Process
User's Guide

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Introduction

PROCESS is the WinPrism/WinPrism L1 program module with which you can process your GPS and GLONASS receiver survey data to determine the baselines. PROCESS in WinPrism accepts single- and dual-frequency carrier-phase data (codeless and full-wavelength) as well as code-phase range data. It calculates the relative positions of and baseline vectors between stations and associated statistical information about the accuracy of the positions and baselines. You begin with survey data files (B-files, E-files, and S-files) extracted from receivers using the WinPrism/TRANSFER/DOWNLOAD function or by conversion from non-Ashtech source files using the WinPrism/TOOLS/RINEX function. After TRANSFER you select the WinPrism PROCESS program module and the processing method that matches the survey method, static, pseudo-kinematic, or kinematic. You then organize the survey data files into a Project Site List (project file) with site and session-specific information that you can verify, change, add to or delete. This data includes site-specific parameters such as antenna height, position, and meteorological data. PROCESS forms Input Parameter files (I-files), Output Listing files (L-files), Vector Output files (O-files), and Residual Plots files (P-files). PROCESS automatically detects and corrects most cycle slips. Residual plots of receiver data facilitate detection of uncorrected cycle slips. Once WinPrism has processed all data from a survey session, you can pass the PROCESS output files to other WinPrism program modules such as DATABASE (for storage) or ADJUST (for least-squares network adjustments).

What's New in Process?

The Process module that ships with WinPrism 2.0 contains some significant enhancements over previous versions. The Quick engine (available for Static or Pseudo-Static processing) can be set to a new 'Auto' mode. The Auto mode frees the user from making a number of technical decisions about how the data should be processed. When Auto is selected, the Quick engine takes charge of choosing the best possible combination of runtime parameters for each baseline. The parameters are set dynamically. This means that a number of vectors can be batch processed, but that the best runtime parameters are still set for each unique vector. The L file gives a complete accounting of which parameters are selected by the Quick engine. Full manual control is still available, but the Auto mode represents the best choice in all but the most unusual circumstances. The Quick engine handles GPS or GPS/GLONASS data.

Whether processing with Auto or manually, a new ionospheric model is available when processing dual band data.

The Process module also ships with a new kinematic engine called GPE. The GPE engine handles GPS or GPS/GLONASS data, and also excels at sorting out mixed data sets such as rapid-static data. GPE is a 'one stop shopping' processing engine, and requires only a minimum amount of expertise on the part of the user. To learn more about GPE, take the tutorial included in this manual.

Function Summary

Following are summary descriptions of the PROCESS program functions:

EDIT PROJECT Option

Allows you to edit and verify site-specific information.

EDIT LOGTIME Option

allows you to edit the LOGTIMES file for use in pseudo-kinematic and kinematic processing. You can edit and verify common data collection periods between sites that will be used during processing.

EDIT RUNTIME Option

allows you to set various common processing parameters that will be used during the current processing session. These parameter settings are the values used to control the data processing both in automatic and manual modes. The default values are set or modified using the WinPrism/PROCESS/SETUP icon. The PROCESS/MANUAL and PROCESS/ AUTOMATIC functions use various subsets of these parameters to process SURVEY TYPE STATIC or PSEUDO (pseudo-kinematic) only. (Processing parameters for SURVEY TYPE KINEMATIC are set via the GPE 'Define Project Dialog' described later in this manual, or within PNAV (refer to the PNAV User's Guide).

RESULTS Option

allows you to view and print the output files resulting from MANUAL and AUTOMATIC processing: Input Parameter files (I-files), Vector Output files (O-files), Output Listing files (L-files), and Residual Plots files (P-files).

SETUP Option

allows you to set the default values of various common processing parameters for static and pseudo-kinematic processing. You can change most of these default parameter values via PROCESS/EDIT RUNTIME for a particular processing session.

AUTOMATIC Option

initiates batch processing of static and pseudo-kinematic B-, E-, and S-files in a programmed sequence, using the parameter values you established with the PROCESS/SETUP or EDIT RUNTIME icon. All vectors between site pairs use the same parameters.

MANUAL Option

processes static and pseudo-kinematic B-, E-, and S-files while allowing you to run the various processing functions individually, specifiying unique runtime parameters for each baseline.

TOOLS Option

provides access to the following utilities and data manipulation programs: EDIT FILETOOL, TIMESYS, TRANSFORM, BLUEBOOK, RESULTS, BARCODE, D+PTS FILE UTILITY and RINEX. For more information, see the Tools User's Guide.

Processing and this Guide

This manual:

- provides the information you need to process static or pseudo-kinematic field survey data transferred from the receivers into your computer using the WinPrism/PROCESS program module, and
- describes the PROCESS interface to the GPE and PNAV programs for kinematic data processing.

We recommend that you process your data on a daily basis to allow for timely detection of errors and resolution of problems. After you process the survey data, you should combine the results into a survey network and perform a network adjustment using the WinPrism/ADJUST program module. The network adjustment gives you a quality check of the PROCESS results by allowing you to compare the PROCESS data with the overall network.

2

Getting Started

This chapter shows you how to start the WinPrism program and run the PROCESS function. The PROCESS function expects to find survey data files (B-, E-, and S-files) to work on in the current directory. These files must all have been collected on the same day (although they may represent multiple survey sessions), and they must all reside in the same directory.

Select Directory

If you started WinPrism from the directory containing survey data files, you may immediately select PROCESS. You can change the current directory to one containing such files before you select PROCESS using the DIRECTORY button.

Using Process

1. To access the PROCESS screen, click on the PROCESS icon from the Main Menu, and observe the PROCESS Main screen, Figure 2.1.

Figure 2.1: Process Main Screen

If the current directory does not contain survey data files, PROCESS displays the error message

ERROR: No data files are found in the current directory

and returns to the Main menu. Change to a directory that contains data files, and re-access the PROCESS screen.

The PROCESS screen consists of:

- Top title bar (unchanging),
- Directory button and current path line,
- Options window. and
- Control Button menu

2. Once the PROCESS screen is accessed, a message is immediately displayed in the Control Button area at the bottom of the screen prompting you to "Select Survey Type". Select the type of data to be processed from the Survey Type menu located on the right-hand side of the Options window. Data can be either static, pseudo-kinematic, or kinematic.
3. Once the survey type has been selected, PROCESS checks the data files and creates a Project file. If the survey type is either pseudo-kinematic or kinematic, a Logtimes file is also created. If a Project File already exists, PROCESS asks if you wish to use the current Project File.
4. Edit the project file by clicking on the EDIT PROJECT icon. Set one station as fixed by setting the knowness field (the K field) to 0, and enter the correct position in WGS-84 coordinates. If necessary, modify the antenna height for each station.
5. If the data is kinematic or pseudo-kinematic, edit the Logtimes file by clicking on the EDIT LOGTIME icon. Ensure that all the site names are valid and that all sites between which you want to process baselines share common collection intervals.
6. If desired, you can edit runtime parameters by clicking on the EDIT RUNTIME icon. Note that the EDIT RUNTIME icon can only be accessed if the data is either static or pseudo-kinematic. Runtime parameters for kinematic data are set in the GPE or PNAV programs.
7. Initiate static or pseudo-kinematic processing usisng the QUICK engine by clicking on the AUTOMATIC icon. Then select PROCESS.
8. Initiate kinematic processing by clicking on either the GPE or PNAV icon. The GPE icon takes you to the GPE processing engine; the PNAV icon accesses the PNAV processing engine.

   For more information about the PROCESS icons, see Chapter 8 (PROCESS Module Program Reference). For more information about processing static and pseudo-kinematic data, see Chapter 4 (The QUICK Engine). For more information about processing kinematic data, see Chapter 5 (The GPE Engine) or the PNAV manual.

3

Data Collection and Processing Methods

PROCESS allows you to process survey data (B-, E-, and S-files) collected statically, pseudo-kinematically, and dynamically. The dynamic survey includes kinematic, fast static, and navigation surveys. This chapter briefly describes each survey method and how PROCESS handles each corresponding survey data type.

Static Survey

Figure 3.1shows the options available for a static survey. In a static survey, all receivers sit on a site and collect data for at least an hour. Data is usually collected at a 20-second recording interval. PROCESS uses data collected during the time interval common to the receivers to compute baseline vectors between the sites. If you select SURVEY TYPE STATIC from the main PROCESS screen and then the icon for the EDIT PROJECT function, PROCESS organizes the session sets of B-, E-, and S- survey data files into a Project Site List and saves it in the current directory as the project file named PROJFILE.STA.

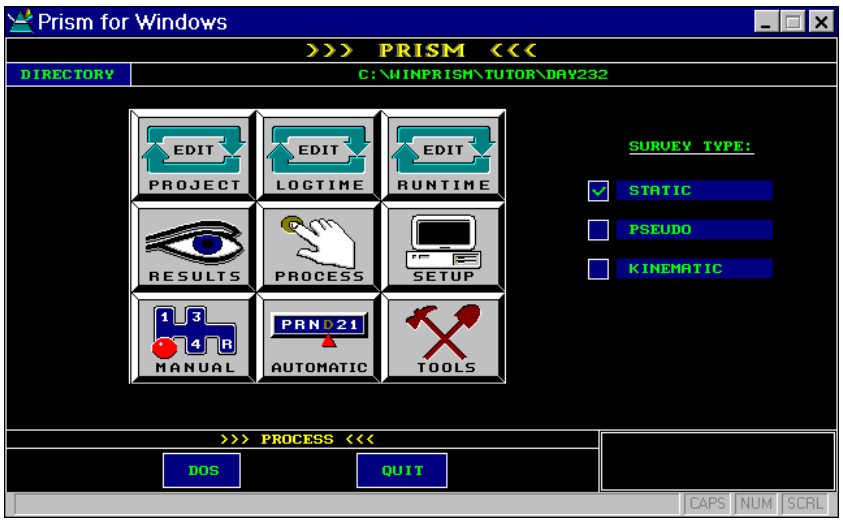

Figure 3.1: Static Survey Opening Screen

Pseudo-Kinematic Survey

A pseudo-kinematic survey can consist of any combination of fixed and roving receivers. The technique involves repeat occupation of individual sites to determine the baselines. Data is usually collected at a 10-second recording interval. The common times used for processing are determined by the LOGTIMES file. Any fixed stations stay on their sites throughout the entire survey while the roving receivers are moved among desired survey sites. Each roving receiver sits on a site and collects data for about ten minutes. Each rover is then moved to the next site, and so on. While the fixed receiver is still continuously collecting data, each rover is returned to each previously occupied site for another ten-minute data collection period. PROCESS uses data collected during the time interval common to the fixed and roving receivers to compute baseline vectors between the sites. When the selected SURVEY TYPE is PSEUDO, PROCESS compares the collection intervals of the roving receivers with the time the base receiver remained on the point to create the LOGTIMES file.

As soon as you select SURVEY TYPE PSEUDO from the main PROCESS screen, Figure 3.2. In this screen, PROCESS:

- reads the B-, E- and S-files to create the project file named PROJFILE.PSD,
- creates the file COMMON.NAV (used by the PROCESS/MANUAL and PROCESS/AUTOMATIC functions),
- generates the LOGTIMES file that identifies common data collection times between any or all of the fixed sites and all of the roving sites. .

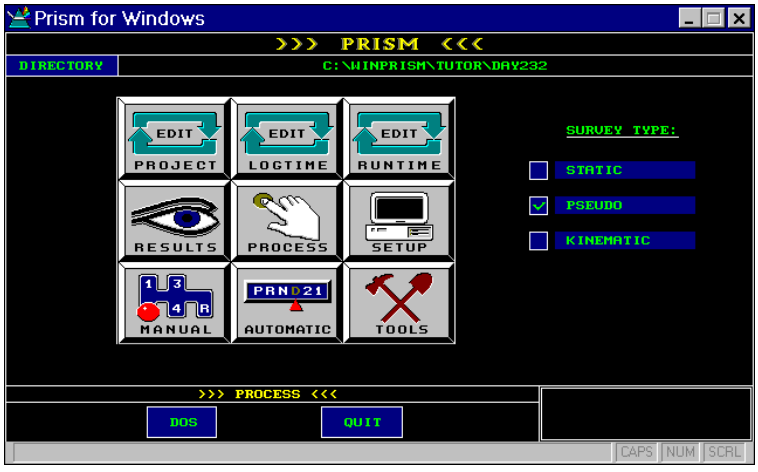

Figure 3.2: Pseudo Kinematic Survey Opening Screen

Kinematic Survey or Fast Static Survey

A kinematic survey or fast static survey can consist of any combination of fixed and roving receivers but requires at least one fixed receiver (also termed a base receiver) and one roving receiver. (We recommend at least two base sites and one or more roving receivers.) The technique involves very short occupations at the individual sites to determine the baselines. Data is usually collected at a 5-second recording interval. The common times used for processing are determined by the LOGTIMES file. Any Base (fixed) stations stay on their sites throughout the entire survey, while the roving receivers are moved among desired survey sites. Each roving receiver sits on a site and collects data for a short period, depending upon the kinematic field procedures used, and the data type collected.

GPE processing is limited to no more than 80 static sites in a roving receiver (ROVR) file. GPE uses the data collected during the time interval common to the base and roving receivers to compute baseline vectors between sites.

As soon as you select SURVEY TYPE KINEMATIC from the main PROCESS screen, Figure 3.3. In this screen, PROCESS:

- reads the B-, E- and S-files to create the project file named PROJFILE.KIN,
- creates the file COMMON.NAV (used by the PROCESS/MANUAL/GPE functions),
- generates the LOGTIMES file that identifies common data collection times between any or all of the fixed sites and all of the roving sites.

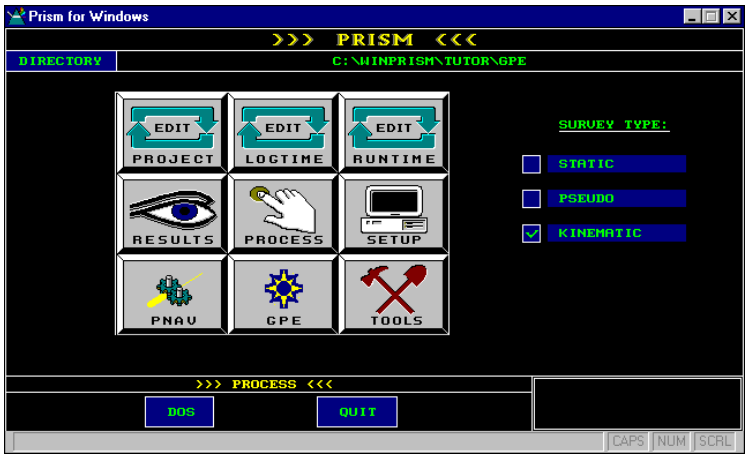

Figure 3.3: Kinematic Survey Opening Screen

Navigation Survey

In a navigation survey, the rover receiver is almost continually in motion. It can be thought of as a kinematic survey without the site occupations. A navigation survey can consist of any combination of fixed and roving receivers, but requires at least one fixed base receiver with known WGS-84 coordinates and one rover receiver. Unlike the other survey types, processing data in navigation mode produces no O-files. Navigation solutions consist of a C-file and a J-file that lists the position and vectors for each for each data point along the trajectory. Both carrier-phase and code-phase data can be processed in navigation mode.

Navigation data is processed almost identically to kinematic surveys. Select SURVEY TYPE KINEMATIC from the main PROCESS screen, and then follow the instructions in this manual for processing kinematic data. Once in GPE, select the Navigation processing method.

4

The QUICK Engine

This chapter shows you how to process survey data (B-, E-, and S-files) collected statically or pseudo-kinematically.

Summary

1. As described in the Getting Started chapter:
   a. Run WinPrism.
   b. Ensure the current directory contains the data files of a particular day you wish to process (it can be multi-session).
   c. Run the PROCESS function.
2. Select the appropriate survey type.
3. Edit the project file.
4. If processing pseudo-kinematically, edit the LOGTIMES file.
5. Edit the runtime parameters.
6. Select AUTOMATIC, deselect any baselines you do not want to compute, and then select PROCESS.
7. View the results.
8. If not satisfied with the results, reprocess via the MANUAL function.

