordinate
OK	Closes Waypoint dialog and saves information about the Waypoint file as specified.
Cancel	Closes Waypoint dialog without saving the displayed information.

Hide/Unhide

Reliance provides you the capability of hiding points. This is useful if you do not wish to have a graphical display of unnecessary points shown in Map View. Hidden points will not be exported. To hide points, perform the following steps:

1. Select a feature you want to hide. All of the points which make up a feature should be highlighted with a red circle.
2. Select **Hide Points** within the **View** drop-down menu.

You must select a feature before the software enables this menu item. Hide points operation can only be performed on one feature at a time.

3. Click the left button and drag the mouse down and to the right to select a group of points to hide—a rubber band rectangle will be displayed to show the enclosed points.
4. Release the left mouse button. All the selected points will now be hidden.

If the rubber band rectangle encloses points other than the selected feature, they will be ignored.

5. Once the points are hidden, they will not be displayed in Map View or Time View, nor will they be placed in any export files.

"Unhide Points" allows you to remove the hidden points selected features. This menu item will be available when there are one or more features with hidden points. To unhide a feature, perform the following steps:

1. Select **Unhide Points** from the **View** drop-down menu to display a dialog with all of the hidden feature names.

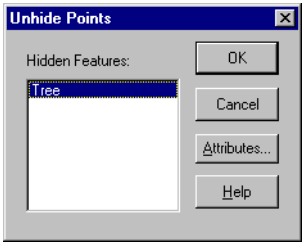

Figure 8.7: Unhide Points dialog

2. Select a feature name in the dialog box and click **OK**.
3. All the points in the selected feature should be unhidden.

Join/Unjoin

Joining point features into a new line or area feature can be done by performing the following steps:

1. Select **Join** in the **Edit** drop-down menu to display the Join Points dialog.

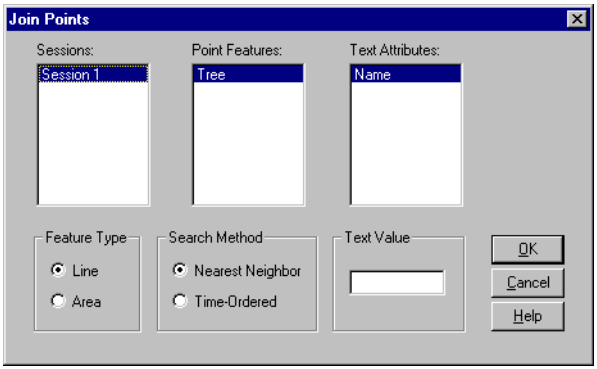

Figure 8.8: Join Points dialog

2. Select the session, point feature, and text attribute that will be used for joining points.
3. Chose whether to create a line or an area feature.

4. Choose whether to perform a “nearest neighbor” or “time-ordered” connection of points.
5. Enter the common text value that all point features to be joined have.
6. Click **OK**.

   When the dialog closes, all point features with the common text value will be joined into the feature type selected. The name of the new feature created will be that of the common text value.

Point features to be joined MUST have the exact same text (alpha) attribute value.

Should you need to remove the newly created line or area feature and reinstate the original point features, perform the following steps:

1. Select the joined feature to be deleted on the Map View window.
2. Select **Delete Join Feature** from the **Edit** drop-down menu.
3. The line or area will then be deleted and the point features will become visible again.

The Filter dialog will be updated to indicate the point features that have been joined into a new feature (either Generic Line or Generic Area) with their appropriate attribute value filtered out. You can remove this attribute filter to display both the original point features as well as the new line or area feature created (refer to “Filtering By Attribute Values” on page 105).

Viewing Collected Data in Time View

While Map View provides a geographical representation of the data collected in Reliance, it is often helpful to view the same data in a chronological representation. Time View does this by graphically presenting the feature information collected by each receiver on a horizontal bar chart, or time line. Point, line, and area features are designated by unique colors on this time line for easy identification.

With Time View, nesting and pausing operations performed in the field are immediately visible. Time View can also be used to identify base station data that was collected simultaneously with the rover data, which is required for post-processing. Since the Project Data Filter affects the data in Time View, the affects of filtering point, line, or area features can be easily determined.

Since feature information is presented on a time line, Time View can be used to review the feature information in the order it was collected. This is helpful when matching feature and attribute information to field notes. Also, Time View can be used to review the rate at which features were collected in the field. This information

can be used to improve the structure of the Feature File as well as improve the field data collection techniques.

The Time View display can be zoomed in for a close look at individual feature occupation times, or it can be zoomed out for a broader examination of rover data collection time spans. For ease of use, the collection times can be viewed in UTC or in any local time system.

Once a feature has been selected in Time View, the Feature Information dialog can be used to view the following:

- Session Name
- Feature Name
- Type
- Minimum number of satellites tracked during the logging of that feature
- Summary of the feature occupation time
- Recording interval
- Antenna height

The Attribute Information dialog can then be used to view a list of the attributes (if any) for that feature. An Offset dialog is also available to view any offset information that may have been entered in the field.

To view collected data chronologically and edit it, perform the following steps:

1. Access the Time View window from the Tools pull-down menu of the Reliance main window.

   The Time View window will be displayed in Overview Mode.

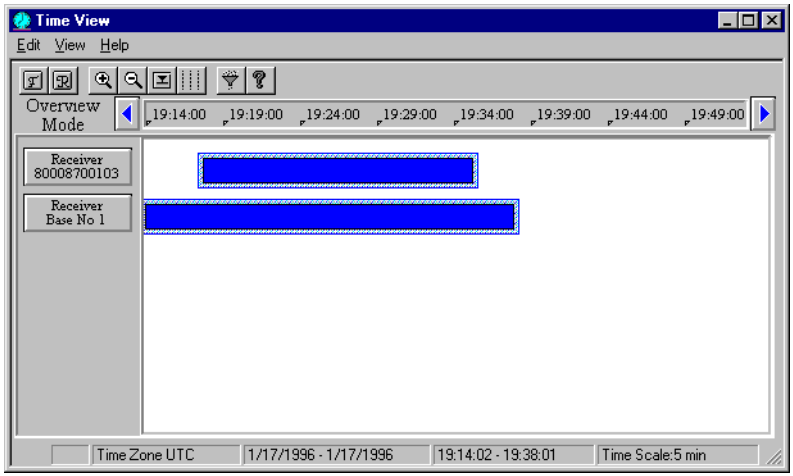

Figure 8.9: Time View window-Overview Mode

2. Click on one of the Receiver buttons to display Time View in “Receiver Mode.”

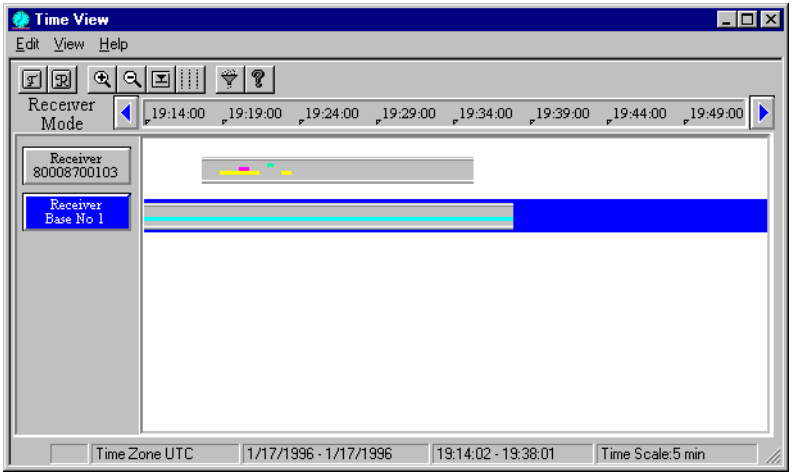

Figure 8.10: Time View window-Receiver Mode

Table 8.7 explains the menu choices of this window:

Table 8.7: Time View Menu Choices

Name	Meaning
Edit (pull-down menu)	
• Filter...	• Provides a “hot-link” to the Filter dialog, which has control over what features (and with what attribute values) are displayed on the Time View. Refer to Chapter 9 for more details on the Filter dialog.
• Exit	• Closes the Time View window and returns you to the Reliance main window.

Table 8.7: Time View Menu Choices

Name	Meaning
View (pull-down menu)	
• Feature Info...	• Displays Feature Information dialog. Refer to “Feature Information Dialog” on page 99.
• Receiver Info...	• Displays Receiver Information dialog. Refer to “Receiver Information Dialog” on page 101.
• Zoom In	• Narrows the Time View by one “step.”
• Zoom Out	• Expands the Time View by one “step.”.
• Scroll Left	• View features collected earlier in session.
• Scroll Right	• View features collected later in session.
• Overview mode	• Default display that allows viewing of all receiver sessions.
• Grid	• Toggles the grid on and off for the time display. A checkmark indicates whether or not the Grid is on.
• Toolbar	• May be toggled on or off. A checkmark indicates whether the Toolbar is on or not. Refer to Table 8.8 for a description of the Toolbar.
• Status Bar	• May be toggled on or off. A checkmark indicates whether the Status bar is on or not. Refer to Table 8.9 for a description of the Status bar.
Help	
• Help	• Displays Help menu.
• Feature Legend...	• Depicts the color bars associated with feature types.

Table 8.8 explains the Toolbar icon buttons of the Time View window:

Table 8.8: Time View Toolbar Icon Buttons

Name	Meaning
Feature Information	Displays the Feature Information dialog with a list of all features in the project.
Receiver Information	Displays the Receiver Information dialog for the selected receiver bar.
Zoom In	Expands the Time View by one “step.”
Zoom Out	Narrows the Time View by one “step.”
Reset	Resets the Time View display to its initial default
Grid	Display or hides the Time Ruler Grid.
Filter	Displays the Project Data Filter window.
Help	Displays the Time View Help information.

Table 8.9 explains the Status Bar of the Time View window:

Table 8.9: Time View Status Bar

Label	Definition
Time Zone	Indicates time zone of data collection
Date Span	Indicates beginning and ending date of data collection.
Time Span	Indicates beginning and ending time of data collection.
Time Scale	Indicates measurement scale of time display.

Above the occupation area is a ruler of time values. These values increase from left to right and constitute the value at their position for the horizontal axis of Time. At each end of the Time Ruler are scroll buttons. Clicking on these moves the occupation area in the direction to which they point. The Time Ruler indicates the values at their positions.

The time and duration of recording at a feature is known as an “occupation”. This data is displayed in the Time View for each occupation recorded in the project. Receivers are shown as a column of buttons to the left of the window, while their occupations are shown to the right as an occupation bar. The occupation bar for the rover can contain up to three colored bands, while the occupation bar for the base can contain only one color. Each color represents a different feature type.

Table 8.10: Time View Color Bands

Color Bands	Identification
Green	Point Features
Red	Line Features
Yellow	Area Features
Blue	Base Data

Suppose a fence feature was being recorded and the field worker encountered a power pole which was part of the fence. The power pole is a point feature, and the fence is a line feature. If the field worker wanted to record the fact that there was a power pole, they would use “nesting” to record both the fence and the power pole. This would result in the power pole (a point feature) and the fence (a line feature) to share data points and hence, occupations.

If the session contains a base station file, the base station receiver is also displayed in the Time View. Receiver bars for base stations look similar, except they contain only a single blue color band.

The Time View only displays the receiver once. When multiple sessions are collected from the same Rover receiver, the occupations for each session are shown on a single receiver bar, from left to right, ordered according to the time and date of recording.

Feature Information Dialog

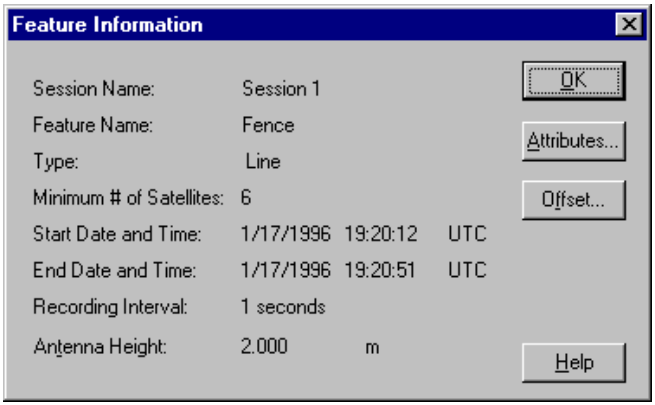

Figure 8.11: Feature Information dialog

The Feature Information dialog displays information about the selected feature. It can be accessed from the menu by clicking on the “View” menu and then on the “Feature Information” menu item, or by clicking on the appropriate icon in the Time View Tool Bar, or by double clicking on the feature’s occupation in the receiver bar.

This dialog shows the feature name, feature type, number of satellites during the occupation, and the recording interval (epoch setting). It also shows the starting and ending dates and times of the occupation. If an antenna height value was entered in the field, it would be shown here. This value may be changed, but the change will not affect the position unitl after the data is processed.

The **Attributes** button displays the Attribute dialog (refer to Figure 8.5). The **Offset** button displays the Offset dialog, described below.

Offsets Dialogs

The Offsets dialogs are shown in one of two forms, one for point features, and one for line and area features.

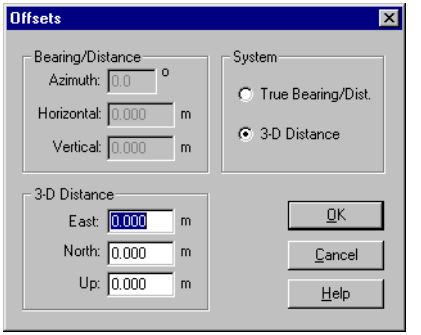

Figure 8.12: Offsets dialog for Point Features

The Offset dialog for point features displays feature offsets that may have been entered in the field in two ways: as a three-dimensional grid distance or as a bearing, and horizontal/vertical displacement. These offsets can be edited if desired, but they do not take affect on the position of the point feature until after processing.

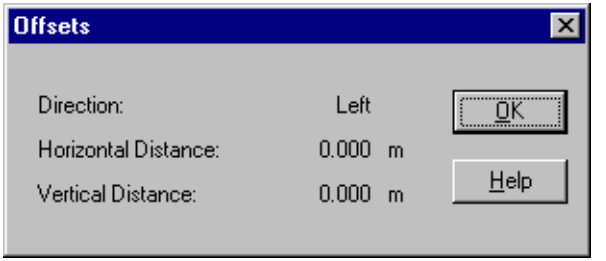

Figure 8.13: Offsets dialog for Line or Area Features

The offset dialog for line or area feature shows the horizontal and vertical distance that the entire feature can be offset by, along with what direction (left or right) it was offset. These can not be edited.

Only one offset per feature is allowed.

Receiver Information Dialog

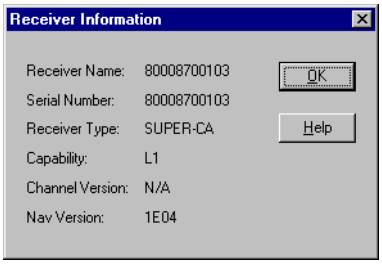

Figure 8.14: Receiver Information dialog

The Receiver Information dialog displays information about the selected receiver. Display it by clicking on the “Edit” menu and then on the “Receiver Information” menu item, by clicking on the appropriate icon in the Time View tool bar, or by double clicking on the receiver name in the receiver bar.

This dialog shows the receiver name, serial number, type, capability, channel version and Nav version. The receiver name defaults to the receiver’s serial number but may be changed to a familiar word or phrase if desired. This is done by typing in the desired name or phrase.

Filtering Collected Data

Filtering limits the data displayed and exported by Reliance Processor. This chapter explains project data filtering by features, by entire session, and by the value of attributes.

Filtering By Feature and Session

The Project Data Filter dialog specifies the features and sessions which are hidden from view in the Map View and Time View. Data which is not hidden will be exported. This is accomplished by building a list of the features and/or entire sessions to be hidden from a list of features to be shown. When a feature or object is shown, it is said to be “visible”. The Project Data Filter dialog contains these lists as well as the controls to move them between each other. Access to the Project Data Filter is provided from the following:

- Reliance Processor main window Data pull-down menu
- Project Control - Filter Data
- Map View window - Edit pull-down menu
- Time View window - Edit pull-down menu

Selecting Filter by any of these methods will provide the same Project Data Filter dialog.

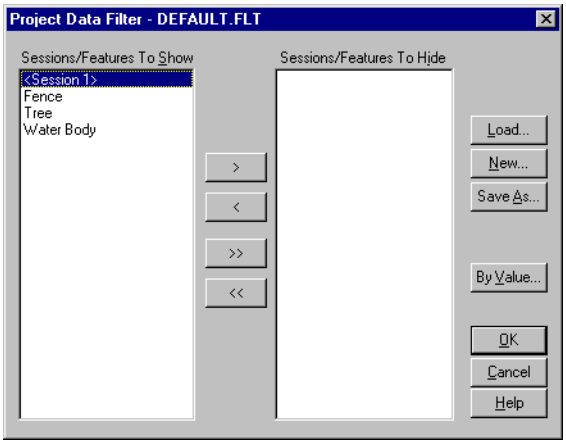

Figure 9.1: Project Data Filter dialog

Table 9.1 explains the various components of this dialog.

Table 9.1: Project Data Filter dialog

Name	Function
Sessions/Features to Show	Session and Features which will be visible in the project. Initially, a new project will have all its sessions and features visible.
Movement Buttons • Single Item • All items	 • Hide or unhide a session or feature. • Hide or unhide all sessions and features in listbox.
Sessions/Features to Hide	Those sessions and features that you have selected to hide.
• **Load...**	• Clicking opens the Load Project Data Filter dialog where the desired file is selected and loaded. This also causes the project's currently active filter setting to be set to the loaded filter file.
• **New...**	• Clicking opens the Create a New Filter File dialog. In this dialog, the file name specifies the name of the new filter file to be created. Different from the **Save As...** function, this button causes the filter to be reset to all sessions and features being visible.
• **Save As...**	• Saves filter sets with a different name for later use with the same or different projects. Displays standard Windows Save As dialog.
• **By Value...**	• Specifies attribute values which a feature must satisfy in order to be visible. Refer to "Filtering By Attribute Values" on page 105.
• **OK**	• Filter Project data by the parameters specified.
• **Cancel**	• Closes this dialog without changing any of the previous settings.
• **Help**	• Displays help on the Project Data Filter dialog.

Filtering By Attribute Values

Clicking **By Value...** in the Project Data Filter dialog displays the Filter Data By Value dialog. This dialog specifies the values a feature's attributes must satisfy in order to be visible on the Map View and Time View displays, and also be exported.

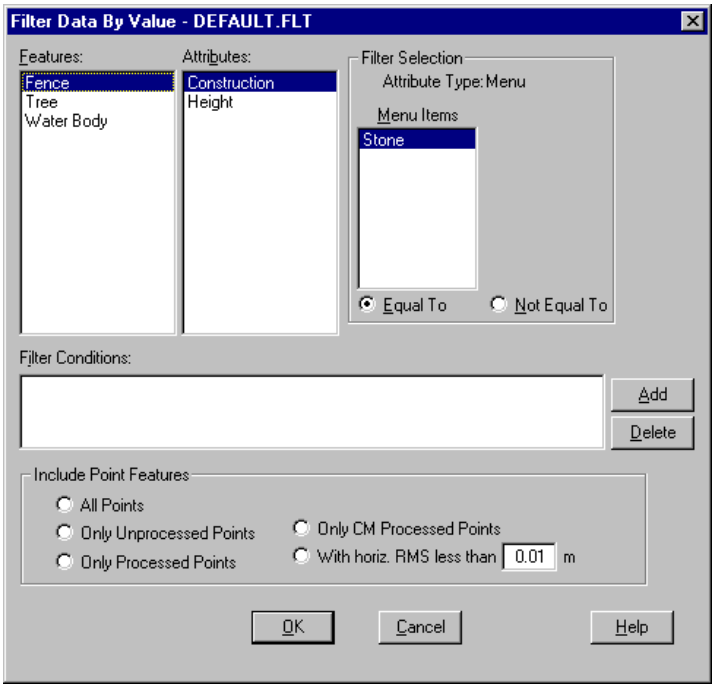

Figure 9.2: Filter Data by Value dialog

Table 9.2 explains the various components of this dialog.

Table 9.2: Filter Data By Value dialog

Name	Function
Features	Contains all features in the project.
Attributes	Contains attributes defined for the feature selected in the Feature listbox.

Table 9.2: Filter Data By Value dialog (continued)

Name	Function
Filter Selection	Shows what attribute values can be selected to filter for the selected attribute. Each type of attribute (text, numeric, menu) has a different format:
• Text	• Provides a field to type in the text value you want to show. Possible ways to filter are “Equal To” or “Not Equal To”.
• Numeric	• Provides a field to type in the numeric value you want to show along with showing the range of values allowed. Possible ways to filter are “Less Than”, “Greater Than”, “Equal to”, “Not Equal To.”
• Menu	• Shows the list of menu items that you can select “Equal To” or “Not Equal To.” in order to show them
Include Point Features	
• All Points	• Standard filter which allows all points to be displayed and exported.
• Only unprocessed points	• Used to view/export those points which were unable to be processed.
• Only processed points	• Used to view/export only those points which were successfully processed.
• Only CM points	• Used to view/export only those points which were successfully CM processed.
• With horizontal RMS less than X meters	• Used to view/export only these points with horizontal RMS values less than X meters, where X can be specified.
Filter Conditions	Shows the conditions that the attributes of a feature must satisfy in order not to be filtered out.
Buttons	
• **Add**	• Adds a new condition to the Filter Conditions area.
• **Delete**	• Deletes a selected condition from the Filter Conditions area.
• **OK**	• Closes dialog and saves information.
• **Cancel**	• Closes dialog and does not save information.
• **Help**	• Brings up Help menu.

For the three different types of attributes (text, numeric, menu), the Filter Data by Value dialog is displayed the following ways:

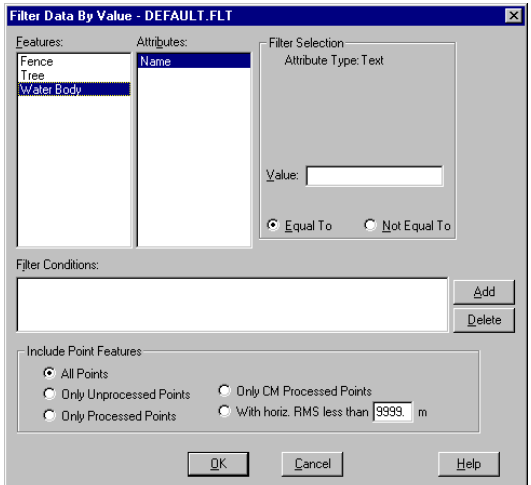

Figure 9.3: Filter Data by Value dialog-text

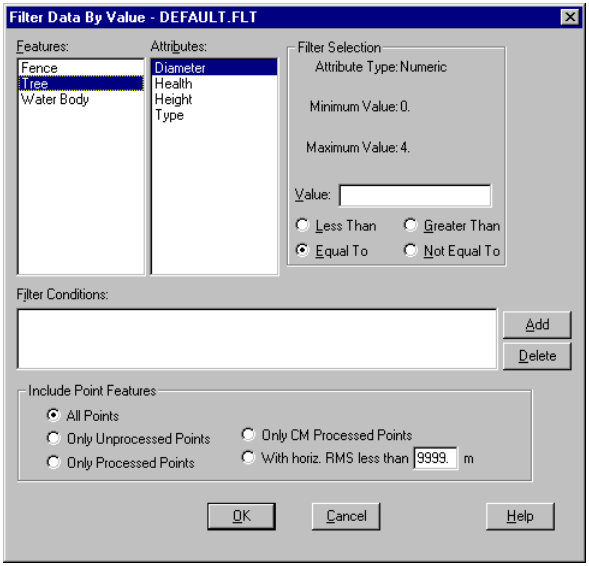

Figure 9.4: Filter Data by Value dialog-numeric

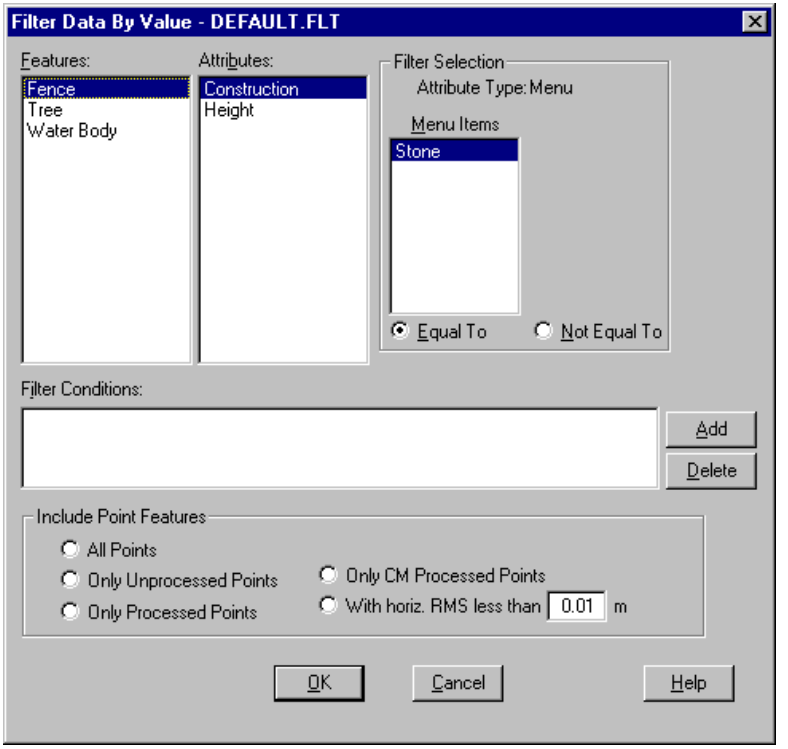

Figure 9.5: Filter Data by Value dialog-menu

A feature with attributes that have filter conditions from this dialog will be shown in the Project Data Filter dialog with a “+” in front of them. Features with a “+” in from of them that are in the **Hide** list in the Project Data Filter dialog will not be shown/ exported, even if they satisfy the filter by value conditions specified.

Effects of Filtering

Filters are project wide.When they are changed, the scope of visible data changes throughout the project. Filtering has no effect on processing. When the data is hidden by filtering, Time View, Map View, and exporting are affected. The displays show hidden data as trajectory. Trajectory data is located in the Time View by double clicking on a receiver’s bar where no colored bands (occupations) exist. Trajectory data is the GPS data recorded by the receiver between feature occupations. The Reliance Processor processing engine requires the data to be continuous throughout a GPS data file.

Processing Collected Data

When features are collected and their GPS positions recorded, the position accuracy is about 100 meters. To obtain higher accuracy, Reliance Processor provides post processing. This is one of the cornerstones of the Reliance Processor product. Post processing uses Differential Correction to obtain highly accurate positions from collected data. Differential Correction is a complex mathematical algorithm. It uses the GPS data recorded at a known location (a base station) during the same time as the data collected at the Rover. The results are highly accurate feature positions. The post-processing tool is accessible from the Project Control window by clicking on **Process Data**, then clicking on Data menu and then on the Process menu item. The post-processing tool may also be accessed by clicking on the **Process** icon button in the Project Control dialog.

Process Selection

The Process Selection dialog is used to select which sessions of a project will be processed.

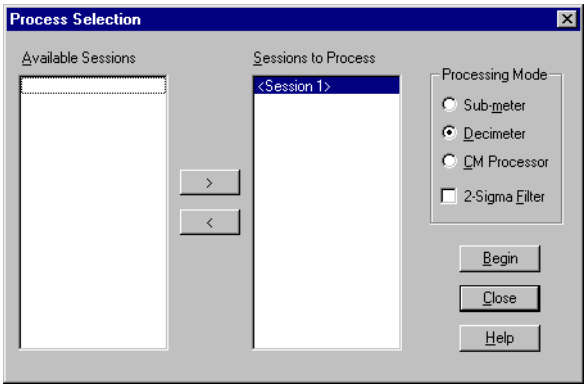

Figure 10.1: Process Selection dialog

Table 10.1 explains the various components of this dialog:

Table 10.1: Process Selection Dialog description

Name	Meaning
Available Sessions	Displays the sessions contained in the project.
Transfer Buttons	Moves sessions from Available Sessions to/from Sessions to Process.
Sessions to Process	Selects project sessions from Available Sessions to process.
Processing Mode	Choose between submeter, decimeter and CM processing. • Submeter will provide an accuracy to less than a meter and requires approximately half the time of decimeter, processing • Decimeter provides an optimum accuracy of 0.1 meters but requires approximately twice the time of submeter processing. • CM Processor will provide precision accuracy for point features collected over 30 minutes. • Choose whether or not to apply the 2-Sigma accuracy filter. For point features, this filter will eliminate bad data points that are far away from the average of all the data points that make up the point feature. This filter could improve the accuracy of point features collected in poor environments, such as heavy tree canopy.
Begin	Starts processing of selected sessions(s).
Close	Closes Process Selection dialog without processing the selected session.
Help	Provides help on the Process Selection dialog.

To process a project session, perform the following steps:

1. Display the Process Selection dialog.
2. Select a project session(s) to process.
3. Click on **Begin**.

   A progress dialog will be displayed.

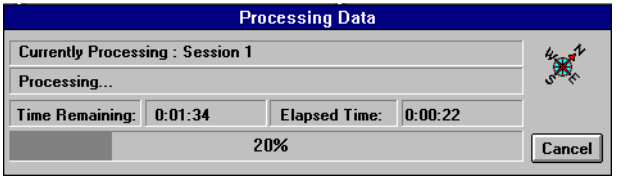

Figure 10.2: Processing Progress dialog

Table 10.2 explains the various components of this dialog:

Table 10.2: Processing Progress dialog

Name	Meaning
Currently Processing	Indicates the project session that is currently being processed.
Time Remaining	Indicates the approximate time remaining to process the project session(s).
Elapsed Time	Indicates the total time elapsed since the start of processing the project session(s).
Cancel	Clicking this button while actively processing a session will stop all processing and the Process Selection dialog will be displayed.

4. Should Reliance Processor encounter points which it can not process, a warning message will be displayed indicating the presence of unprocessed points (refer to “Filtering By Attribute Values” on page 105).
5. Once all sessions have been processed, the Process Selection dialog will be displayed.

Sessions that have been processed will have a “*” after their name. User is prompted to save processed features when closing the project.

Viewing and Editing Processed Data

The difference between processed data and unprocessed data is the positions of the features in the processed data are much more accurate. Filters and other settings will be applied the same regardless of position accuracy.

For example, viewing the Feature Information dialog for one of the point features will display an estimated position accuracy number after processing.

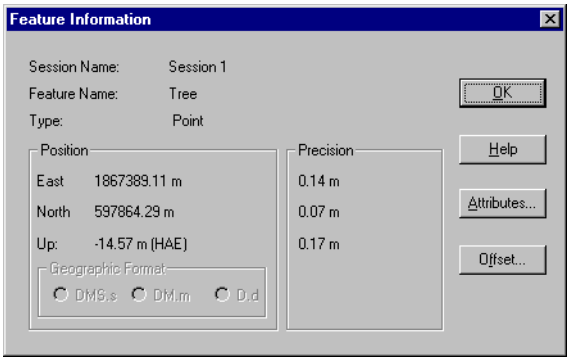

Figure 10.3: Feature Information dialog with accuracies

Prior to processing, position accuracies are labeled "Unprocessed". For point features that are successfully CM processed, a "CM processed" flag will appear under the Precision value.

Exporting Processed Data

Just as with Viewing and Editing processed data, exporting processed data operates exactly as unprocessed data except for the accuracy of the feature locations. You should process data prior to exporting it because the positions are much more accurate; however, nothing in Reliance Processor prevents exporting unprocessed data.

Data Exportation

Data Exportation makes Reliance a flexible and powerful Feature Asset Management tool. Combined with the Project Data Filter, Reliance can export data into many popular GIS and general file formats. This chapter explains how to make Reliance work together with your GIS package.

Exporting Data

The Export Data dialog is the standard File Save As dialog box, Figure 11.1. It allows you to select an export format from a list to export data to a specified directory. For each export file, the program also produces an INF file which contains the project name, current map system, unit, display, and other important information about the exported data. You can refer to the INF file to ensure that all the parameters are set correctly.

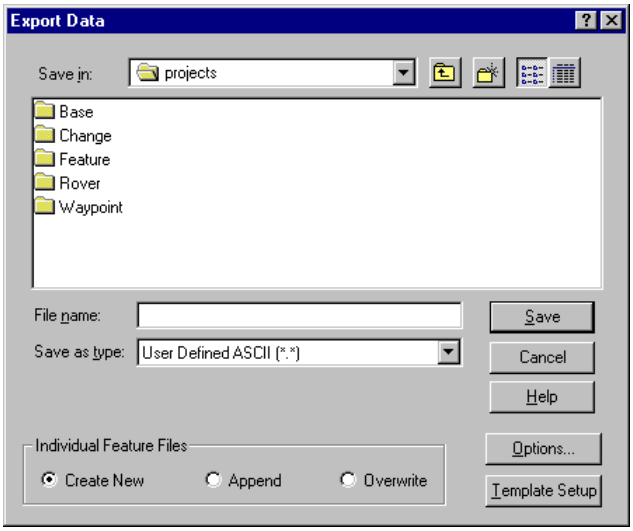

Figure 11.1: Export Data dialog

Table 11.1 explains the various components of this dialog:

Table 11.1: Export Data dialog

Name	Function
Save In	Determines which drive and directory the exported file will be saved.
File Name	Type the name of the export file. The program will create file names with certain extensions required by format specification.
Save as type listbox	A list of export formats available with proper extensions.
Buttons • **Save** • **Cancel** • **Help** • **Options...** • **Template Setup**	 • Select **Save** to retrieve the selected export file name, begin the export process, and exit the Export Data dialog. If the selected file already exists, the program will display an overwrite message. • Select **Cancel** to cancel the export process, and exit the Export Data dialog. • Provides help on the Export Data dialog • Displays the Export Data Types dialog. • Only available for User Defined ASCII (refer to “User Defined ASCII Files” on page 116.
Individual Feature Files • Create New • Append • Overwrite	Only available for User Defined ASCII and Map Info export types. This setting applies when you export features to individual file names which already exist in the export directory. • Creates a new file name if a duplicate file name is found. • Adds newly exported features to existing files with the same name. • Overwrites the existing duplicate file with the new one.

Before exporting your gathered data, perform filtering to ensure that only the desired data is exported. Refer to Chapter 9, **Filtering Collected Data**.

Access the Export Data Types dialog by clicking **Options** on Export Data dialog box.

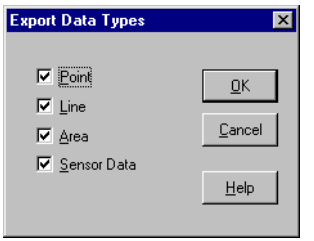

Figure 11.2: Export Data Types dialog

The Export Data Types dialog allows you to choose which feature types(s) to export.

Available Export Formats

The following is a list of the available export formats that may be selected in the Save File As Type listbox:

- User Defined ASCII. The file extension is user-defined, but the default is **.UDA.**
- Shape file format with the extension **.SHP**. The program also creates two additional files with the extensions **.SHX** and **.DBF**.
- Generate file format with the extension **.GEN.** The program also creates a **.DBF** file.
- AutoCAD 12 (or newer) Text file format with the extension **.DXF**.
- AutoCAD 12 (or newer) Binary file format with the extension **.DXF**.
- Intergraph file format with the extension **.ASC**.
- MapInfo file format with the extension **.MIF** the program also creates a **.MID .**
- Comma Delimited file (this format is no longer available—to customize an export file in a comma delimited format, refer to “User Defined ASCII Files” on page 116).

For Shape, Generate, and MapInfo export formats, a separate file is created for each feature exported. For User Defined ASCII, you have the option to create either one file with all features, or one file per feature exported.

Export File Format Descriptions

This section describes each of the Export File Formats.

Information File

The Information File (**.INF** file) lists the Map System and units information for the positions exported. This file is created with any other exported file format. An example **.INF** file header format is shown in Table 11.2.

Table 11.2: Information File Format

Component	Data
Project Name	c:\Reliance\data\day008.prj
Date	2/28/96
Map System	State Plane Coordinate 1983
Zone	California (Zone 3)
Datum	North American 1983
Display	Geographic
Height Datum	Height above ellipsoid

Table 11.2: Information File Format (continued)

Component	Data
Horizontal Unit	Meter
Vertical Unit	Meter
Angular Unit	Degree
Standard Deviation Unit	Meter
Processing Mode	submeter
2-Sigma Filter	Off

At the bottom of the **.INF** file, the columns of data are identified for each feature exported for the particular export format selected. If more than one file is created during export, then a list of filenames is shown at the end of the file.

The Information file is always generated regardless of the export file type selected.

User Defined ASCII Files

Reliance provides the user the ability to customize ASCII files. The following procedure describes how to customize an ASCII export file.

Customizing an ASCII Export File

1. Once the project file is open, click on **Export Data** in the Project Control dialog.

2. Click **Template Setup** to open the User ASCII Template.

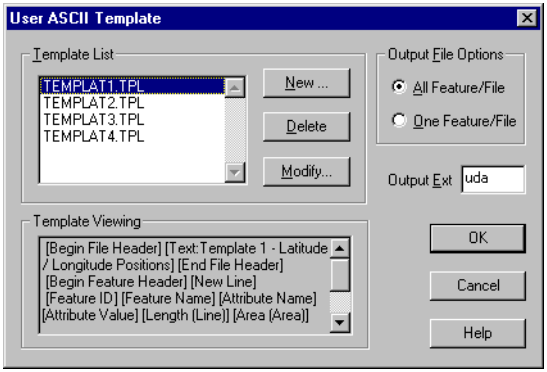

Figure 11.3: User ASCII Template Dialog

Table 11.3 describes the components of this dialog.

Table 11.3: User ASCII Template Dialog

Component	Description
Template Listbox	Provides a list of all default and previously saved ASCII export file templates
Template List Buttons • **New** • **Delete** • **Modify**	 • Creates a new template with a name and opens the User Defined Format dialog. • Deletes the selected template • Opens the Defined Format dialog for the selected template
Output File Options • All Feature/File • One Feature/File	 • All features exported will be stored in one file with the same name as you gave the **.INF** file. • One file will be created for each feature exported. The names of these files will be based on each feature name exported.
Output Ext	Allows user to define extension of output file
Template Viewing	Provides list of fields for selected template in Template listbox
Buttons • **OK** • **Cancel** • **Help**	 • Uses the template selected by user for export file format and closes dialog. • Does not use selected template and closes dialog. • Opens the help dialog for the User ASCII Template dialog

3. Create a new or modify an existing ASCII template with the appropriate Output File option.

User Defined Format

When the user clicks **New** or **Modify** in the User ASCII Template dialog, Reliance displays the User Defined Format dialog.

Clicking New allows you to name a new template while clicking Modify allows you to modify an existing template listed in the Templates List.

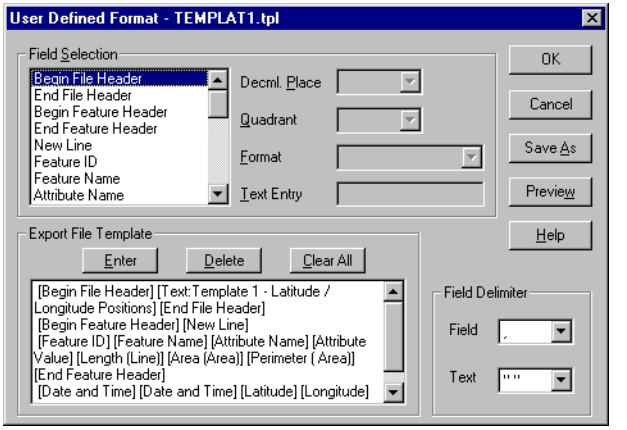

Figure 11.4: User Defined Format dialog

This dialog is used to define the fields and structure of the ASCII export file. Table 11.4 describes the components of this dialog.

Table 11.4: User Defined Format dialog

Component	Description
Field Selection	
Field Selection List	Provides a list of available fields (refer to Table 11.5 for a description of the available field names)

Table 11.4: User Defined Format dialog (continued)

Component	Description
Decml. Place	Indicates accuracy (number of places after decimal). Active only for the following fields: • Northing • Easting • Latitude • Longitude • Height • Precision (Std Devs) • Length (Line) • Area (Area) • Perimeter (Area)
Quadrant	Indicates either N/S and E/W, or +/-. Available only for Latitude and Longitude fields.
Format	Provides format for date and time field. Available formats are indicated in listbox.
Text Entry	Available only for Text: field. Limited to 120 characters.
Export File Template	
Buttons • **Enter** • **Delete** • **Clear All**	 • Enters highlighted field from Field Selection and places in template at current cursor position. *Double-click on a field to highlight it.* • Deletes highlighted fields in template. • Deletes all fields in template.
Field Structure	Provides a real-time structure of the ASCII template which will reflect modifications through the use of the **Enter**, **Delete**, and **Clear All** buttons.
Field Delimiters	
Field	Indicates choice of delimiters between each field (comma, semicolon, or vertical bar).
Text	Indicates choice of delimiters between text (single quotes, double quotes, or none)

Table 11.4: User Defined Format dialog (continued)

Component	Description
Buttons	
• **OK**	• Checks template to ensure position type matches Map System settings. Once it determines the template is ok, saves template settings and closes dialog.
• **Cancel**	• Closes dialog without saving template modifications.
• **Save As**	• Checks template to ensure position type matches Map System settings. Once it determines the template is ok, saves template modifications to another template name.
• **Preview**	• Shows a preview of the field structure for the selected template with simulated data (refer to Figure 11.5)
• **Help**	• Displays help for User Defined Format dialog.

Table 11.5: User Defined Format Field List

Name	Description
Begin File Header	Allows you to provide a header of information for the exported file.
End File Header	You must select this whenever you enter a "Begin File Header" to indicate the end of the information in the file header. Note that a new line will be created when entering this selection.
Begin Feature Header	Allows you to provide a header of information for each feature in the file that is exported.
End Feature Header	You must select this whenever you enter a "Begin Feature Header" to indicate the end of the information in the feature header. Note that a new line will be created when entering this selection.
New Line	Allows you to separate the exported data fields by lines.
Feature ID	Indicates a unique feature ID for each feature exported.
Feature Name	Shows the feature name.
Attribute Name	Shows the attribute names specified for the feature.
Attribute Value	Shows the attribute values entered for the feature.
Latitude	Indicates the latitude of the feature in either D.d, DM.m, or DMS.s formats. This is only available for Geographic Map System displays.
Longitude	Indicates the longitude of the feature in either D.d, DM.m, or DMS.s formats. This is only available for Geographic Map System displays.
Northing	Indicates the north coordinate of the feature. This is only available for Grid Map System displays.
Easting	Indicates the east coordinate of the feature. This is only available for Grid Map System displays.

Table 11.5: User Defined Format Field List (continued)

Name	Description
Height	Indicates the height (either HAE or MSL) of the feature.
Precision (Std Devs)	Shows the precision, in standard deviation, of the positions that were processed. This will always show three values - one for each position coordinate. A string called "Unprocessed" will be shown for these three fields if the data has not been processed yet.
Date and Time	Indicates the date and/or time the feature was collected. Note that you can have date and time field separated (by a comma, semi-colon, or vertical bar) by choosing this selection twice - once for the date and once for the time.
Text	Indicates a custom text entry, which you can enter up to 120 characters. Note that even a space (" ") is a valid text entry.
Length	The length in meters. This is only available for line features.
Area	The area value in square meters. This is only available for area features.
Perimeter	The perimeter value in meters. This is only available for area features.
Full Sensor Data	Contains the interpolated time tag, interpolated position, and the string of data collected from the external sensor for when the feature was collected.
Position Count	Indicates the number of positions that were recorded when the feature was collected.
Process Mode	Indicates the processing mode that was used to process the data - sub-meter, decimeter, or CM processed.
Max PDOP	The maximum PDOP value that occurred during the time the feature was collected. (Typical good PDOP values should be from 2 to 4.)
Min Satellites	The minimum number of GPS satellites that were tracked during the time the feature was collected.
GPS Day of Year	The day of year that the feature was collected.
GPS Week	The week number when the feature was collected.
GPS Seconds of Week	The number of seconds in the week, starting from Saturday at midnight, when the feature was collected.

Figure 11.5 shows the User Defined Format dialog with a preview of the ASCII export file containing simulated data.

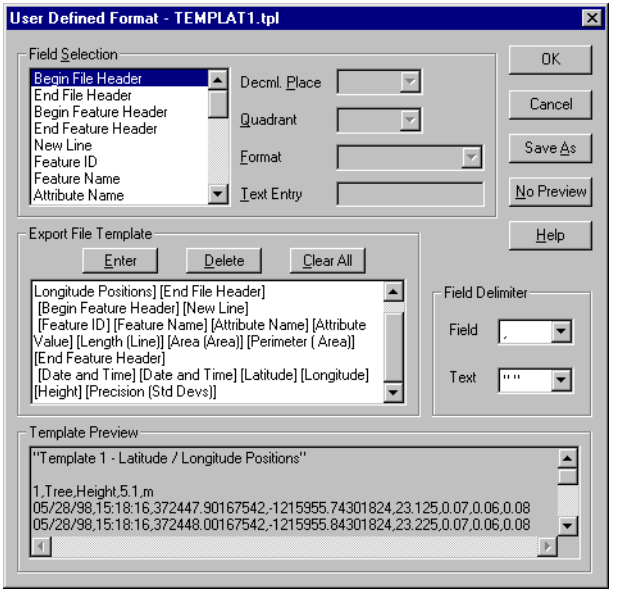

Figure 11.5: User Defined Format dialog with Preview

4. Modify the field selection, field template structure, and field delimiters of the User Defined ASCII export file.
5. Click **Save As** in the User Defined Format dialog to save the template.
6. Click **OK** in the User ASCII Template dialog to use selected template and close dialog.
7. Click **Save** in Export Data dialog to export data in User Defined ASCII export file.