The QUICK Processing Engine

The QUICK processing engine provides you with the ability to process static and rapid static GPS and/or GLONASS data in an efficient and fast manner. It is the default static

and pseudo-kinematic processing engine in WinPrism. Advantages of the QUICK engine include:

- Processing of GPS and GLONASS data simultaneously.
- Optimal coupling, meaning that more than one reference SV can be used per session.
- Fast processing
- A new Auto mode that selects the different input parameters for each baseline depending on the particulars of that baseline.

Select Survey Type

These buttons let you match the PROCESS type with the method used to collect survey data; STATIC, PSEUDO (pseudo-kinematic) and KINEMATIC each process survey data differently. You can process static data pseudo-kinematically; processing pseudo-kinematic data statically, however yields invalid baseline vectors. If you select PSEUDO, PROCESS immediately checks for a LOGTIMES file (in the current directory). If no LOGTIMES file exists, PROCESS automatically generates a LOGTIMES file. If a LOGTIMES file already exists, PROCESS asks if you wish to use the existing LOGTIMES file before creating one.

Select Edit Project

In the EDIT PROJECT screen you define your fixed site (control point) by setting its knowness to zero and entering its correct position in WGS-84 coordinates. You also modify or verify, for each site, the antenna parameters (radius and slant height), meteorological conditions, and other site-specific parameters. Once you are satisfied, click on ACCEPT to accept the project file.

Select Edit Logtime

If you have selected pseudo-kinematic as the survey type, in the main PROCESS screen, you can edit the LOGTIMES file. (EDIT LOGTIME does not apply to static data because WinPrism does not use a LOGTIMES file for static processing.) When computing baseline vectors, the QUICK program processes only data collected during the common site periods.

1. Ensure that all the site names were entered correctly at the receiver, that all site names are valid, and that all sites between which you want to process baselines share common collection intervals.
2. Once you are satisfied, click on ACCEPT to accept the LOGTIMES file.

Select Edit Runtime

In the EDIT RUNTIME screen you can verify or change values of the runtime parameters such as data processing mode and elevation mask. Once you are satisfied, click on ACCEPT.

Select Automatic

In this screen you can choose which vector combinations you wish to process (the default is to process all combinations) and then select PROCESS. AUTOMATIC runs through the following programs in sequence:

1. The program uses the E-files to create a common ephemeris data file called COMMON.NAV.
2. QUICK first creates an input parameter file (I-file) based on the project file and the runtime parameters for each vector and then processes the vector based on the I-file. QUICK creates, for each processed vector, an O-file, an L-file, and a P-file.

Once you have ensured that all data is correct, you may select to process in either Manual or Automatic mode. We recommend automatic purely because it takes a lot of the book-keeping and organizational tasks away from you, and will automatically carry through the best seed coordinates. To start processing, simply click the AUTOMATIC button in the PROCESS screen. You will be shown a baseline matrix where you select the actual baselines you want to process. To actually start processing, click on the PROCESS button. This will launch the QUICK engine which will appear as shown in Figure 4.1.

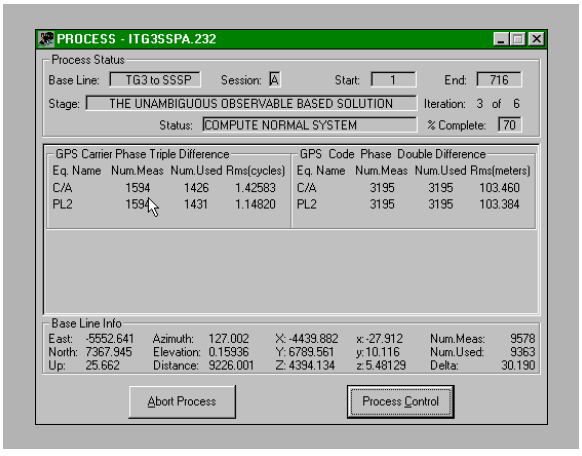

Figure 4.1: Process Status Screen

There are a number of fields in this screen. The title bar of this windows shows the I-file being used for the current baseline, the index of the current baseline and the total number of baselines e.g., 1 of 3 means the first of three baselines. There are three other panels which show the status of processing, observable information and baseline information respectively.

Process Status Panel

Base Line

This indicates the two site names that form the current baseline, with the known site first.

Session

Indicates the session letter of the baseline being processed.

Start and End

These fields display the start and end epochs of the dataset being processed. These can also be considered as the total number of epochs.

Stage and Status

These give information of the progress of the processing. Each stage contains several steps. Each step is indicated by the status.

Iteration

Some of the above stages may require more than one iteration - this field indicates what cycle of the iteration process QUICK is at.

Percentage Complete

Gives a percentage for the completeness of the Status.

Observable Information Panel

This gives information on what observables and combinations are being used, the total number of measurements available, the number actually used after rejection of bad measurements, and the RMS of the sample in either cycles (for carrier phase) or meters (for code phase).

Baseline Information Panel

This gives the current estimated of the components of the baseline being computed.

East/North/Up

The three components of the baseline in an East/North/Up coordinate system with the origin at the known point. Units are meters.

Azimuth/Elevation/Distance

The true azimuth, elevation and distance from the known point to the unknown point. Units are degrees for azimuth and elevation, and meters for distance.

XYZ

The vector between the two points in the WGS-84 cartesin system. Units are meters.

xyz

These are the WGS-84 components of the correction vector between the initial estimate of the baseline for this iteration and the current estimate of the baseline. Units are meters.

Num. Meas.

The total number of undifferenced measurements available, including all satellite systems and observable types.

Num. Used.

The total number of undifferenced measurements actually used after rejection of bad ones.

Delta

The distance between the initial estimate of the unknown point's position and the current estimate, i.e., the Euclidean norm of the vector xyz. Units are meters. When the Delta value is less than the Convergence Criterion specified in the ADVANCED setup screen, QUICK will stop iterating and proceed to the next stage.

In addition there are two buttons you may click on: -

Abort Process

If you wish to stop all processing, click on this button; you will be prompted to make sure that you really want to stop. If you agree, you will be returned to the AUTO PROCESS window. Output files that have already been created will not be erased.

Process Control

Clicking on this button allows you to alter some processing parameters during processing. These are Maximum Iterations, Minimum Measurements, Convergence Criterion and Edit Criterion. These all have the same meaning as described in the

WinPrism manuals - please refer to these for details. In addition, you may elect to enable/disable any warning message generated by QUICK. This is useful if you have a lot of data to process and wish to leave your computer to do something else since each warning message will appear as a message box, temporarily halting processing until you press OK. Any warning messages will still be written to a message.log file which you may inspect after processing.

Warning and error messages during processing are written to the message.log file and may be inspected after processing.

Select Results

to view and print the fruits of AUTOMATIC processing, namely:

- Input Parameter file (I-file) - a binary file that lists the runtime parameters used during processing.
- Residual Plots file (P-file) - a file that graphically displays the double-difference residuals on an epoch-by-epoch basis.
- Vector Output file (O-file) - a binary file that contains the final float and fixed solutions and is used by other WinPrism function modules.
- Output Listing file (L-file) - an ASCII file that shows the intermediate details of processing such as the triple-difference solution leading to the final float double-difference solution, and the integer fixed double-difference solution leading to the final fixed double-difference solution.

5

The GPE Engine

This chapter shows you how to process survey data (B-, E-, and S-files) collected dynamically. The dynamic survey includes kinematic, fast static and navigation surveys.

GPE Quick Reference

Steps in WinPrism

Set the Project Directory

1. Place the appropriate B-, E- and S-files in a directory
2. Start WinPrism
3. Click on the Directory box
4. Navigate to the correct directory
5. Press Accept.

Choose the GPE Engine

1. Choose the Process icon
2. Select Kinematic.

Edit the Project

1. Choose the Edit Project icon
2. Set the Knowness (K) of the base file to zero.
3. Edit the coordinates of the base station as needed.
4. Choose Accept.

Edit the Logtime

1. Choose the Edit Logtime icon
2. Inspect the sequential entries for correctness
3. If edits are desired, select the appropriate time interval line for editing.
4. When edits are finished, choose Accept.

Steps in GPE

Starting GPE

Choose the GPE icon.

Choosing a Processing Method

Choose either Batch-by-File or Data Process from the GPE Control panel.

Defining a Project

1. Select a Processing Method from the GPE Control panel
2. Select a Processing Mode
3. Select a Rover Motion model
4. Select the files to be processed
5. Assign an antenna type to each file to be processed

Starting a GPE Processing session

1. Define the project via the GPE Control panel
2. Select Process

Stopping GPE before the end of a Processing Session

This step is not normally needed.

1. Make GPE Control the active window (either click GPE Control or select it from the task bar)
2. Choose Stop

Create a Plot File

Choose Make Plot on the GPE Control Panel

Exit GPE

Choose Exit from the GPE Control panel

Process Inputs and Outputs

The inputs to and outputs from key PROCESS functions are listed in Table 5.1.

Table 5.1: Key PROCESS Functions

Function	Input	Output
EDIT PROJECT/ EDIT SITE	S-file, B-file	PROJFILE.KIN file
EDIT LOGTIMES	LOGTIMES file	LOGTIMES file
EDIT RUNTIME	not applicable	not applicable

Table 5.1: Key PROCESS Functions (continued)

Function	Input	Output
COMNAV	E-files (or precise orbits files: SP3 or EF18)	COMMON.NAV file
GENLOG	COMMON.NAV file, B-files	LOGTIMES file
GPE	E-files, B-files, COM-MON.NAV file, LOGTIMES file, PROJFILE.KIN file	O-files, P-files, L-files, J-files, C-files, optional R-files

Overview of the GPE Processing Engine

The GPE software is a full service post-processing engine. It is primarily intended to produce high accuracy positions resulting from the post-processing of carrier phase measurements collected using Ashtech GPS or GPS+GLONASS receivers. The software supports the processing of kinematic, static or mixed kinematic and static data files.

Normally, only a minimum of user interaction is required to achieve optimal results.

GPE runs as a module within WinPrism 2.0. As such, a number of the setup and control functions are accomplished from within WinPrism. These parameters are then passed to GPE when a processing session is started. Functionally, then, it is useful to think of a GPE processing session as occurring in two distinct sets of steps. The first set of steps occurs within WinPrism and involve the creation of projects and the use of the editing tools that work provide information to GPE. The second set of steps occur within the GPE software.

Project Creation and Editing in WinPrism

Selecting the Project Directory

Prior to starting WinPrism, all of the data files to be used should be placed in a single directory. When WinPrism is started, you must select the correct directory. To select the project directory, click your mouse on the box labeled Directory as shown in

Figure 5.1. Use the mouse to navigate to the directory that contains the data files. Then choose Accept.

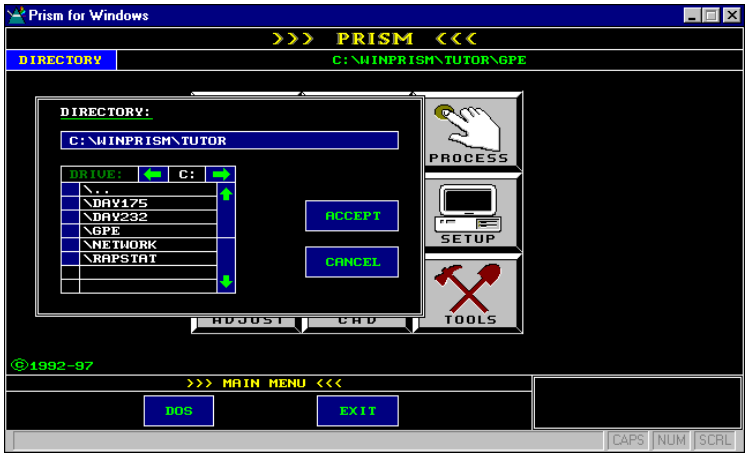

Figure 5.1: Project Directory

WinPrism clears the directory selection dialog and returns to the selections as shown in Figure 5.2.

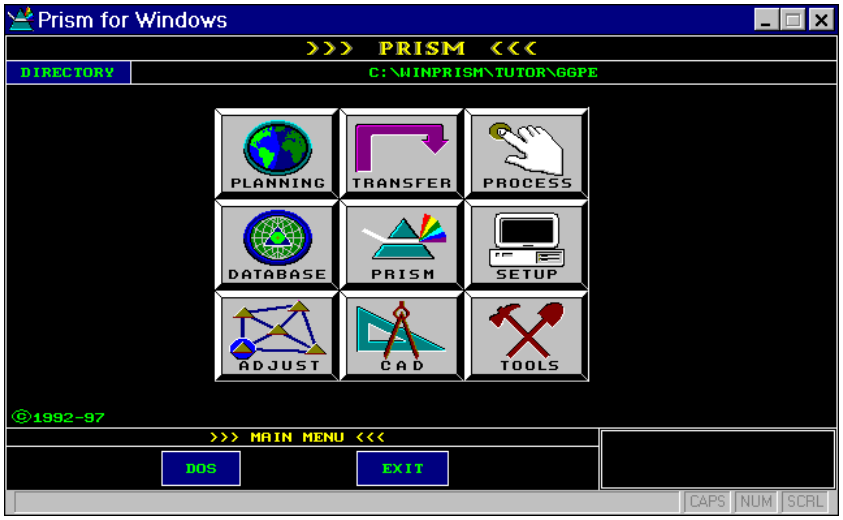

Figure 5.2: Process Icon

Choose the Process icon to access the data processing screen as shown in Figure 5.3.

Steps to Set the Project Directory

1. Place the appropriate B, E and S files in a directory
2. Start WinPrism
3. Click on the Directory box
4. Navigate to the correct directory
5. Press Accept

The Process Icon

Once the Project Directory is created, it becomes necessary to choose the processing engine. To do this choose the Process icon. WinPrism presents a selection based upon the ‘Survey Type’. GPE will process data collected using any field method, and is accessed by selecting ‘Kinematic’.

Choosing the Survey Type

When you select ‘kinematic’, the GPE processor icon becomes available along with some data management tools that are useful when used in conjunction with the GPE processor. These tools are found under the ‘Edit Project’ and ‘Edit Logtime’ icons. When ‘kinematic’ is selected, WinPrism automatically creates a number of project files that are needed by GPE.

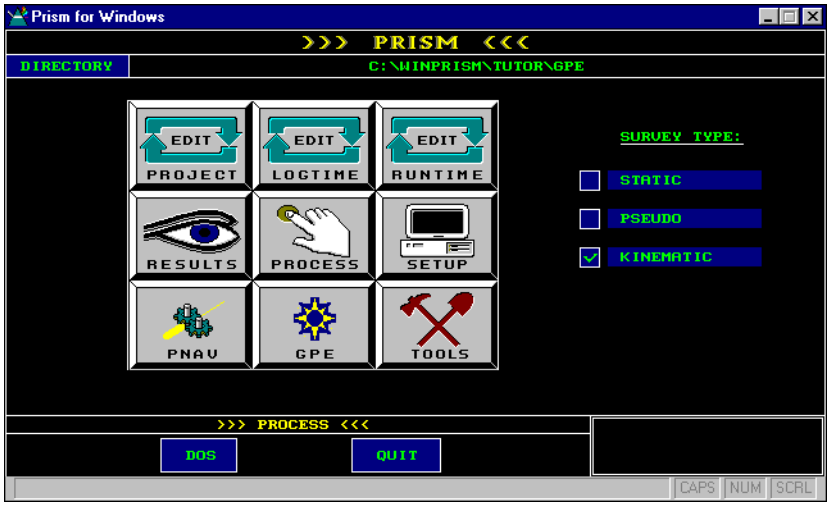

Figure 5.3: Survey Type

Steps to Choose the GPE Engine

1. Choose the Process icon.
2. Select ‘kinematic’ as the survey type.

The Edit Project Icon

The Edit Project icon activates an editable description of the current project, as shown in Figure 5.4. When using GPE, it is necessary to access this dialog for the purpose of setting at least one site to be the ‘known’ base site. This is accomplished by setting the ‘Knowness’ (K) to a value of zero. The base coordinates should also be checked and can be edited if necessary.