Shape File

The Shape file format selection supports users of ArcView. The Shape files consist of a main file, an index file, and a dBASE table. The main file is a direct access, variable-record-length file in which each record describes a shape with a list of its vertices. In the index file, each record contains the offsets of the corresponding main file record from the beginning of the main file. The dBASE table contains feature attributes with one record per feature.

The main file, the index file, and the dBASE table have the same prefix. The suffix for the main file is "**.SHP**." The suffix for the index file is "**.SHX**." The suffix for the dBASE table is "**.DBF**."

Generate File

The Generate file format selection supports users of ArcInfo. The main file with extension "**.GEN**" contains feature's coordinates. For point features, each record begins with a feature index, followed by a comma, and a coordinate. For line and area features, each record begins with a feature index on a separated line, followed by the series of coordinates which defines the line, or area feature. Each component of the coordinate is separated by a comma. An "END" statement signifies the end of the record

The dBASE table with an extension "**.DBF**" contains feature height and attributes with one record per feature.

AutoCAD File Format

AutoCAD files (both binary and ASCII) can be selected which support AutoCAD 12. One file is ASCII while the other is binary. The **DXF** files are standard ASCII text files with an extension "**.DXF**" and specially formatted text. They can easily be translated to the formats of other CAD system. The overall organization of a **DXF** file contains the following sections:

1. Header contains general information about the drawing.
2. Tables contains definitions of named items.
3. Blocks contains Block definition entities describing the entities that make up each Block in the drawing.
4. Entities contains the drawing entities: Line, Point, or Text.
   - The Line section contains the coordinates for the start point, and end point.
   - The Point section contains the coordinate of the point.
   - The Text section contains information of attribute such as attribute value, and insertion point.
5. End of File

Many GIS programs do not recognize geographic coordinates in a DXF file. Select SPC-83 or a similar Grid System (in Map System) before exporting.

Intergraph File Format

The Intergraph file (.ASC) contains records of feature information separated by a blank line. Each record begins with the feature name followed by attribute values, and

the feature's coordinates. Each field is listed on a separated line. Point features will have one coordinate values. Line, and Area features will have at least two coordinate values. Each component of the coordinate is separated by a comma. Table 11.6 displays the Intergraph File format:

Table 11.6: Format for Intergraph File

Point Feature	Line Feature	Area Feature
Feature_name	Feature_name	Feature_name
Attribute_value_1	Attribute_value_1	Attribute_value_1
Attribute_value_2	Attribute_value_2	Attribute_value_2
....	....	....
Attribute_value_n	Attribute_value_n	Attribute_value_n
X1,Y1,Z1	X1,Y1,Z1	X1,Y1,Z1
	X2,Y2,Z2	X2,Y2,Z2
	....	....
	Xn,Yn,Zn	Xn,Yn,Zn
		X1,Y1,Z1

MapInfo File Format

Selecting MapInfo creates files which can be directly imported into any MapInfo application. The set of MapInfo files for each feature exported consists of the following:

Table 11.7: MapInfo File Format

File	Extension	Contents
Main file	.mif	Position information
Attribute file	.mid	Feature attributes

The Main and Attribute files have the same name. One set of files is created for each feature exported.

The Effects of Filter and Hiding on Exportation

If a feature is blocked by the filter or hidden (it is not displayed in the Map View), then it will not be exported to the target file. It is important to set the filter to show only the features you want to export prior to beginning the export process. For more information on filtering, refer to Chapter 9, **Filtering Collected Data**.

Exportation of Processed Versus Unprocessed Data

The only difference between exporting processed and unprocessed data is that the file exported with the unprocessed data contains less accurate points than the processed data. Reliance does not require processing prior to exporting.

Using Exported Data

This section provides examples of how the various export file formats may be used in several GIS packages.

Using User Defined ASCII Files

User defined ASCII files are created so that you can customize the table of information that you want to import into your GIS software package.

The file can even be loaded into Microsoft Excel™ so that further modifications and data analysis can be done.

Using Shape Files in ArcView

Before exporting a Shape File, perform filtering to ensure that only the desired points, lines, or area features are exported.

The basic steps to using a Shape File in ArcView involves the following:

- Creating a new project
- Create a view
- Add a theme

1. Start *ArcView*.

2. Create a project. From the **File** menu, choose **New Project**. A project called Untitled is created and a Project window is opened.
3. Create a view. From the Project window, click to highlight **Views** and click **New**. A view window called View1 is created.
4. Add a new theme. From the **View** menu, select **Add Theme**. The Add Theme dialog box appears that automatically looks for the Shape File in your current working directory.
5. Go to the directory that contains your exported Shape File. Select the exported Shape File and click **OK**.
6. To view the feature, click on the box to the left of the feature file name.

At this point, you can add additional themes, query, or print your ArcView project. Refer to your ArcView Reference manuals for more details on working with ArcView.

Using Generate Files in PC Arc/Info

Before exporting a Generate File, perform filtering to ensure that only the desired points, lines, or area features are exported.

The basic steps to using a Generate File in an Arc/Info package involves the following:

- Creating a coverage
- Clean and build the coverage
- Create a *relate item* to physically merge the database file with the feature attribute table

The example below is for an exported points feature file called **EXAMPLE.GEN**. The Generate format in Reliance creates the following files: **EXAMPLE.GEN**, **EXAMPLE.DBF**, and **EXAMPLE.INF**.

The commands to type at the Arc/Info prompts are in bold letters.

1. Start *Arc/Info.*
2. Create a coverage using the GENERATE program in Arc/Info.

```
Arc>  GENERATE EXAMPLE
Generate>  INPUT EXAMPLE.GEN
Generate>  POINTS
Generate>  QUIT
```

3. Clean and build the coverage.

```
Arc>  CLEAN EXAMPLE
Arc>  BUILD EXAMPLE POINTS
```

4. Create a relate item value to match an item in the feature attribute table.

   Arc> TABLES

   Enter Command: SELECT EXAMPLE.PAT

   Enter Command: ADDITEM

   Item Name: RECORDID

   Item Width: 5

   Item Type: N

   Decimal places: 0

   Start Item (default=last item): <ENTER>

   Item Name: <ENTER>

   Enter Command: CALCULATE RECORDID = EXAMPLE_ID

   Enter Command: QUIT

5. Use the **JOINITEM** command to physically merge the database file with the feature attribute table. Use the **RECORDID** as the shared item to relate the two files.

   ```
   Arc> JOINITEM EXAMPLE.PAT EXAMPLE EXAMPLE.PAT RECORDID RECORDID
   ```

At this point, you may want to verify that the spatial data has been converted. You may do this by using several of the graphic programs within Arc/Info. Refer to your Arc/Info Reference manuals for more details on using Arc/Info.

Using Intergraph Files in Intergraph's MGE ASCII Loader (MGAL)

The Intergraph File (.ASC) can be imported using Intergraph's MGE ASCII Loader (MGAL). MGAL will read GPS data and generate graphics in a design file, in addition to adding graphic attributes to the database. MGAL will also generate necessary database linkages from the attributes to the graphics producing a fully GIS capable map.

Before running MGAL, check to make sure there is a working MGE project. Some of the basic steps involved in creating a MGE Project are:

- Create a Database (such as creating a new Oracle user).
- Generate a RIS Schema (using the new Oracle user).
- Create a Project (using MGE).
- Build the Project Schema into the database (using MGE).

1. Before running MGAL, check to make sure that the features that are to be loaded already exist in the feature table. Feature tables may be created or existing tables may be edited using **Feature/Schema Builder**. Use the **Feature/Schema Builder** to make sure the tables and columns that will hold the attribution exist in the database.

2. Start MGAL. From **Modular GIS Environment** menu, select **Tools** and then **MGE ASCII Loader**. The **MGE ASCII Loader Tools** menu will now appear. To load graphics and attribute data into the system, select **Feature Loader**. The **Feature Loader** form now appears.

   The Feature Loader form is divided into 5 sections:

   - **Project**- The project name is pre-defined based on what MGE project the user is in when MGAL is executed.
   - **Input ASCII File** - This is the file that contains the GPS coordinates and attribute data.
   - **Output Design File** - This file will contain the graphic elements once MGAL is run.

If a new design file is being created and the GPS data contains 3D data, it is important that the user select the proper 3D seed file.

   - **Setup File**—If the Define button is selected, you may specify parameters such as what lines of the file are to be loaded, the coordinate system, and what Record Format Files are to be used.

     Record Format Files - If the **Define** button is selected, the **Record Format Definition** form appears. On this form, the user selects a feature and provides format information by selecting **Record Information**. A **Record Format File** must be generated for each feature that is to be loaded.

     Record Information - On this form, the user provides the start and end column for the easting, northing, elevation, and attribute data found in the ASCII file. The Attribute Information button allows the user to define what database columns are to be loaded and the position of the attribute data in the ASCII file. The Coordinate Information button allows the user to specify which line in the ASCII file contains the coordinate information.

     Back on the Setup File Definition form, the user should use the Select button under Record Format Files to make sure that each feature that is to be loaded has been selected.

   - **Loading Options**—A datapoint in the Load Attributes from ASCII File box will enable MGAL to load attribute information in the ASCII file into the database.

3. Once all of the parameters have been selected, click the OK button to execute MGAL. Use the Process List (selected from the Modular GIS Environment form) to monitor the execution of MGAL.

At this point, you may want to use one of the graphics program within Intergraph to view the imported data. Refer to your Intergraph Reference manuals for more details on using MGAL.

Using DXF Files in FieldNotes

Most CAD software packages are able to import DXF Files easily. The following example shows how to export a DXF file format into FieldNotes, a Windows geographic information system (GIS) and AM/FM (mapping and CAD) package.

1. Start *FieldNotes.*
2. Import the DXF file. From the File menu, select **Open Drawing**. A **Load Drawing File** dialog appears that automatically looks for the DXF files in your current working directory.
3. Go to the directory that contains your exported DXF file. Select the DXF file and click **OK**.

Refer to your CAD Software Reference manuals for more details on importing DXF files.

Using Files in MapInfo

The basic steps for using MapInfo involves the following:

- Importing files
- Creating a workspace
- Adding feature layers

Start MapInfo and to Cancel Quick Start

1. Import files. From the Table menu, choose **Import**. Go the directory that contains your exported MapInfo(.MIF and .MID) files. Select the .MIF file to be imported and click **Import**. A .TAB (MapInfo file) with the same file name as the .MIF file is created. Click OK at the **Import into Tables** dialog box. Repeat these steps for all features to be viewed in this workspace.
2. Create a workspace. From the Window menu, select **New Map Window**. Choose a feature from the Map Tables drop down menu and click **OK** to open the workspace.
3. Add features to workspace. From the Map menu, select **Layer Control**. After the Layer Control dialog box appears, click **Add**. Choose the feature to add to the workspace and click **Add**. Repeat for all features to be added to this workspace.

Batch Processing

This chapter explains how to set up a Reliance project in preparation for batch processing.

Creating a Batch Project

Perform the following steps to create a new Batch project.

Preferences

1. If you are going to download rover files from your receiver, perform the following:
   a. Select Settings under the **Tools** drop-down menu. The **Global Settings** dialog appears.

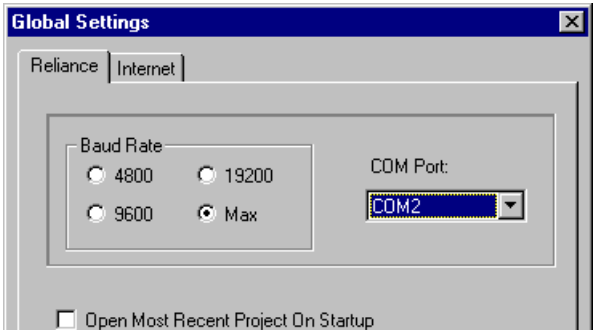

Figure 12.1: Global Settings dialog

   b. On the Reliance settings tab, ensure the correct baud rate and COM port are set.
2. If you wish to download base files from the CORS sites on the Internet, perform the following:

a. Select Settings under the **Tools** drop-down menu.

b. The Global Settings dialog is displayed (refer to Figure 12.1).

c. Click on the Internet Setting tab and choose the appropriate Internet access connection.

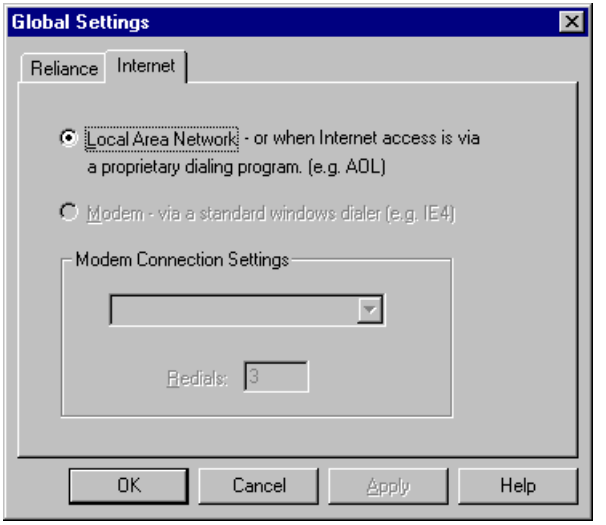

Figure 12.2: Internet Access Dialog

d. "Local Area Network" should be selected when your Internet connection has already been established. You must do this for Internet access accounts that have proprietary dialing programs, such as America Online (AOL).

e. "Modem" should be selected if an Internet connection has not yet been established and your Internet service provider uses a standard Windows dialing program, such as Internet Explorer (IE4).

f. Click **OK** to close dialog.

3. Select **Batch Wizard...** from the **Project** drop-down menu to create a new batch project:

4. Select a drive and a directory for the project file and enter a name for the project file in the Name field.

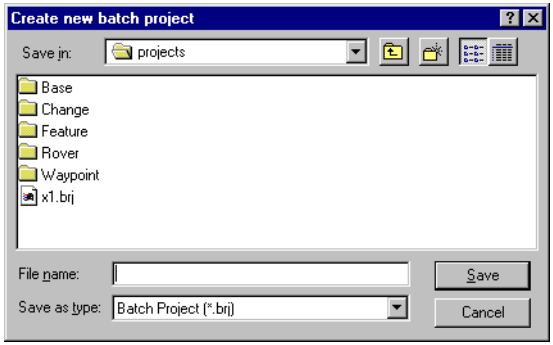

Figure 12.3: Create a New Batch Project

Batch project files have a “ .BRJ” extension.

5. Click **Save** to create the Batch Project File.

Batch Wizard

Reliance displays the Batch Wizard which will guide you through the steps necessary to create a “Batch” project.

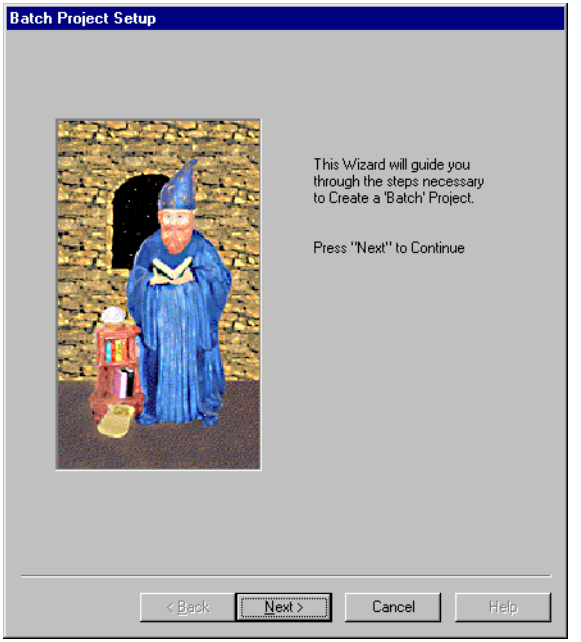

Figure 12.4: Batch Project Setup Dialog

6. Click **Next** to continue.

Reliance displays the **Session Settings** dialog.

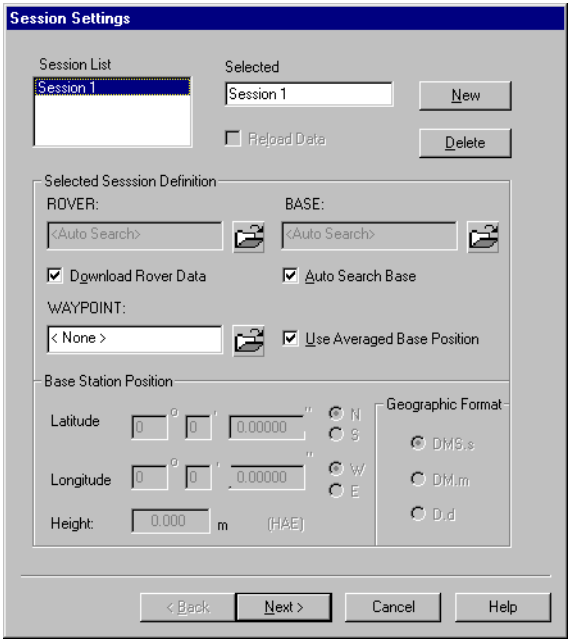

Figure 12.5: Session Settings Dialog

An initial session titled “Session 1” appears in the “Session List” list box and also in the “Selected” edit box. Additional sessions are created by clicking New. This adds a new entry in to the “Sessions” list box titled “UnNamed001”.

Selected Session Definition

7. If you wish to download the rover files from your receiver, click on the Download Rover Data check box.

   This will inactivate the file name text box.

   If you download a rover file from your receiver, perform the following steps (otherwise continue with the next step).

   a. With the Download Rover Data checkbox checked, click on **Next**.

b. The Receiver File Selection dialog is displayed.

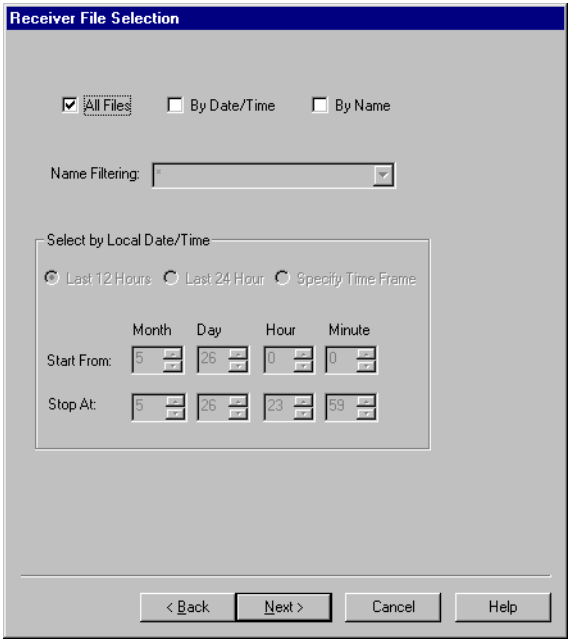

Figure 12.6: Receiver File Selection Dialog

c. You can select files using four different methods:

Table 12.1: Receiver File Selection Methods

Method	Description		
All Files	All rover files would be downloaded		
Date/Time	Last 12 hours	Last 24 hours	Specify Time Frame
Name	Rover files with specified name would be downloaded		
Date/Time & Name	Rover files with specified name and within time frame would be downloaded		

d. Once you have selected the appropriate File Selection parameters continue with the next step.

8. If you wish to select a rover file which already has been downloaded to a local drive, browse and select the appropriate file.
9. If you want Reliance to Auto Search a Base file, click on the Auto Search Base check box.

Reliance searches for a Base File automatically by looking in all directories specified in the Base File Path section of the Directories dialog.

This will inactivate the file name text box.

10. If you wish to select a Base file which already exists on a local drive, browse and select the appropriate file.
11. If you do not know the coordinates of the base station, check the **Use Averaged Base Position** checkbox. The Base Station Position fields will be inactive.

You should always attempt to use the exact base station coordinates. If you must use the averaged base position, the processing precision will not be guaranteed.

Base Station Position

12. If you know the Base Station Position, enter the appropriate coordinates.

Reliance defaults to a Map system of WGS84. If you need to change the system before entering base position, click Next to display the Map System dialog.

If you are getting base data from a CORS site automatically, the base station position will be filled in by Reliance.

13. If you want to display a different Map System, click on **Next** until the Map System dialog is displayed.

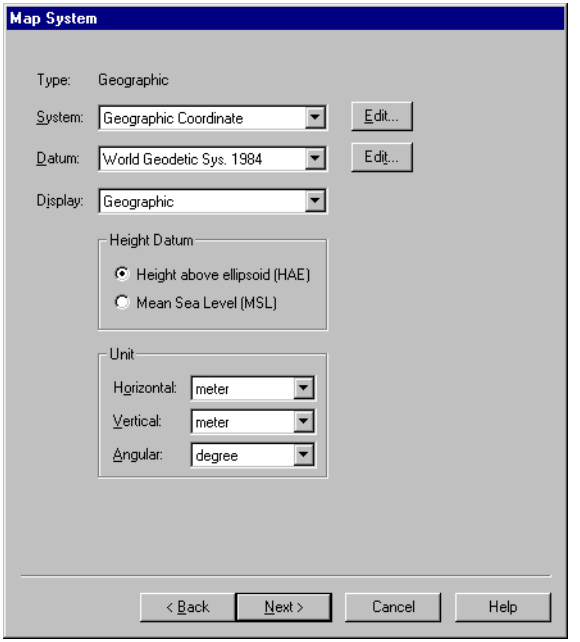

Figure 12.7: Map System Dialog

14. Choose the appropriate Map System parameters.

If you had to display a different Map System on the Session Settings Dialog, changing the Map System on this dialog will automatically change the Base Position Parameters on the Session Settings Dialog.

15. Ensure the appropriate Base Station Position parameters have been entered on the Session Setting dialog.
16. Click **Next**.