Choose ‘Accept’ to save changes and exit from the dialog.

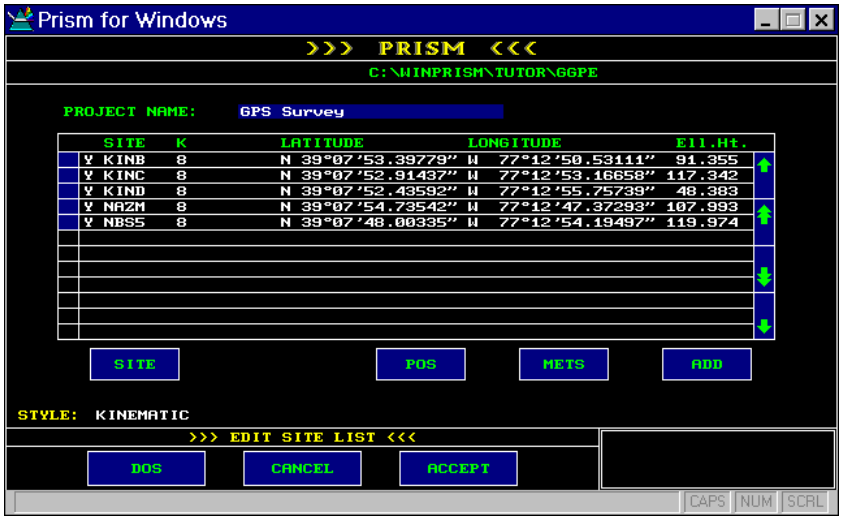

Figure 5.4: Edit Project

Steps to Edit the Project

1. Choose the Edit Project icon.
2. Set the ‘Knowness’ (K) of the base file to zero.
3. Edit the coordinates of the base station as needed.
4. Choose ‘Accept’.

The Edit Logtime Icon

The Edit Logtime dialog, Figure 5.5, presents a description of the current project by time series. When using GPE, it is not essential that this dialog be consulted. It is normally a good idea, however, to routinely check the logtime to make certain that the data that is being handed off to GPE is in the correct format. This dialog allows the user to edit site names, change antenna heights, and exclude data segments from further processing.

Choose ‘Accept’ to save changes and exit from the dialog.

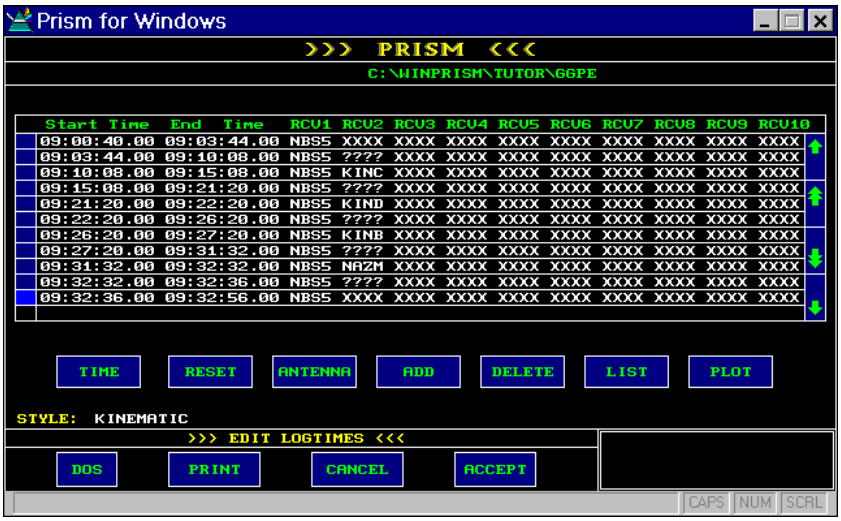

Figure 5.5: Edit Logtime

Steps to Edit the Logtime

1. Choose the Edit Logtime icon.
2. Inspect the sequential entries for correctness.
3. If edits are desired, select the appropriate time interval line for editing.
4. When edits are finished, choose ‘Accept’.

The GPE Icon

When the project and logtime are correct, the GPE post-processing engine is activated by choosing the GPE icon.

The GPE engine consists of two parts. The first part is a control panel that allows the user to make some specific choices about how the project data will be processed and

what the GPE outputs will be. These choices, while very important, are not complicated.

Choose the GPE icon to start the GPE engine and activate the GPE Control Panel.

Steps for Starting GPE

Choose the GPE icon.

The GPE Processing Engine

The GPE Control Panel

The GPE Control panel, Figure 5.6, provides you with:

1. a way to start the GPE engine.
2. a special ‘Make Plot’ tool for use after a GPE session.
3. a way to leave GPE and return to WinPrism.

Figure 5.6: GPE Control Panel

There are two ways to start the GPE engine. These are the ‘Batch by files’ method and the ‘Data Process’ method. Both of these methods activate a ‘Define Project’ dialog and are explained in detail below.

The ‘Make Plot’ tool is used after the GPE processing session is complete but prior to returning to WinPrism.

The ‘Exit’ button function will stop the GPE software and return the user to WinPrism.

The Define Project Dialog

‘Batch by files’ vs. ‘Data Process’

When the project was created in WinPrism all valid data files in the project directory were made available to the GPE engine. Users, however, often wish to process very specific combinations of data to meet special needs. The ‘Batch by files’ method, in conjunction with the ‘Data Process’ method allow the user complete control over how the GPE engine will choose data files for processing.

The ‘Batch by files’ method allows the user to specify which combinations of data files will be processed. Once the desired file combinations are selected, GPE will batch process all of the files at once.

The ‘Data Process’ method allows a single set of files to be selected for processing. When the GPE engine is activated only this single pair of files is processed, regardless of how many data files are available in the project.

Steps for Choosing a Processing Method

1. Choose either Batch-by-File or Data Process from the GPE Control panel.

Both methods, upon selection, present you with a Define Project dialog, Figure 5.7. The Define Project interface is similar for both methods. For both methods, you must do four things:

- choose the specific files to be processed
- assign an antenna type to each file to be processed
- select a processing mode
- select a model of rover motion.

Choosing the Processing Mode

Once a processing method has been selected, the user must select a processing mode. This is probably the most important choice that can be made in the GPE processor because it determines the way in which results of the processing session will be made available to the user. The Processing Mode is selected via a simple drop down selection, as shown in Figure 5.7.

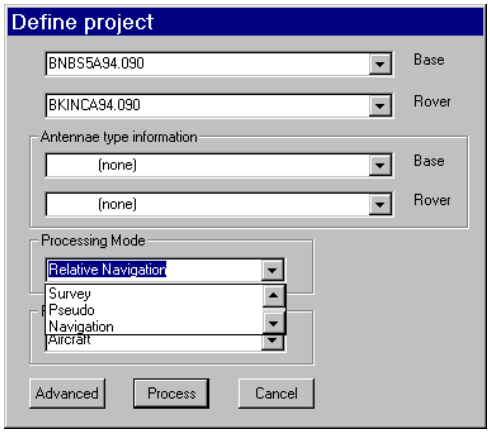

Figure 5.7: Choosing a Processing Mode

GPE supports four processing modes:

- Survey
- Pseudo
- Navigation
- Relative Navigation

The **Survey** processing mode will result in the creation of three output files, the O file, the C file and the J file. The GPE software reads the site names in the logtime file and detects static occupations of sites and also kinematic (moving) epochs. The resultant O file will report a different result for each static occupation in a 'kinematic O file'. Reoccupations of the same site are treated as separate events and each occupation is reported separately in the O file. The Survey mode also outputs a C and a J file. These files report kinematic events on an epoch by epoch basis but report static occupations as a single record.

'**Pseudo**' is similar to 'Survey' except that all static occupations of a given site are combined to give a single report for that site. The GPE processor will recognize reoccupations of the same site as a single cumulative occupation and will create a single vector to that site. Thus, only a single O file will be created for a given site regardless of how many times the site was occupied during the session. The C and J files will report the times at which the static occupations occurred, but the coordinates for all static occupations will be the same (and will match the O file report).

The **Navigation** mode does not recognize static occupations. Therefore, O files are never created. The C and J files report the position of the rover on an epoch by epoch basis.

The **Relative Navigation** mode is similar to the Navigation mode, except that the Relative Navigation mode does not require the base station to be static. On an epoch by epoch basis, the Relative Navigation mode reads the coordinate of the base file and calculates the vector to the rover from this new base coordinate. The accuracy of the Relative Navigation result is, therefore, very dependent upon the accuracy of the data in the base file. For this reason, then, it is recommended that the base file be corrected in real-time as it is collected.

Choosing the Rover Motion

The Define Project dialog also allows you to select a Rover Motion model, Figure 5.8. The appropriate model is selected via a simple drop down menu.

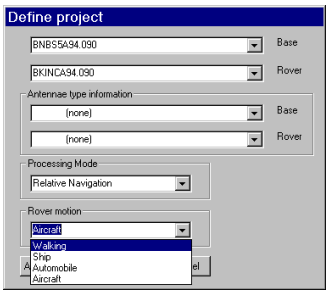

Figure 5.8: Choosing a Rover Motion

GPE supports four Rover Motion models:

- Walking
- Ship
- Automobile
- Aircraft

The appropriate selection for a static occupation is Walking.

The selection of a Rover Motion model is optional. A correct selection does slightly improve the efficiency with which the GPE engine can conduct its business, but does not change the result that the GPE engine presents in the output files.

Selecting the Files to be Processed

You must select the specific files to be included in a processing session. The interface will depend on whether you selected the Batch-by-file method or the Data Process method.

If you select Batch-by-file, then the Define Project dialog will show a Pairs button, Figure 5.9. When this button is selected you are presented with a selection matrix that

shows all possible combinations of files. You then select the specific files to be included in the processing session. The default is to include all files in the processing session.

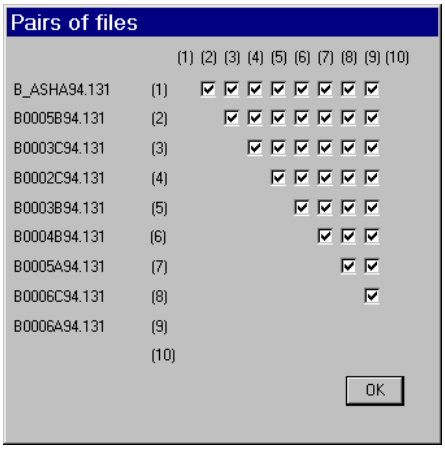

Figure 5.9: Pairs of Files Dialog

If you select Data Process, then the Define Project dialog will show the controls needed to select a single pair of files from those available in the project directory, Figure 5.10.

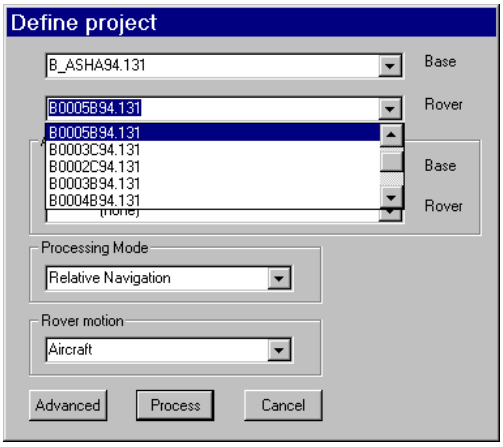

Figure 5.10: Data Process File Selection

Assigning the Antenna Type

The Antenna Type is selected in a manner that changes slightly depending upon the processing method. If the Batch-by-file method is selected, the Define Project dialog presents a button labeled Assign Antenna Types. Selecting this button activates an Antenna Selection dialog that allows a specific antenna type to be assigned to each file available in the project directory (Figure 5.11).

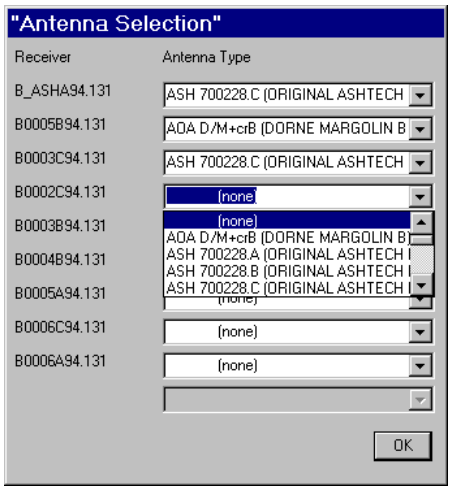

Figure 5.11: Batch-by-File Antenna Selection

If the Data Process method is selected, the Define Project dialog offers a simple Base/ Rover drop-down selection that allows a specific antenna type to be assigned to a specific file (Figure 5.12).

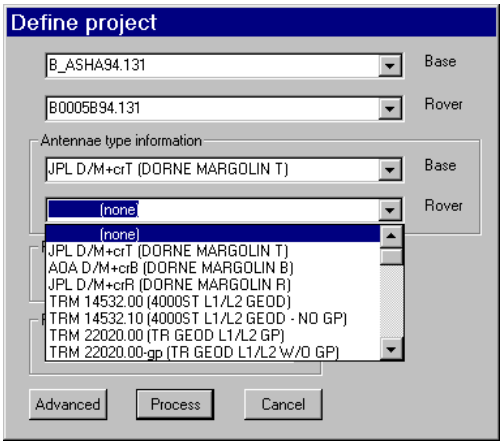

Figure 5.12: Data Process Antenna Selection

Advanced Runtime Parameters

The default Advanced Runtime Parameters are normally the best selection. GPE will sort out the type of data that is contained within the files.

Both the Batch-by-file and Data Process modes present an Advanced button. When activated, this control brings up the Advanced Runtime Options dialog, Figure 5.13. The dialog is the same for both processing methods. Access to these advanced

controls is not normally needed because the default settings will accommodate nearly any situation. The controls are organized into three functional groups:

- General Settings
- Processing
- Model Details

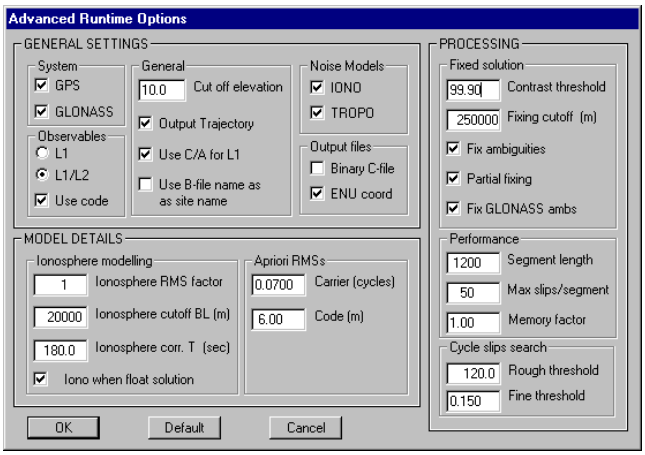

Figure 5.13: Advanced Runtime Options

General Settings

The General Settings are those that have a large breadth in the way that GPE changes the way that data is processed.

SYSTEM

The GPE processing engine supports both the GPS and the GLONASS satellite systems.

If both systems are selected, but data for only one system is available, the GPE engine will use the data that it can, and will continue to process. If a system is toggled to off, the GPE engine will not use observations from satellites of that system.

The default for this setting is for both systems to be switched on.

OBSERVABLES

The GPE processing engine can make use of both single band (L1) and dual band (L1/L2) data.

If L1/L2 is selected, but only L1 data is available, the GPE engine will use only the L1 data and will continue to process. If L1 is selected, the GPE engine uses only L1 observations and ignores any L2 data.

The default for this setting is for L1/L2 to be selected.

The Use code toggle sets the GPE engine to make use of L1 code measurements in its processing.

GENERAL

Cut Off Elevation controls the lowest point above the horizon at which a satellite can still be used.

The **Output Trajectory** toggle controls whether kinematic data will be written to the output files. When this control is toggled to off, the output files will show only the result of static occupations.