Directories

17. The **Directories** dialog is displayed.

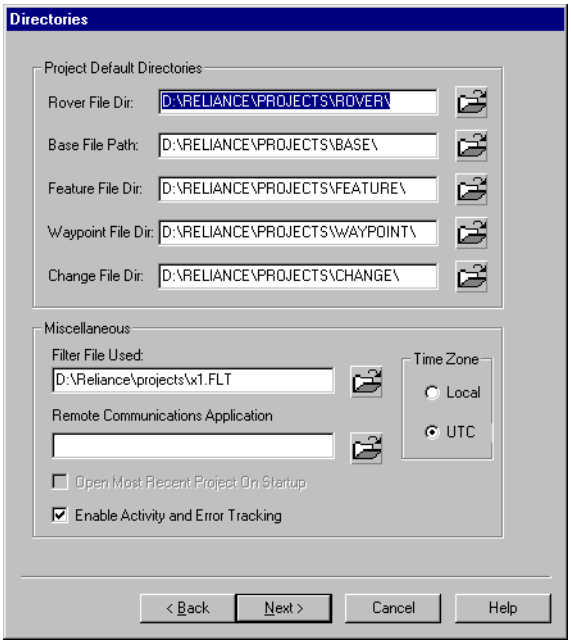

Figure 12.8: Directories Dialog

18. If you selected to download Rover Files from your receiver, the “Rover File Dir” indicates where the files will be saved on your local drive.
19. If you select to auto search Base Files, the “Base File Path” indicates the directories where Reliance will search for the Base Files
20. If you want to search for Base Files from the Internet CORS sites, you must add “,FTP://CORS” to the Base File path.

If you have selected a specific rover and base file in the Session Setting dialog, the directories displayed in the Directories dialog have no relevance.

21. Click **Next**.

22. The Processing Mode and Export Format dialog is displayed.

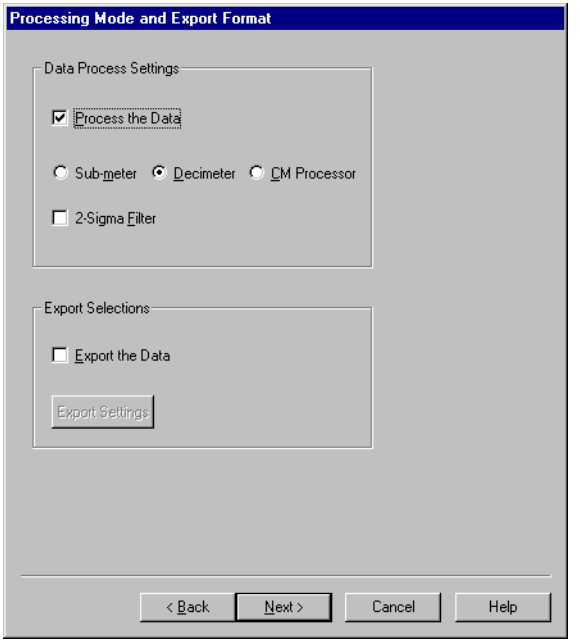

Figure 12.9: Processing Mode and Export Format Dialog

23. If you wish to process the data, choose the appropriate Data Process Settings

24. If you wish to export the data, check the Export Data check box. The Export Settings dialog appears.

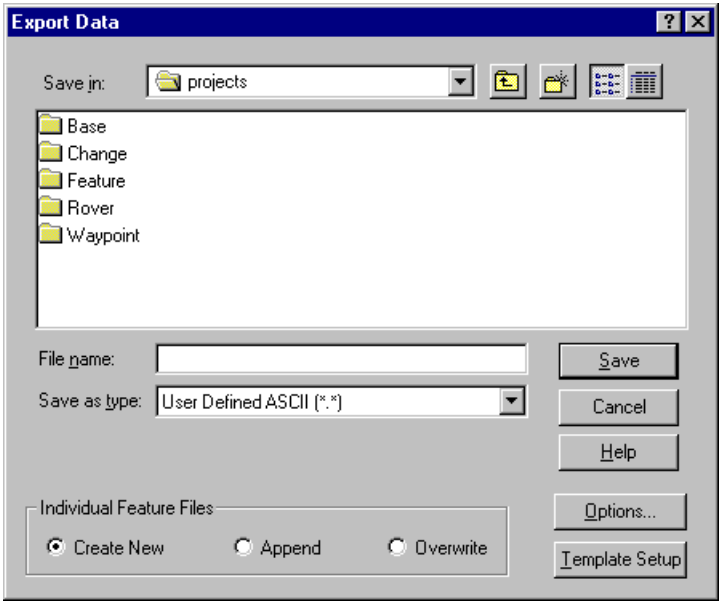

Figure 12.10: Export Settings dialog

25. Click **Next**.

26. The Run Batch Project is displayed.

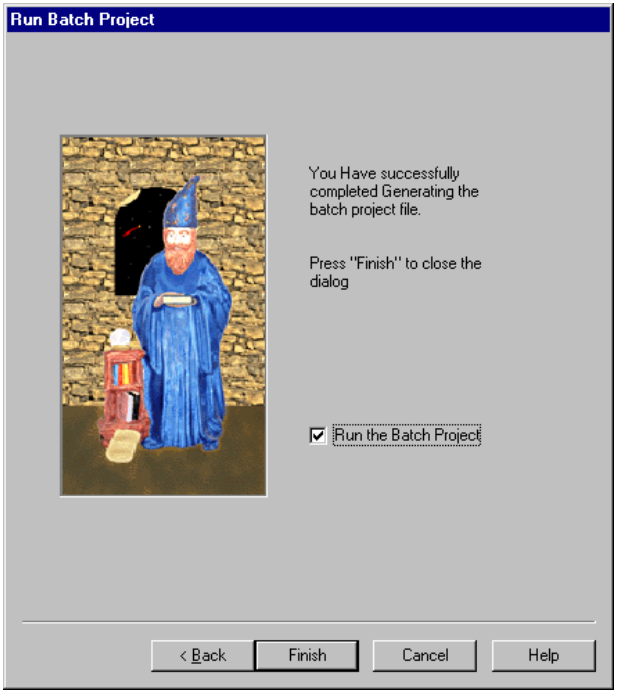

Figure 12.11: Run Batch Project Dialog

27. If you wish to run the batch project at a later time, uncheck the **Run the Batch Project** checkbox.
28. Click **Finish**.

29. The Save Batch Project as a Reliance project is displayed.

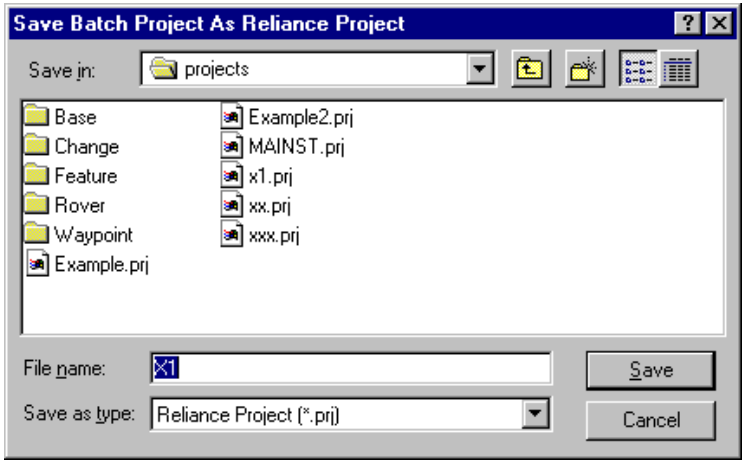

Figure 12.12: Run the Batch Project dialog

30. Enter a name in the file name textbox.
31. Click **Save**.
32. You have successfully completed generating the batch project file and your project will immediately run if you checked the Run Batch Project. If you did not check this box, you can run this project later by selecting it under **Open Project**.

After the batch project has been run, both the Time View and Map View windows will be displayed.

Setting Up a Map System

The Map System dialog allows you to select the map system, the zone (or datum for the Geographic system), display mode, and units to be used in the current project. When a map system is selected, the list of zones is updated accordingly to show all the zones for the selected system. If the selected system is Geographic, then the list of datums is displayed instead. The Geographic system does not have zones. The initial data for the Map System dialog is read from a setup file (**MAPDATA.TXT**), and all the changes made are saved to that file.

Map System Dialog

To get to the Map System dialog, press the Project Setup icon located in either the Project Control dialog or the Reliance Processor main window toolbar.

Click the **Map System** tab to get the Map System setup dialog.

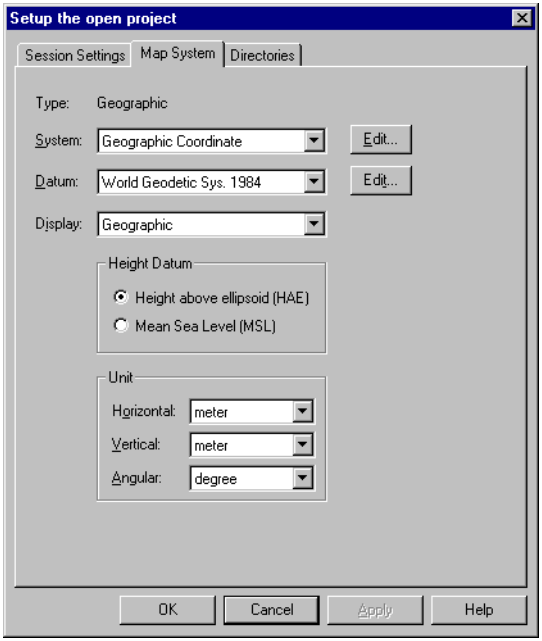

Figure 13.1: Map System dialog

Table 13.1 describes the components of this dialog.

Table 13.1: Map System dialog

Name	Function
Type	The type of the selected system. There are three possible system types: • Geographic-This system does not have zones, datum is selected instead. Also, the Display Mode is limited to Geographic only. • User Defined-A map system defined by you, or supplied with the program, that can be modified, including defining new zones, and changing the existing ones. • Predefined-A predefined map system based on the Universal Transverse Mercator System. The zone information for that system can't be modified, except the local transformation.
System	A list of systems to be selected. At the bottom of this list is the "< Create New >" item which allows you to create a new system by invoking the Create System dialog. If the selected system is Geographic, the Zone selection box changes to Datum selection box. For all other systems, the Zone list box contains the zones defined for the selected system. • **Edit...**-Refer to "Edit System" on page 147.
Zone/Datum	Depending on the selected system, a list of zones or datums to be selected. At the bottom of this list, except for the systems of type Predefined, is the "< Create New >" item which allows you to create a new zone or datum. • **Edit...**-Refer to "Edit Zone" on page 148 for information about editing a zone. Refer to "Edit Datum" on page 153 for information about editing a datum.
Display	Display Mode represents the format that the coordinates are displayed and exported. If the current system is of a Geographic type, the only valid option is Geographic. Otherwise, valid options are Geographic, Standard Grid, or Local Grid.
Height Datum	Choose between Height Above Ellipsoid (HAE) and Mean Sea Level (MSL) for computing altitudes of positions. Since MSL is computed automatically using a worldwide model (GEOID96 for North America and 0SU91 for any other point on the earth), its absolute accuracies are not as well known as HAE. MSL Height Accuracy Estimates will always be displayed as N/A.

Table 13.1: Map System dialog (continued)

Name	Function
Unit • Horizontal • Vertical • Angular	 • A list of horizontal units which includes Meters, Kilometers, International Feet, US Survey Feet, Yard, US Yard, Miles, Nautical Miles, International Nautical Miles, Centimeters, and Inches. It is advised not to select the Centimeter or Inch units unless the area your field data cover is very small. • A list of vertical units which includes Meters, Kilometers, International Feet, and US Survey Feet, Yard, US Yard, Miles, Nautical Miles, International Nautical Miles, Centimeters, and Inches. It is advised not to select the Centimeter or Inch units unless the area your field data cover is very small. • A list of angular units which includes Degrees, Radians, and Gradients.
OK	Saves changes and closes dialog.
Cancel	Closes dialog without saving changes.
Help	Displays on-line Help.

Edit System

Click **Edit** (same line as “System”) to bring up the Edit System dialog that allows you to edit the parameters of the selected system.

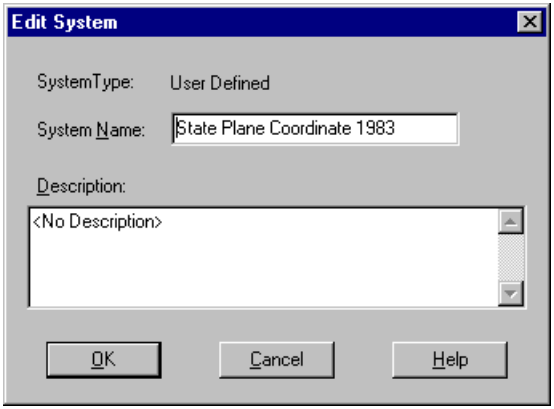

Figure 13.2: Edit System dialog

Table 13.2 describes the components of this dialog.

Table 13.2: Edit System dialog

Name	Function
System Type	The type of map system currently selected.
System Name	The name of the current map system, up to 30 characters longs.
Description	A space provided to allow you to describe the map system.
OK	Saves changes and closes dialog.
Cancel	Closes dialog without saving changes.
Help	Displays on-line Help.

Edit Zone

Click **Edit** (same line as “Zone”) to bring up the Edit Zone dialog that allows you to edit the parameters of the selected zone.

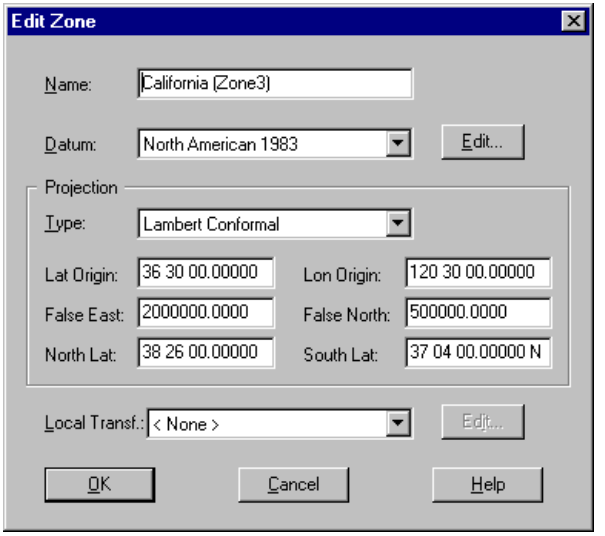

Figure 13.3: Edit Zone dialog

Table 13.3 describes the components of this dialog.

Table 13.3: Edit Zone dialog

Name	Function
Name	A 30-character name of the zone to be edited.
Datum • **Edit**	A list of Datums to be selected. At the bottom of this list, except for the systems of type Predefined, is the "<Create New>" item which allows you to create a new Datum. • Select to bring up the Edit Datum dialog that allows you to modify the parameters of the selected datum (refer to "Edit Datum" on page 153). The datum parameters are with respect to the WGS-84 System.
Projection • Type	Set of projection parameters for the selected zone. The number and the type of those parameters depends on the projection type. The panel is updated each time the new projection is selected. Each projection parameter is an edit box. • A list of projections available for selection. Only four projections are supported. Refer to "Projection Types" on page 150 for more information.
Local • **Edit/Create**	A list of local transformations available for the currently selected zone • Select to bring up the Edit/Create Transformation dialog (refer to "Edit Transformation" on page 156) that allows you to modify/create the parameters of the selected local transformation.
OK	Select to exit and save changes.
Cancel	Select to exit and cancel changes.
Help	Select to bring up the Help menu.

Projection Types

The following projection types are available:

- Transverse Mercator
- Lambert Conformal Conic
- Oblique Mercator
- Stereographic

Figure 13.4 is the Edit Zone dialog with the Transverse Mercator Projection selected:

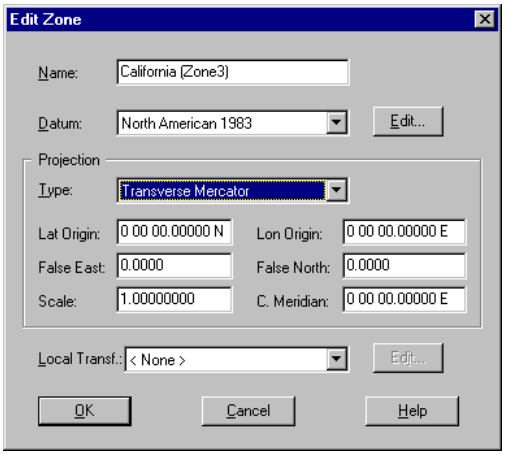

Figure 13.4: Edit Zone dialog with Transverse Mercator Projection selected

Table 13.4 describes the components of the Transverse Mercator Projection:

Table 13.4: Transverse Mercator Projection

Name	Function
Lat Origin	The Latitude of the origin of the projection in degrees, minutes, and seconds.
Lon Origin	The Longitude of the origin of the projection in degrees, minutes, and seconds.
False East	The map grid east coordinates of the origin of the projection. Usually these are set to positive numbers so that negative grid coordinates are avoided over the coverage of the zone.
False North	The map grid north coordinates of the origin of the projection. Usually these are set to positive numbers so that negative grid coordinates are avoided over the coverage of the zone.
Scale	This is the scale factor on the central meridian.
C. Meridian	The meridian (line of longitude) where the scale factor is defined.

Table 13.5 describes the components of the Lambert Conformal Conic (refer to Figure 13.3 for the Edit Zone dialog with Lamber Conformal Conic Projection selected):

Table 13.5: Lambert Conformal Conic

Name	Function
Lat Origin	The Latitude of the origin of the projection in degrees, minutes, and seconds.
Lon Origin	The Longitude of the origin of the projection in degrees, minutes, and seconds.
False East	The map grid east coordinates of the origin of the projection. Usually these are set to positive numbers so that negative grid coordinates are avoided over the coverage of the zone.
False North	The map grid north coordinates of the origin of the projection. Usually these are set to positive numbers so that negative grid coordinates are avoided over the coverage of the zone.
North Lat	The latitude of the northern parallel where the projection touches the earth.
South Lat	The latitude of the southern parallel where the projection touches the earth.

Figure 13.5 is the Edit Zone dialog with the Oblique Mercator Projection selected:

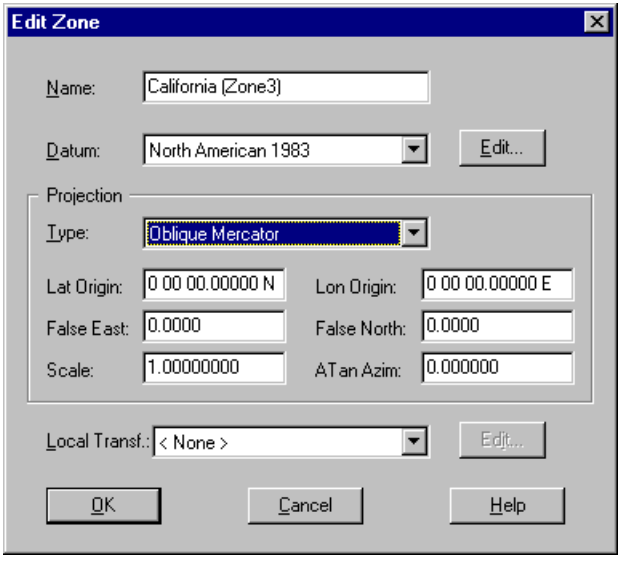

Figure 13.5: Edit Zone dialog with Oblique Mercator Projection selected

Table 13.6 describes the components of the Oblique Mercator Projection selected:

Table 13.6: Oblique Mercator Projection

Name	Function
Lat Origin	The Latitude of the origin of the projection in degrees, minutes, and seconds.
Lon Origin	The Longitude of the origin of the projection in degrees, minutes, and seconds.
False East	The map grid east coordinates of the origin of the projection. Usually these are set to positive numbers so that negative grid coordinates are avoided over the coverage of the zone.
False North	The map grid north coordinates of the origin of the projection. Usually these are set to positive numbers so that negative grid coordinates are avoided over the coverage of the zone.
Scale	This is the scale factor on the central meridian.
ATan Azim	The arc tangent of the true north azimuth of the central meridian.

Figure 13.6 is the Edit Zone dialog with the Stereographic Projection selected:

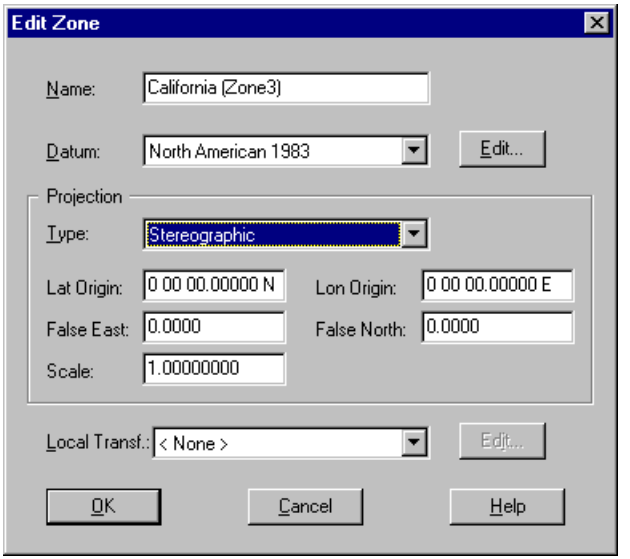

Figure 13.6: Edit Zone dialog with Stereographic selected

Table 13.7 describes the components of the Stereographic Projection selected:

Table 13.7: Stereographic Projection

Name	Function
Lat Origin	The Latitude of the origin of the projection in degrees, minutes, and seconds.
Lon Origin	The Longitude of the origin of the projection in degrees, minutes, and seconds.
False East	The map grid east coordinates of the origin of the projection. Usually these are set to positive numbers so that negative grid coordinates are avoided over the coverage of the zone.
False North	The map grid north coordinates of the origin of the projection. Usually these are set to positive numbers so that negative grid coordinates are avoided over the coverage of the zone.
Scale	This is the scale factor on the central meridian.
ATan Azim	The arc tangent of the true north azimuth of the central meridian.

Edit Datum

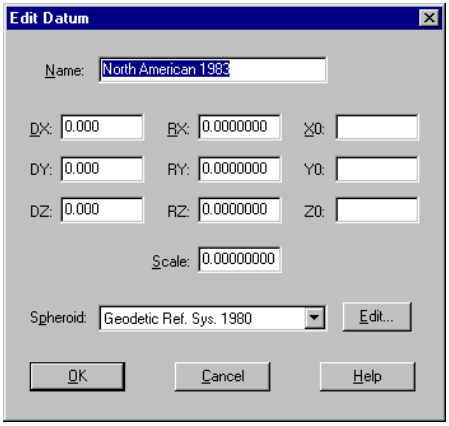

Figure 13.7: Edit Datum dialog

Table 13.8 describes the components of this dialog.

Table 13.8: Edit Datum dialog

Name	Function
Name	The 30-character name of the selected Datum.
DX, DY, DZ	Translation parameters: X, Y, and Z in floating point edit fields. DX is the translation along the x-axis. DY is the translation along the y-axis, and DZ is the translation along the z-axis. All translations are in meters and are with respect to the WGS-84 System.
RX, RY, RZ	Rotation parameters: X, Y, and Z in floating point edit fields. RX is the rotation about the x-axis. RY is the rotation about the y-axis, and RZ is the rotation about the z-axis. All rotations are in seconds of arc and are with respect to the WGS-84 System.
X0, Y0, Z0	Centroid parameters: X0, Y0, and Z0 are used to define a common center between two coordinate system centers. These parameters are not always necessary.
Scale	The floating point scale factor for the datum being edited or defined. This describes the scale difference in ppm between the datum and the WGS-84 System.
Spheroid • **Edit**	A list of available spheroids. At the bottom is of this list is "< Create New >" item which allows you to define a new spheroid. • Select to bring up the Edit Spheroid dialog allowing you to edit the selected spheroid or to define a new spheroid (refer to "Edit Spheroid" on page 155). • You are allowed to enter the Semi Major Axis and Inverse Flattening values by default. The Semi Minor Axis is computed automatically. As you click on the Semi Minor Axis radio button, the Semi Minor Axis field becomes editable. Consequently, the Inverse Flattening becomes non-editable, and its value is computed automatically based on the values of Semi Major Axis and Semi Minor Axis, and vice versa.
OK	Select to exit and save changes.
Cancel	Select to exit and cancel changes.
Help	Select to bring up the Help menu.

Edit Spheroid

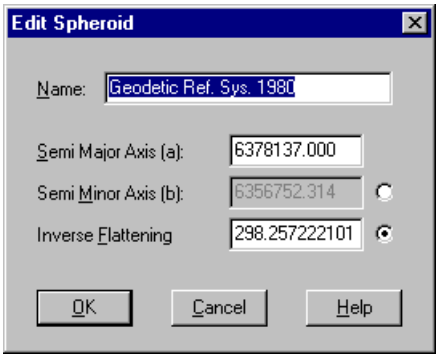

Figure 13.8: Edit Spheroid dialog

Table 13.9 describes the components of this dialog.

Table 13.9: Edit Spheroid dialog

Name	Function
Name	The name of the current spheroid.
Semi Major Axis (a)	A floating point number representing the semi-major axis of the defined spheroid.
Semi Minor Axis (b)	A floating point number representing the semi-minor axis of the defined ellipsoid. Click on the radio button to enter a value for the Semi Minor Axis.
Inverse Flattening	A floating point number of the inverse flattening to represent the shape of the ellipsoid. Click on the radio button to enter a value for the Inverse Flattening.
OK	Select to exit and save changes.
Cancel	Select to exit and cancel changes.
Help	Select to bring up the Help menu.

Edit Transformation

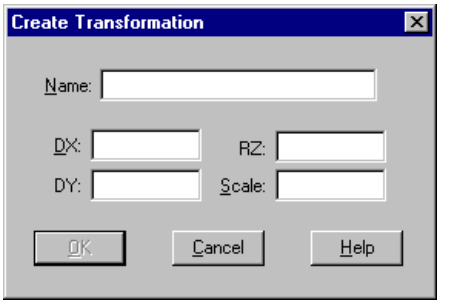

Figure 13.9: Transformation Dialog

Table 13.10 describes the components of this dialog.

Table 13.10: Transformation Dialog

Name	Function
Name	A 30-character name of the local transformation.
DX, DY	Translation parameters: X and Y in floating point edit fields. DX is the translation along the x-axis. DY is the translation along the y-axis. These translations are with respect to the origin of the projection zone you selected in the Edit Zone dialog.
RZ	Rotation parameter: Z in floating point edit fields. RZ is the rotation about the z-axis,which is in seconds of arc and is with respect to the point of origin of the Map Zone.
Scale	This describes the scale difference in ppm between the zone and the local transformation being defined.
OK	Select to exit and save changes.
Cancel	Select to exit and cancel changes.
Help	Select to bring up the Help menu.

Tools

Reliance has a variety of utilities which help you manipulate files and establish settings. These tools include:

- Settings
- RINEX Convertor
- RINEX Interpolation
- Join Files
- Waypoint File Convertor
- Decompress GZ Files

Settings...

In the Tools pull-down menu of the Reliance main window, select Settings... to bring up the Global Settings dialog, which has two tabs – Reliance and Internet.

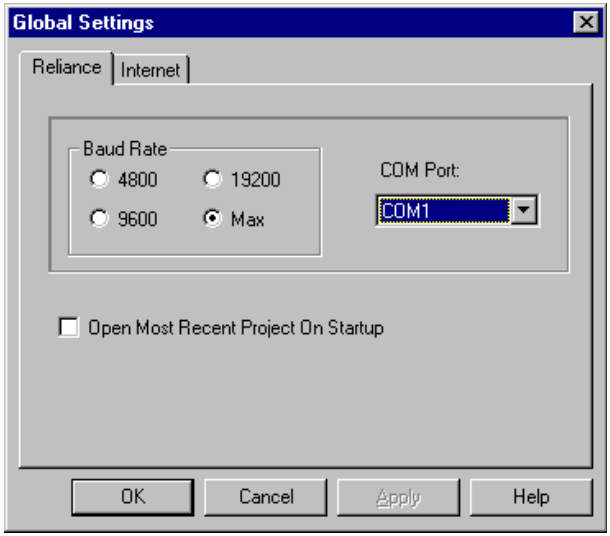

Figure 14.1: Global Settings dialog

Reliance Settings

When you are automatically downloading data from your receiver into a Session, you should first make sure that the COM port and baud rate settings are set correctly in this Reliance settings dialog. Refer to Chapter 5, **Setting Up a Project**.

You can also set to Open Most Recent Project On Startup, which allows you to quickly bring up the project that was most recently being worked on.

Internet Settings

Click on the Internet tab to show the Internet settings dialog.

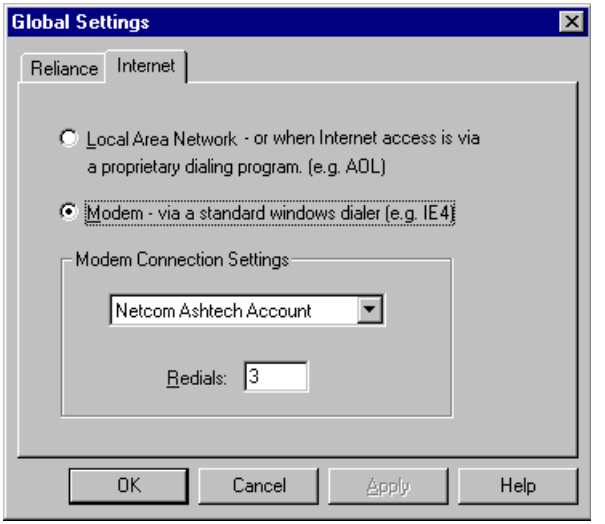

Figure 14.2: Internet Settings dialog

You can choose that you have either a Local Area Network connection or a Modem connection to the Internet.

1. **Local Area Network (LAN)** should be selected when your Internet connection has already been established. You must do this for Internet access accounts that have proprietary dialing programs, such as America On Line (AOL).
2. **Modem** should be selected if an Internet connection has not yet been established and your Internet service provider uses a standard Windows dialing program, such as Internet Explorer version 4 (IE4). If Modem is selected, you can also choose which account to use along with the number of redials to be attempted in case of a poor first connection.

RINEX Converter

RINEX (**R**eceiver **IN**dependent **EX**change) is a standard format for GPS, GLONASS, or GPS+GLONASS data supported throughout the industry.

The **RINEX Converter** utility provides a means to translate single or multiple RINEX formatted data files from any receiver to Ashtech formatted files, and, alternatively, convert Ashtech data files to RINEX format. **RINEX Converter** supports RINEX format version 2.01.

“Ashtech format” is our proprietary format for the data collected by our GPS receivers. This format is required in order to use the data in this application.

While you can convert any RINEX format file to an Ashtech format file, only RINEX files with Base Station data are useful for this application, since it is required that you use an Ashtech GPS receiver for your Field data collection.

You may also convert any Ashtech format file to a RINEX format file, if desired.

Starting RINEX Converter

When **RINEX Converter** converts a RINEX file to Ashtech format, the conversion produces four types of data:

Obs	Observation data
Nav	Navigation data
Nav G	GLONASS navigation data if available
Met	Meteorological data

In addition, the observation data is separated into three files:

B-file	GPS measurement data
E-file	Ephemeris data
S-file	Site information

Select Rinex Converter in the Tools pull-down menu of the Reliance main window. **RINEX Converter** opens the **RINEX to Ashtech** window, Figure 14.3.

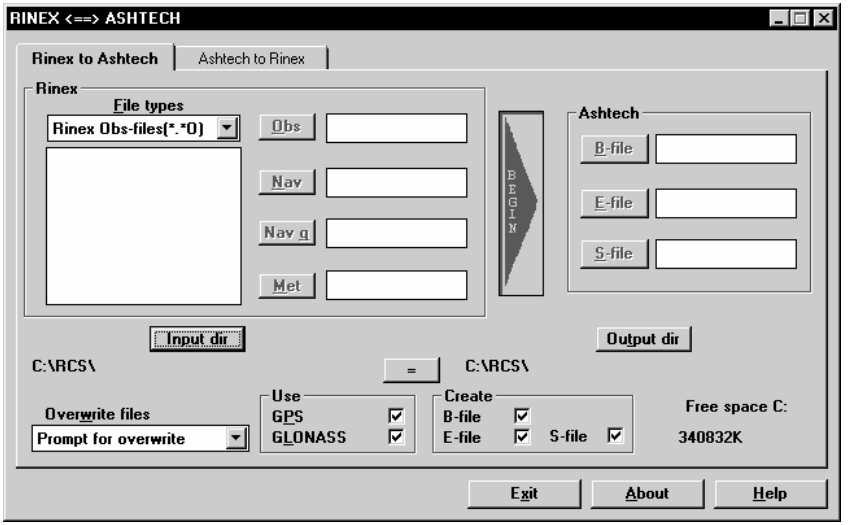

Figure 14.3: RINEX-to-Ashtech Window

Table 14.1 describes the fields in the **RINEX to Ashtech** window.

Table 14.1: RINEX to Ashtech Fields

Item	Description
File Types	Lists the files types: RINEX Observation (*.*O), All files (*.*). RINEX NAV-file*.*N, RINEX Nav g-file*.*G, RINEX Met-file *.*M. To select a file type, click the arrow to the right of the field and select file type from the displayed list.
Available Files Listbox	List of files in current directory. To select a file, click on the file. To select multiple files for batch conversion, select the first file and then hold the **Control** key, while selecting additional files.
Obs	This field lists the file name of the observation data file corresponding to the selected RINEX data file in the Available Files List box.
Nav	This field lists the file name of the GPS navigation data file corresponding to the selected RINEX data file in the Available Files List box.
Navg	This field lists the file name of the GLONASS navigation data file corresponding to the selected RINEX data file in the Available Files List box.
Met	This field lists the file name of the Meteorological data file corresponding to the selected RINEX data file in the Available Files List box.

Table 14.1: RINEX to Ashtech Fields (Continued)

Item	Description
BEGIN	Click this button to open the **Conversion Status** dialog and begin converting the RINEX files to Ashtech format.
B-File	This field lists the suggested file name for the output B-file (GPS measurement data).
E-File	This field lists the suggested file name for the output E-file (ephemeris data).
S-File	This field lists the suggested file name for the output S-file.(site information)
Input Dir	Click this button to open the **Set Input Directory** dialog to specify the directory where source data files are stored.
Input Directory	This field displays the directory path where the source data files are stored.
=	Click this button to set the output directory the same as the input directory.
Output Dir	Click this button to open the **Set Output Directory** dialog to specify the directory where converted files are stored. To minimize confusion, select a different directory than the source files directory for the output directory.
Output Directory	This field displays the directory path where converted data files are stored.
Overwrite Files	Select the overwrite privileges: Prompt for overwrite, Always overwrite, or Never overwrite. To select an overwrite privilege, click the arrow to the right of the field and select an overwrite privilege from the list presented.
GPS	Check this box if GPS data will be used in conversion. This option is on by default.
GLONASS	Check this box if GLONASS data will be used in conversion (on by default).
B-File	Check this box to create a B-file when converting RINEX files.
E-File	Check this box to create a E-file when converting RINEX files.
S-File	Check this box to create a S-file when converting RINEX files.
Free Space	This field displays the available disk drive space for the selected Output directory.
Exit	Closes RINEX Converter.
About	Displays software version number.
Help	Opens on-line help system.

Converting RINEX to Ashtech Format

RINEX data files from any GPS or GPS+GLONASS receiver can easily be converted to Ashtech format for post-processing. The following procedure specifies how to convert RINEX data files to Ashtech format:

1. In the **RINEX to Ashtech** window, click **Input Di**r to open the **Select Input Directory** dialog, Figure 14.4.

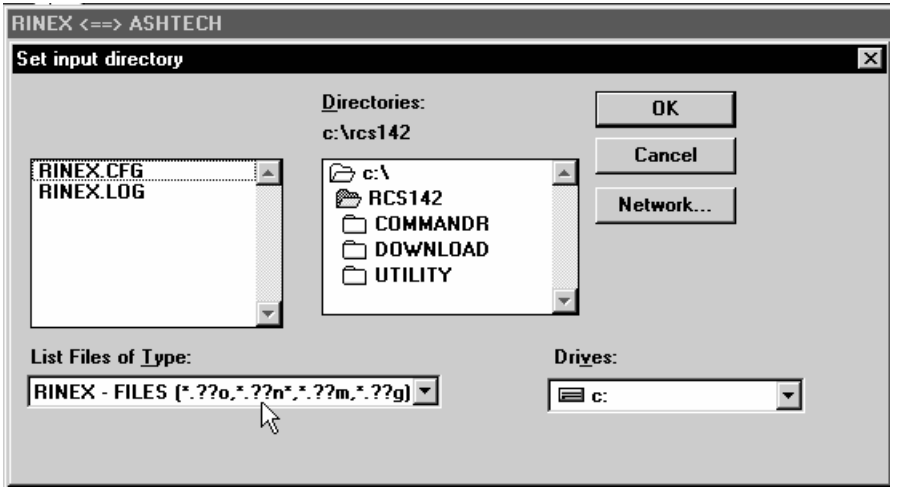

Figure 14.4: Select Input Directory Dialog

2. At this point, you have to know where your RINEX files are located. Using standard Windows file navigation procedure, select the directory where the files you wish to convert are located.
3. Click **OK** to accept the directory and close the **Set Input Directory** dialog.

   The **Available Files** listbox, similar to Figure 14.5, lists the RINEX files, and the **Input Directory** field lists the directory path.

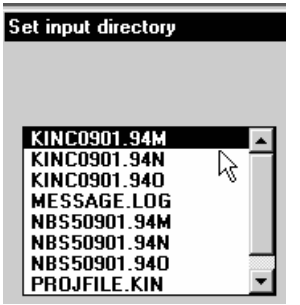

Figure 14.5: Available Files List Box

If you are converting RINEX files translated from a RINEX converter that does not use the standard RINEX naming format, the observation files may not have the format *.*O. If the files are not listed in the Available Files listbox, change the File Types to All Files on the Rinex to Ashtech tab and All Files in the Input Directory.

4. Select the file you wish to convert to Ashtech format. You can select multiple files by holding down the **Control** key while selecting files.

   After selecting a file to convert, the **OBS**, **NAV**, **NAV G**, **MET**, **B-File**, **E-File**, and **S-File** fields populate with suggested file names. If you selected multiple files, the filenames listed are associated with the file selected last.

To avoid confusion, do not change the suggested file names. To restore the original suggested output file name, double-click the filename in the available files list box.

5. Click **Output Dir** to open the **Select Output Directory** dialog, Figure 14.6.

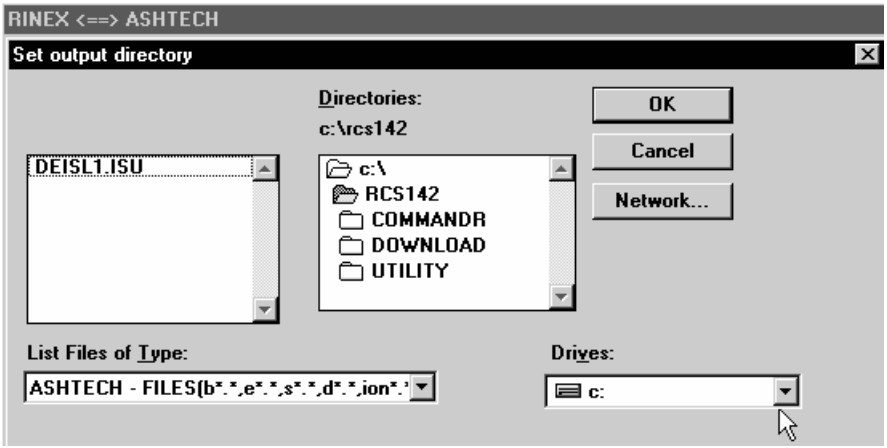

Figure 14.6: Select Output Directory Dialog

6. Navigate through the directories and drives to select the directory where you want to store the converted files.

To avoid confusion, save the converted Ashtech files to a different directory than where the RINEX files are located.

7. Click **OK** to accept the directory and close the **Set Output Directory** dialog.

The **Output Directory** field lists the directory path.

8. Select the **Overwrite Files** privileges by clicking the arrow to the right of the **Overwrite Files** field, and selecting a privilege from the list presented. There are three overwrite privileges:
   - **Prompt for Overwrite** - (Default setting). If RINEX Converter detects that a converted file has the same name as an existing file, that is, the new file will overwrite the existing file, a dialog opens, asking if you wish to overwrite the existing file. If you click NO, then RINEX Converter skips the file, and continues to the next file.
   - **Always Overwrite** - This option writes over existing files with a new file.
   - **Never Overwrite** - This option does not convert data for a given file if a file with the same name already exists.
9. By default, RINEX Converter assumes that the RINEX files use both GPS and GLONASS data; however, if there is not a Nav g file, GLONASS data will not be included in the B-file.
10. By default, RINEX Converter creates a B-file (raw data binary), an S-File (receiver parameters), and an E-File (binary ephemeris), in Ashtech format. If you do not want one or more of these file types created, uncheck the corresponding check boxes.

11. Click **BEGIN** to convert the selected RINEX files to Ashtech format. The **Conversion Status** dialog opens (Figure 14.7).

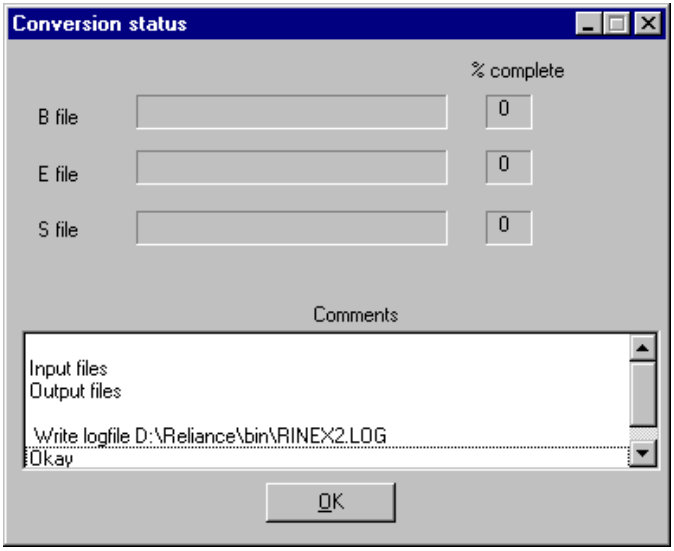

Figure 14.7: Conversion Status Dialog

12. The **Conversion Status** dialog shows the status of each file as it converts. Upon completion, the box indicates 100% for each file, or 0 if a file were not converted for lack of data, e.g. GLONASS data, as noted above. Click **OK**.
    - Click **Cancel** to cancel the conversion to the current file type and proceed to the next file type.
    - Click **Cancel All** to cancel the entire conversion.
13. A *.log file is created in the directory containing all conversion activity. When restarted, RINEX converter overwrites the existing log file. To save the old log file, rename or move the file before restarting RINEX Converter.

The selected RINEX files are now in Ashtech format and can be used with data files from Ashtech receivers for post-processing.

Converting Ashtech Files to RINEX Format

Ashtech files from any GPS or GPS+GLONASS receiver can easily be converted into RINEX format. To convert Ashtech data files to RINEX format:

1. Select the **Ashtech to RINEX** tab in the RINEX main window, as shown in Figure 14.8.

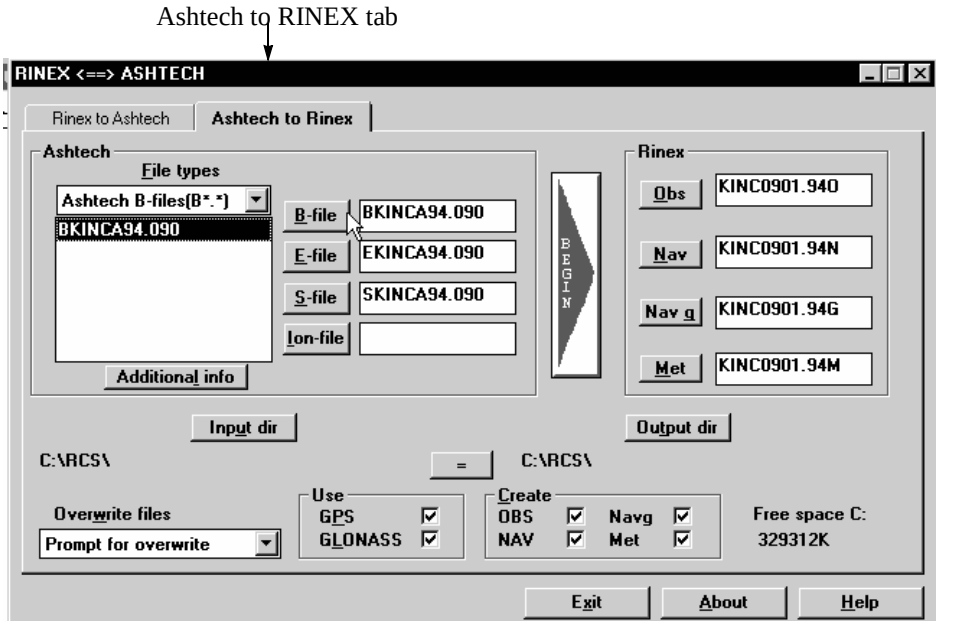

Figure 14.8: Ashtech to RINEX Tab

Table 14.2 describes the fields in the **Ashtech to RINEX** tab.

Table 14.2: Ashtech to RINEX Tab Fields

Item	Description
File Types	Lists the files types: Ashtech B-Files (B*.*), Ashtech E-file (E*.*), Ashtech S-file (S*.*) or All files (*.*). To select a files type, click the arrow to the right of the field and select file type from the list presented.
Available Files Listbox	List of files in current directory. To select a file, click on the file. To select multiple files for batch conversion, select the first file and then hold the **[Control]** key, while selecting additional files.