The **Use C/A for L1** toggle controls whether C/A measurements will be used in the processing of L1 data. When this control is toggled to off, PL1 will be used in the processing of L1 data.

The **Use B-file Name as Site Name** toggle instructs the GPE processor to consider a file to be a single static occupation with a site name equal to the site part of the filename.

NOISE MODELS

You can choose to apply either an Ionospheric model, a Tropospheric model or both. By default, both models are switched on. The applicability of the Ionospheric model, however, is constrained by the values in the Ionosphere Modeling Frame in the Model Details section of the Advanced Runtime Options dialog (described below).

OUTPUT FILES

The **Binary C file** toggle changes the C file output from an ASCII to a binary format. The default for this switch is off.

The **ENU coord** toggle changes the J file coordinate system from ECEF to ENU and back. The default for this switch is on.

Model Details

IONOSPHERE MODELING

The settings on this frame control the way in which the Ionospheric model (if selected) is applied. The most important setting is the Ionosphere Cutoff Baseline. Generally, GPE performs most efficiently when the ionospheric model is applied only when it can do some good. A baseline of 20 kilometers represents the distance at which the ionospheric model becomes useful.

The Ionosphere RMS factor is used by GPE to scale the amount of correction that is applied during baseline processing. This value, like the ionosphere correction on the same

frame, can be used to fine tune the way that the ionospheric model correction is applied.

The Ionosphere Cutoff Baseline (BL) sets the minimum baseline at which the ionospheric model correction will be applied. The default value is 20,000 meters (20 Km).

The Iono when Float toggle allows GPE to apply ionospheric modeling to the float stage of the vector calculations. This can be especially useful in static processing.

APRIORI RMS

This frame presents an input box for setting both a carrier and a code value. These values can be used to fine tune the way that GPE calculates baselines. The default values allow GPE to achieve an optimum result, and should not be changed unless an Ashtech support engineer advises you to make changes.

Processing

FIXED SOLUTION

This frame sets the conditions for fixing the amibiguities of a data set. The Contrast Threshold sets the confidence needed by GPE to fix biases. The default value is 97%.

The Fixing Cutoff is the maximum baseline at which GPE will ever fix biases. The default value is 250,000 meters (250 Km)

The Fix Ambiguities toggle determines if GPE will attempt to fix ambiguities. The default setting is for fixing ambiguities to be switched on. The Fix Ambiguities toggle can be used to cause GPE to calculate only float solutions for both the GPS and the GLONASS data available. Ambiguites can be fixed for just the GPS portion of a data set by leaving the Fix Ambiguities toggle on, but by switching the Fix GLONASS Ambiguities to off.

The Partial Fixing toggle allows GPE to calculate the best solution possible even if the Contrast Threshold needed for a fixed solution cannot be achieved. In other words, a partial solution might be thought of as the very best possible float solution.

GPE will not attempt to fix biases if there is not enough data in the project files. In order to be sure of getting the best results, be sure to collect at least as much data as indicated in Table 5.2.

Table 5.2: Minimum GPE Obs. Time (min) by Baseline Length

Baseline Length (km)	1	5	10	15	20	25	30
L1 only data	5.5	7.5	10	12.5	15	17.5	20
L1/L2 data	2.5	3.5	4.5	6	7	8.5	9.5

Table 5.2: Minimum GPE Obs. Time (min) by Baseline Length (continued)

Baseline Length (km)	1	5	10	15	20	25	30
GPS/GLONASS data	2.5	3.5	4.5	6	7	8.5	9.5

PERFORMANCE

The values in the performance frame control how GPE will search the data set.

The Segment Length value sets the number of epochs that GPE will analyze at a time. It represents the amount of data that GPE will use simultaneously as it looks for the solution. The Segment Length works in conjunction with the Memory Factor. When the Memory Factor is set to 1.0, GPE develops a cumulative solution to the data set by analyzing the various segments in sequence. If the Memory Factor is set to zero, GPE will consider each segment to be a discrete piece of data that is unrelated to any other segments. The default value for the Memory Factor is 1.0.

The Max slips/segment toggle places a limit on the segment length that GPE will analyze, without regard to the value for Segment Length.

CYCLE SLIPS SEARCH

The GPE engine implements a very sophisticated evaluation of the suitability of the data for processing. A portion of this evaluation can be fine tuned by setting the Rough Threshold and Fine Threshold values in this frame. You should not change these values unless advised to do so by an Ashtech support engineer.

Steps for Defining a Project:

1. Select a Processing Method from the GPE Control panel
2. Select a Processing Mode
3. Select a Rover Motion model
4. Select the files to be processed
5. Assign an antenna type to each file to be processed

The GPE Processing Session

The GPE processing session is initiated by choosing Process on the Define Project Dialog. A new ‘GPE’ window appears and the processing is fully automatic from this point forward. If a second GPE processing session is started without returning to WinPrism, subsequent GPE processing sessions will self minimize to the task bar.

The progress of the GPE processing session is displayed in the GPE window, Figure 5.14. Normally, however, the processing occurs so quickly that there is little information that can be gleaned from attempting to decipher the progress messages.

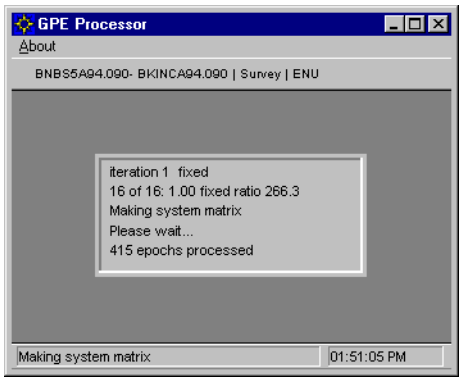

Figure 5.14: GPE Processing window

Steps for Starting a GPE Processing session

1. Define the project via the GPE Control panel
2. Select Process

The GPE processing session can be terminated from the GPE Control panel. When the GPE engine is started, the appropriate Stop button on the GPE Control panel activates (Figure 5.15). When the Stop button is pushed, GPE immediately stops and

the project is returned to the GPE Control panel. If the GPE engine is started again (via the Process button), the project files are processed from the very beginning.

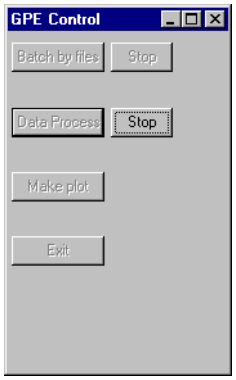

Figure 5.15: GPE Control Panel Stop button

Stopping GPE before the end of a Processing Session

1. Make GPE Control the active window (either click GPE Control or select it from the task bar)
2. Choose Stop

When the GPE engine finishes processing, the engine stops and the program returns to the GPE Control panel. At this point, the Exit button becomes active. When this button is selected, GPE stops and returns you to WinPrism.

Steps to Exit GPE

Choose Exit from the GPE Control panel (Figure 5.16).

Figure 5.16: GPE Edit button

Using the GPE Make Plot Function

The GPE Control panel provides a special Make Plot utility. If a plot file is desired, the best time to create it is after a GPE processing session but prior to exiting GPE. GPE creates a plot file from all J files that it finds in the project directory.

To create a plot file, choose the 'Make Plot' button.

Steps to Create a Plot File

Choose Make Plot on the GPE Control Panel.

To interpolate photogrammetry data, use the tools provided with PNAV and then return to GPE to make the plot file. See the PNAV user's manual for complete directions.

GPE Tutorial

The GPE Tutorial Data

When you installed WinPrism, the GPE tutorial data was automatically installed as well. The data consists of the B-, E- and S-files needed to comprise a valid project. The file Bkinca94.090 is the roving file and contains a mixture of kinematic and static data. The file Bnbs5a94.090 is the base. The ephemeris data is contained in the E-files and these are named in a manner similar to the B-file so as to make it obvious which E-file goes with which B-file. The corresponding S-files contain information about the conditions under which the data was collected, such as antenna height information and meteorological data.

The tutorial data contains a mixture of both static and kinematic data. As you will see, the roving receiver was moved between a series of static occupations. GPE excels at being able to sort out data of this type and also gives you convenient control over the type of data that will be reported to the output files.

Step-by-Step Processing

Before starting the tutorial make sure that WinPrism is installed and that the Sentinel key is attached to the applicable parallel port (typically LPT1).

Starting WinPrism

When you installed the WinPrism software, you were asked to specify a WinPrism directory. This directory contains the file Winprism.exe. Running this program will start WinPrism. With the Win95/NT operating systems, any program can be started in a number of different ways. For this tutorial, we will take advantage of the features of Win95 and run the program from the Start button.

- Choose Start - Programs - Prism for Windows - WinPrism

The WinPrism program will start and present the initial screen.

Choosing the Project Directory

The tutorial data was automatically installed in a directory under WinPrism. Using Explorer, you will find the data at the location Drive\WinPrism\Tutor\GPE where “drive” is the letter corresponding to the disk drive where you installed WinPrism.

The next step in the tutorial is to tell WinPrism which data set you would like to use.

1. Click the mouse on the Directory field near the top left corner of the WinPrism window.
2. Select the correct drive and directory for this tutorial (normally C:\WinPrism\Tutor\GPE).
3. Choose Accept

The directory label changes to show the current directory (Figure 6.1).

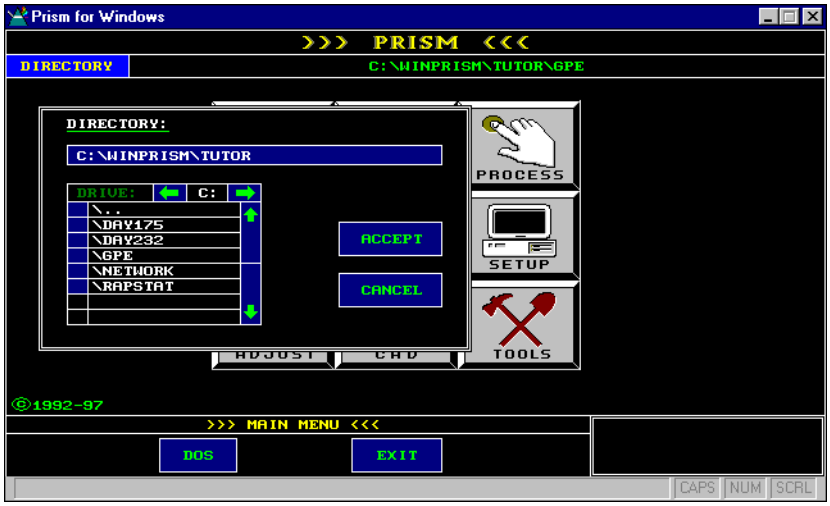

Figure 6.1: Selecting the Tutorial Directory

Choose the GPE Engine

WinPrism consists of a wide variety of tools. To conduct a GPE processing session, it is first necessary to navigate to the part of WinPrism where it is appropriate to choose a processing engine.

WinPrism automatically creatse the files that it needs to track a project and also makes the GPE icon available for selection. Before a GPE processing session can actually be conducted, however, it is necessary to use some of the data management tools provided by WinPrism. Therefore, you are not yet ready to select the GPE icon.

1. Select the Process icon

2. Select the Kinematic Survey Type (Figure 6.2).

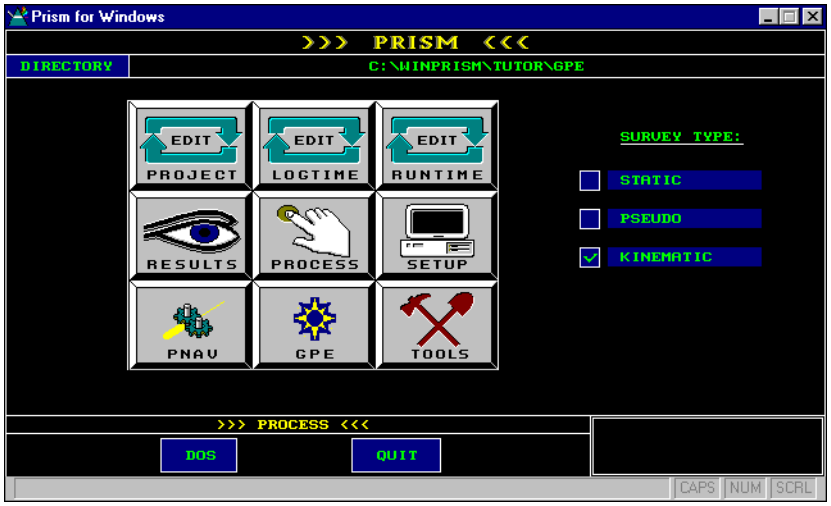

Figure 6.2: Selecting the Kinematic Toggle

Edit the Project

The Edit Project icon activates an editable listing of the current project (Figure 6.3). In using the GPE processor, it is always necessary to visit this screen so that the base station can be assigned and the base coordinates checked. The base site for this project is NBS5 and the base coordinates are:

- Latitude N 39 - 07 -48.36842
- Longitude W 77 - 12 - 54.11582
- Ellipsoid Height 105.588 meters.

1. Click the mouse on the line that shows the site name of NBS5.
2. Click on the K column of the NBS5 line and enter the value of 0 (zero), as shown in Figure 6.4. This establishes NBS5 as the base site.
3. Tab to the Latitude field.
4. Carefully edit the Latitude, Longitude and Ellipsoidal Height to EXACTLY match the coordinates given above for the base site.

5. Choose Accept

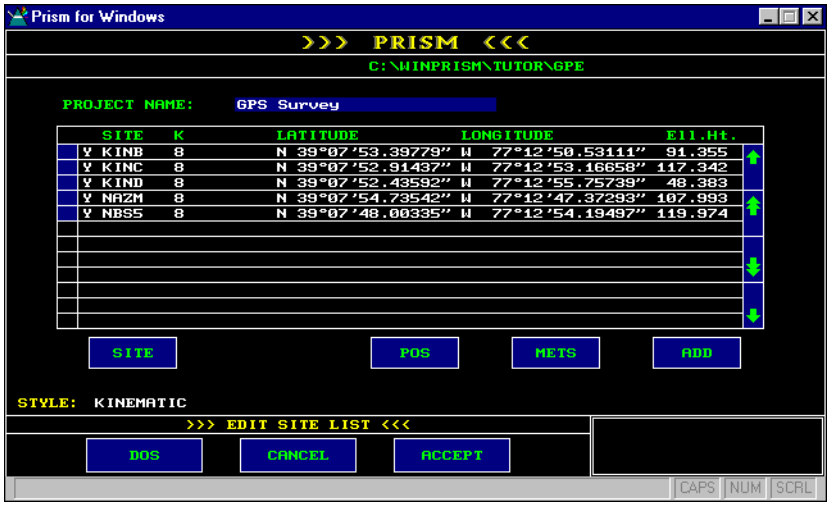

Figure 6.3: Edit Project Dialog

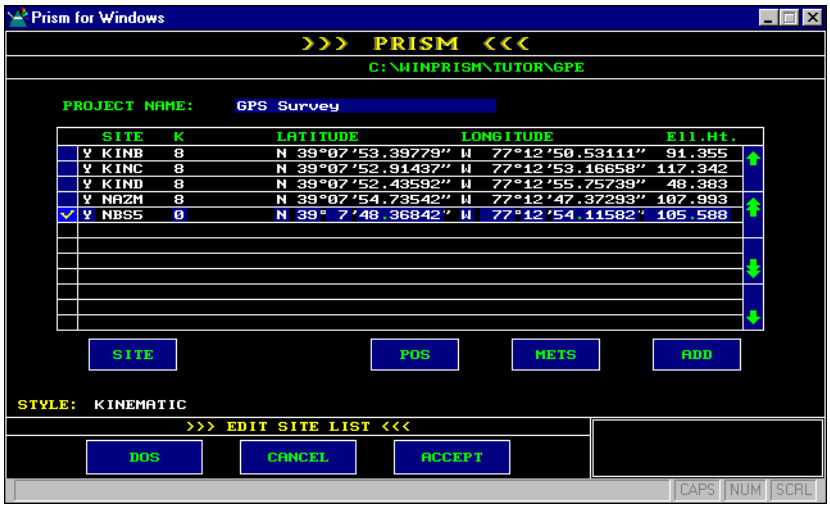

Figure 6.4: Correct Base Coordinates Entered

Edit the Logtime

Choosing the Edit Logtime icon activates a time sequence of events in the current project. For the tutorial data we can see that the base data (site NBS5) was all collected with a single receiver (RCV1) and that the data was collected continuously (since the end time of one line always matches the start time of the next line). RCV2 was used to collect all of the rover data. A site name of ???? indicates that the receiver was moving during a given time period and thus no site name is appropriate. In the RCV2 column, then, one can see that the receiver moved between four sites during the duration of the project. These sites are named KINC, KIND, KINB and NAZM, as shown in Figure 6.5.