Table 14.2: Ashtech to RINEX Tab Fields (Continued)

Item	Description
B-File	This field lists the file name of the B-File corresponding to the selected Ashtech data file in the Available Files List box.
E-File	This field lists the file name of the E-File corresponding to the selected Ashtech data file in the Available Files List box.
S-File	This field lists the file name of the S-File corresponding to the selected Ashtech data file in the Available Files List box.
BEGIN Button	Click this button to open the **Conversion Status** dialog and begin converting the Ashtech files to RINEX file format.
Obs	This field lists the suggested file name for the converted Observation Data file.
Nav	This field lists the suggested file name for the converted Navigation Data file.
Navg	This field lists the suggested file name for the converted GLONASS Navigation Data file.
Met	This field lists the suggested file name for the converted Meteorological Data file.
Input Dir	Click this button to open the **Set Input Directory** dialog to specify the directory where source data files are stored.
Input Directory	This field displays the directory path where the source data files are stored.
=	Click this button to set the output directory the same as the input directory.
Output Dir	Click this button to open the **Set Output Directory** dialog to specify the directory where converted files are stored. To minimize confusion, select a different directory than the source files directory for the output directory.
Output Directory	This field displays the directory path where converted data files are stored.
Overwrite Files	Select the overwrite privileges: Prompt for overwrite, Always overwrite, or Never overwrite. To select an overwrite privilege, click the arrow to the right of the field and select an overwrite privilege from the list presented.
GPS	Check this box if GPS data will be used in conversion. This option is on by default..
GLONASS	Check this box if GLONASS data will be used in conversion (on by default)..

Table 14.2: Ashtech to RINEX Tab Fields (Continued)

Item	Description
Obs	Check this box to create an Observation file when converting to RINEX.
Nav	Check this box to create a Navigation file when converting to RINEX files.
Navg	Check this box to create a GLONASS Navigation file when converting to RINEX.
Met	Check this box to create a Meteorological file when converting to RINEX.
Free Space	This field displays the available disk drive space for the selected Output directory.
Exit	Close RINEX Converter.
About	Opens the dialog which displays information pertaining to the software version number.
Help	Opens the on-line help system.

2. Click **Input Dir** to open the **Set Input Directory** dialog (Figure 14.9).

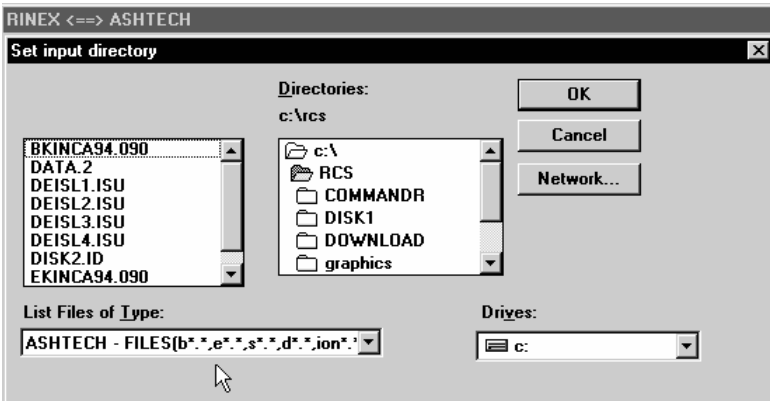

Figure 14.9: Set Input Directory Dialog

3. Navigate through the directories and drives to select the directory where the files you wish to convert are located.
4. Click **OK** to accept the directory and close the **Set Input Directory** dialog.

5. Select the file you wish to convert from Ashtech to RINEX format.You can select multiple files to batch convert, by holding down the **Control** key while selecting files.

   After selecting a file to convert the **B-File**, **E-File**, **S-File**, **OBS**, **NAV**, **NAV G**, and **MET**, fields populate with suggested file names. If you selected multiple files to batch convert, the filenames listed are associated with the file selected last.

To avoid confusion, do not change the file names.

6. Click **Output Dir** to open the **Set Output Directory** dialog, Figure 14.10.

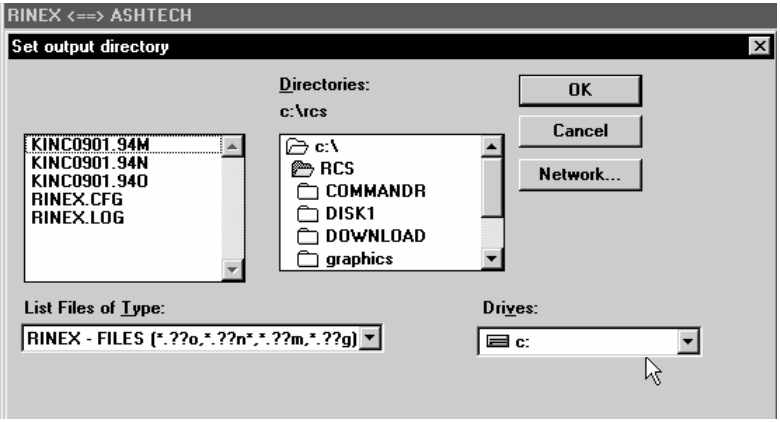

Figure 14.10: Set Output Directory Dialog

7. Navigate through the directories and drives to select the directory where you want to store the converted files.

To avoid confusion, save the converted Ashtech files to a different directory than where the RINEX files are located.

8. Click **OK** to accept the directory and close the **Set Output Directory** dialog.

   The **Output Directory** field lists the directory path.

9. Click **Additional Info.** to open the **Additional Info for Selected Files** dialog to the **OBS** Tab (Figure 14.11).

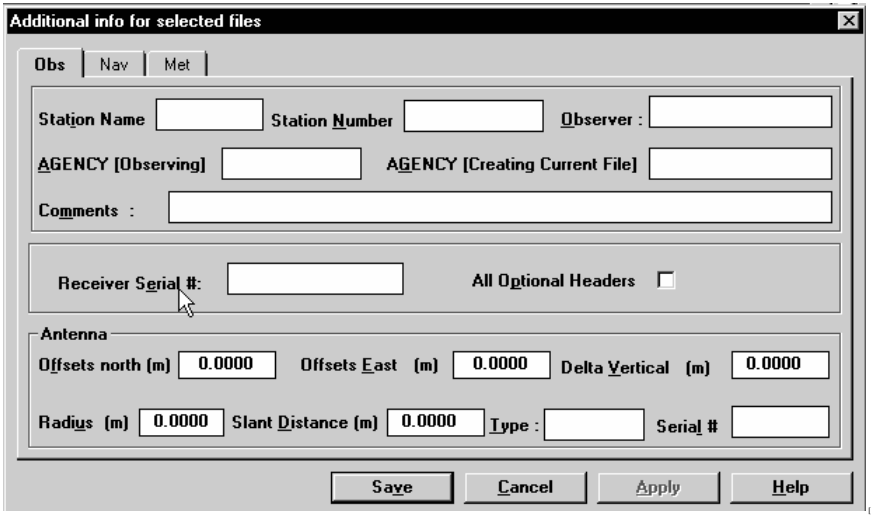

Figure 14.11: Additional Info for Selected Files Dialog - OBS Tab

Traditionally the information listed in these tabs are stored in RINEX data files to give the user reference information about the data. Although this additional information is optional, it provides a useful reference for future use.

10. Complete the fields in the **OBS** Tab. The information entered in the **OBS** tab is stored in the Observation data file. Table 14.3 describes each field.

Table 14.3: Additional Info for Selected Files Dialog - OBS Tab

Field	Description
STATION INFORMATION	
Station Name	Name of the survey point or station where data was collected.
Station Number	Number of the survey point or station where data was collected.
Observer	Name or code of the surveyor who collected the data.
AGENCY (Observing)	Name of the company or agency who collected the data.
AGENCY (Creating Current File)	Name of the company or agency who converted the data to RINEX.
Comments	Any comments pertaining to the station, data quality, cover, GPS/ GLONASS, etc. 50-character length limit.

Table 14.3: Additional Info for Selected Files Dialog - OBS Tab (Continued)

Field	Description
RECEIVER INFORMATION	
Receiver Serial #	Serial number on the receiver to identify exactly which receiver collected the data.
All Optional Headers	Check this box if you want all non-mandatory fields to be filled-in the RINEX file header.
ANTENNA INFORMATION	
Offsets North (m)	Horizontal distance, in meters, that the antenna is offset from the marker in the North/South direction. + is north, - is south.
Offsets East (m)	Horizontal distance, in meters, that the antenna is offset from the marker in the East/West direction. + is east, - is west.
Delta Vertical (m)	True vertical distance, in meters, between the bottom of antenna and the marker.
Radius (m)	Radius of the antenna in meters.
Slant Distance (m)	Measured distance, in meters, from the edge of the antenna to the marker.
Type	Type of antenna used in data collection.
Antenna Serial Number	Serial number of the antenna to identify exactly which antenna was used for data collection.

11. Click **Apply** to save the changes made to the **OBS** Tab, and click on the **Nav** Tab to switch to the **Nav** Tab (Figure 14.12).

You can enter information for all three tabs and save all the data using the Save button. The best practice however, is to save the data for each tab immediately after entering the data in case of a computer or power failure by using the Apply button.

The Save button saves the data entered on the active tab only, and closes the Additional Info for Selected Files dialog.

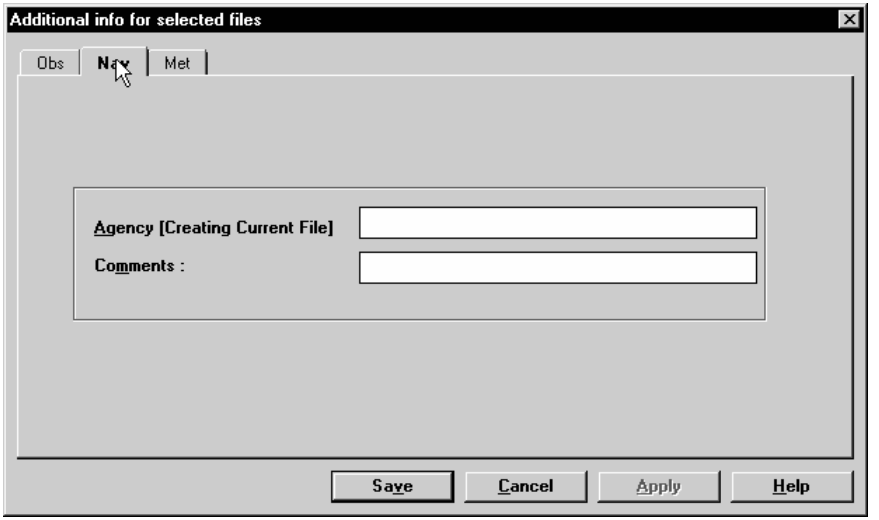

Figure 14.12: Additional Info for Selected Files Dialog - NAV Tab

12. Complete the fields in the **NAV** tab. The information entered in the **NAV** Tab is stored in the Navigation data file. Table 14.4 describes each field.

Table 14.4: Additional Info for Selected Files Dialog - NAV Tab

Field	Description
Agency (Creating Current File)	Name of the company or agency who converted the data to RINEX.
Comments	Any comments pertaining to the station, data quality, cover, GPS/GLONASS, etc. 50 character length limit.

13. Click **Apply** to save the changes made to the **NAV** Tab, and click on the **MET** tab to switch to the **MET** tab, Figure 14.13.

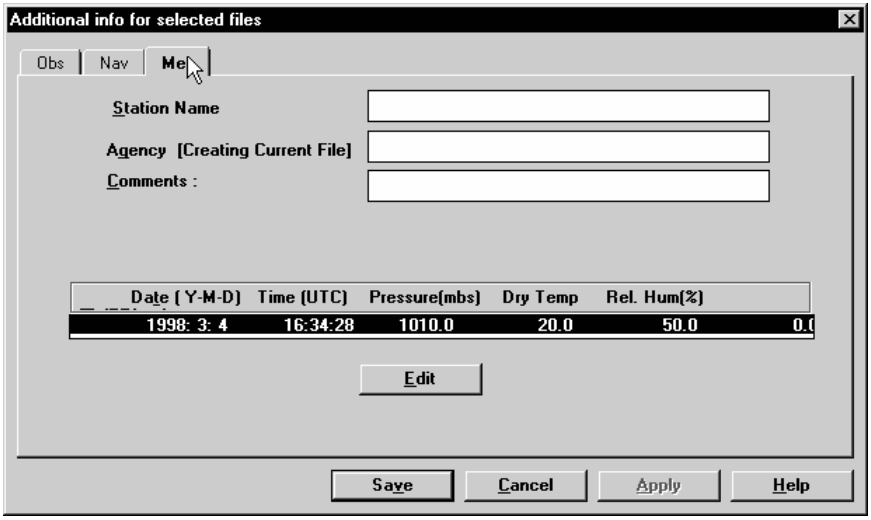

Figure 14.13: Additional Info for Selected Files Dialog - MET Tab

14. Complete the fields in the **MET** tab. The information entered in the **MET t**ab is stored in the meteorological data file. Table 14.5 describes each field.

Table 14.5: Additional Info for Selected Files Dialog - MET Tab

Field	Description
Station Name	Name of the survey point or station where data was collected.
Agency (Creating Current File)	Name of the company or agency that converted the data to RINEX.
Comments	Any comments pertaining to the station, data quality, cover, GPS/ GLONASS, etc. 50-character limit.
Meteorological Data Listbox	Date and time atmospheric data was collected (atmospheric pressure, temperature, relative humidity, and ZWET (Zenith Wet Tropospheric Delay).
Edit	Click this button to open the Edit dialog and edit the selected Meteorological data line.

15. Click **Edit** to open the **Edit** dialog and change the Meteorological data.

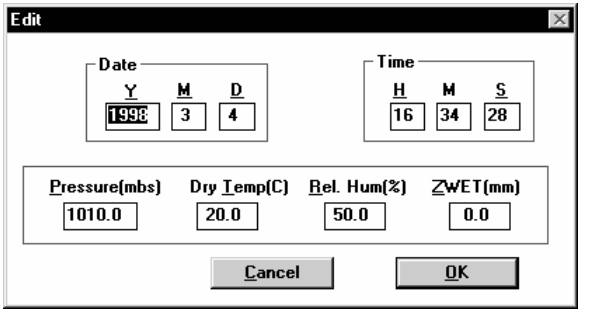

Figure 14.14: Edit Dialog

16. Enter the meteorological data and the data and the UTC time that the data was taken, and press **OK**. Table 14.6 describes the fields in the **Edit** dialog.

Table 14.6: Edit Dialog

Field	Description
Date	The year, month, and date that the data was recorded. D is the day of the month (not Julian day) the data was recorded.
Time	The time the data was recorded. H is the hour of the day the data was recorded in UTC time (24 hour time scale) M is the minute of the hour the data was recorded in UTC time. S is the second of the minute the data was recorded in UTC time
Pressure (mbs)	The recorded barometric pressure of the atmosphere in millibars.
Dry Temp (C)	The recorded temperature of the air not corrected for humidity, in degrees Celsius.
Rel. Hum (%)	The recorded relative humidity of the air in percent of 100.
ZWET (nm)	Zenith Wet Tropospheric Delay—in millimeters (default=0)

17. Click **OK** to accept the meteorological data and close the **Edit** dialog.

18. Click **Save** to save the changes made to the **Met** tab and close the **Additional Info for Selected File**s dialog.
    - The **Apply** button saves any changes made to the active tab, and does not close the **Additional Info for Selected File**s dialog.
    - The **Save** button saves any changes made any tab, and closes the **Additional Info for Selected File**s dialog.
19. Click **Begin** to convert the selected Ashtech files to RINEX format. A status dialog opens, showing the status of the conversion process. Upon completion, the box indicates 100% for each file.
20. Click **OK**.

    A *.log file is created in the conversion directory. When started, RINEX converter overwrites the previous *.log file. To save the previous *.log file, rename or move the file before starting RINEX converter.

Converting More than One File at a Time (Batch Processing)

To convert more than one file at a time:

- If the files are contiguous, use **Shift** and **click** to select the group.
- If the files are scattered throughout the directory, use **Control** and **click** to select the desired files.

If you are using a Trimble Community Base Station for your Base Station data, you must first convert the files (which are in the Trimble-proprietary SSF format) to RINEX. You cannot convert these files directly to Ashtech files.

Interpolating RINEX Data

A RINEX Interpolation program has been supplied with Reliance Processor to allow you to interpolate RINEX files to shorter intervals that will better match your Rover data. For example, typical Base data you get from the CORS site has an interval of 30 seconds, while your typical Rover data has an interval of 2 seconds. Therefore, you should interpolate your CORS base data down to 2 seconds to match your Rover data interval in order to get the best possible results when processing the data.

The RINEX Interpolation program can be accessed from the Tools pull-down menu in the Reliance main window. Its operation is described below.

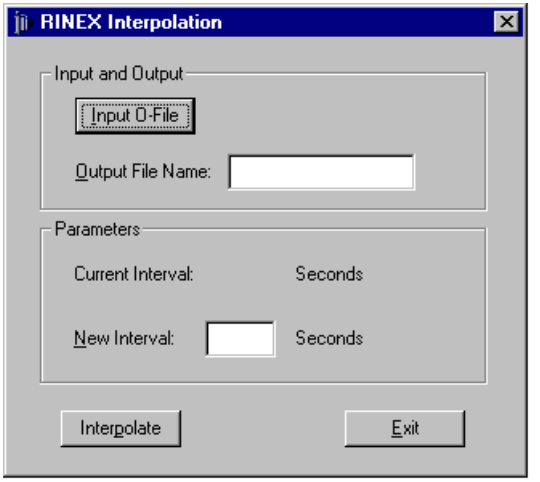

Figure 14.15: RINEX Interpolation dialog

Clicking on the Input O-File button will bring up the screen below. From this screen, select the appropriate RINEX O-file (GPS measurement data) to interpolate.

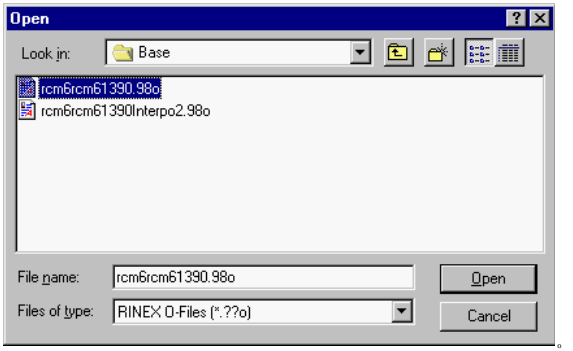

Figure 14.16: Open RINEX O-File dialog

After selecting the Input O-File, specify the Output File Name and New Interval.

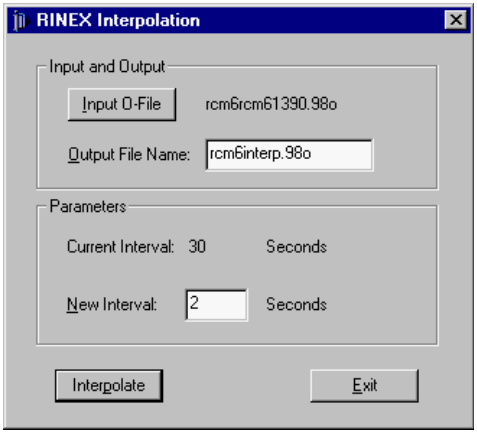

Figure 14.17: RINEX Interpolation with file names dialog

Now press the Interpolate button. A progress bar will appear at the bottom of the screen to show you the status of the interpolation.

The Interpolation program does not need to alter to the RINEX N-file (ephemeris data). The original N-file name will be copied to the same new name you specified for the output O-file. For the example above, the file "rcm6rcm61390.98n" will be copied to "rmc6interp.98n".

Joining Data Files

A Join Files Utility program has been supplied with Reliance Processor to allow you to join multiple Base files into a single file for easier processing of your Rover data.

The Join Files program can be accessed from the Tools pull-down menu in the Reliance main window.

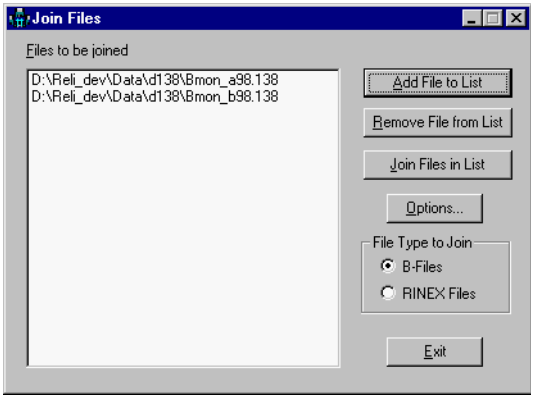

Figure 14.18: Join Files Main dialog

The Base Station files could be in either Ashtech or RINEX format. Select the proper file format in the File Type to Join box.

In order to correctly process the Rover data, the Base Station files to be joined should be consecutive in time. Clicking the Options button brings up the following dialog, which allows you to select the maximum allowable time gap between the files you are joining. It is recommended that you keep this value at 120 seconds (default) or less in order for the Reliance Processor to process the Rover data successfully.

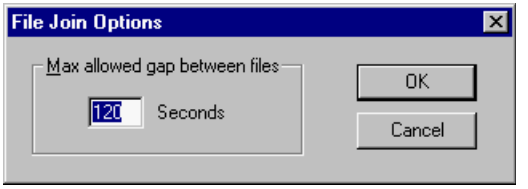

Figure 14.19: File Join Options

On the main screen, press the Add File to List button to bring up the Open dialog:

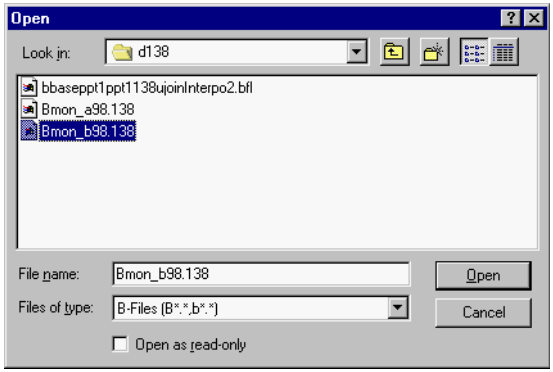

Figure 14.20: Open Files to Join dialog

Note that you can select several files from the same directory at once in this dialog. Highlight the files that you would like to join and press Open. This will return you to the main screen.

To join the files shown in the listbox, press the Join Files in List button. A Save As dialog will now appear, which allows you to name and place the new file you are creating.

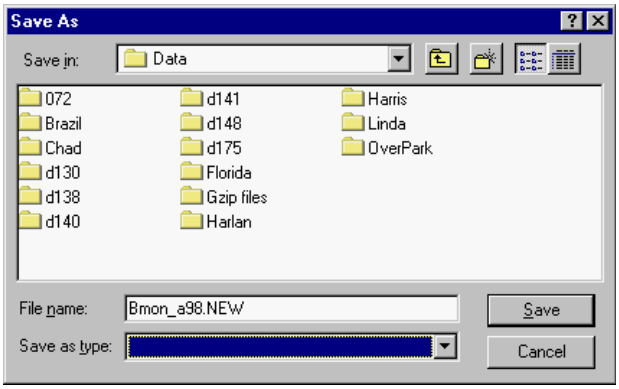

Figure 14.21: Save As dialog

After clicking Save, the Join Files program main screen will appear and show a progress bar at the bottom right.

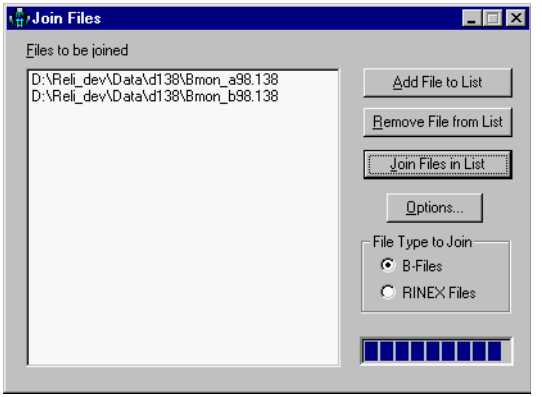

Figure 14.22: Join Files Main dialog with Progress

After the files are successfully joined, they will clear from the listbox display.

Waypoint File Converter

A Waypoint File Converter program has been supplied with Reliance Processor for those who already have a list of several waypoint entered in a standard ASCII text file. This program allows these points to be easily converted to the Reliance Waypoint File format. This program allows you to convert Reliance Waypoint Files to readable ASCII files as well.

The Waypoint File Converter program only works with latitude and longitude positions that are in the WGS-84 coordinate system.

The Waypoint File Converter program can be accessed from the Tools pull-down menu in the Reliance main window.

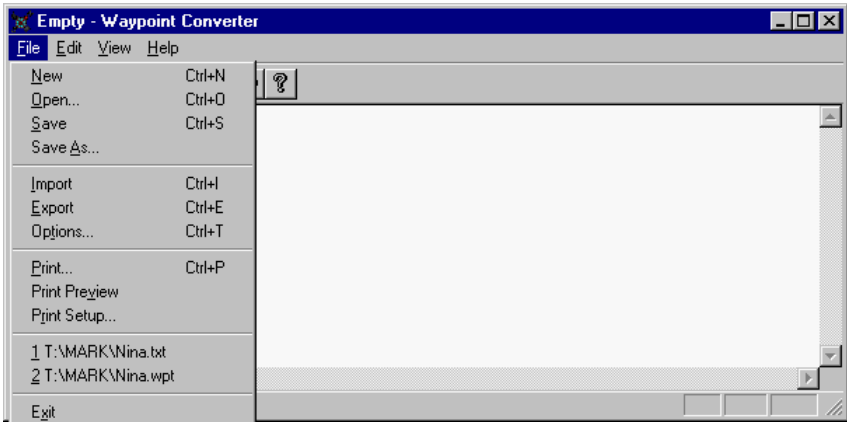

Figure 14.23: Waypoint Converter dialog

The selections in the File pull-down menu are described in the following table:

Table 14.7: Pull-down Menu Descriptions

Selection	Description
New, Open, Save, Save As	Standard file operations to be used on ASCII text files (default *.txt) that contain waypoint information.
Import	Imports Reliance Waypoint Files so that they can be saved and/or printed as an ASCII text file.
Export	Exports ASCII text files of waypoints to the Reliance Waypoint File format.

Table 14.7: Pull-down Menu Descriptions

Selection	Description
Options	Allows you to specify how an existing ASCII text file of waypoints is formatted in order to create a valid Reliance Waypoint File when exporting.
Print, Print Pre-view, Print Setup	Allows you to print the current waypoint file displayed in the Waypoint Converter window.
Most Recent Used	Shows a list of the most recently used files for quick re-selection.
Exit	Exits the Waypoint Converter program.

Below is an example of how this program is used:

1. Select Open in the File pull-down menu to open an existing ASCII text waypoint file.

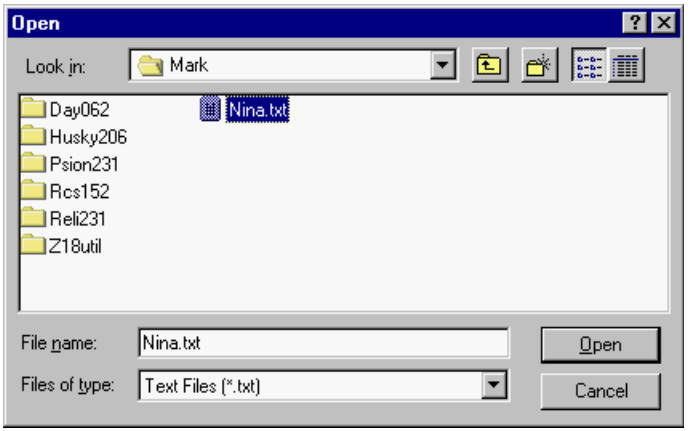

Figure 14.24: Open dialog

2. Click on the Open button to load the file into the Waypoint Converter window display.

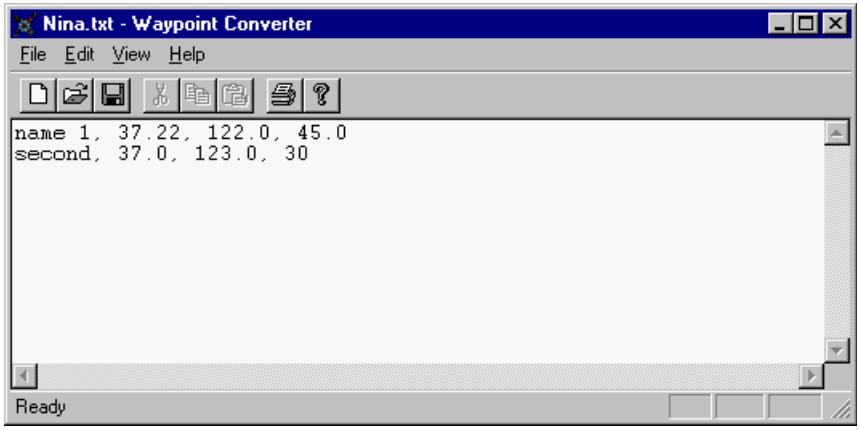

Figure 14.25: Waypoint Converter dialog with Waypoints

3. Select Options in the File pull-down menu to make sure the format of the opened file is correct for exporting.

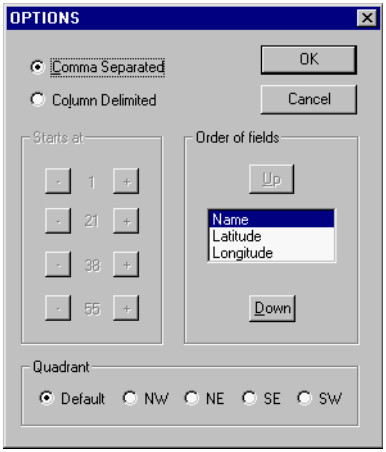

Figure 14.26: Options dialog

In the Options dialog you can specify how the waypoint information is delimited, what the order of the fields are in, and what quadrant the waypoints are in...

4. Select Export in the File pull-down menu to save the ASCII waypoint file to a Reliance Waypoint File format.

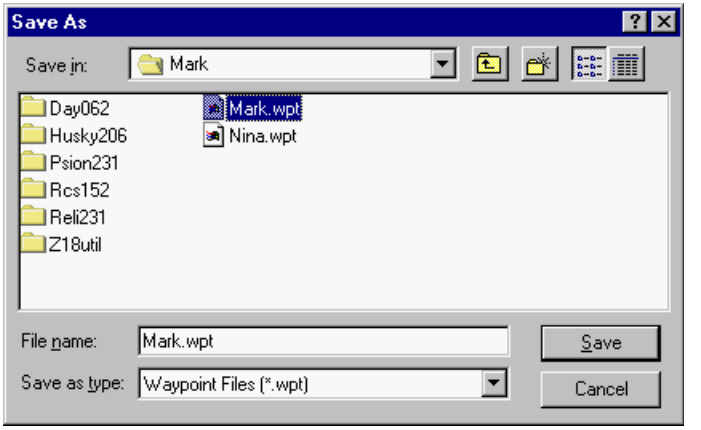

Figure 14.27: Save Waypoint File dialog

The new file created should have the *.WPT extension so that Reliance Processor and the handheld FAMlog will recognize it.

Decompress GZ Files

A small utility program has been provide with Reliance Processor that allows you to easily decompress files that have been packed by the GZIP program. Typically, files that have been “GZIP’ed” are Base data that is located on the CORS Internet site. These files usually have the extension “gz”

In Reliance, this program appears as a standard Save As dialog. It can be accessed by selecting Decompress GZ Files from the Tools pull-down menu in the Reliance main window..

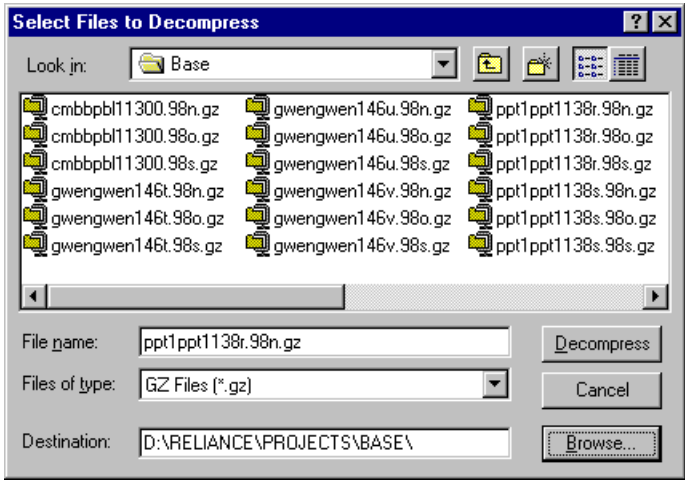

Figure 14.28: Select Files to Decompress dialog

Simply select the appropriate file to decompress, choose an appropriate destination directory, and click on the Decompress button.

Question & Answers

System Requirements

How much hard disk space does my PC need?

With Windows running, 20 Mb of free disk space is needed to install Reliance Processor. You should plan on devoting a large portion of your hard disk space to the Reliance Processor, in order to accommodate data files and other information sets that will accumulate as you use the system.

What type of processor does my PC need?

If you can run Windows 95™ or Windows NT™ on your PC, you can run Reliance Processor. We recommend a Pentium system with 64 megabytes of RAM for best performance. Reliance Processor will perform well on most GIS-ready PCs.

Can I run other applications while Reliance Processor is running?

Yes. Reliance Processor will run along with other Windows applications. Reliance Processor will even download and process data while you are using other Windows applications. However, you must have enough resident memory to support the fundamental requirements of all the open applications.

Reliance Processor Window

Why can't I re-size the Reliance Processor window?

Reliance Processor has a unique "unbounded" interface that allows its dialog windows to appear outside of the main Reliance Processor window. The main window can be maximized to fill the entire screen, or can be minimized to be just a title and tool bar. You can now run a Windows desktop mapping or GIS program alongside your processing software, for easy verification of results and simplified file transfers.

Project Setup

What is a project?

A project is the collection of all the field and base data collected for the particular region being mapped, as well as any related Feature and Change information. A project also has a "state," or set of defined operating parameters, that may vary from one project to another. As an example, one user of the data you process may wish to receive their

exported data in Latitude/Longitude (Geographic) Coordinates, using the WGS84 ellipsoid, while another might request all project work be delivered in UTM Coordinates with the North American Datum of 1927 as their frame of reference. These values are set in menus within the Project Control dialog window.

What is a session?

A session is a particular set of GPS measurements and features. A session can last as little as a few minutes or as long as several days. Each session must contain at least one feature. A session ends when a different feature file is selected, the recording interval is changed, the session name is changed, or the SCA-12 receiver is turned off. Sessions are the building blocks of a project: a pipeline asset inventory project might be called Pipeline.prj, while MondayAM.S01 and MondayPM.S03 would be valid sessions names for collected field data.

Do I have to use the default directories?

No. The default directory names are just a suggestion. Some users prefer to group the base, rover, feature, waypoint, and change files together in one directory on a day-by-day or project-by-project basis. However, once you set default directories for a project, they must remain the same throughout the project. If you change directory names or file locations, the software will be unable to recognize the address of a requested data file. We suggest you find a comfortable working setup and stay with it to remove chances for confusion.

What type of file can I select as a Rover file?

Files with the “S” extension followed by a two digit number are selectable as a rover file. For example, wetland.s01 is a valid rover file name.

What type of file can I select as a Base file?

Files that begin with “B” which are in the Ashtech B-file format are selectable as a base file. These files may be logged directly into the PC, downloaded from an Ashtech receiver, or converted from the industry-standard RINEX format using Reliance Processor. For example, bbasea96.175 is a valid base file name.

What is a Change file?

A change file contains position and feature information for each point logged in the field. The rover and base files are condensed into a change file for faster session loading. Once a session has been loaded and processed, the change file contains all of the required corrected information for displaying, filtering, and exporting the data.

Feature Editor

What is a feature file?

A feature file contains a list of the features that are to be logged in the field. This file is created in the office with the Reliance Processor Feature Editor and then transferred to the handheld field data logger. Most features will have a list of associated descriptive attributes, although some features may not have these additional information layers. Attributes can be numbers, text, or menu items. There is no limit to the number of attributes you can link to a feature. The feature file also describes the point symbols, line colors, line styles, fill colors, and fill styles used when displaying logged features in the Map View.

Transfer and Download

How do I upload feature and waypoint files to the handheld?

Files are transferred between the PC and Handheld using the Transfer dialog. Begin by opening the Transfer module from the Project Control menu, or use the Tools menu in the Reliance Processor header bar. Once you've opened the Transfer module, turn on the Husky and exit the Reliance Processor FAMlog software (use the shift key and select the EXIT softkey, release the shift key and type "Y" to confirm your exit) Now connect your handheld to the PC using the supplied cable. Once you're connected to the PC, type HCOM at the DOS prompt, and press the yes key to launch the HCOM File Transfer Utility. Once you've accomplished these steps, select and press the "Transfer information between the PC and the handheld device" button in the open Transfer Data dialog. You'll see a simplified Transfer dialog for viewing, transfer, and file deleting on the handheld.

How do I download files from the GPS receiver?

GPS measurement data and any integrated feature & attribute information are stored on the SuperCA-12 GPS receiver. These integrated files are transferred to the PC through the Download module in Reliance Processor. The first step in transferring files is to connect your receiver to a PC serial port using the standard female DB9 connector in your backpack system. If you're working with a base station, use the DB9 female connector supplied with the standard base receiver cable. Now turn on the GPS receiver. Next, press the "Download GPS data from the GPS receiver" button on the Transfer Data dialog. This will start the Download dialog. You should now be able to view, download, and delete files from any Ashtech GPS receiver connected to the system. Make sure you select the correct path for your data files before transferring data. Remember to turn off the GPS receiver when you're done with the file transfer process.

Why aren't all my PC COM ports shown?

Reliance Processor automatically lists only the available COM ports. For example, if your PC has two COM ports and the mouse uses port 1, only port 2 will be listed.

Why are there so many rover files?

New rover files are created each time the receiver is powered on, each time Reliance Processor is exited and restarted, each time a session name is entered, each time a feature file is selected, and each time the recording interval is changed. The creation of these new files is required for Reliance Processor to properly post-process and locate features in the data.

Refer to Field Operations manual for instructions on how to reduce the number of superfluous rover files created.

Time View and Map View

How do I view features?

You can view features in Time View by selecting a rover receiver from the listed files, then double-clicking on an item of interest. Selecting a rover receiver is as simple as pressing once on the identifying label alongside the file viewing area. In Map View, double click on a displayed feature graphic to view the associated information.

Where can I view attribute information?

Once you've double-clicked on a point feature in Time View or Map View, a "feature information" dialog will appear on screen. To view an attribute Name, Type, or Value, just click once on the "Attributes" button at lower right in the dialog.

Where can I view offset information?

Once you've double-clicked on a point feature in Time View, a "feature information" dialog will appear on screen. To view the point offset, just click once on the "Offsets" button at lower right in the dialog.

How do I select or change the map system used in Map View?

Mapping systems are modified at the overall project level. Start by clicking on the Project Setup icon under the Project Control menu. When the window opens, press on the Map System button to access the various functions. Map System will display a selection of projections, datums or zones, and display modes. Note: Changing these settings affects all files within the open project. If your local area is not listed in any of possible combinations of the Map System function, you can set your own. Refer to Chapter 13, **Setting Up a Map System** for additional instructions.

Filter

How do I filter features by attribute value?

Most features will have attributes. And by definition an attribute will have a value, such as numbers, text, or associated menu items. These values are entered either as a listed value, or the field operator will have key-entered the information directly. To filter an attribute or feature by an associated value, the first step is to open the Filter Data module from Project Control, or the Tool Bar. The dialog you'll see has two windows; one for Sessions/Features to Show; and the other for Session/ Features to Hide. To filter a particular feature, use the arrow keys in the center of the window to move features from one side to the other. To filter by value, make sure the data you wish to work with is in the Show area. Now press on the By Value button. If a feature has any associated attributes, they will be displayed in the Attributes list when that Feature is highlighted. The Filter Selection function looks at the attributes, and their associated values, and will present a list of choices. For example, when using the sample dataset provided with the system, a Tree's health can be used as a modifying factor in your selection process, so only those surveyed trees judged to be healthy will be displayed and made available for transfer to your GIS.

Does filter affect the exported data?

Yes. Data which has been excluded in the filtering process will not be exported, or shown in Time View or Map View.

RINEX Converter

Can I use a base station receiver from another manufacturer?

Yes, provided the files have been converted to RINEX format. Once in RINEX format, these files are readily converted to Ashtech format using the Reliance Processor RINEX Converter.

Can I convert Reliance Processor Data to Rinex format?

Yes, but the feature information will be lost in the conversion.

Process

What is the difference between submeter and decimeter processing?

Submeter processing uses smoothed C/A code data, and is available from all Reliance Processor receivers. Decimeter processing requires either the purchase of

a Decimeter system, or an upgrade to your Submeter equipment. Decimeter results are obtained by using the carrier phase of the L1 satellite signal.

Export

What file formats can I export data to?

ESRI Shape (SHP) and Generate (GEN) formats, Autodesk Text and Binary (DXF) files, the standardized Intergraph ASCII (ASC) output/input structure, MapInfo Format (MIF) and a User-defined ASCII text (UDA) format. All GIS systems will accept at least one, if not all, of these basic data formats.

What exactly is exported?

Feature names, attributes, and positions are exported. Feature symbols are not exported.

What map system is my exported data in?

When data is exported, the map system used will the one that is selected in Project Setup/Map System. The INF file, which is also created when data is exported, contains map system information as well.

GPS

In most cases you'll probably find you're within 35-50 meters of your actual position if you compare the system reading with a known point. However, SA fluctuates so much you could be 35 meters over there one minute, then 50 meters the other way 10 minutes later.

What is differential GPS, and how do I get it?

Differential GPS is a straightforward method to overcome the effects of SA. There are two basic ways to achieve differential results. The most common uses a computer to process data collected and stored while in the field, then downloaded later to a system. Another method is by receiving radio signals that provide corrections in real time. The first is known as Post Processed Differential, the later as Real-Time Differential. Each is useful, although post-processing is the most common, reliable, and proven method now available. Ashtech receivers operate in either mode.

The fundamental theory behind differential correction is simple. At least two receivers must operate at the same time, with one unit located on a known point. Both receivers must be using the same set of satellites to derive positions. In post-processed differential, GPS data collected on the known point (by a receiver usually referred to as a reference station) is used, after the field survey is

completed, to remove inaccuracies from the field data. The process actually finds its roots in the principles of quadratic equations.

Post-Processed differential corrects for SA after collection (post-processed), while Real-Time differential applies corrections while you're in the field.

Technical Reference

GPS Concepts

The Global Positioning System (GPS) is used for worldwide navigation and positioning, which includes surveying, mapping and Field Asset Management (FAM). Utilizing GPS as a FAM tool along with Geographic Information System (GIS) software will allow you to obtain field asset maps with very accurate positioning information in a cost-effective way.

Overview

GPS consists of a network of 24 orbiting satellites, maintained by the U. S. Department of Defense, which are open for commercial and private use by anyone at no charge. GPS satellites are at an altitude of about 20,000 km, which puts them in 12-hour orbits around the Earth. Each satellite broadcasts a coded radio signal on two frequencies - called L1 and L2. The Coarse/Acquisition (C/A) code is broadcast on the L1 frequency and the Precision, or P, code on both the L1 and L2 frequencies. Not all GPS receivers can track all the codes and frequencies that the GPS satellites transmit.

Use of GPS

Though GPS positioning is available around the world, GPS receivers cannot pick up the satellites' signals unless they have a clear view of the sky. GPS works almost everywhere, though dense tree canopies and "urban canyons" may significantly degrade GPS positions. Nevertheless, GPS is now accepted as the positioning technology by a majority of surveying, mapping, and FAM applications.

Accuracy

The accuracy of stand-alone GPS positions is 100 meters. This can be greatly improved using a technique known as Differential GPS (DGPS). GPS measurements are recorded by a reference receiver at a known location (called a GPS base station) at the same time that the field measurements are recorded by the rover receiver. Data is processed after the fact or "post-processed", by sophisticated PC software. Differential GPS can also be performed in real-time using correction data broadcast from a reference receiver (typically in RTCM format).

The real-time DGPS method, requiring the use of a radio link between the reference and rover GPS receivers, can provide 1-3 meter accuracy. Post-processing mode can be more accurate, (less than 1 meter for the Reliance Submeter package and as good as 1-2 decimeters for the Reliance Decimeter package), more reliable and is less expensive.

Error Sources

The Reliance system utilizes DGPS techniques to obtain accurate position information. The typical error sources that affect DGPS also affect Reliance. These error sources include:

- GPS signal multipath
- GPS satellite geometry
- Maintaining lock to satellites
- Selective Availability (SA)

Refer to “You may also transfer Waypoint and Feature Files back from the handheld if you wish.” on page 72 in Chapter 6, **Data Collection**.

Coordinate Systems / Datums

While the GPS receiver performs all its position calculations in the WGS-84 coordinate system, there are conversions available for hundreds of other coordinate systems and datums from around the world to allow you to use the appropriate coordinate system and datum for your application. Reliance also allows user-defined transformations.