There are no actual edits needed for the tutorial data, but it is useful to have looked at the logtime because it provides guidance as to what the correct processing mode will be for the upcoming GPE processing session.

1. Select Cancel.

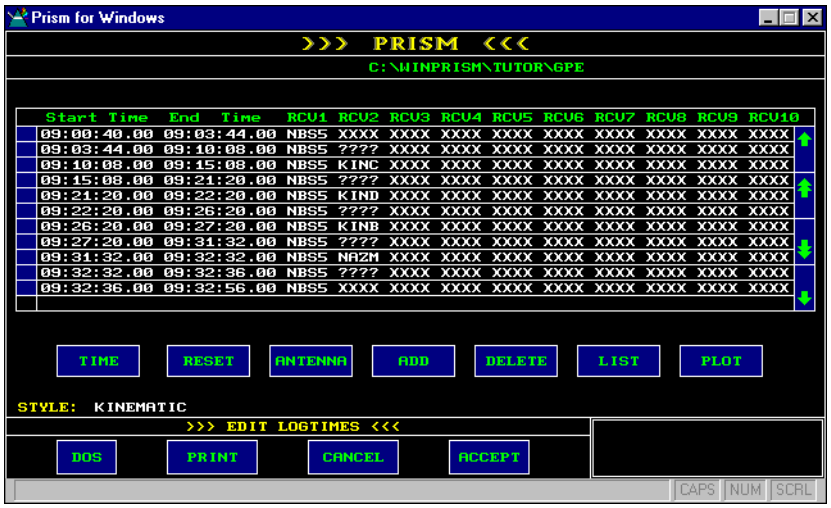

Figure 6.5: Edit Logtime Dialog

Starting GPE

When you are finished editing the project and inspecting the logtime, you are now ready to start a GPE processing session.

Choose the GPE icon.

Defining the Project with GPE Control

Choosing a Processing Method

When the GPE icon is selected, the WinPrism screens disappear and the project is handed off to the GPE Control panel. GPE Control is used to select the processing method. The choices are Batch-by-file or Data Process. Since there is only a single base file and a single roving file in the project, it doesn't matter which selection is made because there will always be just a single pair of files to be processed.

Choose 'Data Proess'

This brings up the 'Define Project window, Figure 6.6.

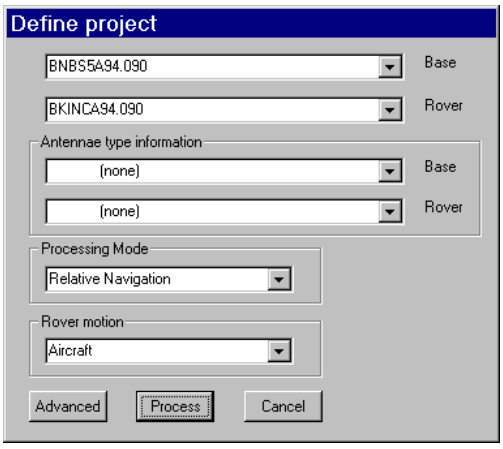

Figure 6.6: Define Project Window

Define the Project

The Define Project dialog requires that you specify which files to use and how the data is to be processed by GPE.

The first decision is to select the base and the rover. This is easily accomplished using the drop down lists that are provided.

Secondly, GPE accepts inputs as to which antenna type should be assigned to each file. This step is not absolutely necessary, but GPE does process more efficiently if the antenna type can be specified. If the antenna type is not known, then the default of None should be selected.

The Processing Mode selection is probably the most important item to be considered in the Define Project dialog. The processing mode will greatly influence how the GPE

processor interprets the data in the files and also how the resultant output files should be written.

In our case, we wish to obtain reports which show our mixed data set. The best selection for this is Survey.

The Rover Motion for this data is Walking (Figure 6.7).

1. Select BNBS5A94.090 as the Base file.
2. Select BKINCA94.090 as the Rover file.
3. Select (none) as the antenna type for both the base and rover.
4. Select Survey as the processing mode.
5. Select Walking as the Rover Motion.

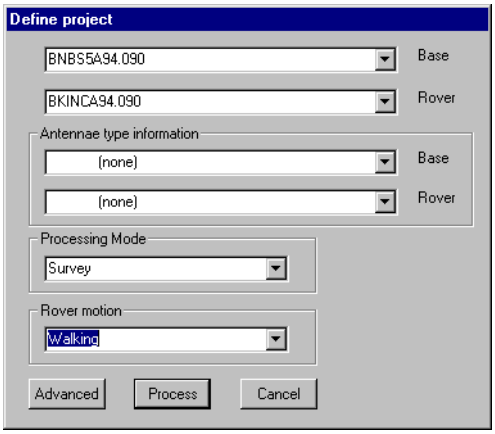

Figure 6.7: Tutorial Project defined

"Walking" is the best choice when processing static data.

Processing the Tutorial Data

The project is now ready for processing. This is accomplished by pressing Process on the Define Project dialog. The actual processing is entirely automatic. When the GPE processing session is finished, the GPE processing window, Figure 6.8, disappears and the focus returns to the GPE control panel.

Choose Process on the Define Project dialog.

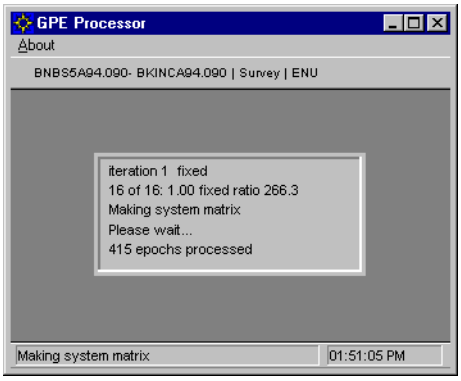

Figure 6.8: Processing Tutorial Data

Final Steps

Creating a Plot File

When the GPE processing session is completed, the GPE Control panel becomes fully active once again. At this point it is useful to take advantage of the Make Plot control. When this control is activated, all J-files in the project directory are used to create plot (or P) files that can be viewed in WinPrism.

1. Choose Make Plot.

2. When the plot utility stops running, choose Exit (Figure 6.9).

   Choosing Exit causes GPE Control to stop running and return you to WinPrism.

Figure 6.9: Make a Plot and Exit

Evaluating the GPE Output

During the GPE processing session, a number of files were created. Some of these files were needed by WinPrism and GPE to manage the data files.

Most of the new files, however, were created as a consequence of the processing mode selection. Since you chose Survey as the processing mode, GPE created an O-file for each static occupation in the project. Accordingly, you will find four O-files in the project directory. O-files can be viewed via the Process-Results icon. Check the Vector Output and select OBS5INC.090. A portion of OBS5KINC.090 is shown below:

```
FIXED SOLUTION
RMS:        0.0295 m   Percentage of Fixing: 100.0
Latitude:   N 39 7 53.47938
Longitude:  W 77 12 53.17669
ELLIP. HT:  103.680
delta X:          -0.342 +/-   0.000
delta Y:         103.439 +/-   0.000
delta Z:         121.060 +/-   0.000
```

This report gives the coordinates of the static occupation on site KINC and also the vector from the base station to the site.

The Survey processing mode default also directs GPE to report kinematic data on an epoch-by-epoch basis, but to report static occupations as single events regardless of

how many epochs passed during the static occupation. All of this data is found in the C- and the J-file. These text files are best viewed in their entirety by opening them in Microsoft Wordpad or Microsoft Word. Selected records from these files are shown below.

Selected records from CKINCA94.090

```
???? 03/31/94 09:10:00.000000 10   1.2 N 39.13152201 W 77.21477131   105.7395
???? 03/31/94 09:10:04.000000 10   1.2 N 39.13152201 W 77.21477131   105.7404
KINC 03/31/94 09:10:08.000000 10   1.2 N 39.13152205 W 77.21477130   103.6798
???? 03/31/94 09:15:08.000000 10   1.3 N 39.13152205 W 77.21477128   105.7343
???? 03/31/94 09:15:12.000000 10   1.3 N 39.13152204 W 77.21477131   105.7377
```

The kinematic data can be excluded by setting the 'Output Trajectory' switch to off in the Advanced Runtimes dialog.

Selected records from JBS5INCA.090

```
378600.00   1.21      22.556    0.002     157.612    0.001       0.152    0.003
378604.00   1.21      22.556    0.002     157.612    0.001       0.152    0.003
378608.00   1.21      22.557    0.000     157.616    0.000      -1.908    0.000
378908.00   1.29      22.559    0.002     157.616    0.001       0.146    0.003
378912.00   1.29      22.557    0.002     157.615    0.001       0.150    0.003
```

Notice that in the C-file, the static occupation of site KINC is shown as a single event even though the site was occupied for a full five minutes. The kinematic data (????) however, is constantly in motion and reports are given at the four-second recording interval. The J-file also shows the 5-minute occupation as a single event but, due to the J-file format, the time interval shows up as 300 seconds rather than 5 minutes (line 378608 to 378908).

The coordinates of site KINC are exactly the same in the C-file as they are for the same site in the O-file except that the C-file reports the coordinates in degrees and decimal degrees, while the O-file reports the coordinates as degrees-minutes-seconds.

The J-file reports the position of a record as a vector from the base station to the rover. At first glance, it seems that the J-file is reporting a vector that is quite different from the one reported by the O-file but this is only nominally the case. The O-file always reports the vector in the Earth Centered Earth Fixed (ECEF) coordinate system while the J-file can be written in either ECEF or in the East/North/Up (ENU). Since we wished to make a plot file, we accepted the GPE default of setting the J-file coordinate system to ENU.

If we had made a different processing mode selection, the output files would have been somewhat different. The Navigation mode ignores all static occupations and thus creates C- and J-files that report all epochs rather than reporting static

occupations as a single event. Since static occupations are ignored in navigation mode, no O-files are ever created.

7

QUICK Data Processing & Analysis

Choosing Which Engine To Use

The QUICK engine and the GPE engine work with all types of static and pseudokinematic data, including GPS/GLONASS data. The GPE engine also handles GPS or GPS/GLONASS kinematic data. For marginal or unsatisfactory solutions, you may choose the alternate engine to see if it improves your results.

The QUICK engine also offers a selection of processing modes.

Choosing Which Processing Mode To Use

The QUICK processing engine provides a choice of processing modes that can be used with both static and pseudo-kinematic data. The processing mode is selected in either the PROCESS/EDIT RUNTIMES screen or the PROCESS/SETUP screen. The processing mode determines how the data is processed and which observables are used. To achieve the best accuracy, it is very important to choose the correct processing mode. A description of the different processing modes available in the QUICK is provided in Table 7.1.

Table 7.1: Different Processing Modes - Various Type of Static Data

Processing Mode	Description
L1 only	Used for processing data from L1 only receivers
L2 only	For research purposes only - not recommended
L1 C	L1 corrected, creates an ionosphere free, biases free solution using dual band data. Generally used on very long baselines where biases cannot be fixed.
L1 - L2	For research purposes only - not recommended
L1 + L2	For research purposes only - not recommended
L1 & L2	Bias fixed, dual band solution. Generally used on short baselines where the ionosphere error is assumed to be small.
L1 & L2 C	Bias fixed, ionosphere free dual band solution. Generally used on longer (> 10 km) baselines where the ionosphere error may be significant.
AUTO	An all encompassing solution that dynamically changes the Quick engine runtime parameters for each baseline.

In all but the most unusual conditions, the "Auto" mode is the best selection.

QUICK Engine Basic Analysis Method

This chapter describes the basic method for analyzing the solutions resulting from QUICK processing of static and pseudo-kinematic survey data.

Background

As part of the PROCESS/AUTOMATIC and PROCESS/MANUAL functions, the QUICK program compares data gathered from the GPS or GLONASS satellites visible to a selected pair of receivers and smooths it via least-squares analysis until the statistical error is minimized and the unknown station converges. WinPrism produces an Input Parameter file (I-file) to control the process. When finished, QUICK produces, for the resultant baseline vector calculated between the two stations, a Vector Output file (O-file), a Residual Plots file (P-file), and an Output Listing file (L-file). Using the PROCESS/RESULTS icon you can display or print these files to help you evaluate the accuracy of the baseline. From the I-file you can review the runtime parameter values used in processing the selected site pair. In each O-file you can see the station information (derived from the corresponding S-files) for the two sites, the various resulting baseline solutions and the accuracy statistics for the resulting solutions. The P-file shows the noise in the measurements used in the vector solution (residuals).

Guidelines to Analysis

The criteria discussed in this chapter ARE ONLY GUIDELINES! Your solution may be good even if it doesn't meet all of the criteria of a good solution as indicated by the P-file, O-file, or L-file; it may be bad even if it does meet all of these criteria. We recommend that you process all the possible site pairs in the current directory, place the resulting baseline vectors in a least-squares network adjustment (such as FILLNET), and look for ill-fitting vectors (outliers). More specifically:

1. Use PROCESS/AUTOMATIC for all combinations of site pairs to calculate the baseline vectors.
    a. View the Summary Output by clicking on the SUMMARY button. A problem solution might have an RMS that differs from the other vectors by 50%. Use the summary as a guide to finding outlying vectors during network adjustment.

b. Run all your computed baseline vectors through a network adjustment.
c. If the adjustment reveals an outlier, perform the next step.

2. Toggle between the Fixed and Float solution in the FILLNET program.
   a. Inspect the solutions in the vector output file (O-file).
   b. If the float solution is better than the fixed solution, repeat the network adjustment using the float solution.
   c. If you still have outliers, perform the next step.
3. Analyze the processing details in the output listing files (L-files)
   a. Delete the outlier if sufficient redundancy allows it.
   b. If you still have outliers, perform the next step.
4. View the residual plot files (P-files) to determine if the problem is apparent.
   a. Repair any cycle slips not automatically corrected by WinPrism.
   b. Review the input parameter file (I-file) used for each errant vector.
   c. Modify the runtime parameters as desired using SETUP or EDIT RUNTIME in PROCESS/MANUAL.
   d. Reprocess the baseline vectors either manually or automatically.

Repeat the network adjustment.

QUICK Residual Plots File Analysis

This section describes a normal "white noise" P-file resulting from QUICK processing of static and pseudo-kinematic survey data and the use of the P-file to fix common bad vectors.

White Noise

If your plotfile looks like white noise, and the scale is within the accuracy of your survey, your solution is good (for example, Figure 7.1). Note that the scale on the plot files is in cycles, not meters - you can look in the output listing to see how long a

cycle is. (It is dependent on the data processing mode runtime parameter; for example, L1 cycles = approximately 19 centimeters).

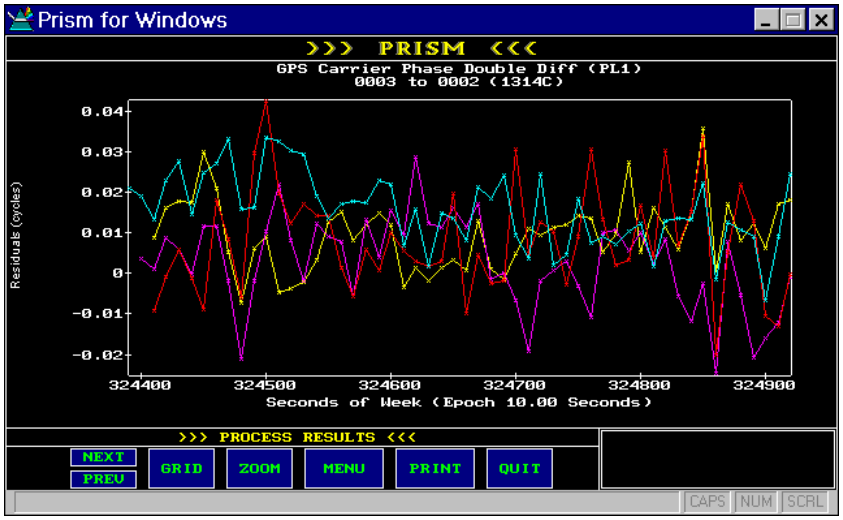

Figure 7.1: White Noise Plotfile

- The range of Y-axis variation is small (Residuals [Cycles] less than +/- 0.05).
- No drift tendency + or - along Y-axis; that is, plot should be horizontal rather than sloping.

Fixing Common Symptoms

In general you will fix inadequately processed vectors using the PROCESS/ MANUAL function to change processing parameters and reprocess the sites. Refer to the Manual section of the Program Reference chapter for detailed instructions. Table 7.2 lists suggestions that may fix common problems. It is possible that only one change is necessary, or that you may have to change several parameters, or that none of these changes will work. Through experience, you will learn what changes work best with your particular application.

Table 7.2: Suggestions for Baseline Problems

Baseline problem	Does your data set meet the following criteria?	If it does meet the criteria, this may help make your results more reasonable
For each satellite, your plot is nonlinear like arcs.	S-files contain incorrect meteorological data	Edit your site parameters so that all meteorological data is set to the default. Reprocess.
For each satellite, your plot is nonlinear, all following the same pattern. (bad reference satellite?)	Not applicable	Identify the reference satellite via the P-files, and in the runtime parameters, mark this satellite as not to be used as a reference satellite. Reprocess.
periodicity in a plot (multipath?)	Not applicable	Increase the elevation mask. Reprocess.
A single satellite plot appears very noisy and/or has a large slope.	Baseline data includes data from at least 5 (preferably 6) satellites	In the runtime parameters, omit this satellite from use. Reprocess.
No matter what changes you make, you can't get a good fixed solution, but you do get a good float solution.	Is the baseline long?	Often, biases can't be fixed on a long baseline. If you are satisfied with the RMS, go ahead and perform an adjustment.

8

Process Module Program Reference

This chapter provides detailed instructions for running the options of the WinPrism/ PROCESS function. A section is devoted to each option on the Options Grid.

Before you can reach the PROCESS function icons described in this chapter, you need to:

- Start the WinPrism program.
- Run WinPrism SETUP to specify a temporary files directory and printer parameters.
- Specify the current directory.
- Run PROCESS.

Refer to the Getting Started chapter for these procedures.

Edit Project

EDIT PROJECT allows you to view and modify the project file. You can change antenna parameters (ANT), station positions (POS), meteorological parameters, and add site names to the project site list.

Bringing Up EDIT PROJECT

Select EDIT PROJECT; the program displays the PROJECT FILE screen, similar to Figure 8.1.

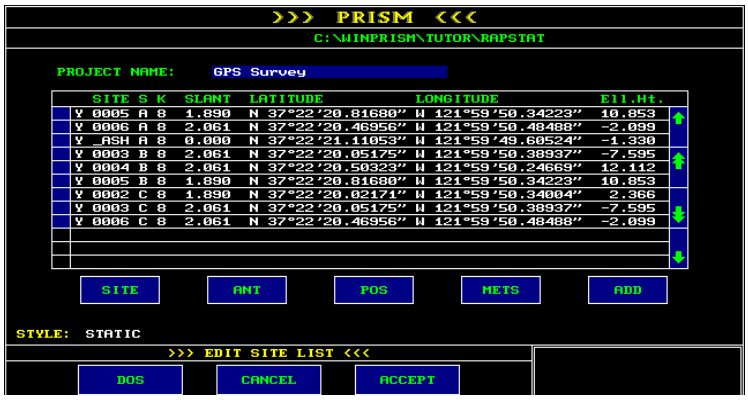

Figure 8.1: EDIT PROJECT Screen

The screen contains the Project Name, the Project Site List, the Style field displaying the Survey Type you selected in the main PROCESS screen, and a row of Editing Buttons (SITE, ANT, POS, METS, and ADD). At the bottom is the Control Button menu. Each line item in the Project Site List represents a site occupied during the survey session. You may edit the lines in the Project Site List window directly by retyping data fields, or you can pop up overlay screens to edit additional information with the row of buttons below the list.

Each part of the screen is discussed in detail in the following sections.

Selecting a Site Line Item

1. To edit a site line item in the Project Site List, click anywhere on the desired line. A check mark appears in the left-hand column of the line that has been selected to make a change:
   - Move the cursor to the desired column, and make the change, or,
   - Click on the edit button associated with the item you wish to change and make the change within the popup screen.
2. Beside the file window is a vertical bar containing up- and down-arrows. If the file is larger than the window can accommodate, you can:

- Select the ↓ or ↑ to scroll through the file line-by-line, or,
- Select the double ↓ or double ↑ to scroll through the file a "page" at a time.

Project Name

This data entry field contains the project name that will appear as the title in the vector output file. You can select the field and type the name you desire.

Project Site List

The Project Site List contains information for each site occupied, presented in a series of columns. The columns are: Process Toggle, SITE, S, K, SLANT, LATITUDE, LONGITUDE, and ELL. HT. Each column is discussed below.

Process Toggle - This field indicates if the site should be processed or not, and can be toggled to either Y or N. A Y(es) processes the site, a N(o) does not process the site.

SITE - Site is the 4-character station ID of the occupied point. This field can not be edited.

S - S is the session indicator, and reflects the session field from the B-file name. This field can not be edited. Be aware that QUICK will only try to process between sites within the same session.

K- K is the knowness field, and indicates the accuracy of the given position. This field ranges from 0 through 9, where 0 means that the site is known very accurately and should be held fixed, and 9 means that the position is completely unknown. Initially, the knowness field shows an 8 for every site, indicating that the position is a pseudorange position acquired from the B-file. Prior to processing, the knowness of the fixed site should be set to 0. This tells the program which site is to be held fixed. After processing, PROCESS changes the knowness field of the rover sites to indicate the accuracy based upon the RMS of the vector solution.

SLANT - Slant is the antenna slant height from the S-file. PROCESS uses the slant height along with the antenna radius to compute the vertical offset from the survey mark to the antenna. The slant height may be edited directly on the line, or by clicking on the ANT editing button. The default antenna radius is taken from the PROCESS/SETUP screen. This value may be edited by clicking on the ANT editing button.

LATITUDE - The station latitude in WGS-84 coordinates. Initially, the position is a pseudorange position taken from the B-file. After processing, the coordinates of the processed site are updated to indicate the computed positions. Prior to processing, edit the coordinates of the fixed site with the

known coordinates. The latitude may be edited directly on the line, or by clicking on the POS editing button.

LONGITUDE - The station longitude in WGS-84 coordinates. Initially, the position is a pseudorange position taken from the B-file. After processing, the coordinates of the processed site are updated to indicate the computed positions. Prior to processing, edit the coordinates of the fixed site with the known coordinates. The longitude may be edited directly on the line, or by clicking on the POS editing button.

Ell. Ht. - The station ellipsoidal height in WGS-84 coordinates. Initially, the position is a pseudorange position taken from the B-file. After processing, the coordinates of the processed site are updated to indicate the computed positions. Prior to processing, edit the coordinates of the fixed site with the known coordinates. The height may be edited directly on the line, or by clicking on the POS editing button.

Editing Buttons

The button row beneath the project site list window enables you to edit additional station parameters. These buttons are used after you have selected a site line item in the Project Site List. After the values have been changed, use the ACCEPT button to accept the values and return to the EDIT PROJECT screen, or the CANCEL button to return to the EDIT PROJECT screen without changing any values.

SITE

enables you to enter or edit site information for the selected site line item (Figure 8.2).

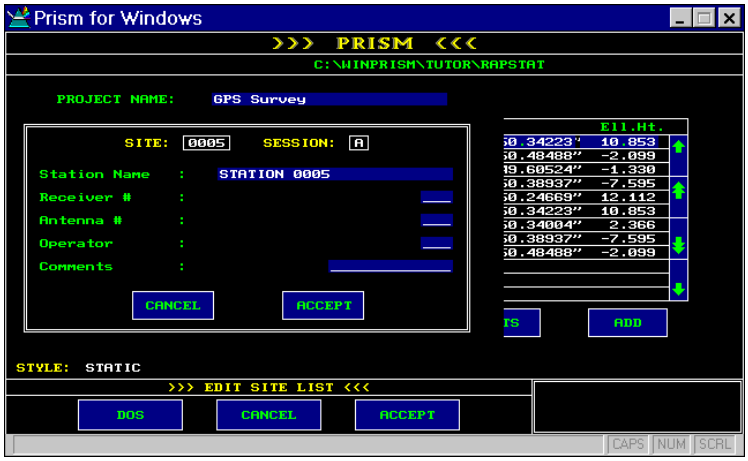

Figure 8.2: Site Panel

You can select and type desired changes to the fields: Station Name, Receiver #, Antenna #, Operator, and Comments.

Station Name

is the full station name and is used in the vector output file.

Receiver #

usually the last three digits of the receiver serial number.

Antenna #

usually the last three digits of the antenna serial number.

Operator

contains the field operator's initials.

Comments

thirteen-character comment field to further describe the station.

ANT Button

lets you alter the antenna parameters (slant height, radius and offset) for the selected site line item. You can also set the radius and offset for all sites in the current Project Site List.

You can select and type desired changes to the fields Slant Height, Antenna Radius, and Vertical Offset. All distances are in meters.

Slant Height

The distance from the mark to the edge of the antenna.

Antenna Radius

The distance from the center to the edge of the antenna. This radius will vary with the type of antenna.

Vertical Offset

is any additional vertical offset between:

- the plane where the slant is measured and the actual antenna phase center, or,
- the point from which the slant antenna height is measured and the actual station mark.

SET ALL

allows you to apply a specific set of radius and offset values to all sites in the current Project Site List, Figure 8.3.

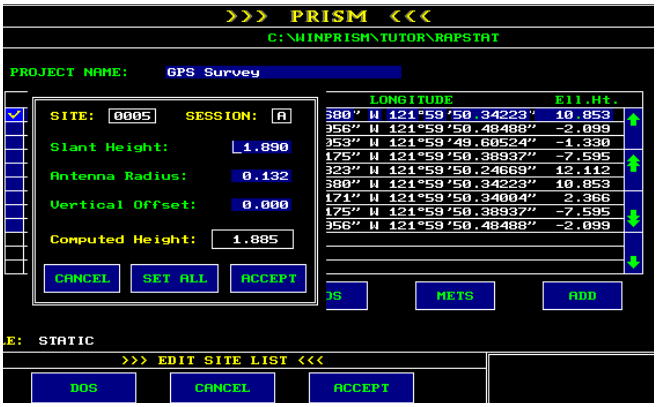

Figure 8.3: ANT Panel

You can select and type desired changes to the fields Radius and Offset.

POS Button

lets you alter the position coordinates for the selected site line item (Figure 8.4).

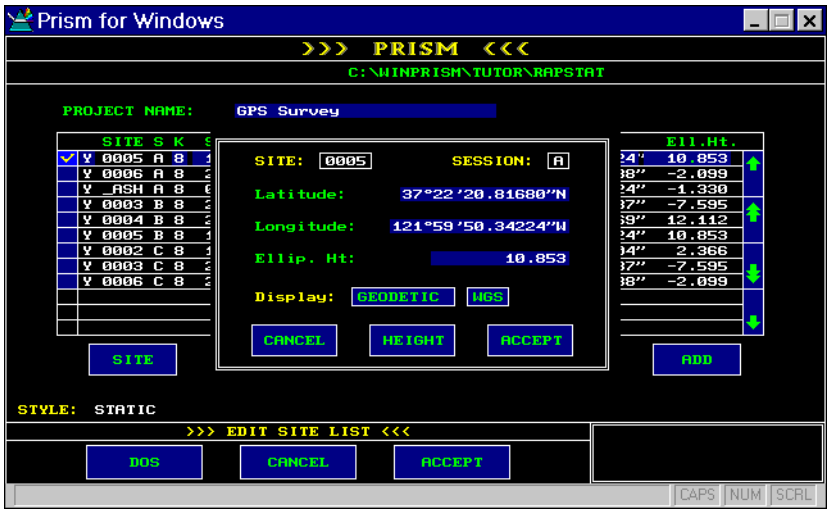

Figure 8.4: POS Screen

You can toggle this screen between the default GEODETIC coordinate system shown above and the CARTESIAN coordinate system by clicking the Geodetic box on the Display line. In addition, you can display the coordinates in the E90 coordinate system by toggling the WGS box on the display line.

GEODETIC Position (default)

lets you select and type desired changes to the fields Latitude, Longitude, and Ellip. Ht.

Latitude

in degrees, minutes, seconds (to five decimals), quadrant (N or S).

Longitude

in degrees, minutes, seconds (to five decimals), quadrant (E or W).

Ellip. Ht

is the ellipsoidal height, distance from WGS84 reference ellipsoid in meters.

HEIGHT

allows you to compute ellipsoidal height if you know mean sea level and geoidal height. If the WGS-84 ellipsoid height is not available for the control

station, you can enter the sea level elevation and geoidal height, and the ellipsoidal height will be computed for you.

Cartesian Position

Position X, Position Y, and Position Z are WGS-84 Cartesian coordinates, the distances in meters from the geocenter.

You can select and type desired changes to the fields, and WinPrism translates them into Latitude/Longitude/Ellipsoidal Height on the corresponding site line item in the EDIT PROJECT screen.

Position X

is the X-component of the Cartesian distance from the geocenter of the WGS-84 ellipsoid to the point.

Position Y

is the Y-component of the Cartesian distance from the geocenter of the WGS-84 ellipsoid to the point.

Position Z

is the WGS-84 ellipsoid to the point.

METS Button

Lets you alter the meteorological parameters (downloaded in the S-file) for the selected site line item (Figure 8.5).

For SURVEY TYPE KINEMATIC, GPE ignores any edits via this function to the meteorological parameters.

The field operator may enter meteorological data in the receiver; if the operator makes no such entry, this data defaults to standard atmospheric conditions as defined in PROCESS Setup. For general surveying (that is, 2 to 10 ppm) Ashtech recommends that the operator not enter MET values into the receiver, but enter them in a log sheet instead. If METS values are entered into the receiver, the operator must enter at least three values:

- Temp-Dry (degrees Celsius)
- Temp-Wet (degrees Celsius) or Humidity (%)
- Pressure (millibars)

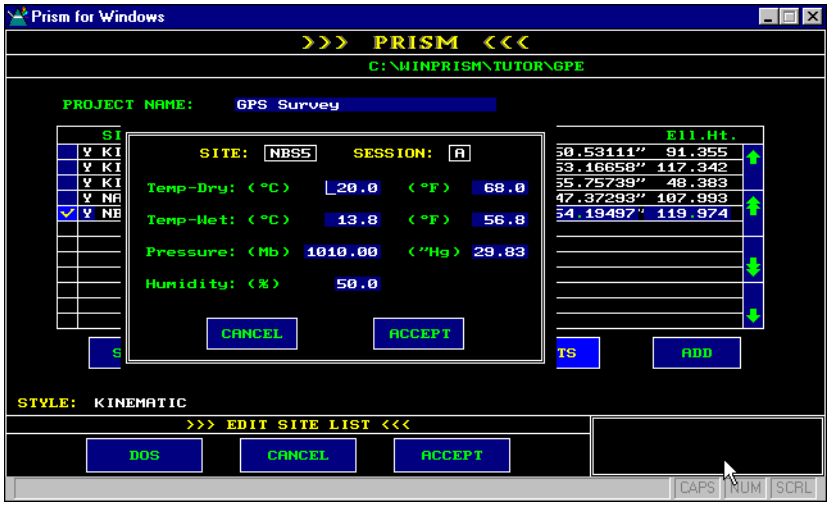

Figure 8.5: Mets Screen

You can select and type desired changes to the fields: Temp-Dry: (°C) and (°F); Temp-Wet: (°C) and (°F); Pressure: (Mb) and ("Hg), and Humidity: (%). If you change any values they must be referenced to sea-level conditions.