General

The Global Positioning System (GPS) is a remarkable new technology. It can produce a position fix virtually anywhere on the Earth, 24 hours a day, 365 days a year. Positions are calculated in the GPS receiver by a (relatively) simple process of distance measurements, working with extremely accurate time codes broadcast by a network of 24 orbiting satellites. The satellite system is operated by and funded through the US Department of Defense. GPS receivers are passive systems, and require no access code, user fee, or special operator’s license.

Since the US Department of Defense (DoD) is concerned with the security of United States, it has developed a program of intentional GPS signal disturbance, known as Selective Availability (SA). By manipulating information broadcast by the satellites, SA provides a reasonable level of accuracy for recreational use (about 100 meters) while disrupting “unauthorized usage” such as missile guidance systems and artillery targeting.

Although SA produces a disrupted signal, these “degraded” signals are still quite usable, and a great many ways of circumventing SA have been devised. The basic process is simple in concept, and straightforward in practice. Known as Differential GPS, it involves the use of more than one receiver.

Pay close attention to sampling rates when you’re working with a mixed set of receivers. Remember to allow for increased collection times if you’re using a base

station that samples every five seconds or more. Reliance receivers have no problems working with these “slow” sample rates Make sure to allow for sufficient overlapping data. Various testing programs around the United States have determined that a five minute static occupation time should fulfill virtually every GIS data acquisition requirement. The Reliance Decimeter system produces 10 cm + 1 ppm accurate results with five minutes on a point.

Mobile operations may require a faster sampling rate at the reference station, depending on the speed of the field data collection platform, and the required density of sampled points in the collected file.

Decimeter operations with Reliance systems are readily achieved with RINEX data. However, you should check to make sure both CODE and CARRIER phase data from the L1 frequency, at an appropriate sampling rate, are acquired by your base unit. If your equipment can fulfill these basic requirements, we can process RINEX data as if you originated it.

Although these upgraded units may have been changed, many systems are still not fully synched with GPS. While they will collect valid data on the second, they may not be in synch with the overall time standard. For example, setting a 5-second epoch interval on some of these new base stations results in data collected at:06 and:11 and:16 seconds past the minute. When an Reliance system is set to a 5 second interval, it collects at:05 and:10 and:15 and so forth. It is synched to the GPS second and to overall GPS time. The two datasets just described will not process, since the measurements are off by one second. Make sure the reference data you work with is either fully synched to GPS time, or set your field receiver to 1 second data collection interval in order to fit into the unreliable time frame of the reference station.

This manipulation may sound complicated. But once you have the correct procedure, it’s a simple, accurate, workable process. Ensuring compatibility is assured once it’s set up. Call your Reliance representative for additional technical assistance.

GPS under Trees

GPS receivers are not at their best in forests. Signals from the GPS constellation must be able to reach the receiver for it to produce a position fix. If you’re behind a ridge, building, or other solid mass, those signals won’t get through. Trees, on the other hand, vary in their ability to obscure and disrupt the acquisition of position fixes. Your ability to obtain a fix depends on issues such as crown closure, stand density, elevation of satellites, and leaf type.

For the most part, with proper planning you should be able to get fixes just about anywhere. You should collect data when satellites are higher in the sky relative to your position. More satellites overhead means less chance for signal blockage by tree trunks, the real culprits in forest-region survey work. For best results the receiver

should definitely be out in the open, but with proper planning you should be successful wherever you go. Take a 50-meter steel tape and good compass when you're in difficult areas. If you can't get a position fix in a particular spot, measure out an offset and enter the value in the Reliance Field Asset Management software. The offset position automatically makes corrections in the post-processing calculations.

Multi-channel GPS receivers

Acquiring a GPS position involves, either three or four satellites, depending on whether we're looking for a 2D or 3D fix. In general, if you're looking for reliable, accurate results, you should have at least four or more parallel channels with which to receive data. Three-channel and fewer receivers are suitable for recreational use, but are not reliable for professional applications. Ashtech Reliance systems are all 12 channel receivers. In addition to maintaining a lock on all satellites that may be overhead, such "all-in-view" receivers also "over-determine" a position fix using more measurements. Ashtech Reliance systems are designed with these features to provide more accurate results, faster operation in areas of intermittent obstructions, and superior satellite tracking capability.

The GPS signal

Briefly, the GPS signal is time codes used to calculate distance from satellite to receiver.

Satellites in the GPS constellation broadcast on two Carrier frequencies, L1 and L2. The L1 Carrier signal carries three phase modulated messages, the C/A Code (used by virtually all GPS receivers), P Code, and a data sequence. L2 is made up of a Carrier phase and a P Code message. The L1 Carrier frequency has a wavelength of 19 cm, while L2 is about 25 cm. L1 is broadcast at 1575.42 MHz, and L2 at 1227.60 MHz.

A cellular phone is about 850 MHz, and microwave ovens are around 2000 Mhz. GPS signals were intentionally designed to be broadcast in a relatively "dead" area on the electromagnetic spectrum, to avoid interference problems. Ashtech receivers are noted around the world for their resistance to jamming from outside interference. However, many other receivers now available are adversely affected by sources such as microwave towers, heavy radio traffic in port and harbor operations, and so on. Contact your local Ashtech representative for a copy of an independent survey of receivers under adverse RF interference conditions. The Ashtech Reliance is unaffected by power lines as a source of interference.

Course Acquisition (C/A) Code is the fundamental source of positions data. Each satellite has its own code, denoted by the acronym PRN, or Pseudo Random Noise. When you hear someone speaking about PRN 17, they're referring not only to the satellite, but also to the nature of the C/A Code it's broadcasting. C/A Code has a wavelength of about 300 meters.

L1 Carrier has a wavelength of 19 centimeters and is the most common source of centimeter-level accuracy in position fixes.

The Data Sequence that's also broadcast contains useful information such as almanac, ephemerides, and other "housekeeping" data important to the operation of the receiver. Ephemeris data are used directly in the process of computing a fix, by providing an orbital frame of reference. Since GPS position data are calculated in a process of trilateration (the intersection of linear measurements from a remote object) the ephemerides provide the location from which a receiver calculates a distance.

For more information on the broadcast message and other GPS information, refer to the Guide to GPS Positioning, by David Wells of the Canadian GPS Associates. Obtain this well-detailed (yet surprisingly accessible to the non-professional) manual from the Canadian Institute of Surveying and Mapping, Box 5378, Postal Station F, Ottawa, Ontario, Canada, K2C 3J1. You may also call and request a copy at 613-224-9851 use a Visa/Mastercard; the price is $35.00 Canadian, but well worth the price.

GPS Ephemerides

Ephemerides are automatically received and stored by the receiver as a normal part of its operation. They provide a precise (within the scope of SA) frame of reference with which a receiver calculates a position fix. In addition, the Reliance system acquires and stores an Almanac of predicted satellite orbits. This almanac is used as a "road map" of intelligence about where satellites are, and will be. Every time you turn on your Reliance system it uses almanac data to determine which are the most favorable satellites to use when calculating a position fix.

Dilution Of Precision (DOP) is a measure of the geometric quality of a satellite grouping. Since GPS positions are determined by measuring from a series of satellites, better geometry in the sky means better results on the ground. DOPs are referred to on ascending scales, where 1 is great, 3 is OK and a 6+ number may have negative effects on the results. In general, the more evenly distributed satellites are across the sky, the better your results are after the fact. You can program your Reliance system to warn you, or ignore, position fixes and data gathered when geometry is bad. You can run the mission planning software to produce a graphic plot of DOP levels across your work day. As a rule of thumb for most operations, you'll encounter poor DOPs when parts of the sky are obstructed, reducing the number of available satellites. Urban/suburban operations close by large buildings, or forestry/

natural resource applications where you'll be under heavy tree canopy and on steep hillsides can all effect your DOP levels. The Reliance Mission Planning software allows selective masking of various parts of the sky when you're creating a field work plan. If you're on a south-facing slope, you can block out the northern sky and determine when the times for best accuracy.

In most cases, you need not think about DOPs very often.

Measurement Units, Map Projections, Coordinate Systems, and Datums

Ashtech uses standard survey measurement units, such as meters and feet (US and International). Most surveyors and GIS operators work in meters, although some work in feet. Ashtech also offers the capability to define your own coordinate systems and datums. This involves map projections, coordinate systems, and datums.

A map is developed using a projection, a mathematical translator between the round(ish) Earth and the flat map. This is actually quite complicated, because a map is flat and the Earth is not. The Earth is really not a sphere either, it's more like an orange. Frankly, any map is inherently inaccurate because it "stretches the corners" to fit.

Grab an orange and try to wrap a sheet of paper around it without folds or wrinkles. The only way to get the paper to wrap evenly is to cut here, nip there, and tuck in a few places. That's what a map projection does, it takes a round surface and spreads it onto a flat one, doing the best job it can to avoid distortion along the way.

The challenge is to make a projection that fits best throughout the space it covers with the least distortion possible. There are many of these projections available to the map maker, but for the most part there are a handful of projections in practical use today. Ashtech Reliance software supports all of these common projections.

Coordinate systems describe where you are in a map projection. Some people use Northings and Eastings from an agreed-upon starting point, and describe their positions in meters or feet. Others work in Latitude and Longitude, which divides the Earth into degrees, minutes, and seconds. A convenient rule of thumb to use when working in Lat/Lon is one second of Latitude equals 30.92 meters on the ground. To find the same measure for Longitude, calculate the cosine of the Latitude, then multiply this number by 30.92 and you'll have the distance for a second of Longitude.

Datums are more refined versions of the ellipsoid. OK, so what's an ellipsoid? The official term for the Earth is an oblate spheroid, although for some reason it's more frequently referred to as an ellipsoid. Mathematicians have developed a number of ellipsoids, the most common being Mr. Clarke's, developed in 1866. A datum is just a locally refined version of the ellipsoid, a more precise description of the local

characteristics. (It may or may not be more precise, but it is the locally accepted definition.)

As an example, in the United States, we have NAD27 and NAD83--the North American Datums of 1927 and 1983. Nothing's really moved on the Earth in the 56 years between these two but the accuracy of the definitions has improved considerably. A new Worldwide Geodetic System was developed in 1984. It is used across the globe by GPS receivers as a standard reference of datum and ellipsoid. The importance to a GPS user is making sure you get the datum correct when you plot coordinates to your map. A mistake in selecting the correct datum almost always results in a sizable error. The difference between NAD27 and NAD83 is minimal in Bloomington, Indiana, about 42 meters in Albany, New York, and about an even 70 meters in Las Vegas, Nevada.

Why are there such differences? The NAD83 is a more refined, and better described, mathematical description of the ellipsoid in North America. Any differences between it and the NAD27 are really improvements. The WGS84 is based on the NAD83. At least this is the case for all practical purposes when working with GIS-level GPS results (<1 meter accuracy) any difference between the two is centimeters of background noise. However, when you get into the <30 cm accuracy of the Reliance Decimeter unit, a small difference can have an effect on your results. Make sure you select the right datum when to process your data.

Many users find the Reliance system far more accurate than the GIS base maps. An example of how this shows up would be a road edge acquired by the Reliance system follows the true line of the feature, while the road location in the GIS is offset. The Reliance system can then be used as a constant source of map accuracy updates. It improves the relational accuracy of the GIS database every time it's used in the field.

Ashtech Reliance software takes care of all the details for you. Just make sure to select the proper values in the Map System section of the Project Setup dialog box, and the Reliance output will match your maps. If they don't match, look very carefully (on both sides of the process) to make sure you selected the right datums, projections, and coordinates. Then look at your base maps again. Chances are their origin scale or reference method was off somewhere in their history.

GPS is an extremely accurate tool. In more than just a few cases it's found problems with maps that were thought to have been quite good. If this happens to you, or you think it's happening, check your procedures, run your sessions again, and recheck it all again. If you're still looking at GPS positions that appear out of place after three tries at the data, run another check by tying a few known points together on the map with your GPS equipment. Use National Geodetic Survey control points if possible. Since NGS points are very accurately described, you'll have a good baseline measurement for comparison. If the GPS-derived distances between the points match the values that you've derived from NGS-supplied materials, but the distances are

different on your map, you've got a problem with your map. GPS can help you fix these type of offsets.

Post-Processed Differential with GPS

If two identical sets of data, both degraded by SA with one set of data (one end of the quadratic equation) was gathered on a known point, a software program can calculate the magnitude of the SA-induced degradation. These calculations are then used by another software processor to remove errors from the dataset acquired in the field (the other end of the equation). The process is automated in the Reliance software. Four basic rules must be followed:

- You must use at least two receivers.
- You must take data files at overlapping times.
- You must use the same sets of satellites in each receiver.

With a little planning, some care, and a manual nearby on your first try, you'll find the differential process is easy to use. Remember the four basic requirements, and the underlying principle of identical datasets.

You can use more than two receivers at a time. In fact, with an Ashtech Continuously Operating Reference Station (CORS), you could serve the needs of hundreds of field receivers from one centralized station. You must make sure at least one of the units in your differential operation is on a control point. Without a tie to an absolute control, or known point, any differential results will be accurate to each other, but there won't be any reference to the rest of the world. Establishing a precise location for a control point determines how well your field collection will tie into maps from other sources. However you choose to collect position fixes in a particular area, make sure you work with a consistent control point, or your results will be scattered.

Data taken by field and control receivers must be acquired concurrently. Fortunately, extremely accurate timing data is part of the GPS position record, so your data sets need only OVERLAP. Make sure your data collection is concurrent over a specified time period. The Reliance takes care of the rest.

Real-Time Differential with GPS

An accurate fix on your current location is achieved through a simple-in-theory process known as real-time differential. Real-time works in the same basic way as post-processed differential. It compares reference data with a known position. However, instead of collecting data for after-the-fact correction, a radio signal is broadcast which carries the corrections. You'll need some form of radio reception

device tuned to the broadcast frequency and linked to the GPS receiver, which calculates accurate position fixes as it receives corrections.

The drawback is that the range from the control station is limited by the power and type of radio broadcast system. Without radio contact, there's no real-time correction. The Reliance system has on-screen messages, as well as setup parameters that prevent you from working with uncorrected data. If radio contact is lost, most people rely on post-processed differential.

There is no way to predict the range of real-time systems. However, a good rule of thumb for portable transmission stations is 25/25/25. This refers to 25 watts of power broadcast from 25 feet above ground level producing an effective range of 25 miles over generally even topography. If your survey area is hilly or wooded, the effective range of your radio system can be sharply limited. New digital communications systems, as well as cellular telephony, can communicate real-time corrections. However, for most uses, a licensed set of VHF or UHF radio modems can be used. Ashtech can provide technical advice on the advantages and disadvantages of radio systems.

Real-time is so useful that companies have been formed to offer accuracy improvement services. Typically these companies work through FM subcarrier frequencies and use "pager" technology to receive the corrections. The fees for these services are relatively inexpensive, typically around $100.00 per month, usually with unlimited access. Some companies offer corrections data with a satellite link. Consult your local dealer for the latest Information.

Technical Support

How to contact Ashtech Technical Support

You can obtain technical support by phone, fax, electronic mail, postal mail, and through our bulletin board system.

- Technical Support (USA) Phone: 800-229-2400 (toll free) or 408-524-1400
- Technical Support (USA) Fax: 408-524-1500
- Technical Support E-mail: support@ashtech.com

Technical Support by E-Mail

You may contact Ashtech Technical Support by e-mail through support@ashtech.com. Include as much information as you can to describe the problem that you are encountering.

Technical Support by Postal Mail

You may contact Ashtech Technical Support by postal mail. Include as much information as you can to describe the problem that you are encountering. Address your correspondence as follows:

- ASHTECH RELIANCE SUPPORT
- 1170 KIFER ROAD
- SUNNYVALE, CA. USA 94086-5314

Technical Support by Bulletin Board System

The Ashtech Bulletin Board System (BBS) has facilities to leave support questions and problem reports. Just follow the instructions when you log on. Be sure to tell us how to contact you

Once on line, you may find that certain general problems have already been solved and recommended procedures are specified waiting for you to download it to your computer. Especially read the bulletins. They will provide you with the latest information.

- Bulletin Board System (USA): 408-524-1527

Suggestions and Comments

We welcome suggestions. You can pass your suggestions to us by any of the means mentioned above. Short, concise suggestions can be left by phone, but long or involved

suggestions are best handled in writing. We have found that e-mail and BBS upload are the most convenient way to leave suggestions.

Sales, Marketing, and Other Business

For correspondence other than support issues, please address your correspondence as follows:

- ASHTECH
- 1170 KIFER ROAD
- SUNNYVALE, CA. USA 94086-5314
- Phone (USA): 408-524-1400
- Fax (USA): 408-524-1500

Build a New Project

The following flow chart demonstrates how to build a new project.

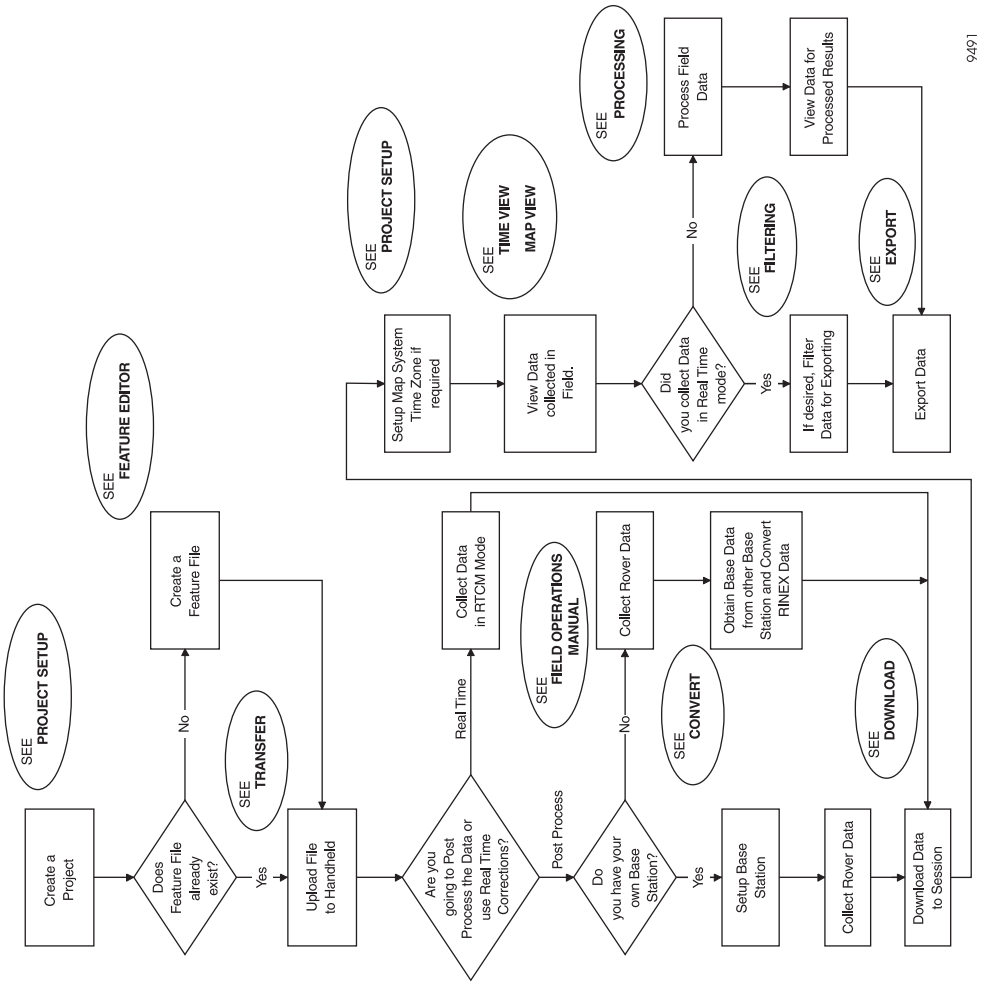

Figure A.1: New Project Flowchart

Glossary

Base Station
See **Reference Station**.

B-File
Binary file in Ashtech format that contains proprietary GPS measurement data format which is stored in the receiver.

C/A
See **Coarse/Acquisition Code**.

Carrier phase data
Refers to the measurement of the phase of the GPS signal.

C-File
Ashtech proprietary data file containing the positions computed and stored by the rover receiver.

Coarse/Acquisition Code
Coarse/Acquisition code modulated onto the GPS carrier.

Datums
The mathematical definition of a surface from which coordinates of a given system are referenced.

Decimeter
One tenth of a meter or 10 centimeters.

D-File
Ashtech proprietary file which is created by Field collection software and stored in the receiver.

DGPS
Differential Global Positioning System. Commonly used to refer to Real-time differential correction techniques.

Differential Correction
The process of applying the difference between a computed position at a point and its known value in order to apply this "correction" to other GPS receivers in the area.

Differential GPS
See **DGPS**.

DOS
Disk Operating System. Reliance uses MS-DOS developed by Microsoft.

E-File
Binary file in Ashtech format which contains the ephemeris data.

Ephemeris Data
Information transmitted from a satellite which allows the GPS receiver to determine the satellite's position in space.

Export
Taking Reliance data and sending it to GIS applications.

FAM
See **Field Asset Management**.

Field Asset Management
Managing items, their features and attributes, in a field environment.

Generate
The file format for the ArcInfo GIS software application.

Geographic Information System
A system of digital maps and attached database which is organized by physical location.

GIS
See **Geographic Information System**.

Global Positioning System
Constellation of satellites providing worldwide coverage for positioning information.

GPS
See **Global Positioning System**.

GPS satellite geometry
The satellite distribution at a given location. measured by the PDOP index.

GPS signal multipath
Occurs when the GPS signal arrives at the antenna by a path other than a straight line. Causes time delay, which in interpreted as an error in distance by the receiver.

INF File
Refers to the file Reliance creates when exporting data to keep track of the native map system and unit information.

L1
The 1575.42 MHz component of the GPS signal.

L2
The 1227.60 MHz component of the GPS signal.

PC
Personal Computer.

Post-processing
Computations involved with refining collected GPS satellite measurement data.

Projects
Main element of data in Reliance.

Radio Technical Commission for Maritime Services
Commonly refers to a format of real-time DGPS format.

Reference Station
A stationary GPS receiver logging, or broadcasting, data from a known point. The data is used for differential correction. Reference Station is synonomous with Base Station.

RINEX
Receiver Independent Exchange Format. A "universal" GPS measurement data format designed to allow compatibility between different brands of GPS receivers.

RTCM
See **Radio Technical Commission for Maritime Services**.

SA
See **Selective Availability**.

Selective Availability
A technique used by the US Department of Defense to degrade GPS signals.

Shape
The file format for the ArcView GIS software application.

Submeter
Measurement less than one meter.

Unbounded
Having the ability to switch between applications without physically switching them

Urban Canyons
A term used in the GPS world to describe a operating environment where buildings along a street create obstructions to the GPS signal.

Waypoints
A term used to describe a pre-determined coordinate point to which a GPS receiver can navigate.

WGS-84 coordinate system
World Geodetic System, 1984. This coordinate system is used by GPS receivers for computing their positions.

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