Temp-Dry: (°C) 20.0 (°F) 68.0

is the standard sea-level Celsius and Fahrenheit actual (dry-bulb) temperature.

Temp-Wet: (°C) 13.8 (°F) 56.8

is the standard Celsius and Fahrenheit hygrometric (wet-bulb) temperature.

Pressure: (Mb) 1010.00 ("Hg) 29.83

is the standard barometric pressure in millibars and inches of mercury.

Humidity: (%) 50.0

is the relative humidity computed from the standard dry-bulb/wet-bulb hygrometer temperatures.

CANCEL - cancels the changed meteorological data.

ACCEPT - accepts the changed meteorological data.

ADD Button

Enables you to add a new site line item to the Project Site List for static data.

For pseudo-kinematic and kinematic data, you enter new site names in the PROCESS/EDIT LOGTIME screen. When you accept the changes to the LOGTIMES List, WinPrism automatically copies new site names from the LOGTIMES file to the project file (PROJFILE.PSD or PROJFILE.KIN).

If the site name was entered incorrectly in the receiver, ADD allows you to attach the correct site name to the survey data. For static sessions, you can also use ADD to copy the data from a multi-session static file in the first session to a site line with the same station identifier in the other sessions. All position data in site lines so duplicated will be linked as long as the sites continue to be described by the same B-file; if you edit the position in any of these linked site lines, the changes will ripple through all the associated site lines. The new site line will appear in order of session, and each session is ordered alphabetically. In this case, the first site line is selected.

You can select and type desired changes to the fields: SITE, SESSION, and B-FILE. You control the application of any changes with the SITE menu buttons: CANCEL and ACCEPT. CANCEL cancels the new site file information. ACCEPT accepts the new site file information.

Edit Site List Control Button Menu

At the bottom of the EDIT PROJECT screen is the Control Button menu. The Control Button menu allows you to shell out to DOS and also allows you to returnto the PROCESS screen after either saving or cancelling any changes to the EDIT PROJECT screen. The buttons available are DOS, CANCEL, and ACCEPT:

DOS - shells out temporarily to the DOS prompt; typing EXIT<ENTER> at the DOS prompt returns you to WinPrism.

CANCEL - cancels any changes and returns you to the main PROCESS screen; the current PROCESS session continues to use the existing project file.

ACCEPT - accepts any changes made in this screen and writes them to the project file.

Edit Logtime

EDIT LOGTIME lets you view and modify the LOGTIMES file for PSEUDO or KINEMATIC data. (EDIT LOGTIME does not pertain to static data. The LOGTIMES file contains information on the time intervals each site was measured for a set of GPS or GPS+GLONASS receivers. The LOGTIMES file lists all site identifiers for all the receivers that collected data during common time intervals and shows the common time intervals. (It applies to the B-, E-, and S-files in the current directory.) Each line is a logtime interval, that is, a period of time. Whenever the site

identifier changes in any of the receivers, a new interval is created. For pseudo-kinematic data, the QUICK program uses the LOGTIMES file to distinguish the data associated with each baseline pair from the data collected while the receivers were moving. With EDIT LOGTIME you can ensure that the common times are correct and that all the site identifiers were entered properly. You can change site identifiers (SITE) to correct field typographical errors.

IMPORTANT
For KINEMATIC data, ensure that the time in the LOGTIMES file is contiguous. If there is a break in the time somewhere in the LOGTIMES file, the GPE program assumes that there is a break in the data as well.

Edit Logtimes Control Button Menu

Figure 8.6 shows the Edit Logtimes control button menu.

Figure 8.6: Edit Logtimes Control Button Menu

DOS shells out temporarily to the DOS prompt; typing EXIT<ENTER> at the DOS prompt returns you to WinPrism.

CANCEL cancels any changes and returns you to the main PROCESS screen; the current PROCESS session continues to use the existing LOGTIMES file.

ACCEPT accepts any changes made in this screen for use in the current PROCESS session, replacing the existing LOGTIMES file.

PRINT prints the LOGTIMES file with your changes, but does not write these changes to the LOGTIMES file.

Bringing Up EDIT LOGTIME

From the PROCESS screen, select EDIT LOGTIME; the program displays the EDIT LOGTIMES screen, similar to Figure 8.7.

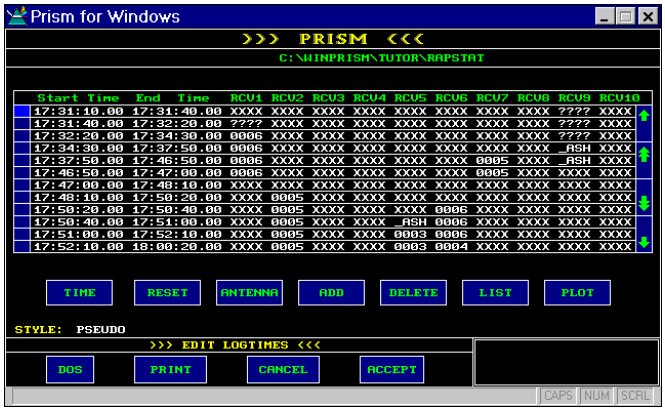

Figure 8.7: Edit Logtimes Screen

The Options Window contains a window into the LOGTIMES file, the STYLE field displaying SURVEY TYPE (PSEUDO) you selected in the main PROCESS screen, and a row of Editing Buttons (TIME, SITE, ANT HT, ADD, DEL, and LIST). At the bottom is the Control Button menu. Each line item in the LOGTIMES file represents a time interval of the pseudo-kinematic or kinematic survey session. You may edit the lines in the LOGTIMES file window directly by retyping data fields, or you can pop up overlay screens to edit additional information with the row of buttons below the LOGTIMES window.

Selecting a LOGTIMES Line Item

1. To edit a LOGTIMES line item, click anywhere on the desired line. A check mark in the left-hand column indicates which line has been selected.
2. Beside the interval list is a vertical bar containing up- and down-arrows. If the list is larger than the window can accommodate, you can:

- Select the ↓ or ↑ to scroll through the list line-by-line, or,
- Select the double ↓ or double ↑ to scroll through the list a "page" at a time.

Direct Editing of the LOGTIMES File

The logtime list format is a series of data fields, each separated by a space. To modify a field, move the cursor to the field and type in the correct information. The fields have the following significance:

Start Time—Start time of occupation (UTC); start of the common time interval in hours, minutes, and seconds (to two decimals).

End Time—End time of occupation (UTC); end of the common time interval.

RCV1-10—Site names corresponding to receivers 1 to 10. These are site names that are entered in the receiver during pseudo-kinematic or kinematic site occupations. Each RCVX column label corresponds to a given receiver, and the data in the column identifies the site name entered at each site. A base receiver would have the same site identifier throughout the list. A roving receiver has an alphanumerical identifier while sitting on a point, and while moving to a new site the rover identifier is ????. If the site identifier in any receiver changes, a new interval is created.

If you change site names in these fields and accept the changes to the LOGTIMES List, WinPrism automatically copies new site names from the LOGTIMES file to the project file (PROJFILE.PSD or PROJFILE.KIN). Enter approximate coordinates for a new site via the PROCESS/EDIT PROJECT screen.

Button Editing of the LOGTIMES File

The button row beneath the LOGTIMES window enables you to edit time, site, and antenna information for the line item you have selected in the LOGTIMES window.

TIME Button

enables you to edit the time interval for the selected LOGTIMES window line item, as shown in Figure 8.8.

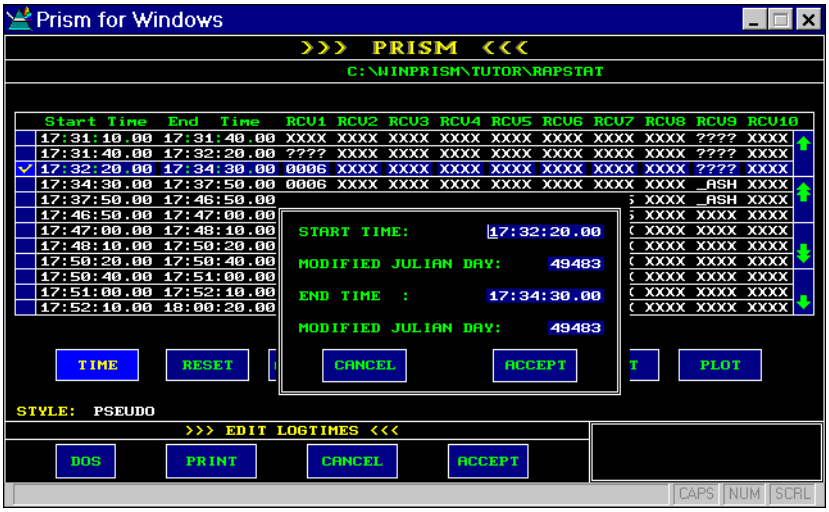

Figure 8.8: Time Button

You can select and type desired changes to the fields: START TIME, MODIFIED JULIAN DAY, END TIME and MODIFIED JULIAN DAY. You control the application of any changes with the TIME menu buttons: CANCEL and ACCEPT.

START TIME

is the start time of occupation (UTC); start of the common time interval in hours, minutes, and seconds (to two decimals).

MODIFIED JULIAN DAY

is the date of the start time in the Modified Julian Day format.

END TIME

is the end time of occupation (UTC); end of the common time interval.

MODIFIED JULIAN DAY

is the date of the end time in the Modified Julian Day format.

ACCEPT

accepts the values and removes the popup.

CANCEL

removes the popup without changing any values.

RESET Button

enables you to change the site identifier and:

- Toggle the ambiguity reset flag for each of the ten possible receivers within the time interval for the selected time interval,

[or]

- Turn all ambiguity reset flags on or off for all receivers and all time intervals in the current LOGTIMES window.

If the ambiguity reset value is changed for a particular site/interval, each contiguous interval with the same site name will also be changed.

The Reset button is used only for kinematic processing with PNAV.

In this case, the third LOGTIMES window line is selected (Figure 8.9).

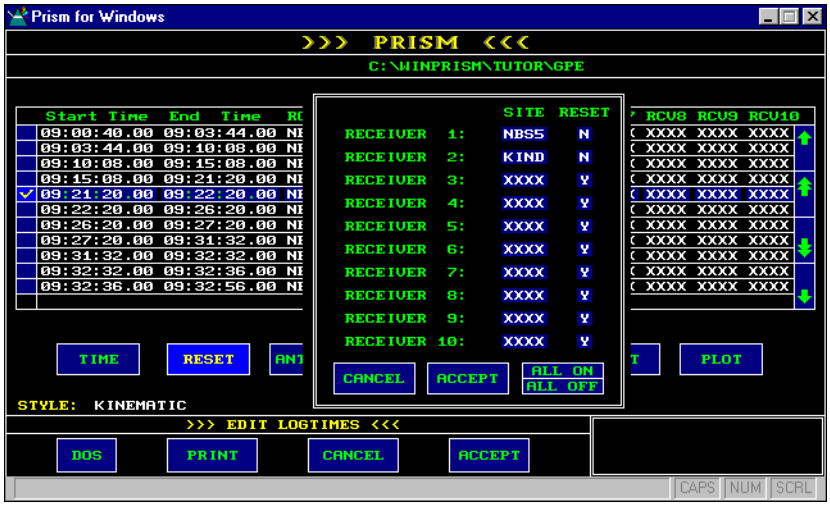

Figure 8.9: Reset button

You can select and type desired changes to the fields: RECEIVER 1 through RECEIVER 10.

RECEIVER X Row

Each RECEIVER X data field row identifies the receiver file (B-file) and matches the corresponding RCVX column in the LOGTIMES window.

SITE Column

Select and type desired changes.

RESET Column

Each RECEIVER X data field row lists whether to reset the ambiguities for the static site (default Yes) and matches the corresponding RCVX column in the selected LOGTIMES line item; type Y or N. If the data was collected by the fast static (GPE) method, enter Yes; if it was collected by the kinematic (GPE) method, enter No.

ALL ON Button

resets the ambiguities (specifies Yes for the RESET value) for the static site for all receivers and all time intervals in the LOGTIMES window.

ALL OFF Button

does not reset the ambiguities (specifies No for the RESET value) for the static site for all receivers and all time intervals in the LOGTIMES window.

ACCEPT Button

accepts the values and removes the popup.

CANCEL Button

removes the popup without changing any values.

ANTENNA Button

Enables you to:

- Edit the slant, radius, and offset value of the antenna height for each of the ten possible receivers within the time interval for the selected LOGTIMES window line item, or,
- Set the same antenna height for each of the ten possible receivers for all sites and time intervals (Figure 8.10).

If the antenna height is changed for a particular site/interval, each contiguous interval with the same site name will also be changed.

Antenna heights in the Logtimes file are for kinematic processing only.

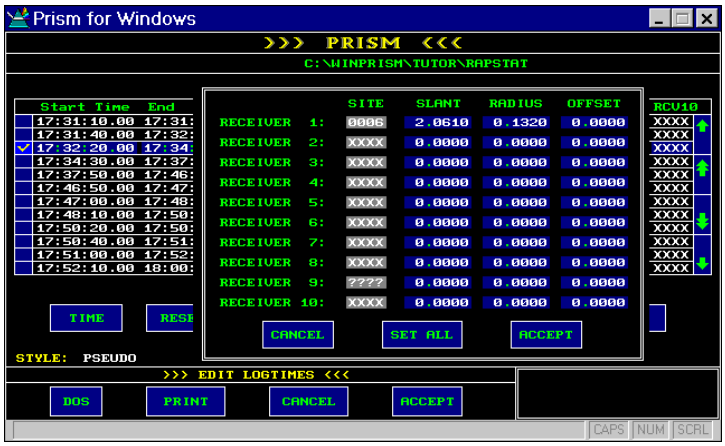

Figure 8.10: ANT button

Because the antenna height is associated with time, you can have different antenna heights for revisits to a point during the same session.

You can select and type desired changes to the fields: RECEIVER 1 through RECEIVER 10.

SITE Column

displays the site name in the LOGTIMES list; you cannot edit this field.

SLANT Column

is the distance from the mark to the edge of the antenna. Select and type desired changes.

RADIUS Column

is the distance from the center to the edge of the antenna.

OFFSET Column

is any additional vertical offset between:

- The plane where the slant is measured and the actual antenna phase center, or
- The point from which the slant antenna height is measured and the actual station mark.

After making all the desired changes, use the following buttons at the bottom of the popup screen:

CANCEL Button

removes the popup without changing any values.

SET ALL Button

for selected receiver in the popup screen (indicated by the text cursor) applies the current values of SLANT, RADIUS, and OFFSET for all sites and time intervals in the LOGTIMES window. If you select SET ALL, WinPrism prompts, typically:

```
Change all heights for receiver #1?
```

Answer YES or NO.

ACCEPT Button

accepts the values and removes the popup.

ADD Button

Adds a logtime line (empty of data for your subsequent editing) after the current selected line (Figure 8.11).

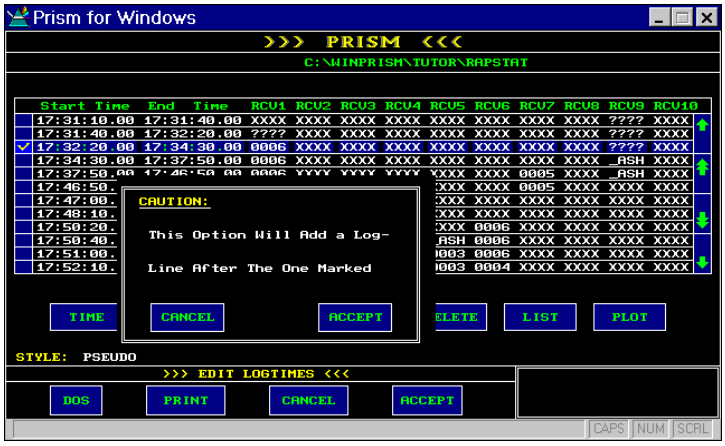

Figure 8.11: Add Button Screen

You choose whether to complete the addition with the ADD menu buttons: CANCEL and ACCEPT.

ACCEPT accepts the addition and removes the popup.

CANCEL removes the popup without adding a line.

The default Start Time for the added line is the End Time for the selected line.\

If you add site names and accept the changes to the LOGTIMES List, WinPrism automatically copies new site names from the LOGTIMES file to the project file (PROJFILE.PSD or PROJFILE.KIN). Enter approximate coordinates for a new site via the PROCESS/EDIT PROJECT screen.

DEL Button

deletes the selected logtime line (Figure 8.12):

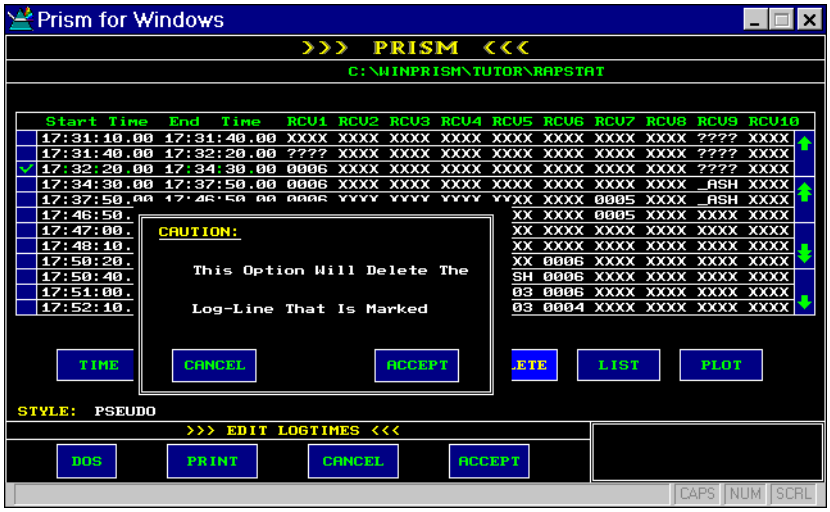

Figure 8.12: Delete Button Screen

You choose whether to complete the deletion with the DEL menu buttons: CANCEL and ACCEPT.

ACCEPT accepts the deletion and removes the popup.

CANCEL removes the popup without adding a line.

LIST Button

lists, for each of the ten possible receivers, the B-file used to create the LOGTIMES file. Each RECEIVER and B-file name pair corresponds to an RCVX column in the LOGTIMES interval list. Observe, typically:

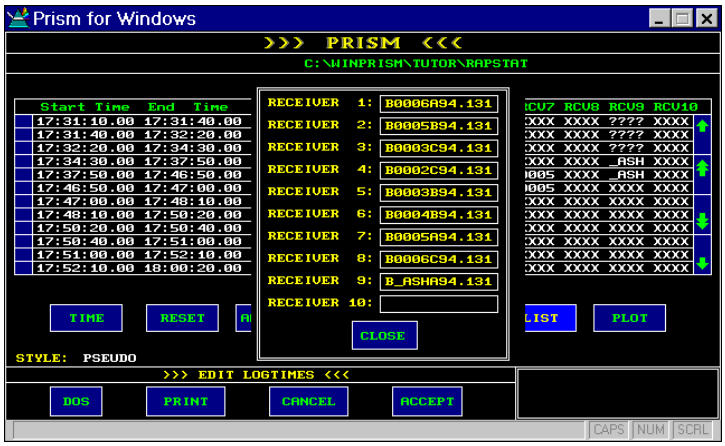

Figure 8.13: List Button Screen

You cannot edit these file names in this popup screen.

CLOSE returns you to the EDIT LOGTIMES screen.

PLOT Button

You may view a plot of the logtimes data by clicking on the PLOT button. This is useful to get an overall impression of when each receiver was collecting data and

when there is common data between receivers. You will see a screen similar to Figure 8.14:

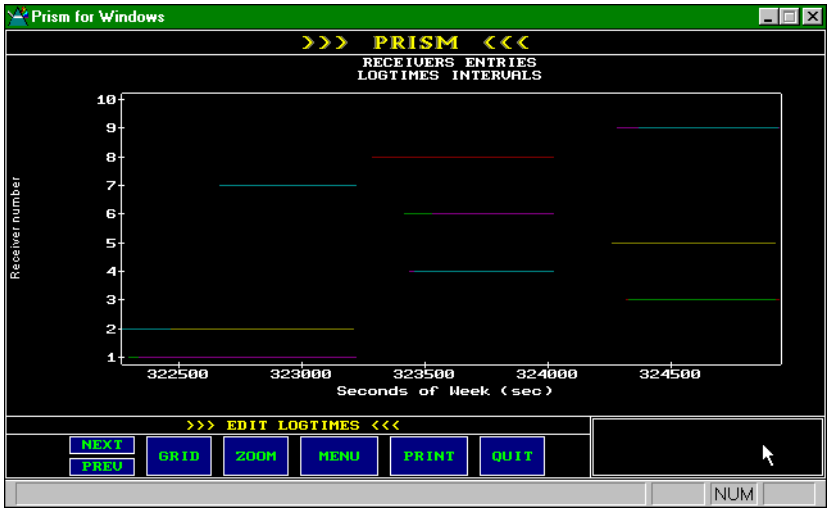

Figure 8.14: Plot Screen

The receiver ID numbers are plotted vertically (the IDs match those in the EDIT LOGTIMES screen) while the time in GPS Seconds of week is plotted horizontally. Horizontal bars indicate when a particular receiver was collecting data. Furthermore, if the sitename changes while a receiver is on, the bar will change in color.

Edit Runtime

EDIT RUNTIME lets you modify certain runtime parameters for use by QUICK during the processing of static or pseudo-kinematic data. For kinematic data, this icon is inactive. The default values of all runtime parameters are defined using the PROCESS/SETUP icon. The next time you run WinPrism, the runtime parameters changed in EDIT RUNTIME revert to the SETUP defaults.

Bringing Up EDIT RUNTIME

1. In the main PROCESS screen, select the desired SURVEY TYPE.
2. Select EDIT RUNTIME

EDIT RUNTIMES Control Button Menu

DOS - shells out temporarily to the DOS prompt; typing EXIT<ENTER> at the DOS prompt returns you to WinPrism.

CANCEL - cancels any changes and returns you to the main PROCESS screen.

ACCEPT - accepts any changes made in this screen for use in the current PROCESS session.

Selecting QUICK Runtime Parameters

Before you start processing with QUICK, you should ensure that the runtime parameters are correct for your purposes (Figure 8.15).

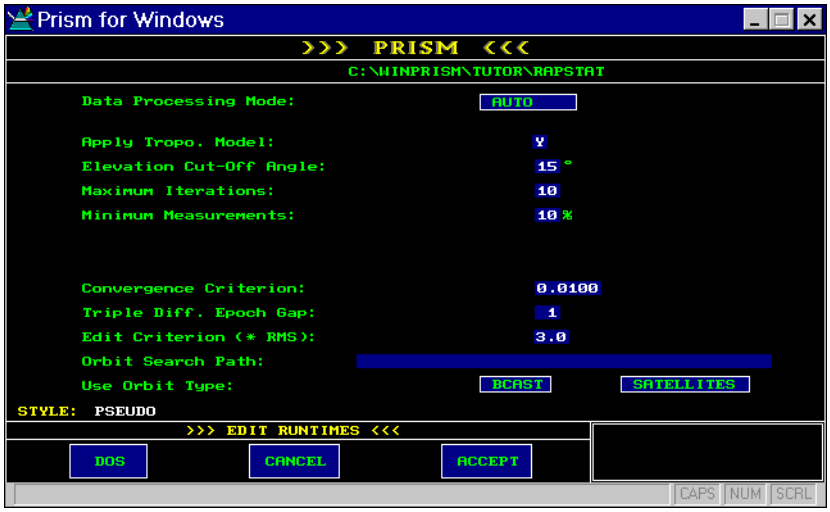

Figure 8.15: Edit Runtimes Screen

The screen contains the more common Runtimes parameters with the default values displayed in the PROCESS/SETUP screen, and the Style field displaying survey type you selected in the main PROCESS screen.

Data Processing Mode

allows you to select the data processing mode. The button cycles through the processing modes listed in Table 8.1.

Table 8.1: Different Processing Modes - Various Type of Static Data

Processing Mode	Description
L1 only	Used for processing data from L1 only receivers
L2 only	For research purposes only - not recommended
L1 C	L1 corrected, creates an ionosphere free, biases free solution using dual band data. Generally used on very long baselines where biases cannot be fixed.
L1 - L2	For research purposes only - not recommended
L1 + L2	For research purposes only - not recommended
L1 & L2	Bias fixed, dual band solution. Generally used on short baselines where the ionosphere error is assumed to be small.
L1 & L2 C	Bias fixed, ionosphere free dual band solution. Generally used on longer (> 10 km) baselines where the ionosphere error may be significant.
AUTO	An all encompassing solution that dynamically changes the Quick engine runtime parameters for each baseline.

Apply Tropo. Model

accepts typed Yes or No. For expert use only. If Y (factory default), WinPrism uses the temperature, pressure and humidity of both stations from the Project File to compute a tropospheric delay correction that is applied to the computation of the baseline vector. If the temperature, pressure and humidity are not entered into the Project File either manually or via the S-file downloaded from the receiver, WinPrism uses the default values for Apply Trop. Corrections from the PROCESS Setup screen. If N is specified, WinPrism does not compute the tropospheric delay correction and ignores any temperature, pressure, and humidity values.

Elevation Cut-Off Angle

factory default 15 (degrees), range 0 to 90. This parameter specifies the elevation angle below which WinPrism ignores data. Generally, you should not decrease this value because data at elevations below 15° is subject to a great deal of tropospheric delay. If there is a long data set and the results are not acceptable, try increasing this value to eliminate some of the tropospheric delay in the lower elevation data. We recommend that you plan observation sessions using a 15° cutoff for L1 and L2.

Maximum Iterations

factory default 10, range 0 to 99; type your choice in the field. For expert use only. This parameter specifies the maximum number of iterations that QUICK will perform if it does not converge on a solution.

Minimum Measurements

factory default 10, range 0 to 99. This parameter lets you specify the percentage of measurements (compared to the reference satellite) below which WinPrism automatically omits any satellite from processing. At the factory default 10, WinPrism omits from processing any satellite with less than 10 percent of the measurements of the reference satellite. Sometimes, a satellite with just a few measurements causes an undue influence on the solution, degrading the solution. This parameter helps avoid that problem.

Convergence Criterion

factory default is 0.0100, range 0.0000 to 9.0000; specifies the amount of change (in meters) allowed between the position computed in the previous iteration and the position computed in the current iteration, defining convergence for the differencing algorithms. The triple differencing convergence is defined by the specified value; the double differencing convergence is 100 times smaller. For example, with the factory default, the triple convergence occurs when the position of the current iteration changes from the position of the previous iteration by one centimeter (0.01) or less, and the double differencing convergence occurs when the position changes by a tenth of a millimeter (0.0001) or less. If this criterion is met before the maximum number of iterations occur, the differencing routine will end. If it is not met, the software will continue until the maximum iterations occur.

Triple Diff. Epoch Gap

factory default is 1, range 0 to 99. This parameter is the number of epochs to skip between the epochs that are triple-differenced.

Edit Criterion (* RMS)

factory default 3.0, range 0.0 to 99.0. If the RMS of an epoch phase measurement is greater than this edit criterion times the average RMS in the last iteration, WinPrism considers the epoch phase measurement invalid and does not use it.

Orbit Search Path

indicates the path on the hard disk for the location of the precise orbit files.

Use Orbit Type

toggles the following orbit types: BCAST (factory default), SP3, or EF18. If you select SP3 or EF18, the QUICK program uses precise orbit files instead of the E-file broadcast orbit data from the common navigation file to compute the satellite positions. For details, see the Information on Precise Orbits chapter

Satellites

Allows acess to runtime parameters specific to the QUICK engine. Clicking this button brings up the screen shown in Figure 8.16:

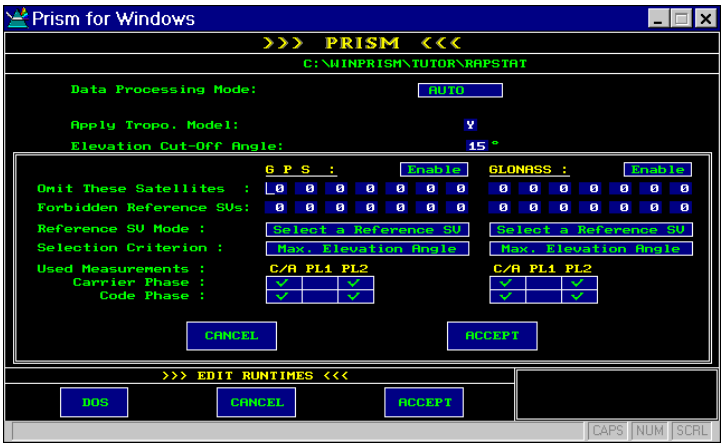

Figure 8.16: QUICK Satellite Selection Screen

In this screen you are able to manually select satellites and observables used in the current processing run. Table 8.2 lists the controls that are available:

Table 8.2: Screen Controls

Buttons	Description
GPS Enable/Disable	This toggle button allows you to choose between using or ignoring all GPS satellites available in the current dataset.
GLONASS Enable/Disable	Thus toggle button allows you to choose between using or ignoring all GPS satellites available in the current dataset. By default, the GLO-NASS is disabled.

Table 8.2: Screen Controls (continued)

Buttons	Description
Omit These Satellites	You may enter the PRN numbers of up to 7 GPS and 7 GLONASS satellites to omit in processing. the seven entry fields under the GPS header are for GPS satellites and the seven fields under the GLONASS header refer to GLONASS satellites. this is a useful feature if you know that a particular satellite is unhealthy or is affected by bad multipath etc. and want to ensure that it is not used during processing.
Forbidden Reference SVs	You may enter the PRN numbers of up to 7 GPS and 7 GLONASS satellites if you do not want them to be used as the reference satellite during processing. The seven entry fields under the GPS header refer to GLONASS satellites. This is a useful feature if you know that a particular satellite is unhealthy or is affected by bad multipath etc. Note that these fields are disabled if you choose “Optimal Coupling” as the Reference SV mode described below.
Reference SV Mode/Optimal Coupling	You may toggle between two options here. The first mode “Select a Reference SV” means that the software scans the data files and automatically selects one satellite to be used as the reference satellite. Only one satellite is selected per session and if it sets below the horizon during data collection (possible with long datasets) the remaining data is not used. In Optimal Coupling mode, the concept of a reference SV is invalid. Instead double differences are performed in an optimal manner and therefore there is no consideration as to whether a reference SV sets before the end of the dataset. When Optimal Coupling is selected, the Forbidden Reference SVs fields are disabled.
Selection Criteria	In the current implementation the reference SV selection criterion is solely by maximum elevation angle.
Used Measurements	This is a matrix where you may select exactly which observables to use. Simply make a checkmark in the appropriate box to use that observable. If a chosen observable is not in your dataset, the observable will simply be ignored during processing. By default, the code phase is disabled. Code phase can often improve the programs ability to fix biases.
Cancel	Cancels any changes you have made.
Accept	Accepts all changes.

Results

RESULTS opens a viewing window into processed files resulting from the MANUAL and AUTOMATIC function icons of PROCESS. Specifically you can view Input Parameter files (I-files), Output Listing files (L-files), Vector Output files (O-files), Residual Plots files (P-files), and Rover Trajectory files. These files must reside in the current directory.

Bringing Up RESULTS

Select the RESULTS icon, which brings up the display shown in Figure 8.17.

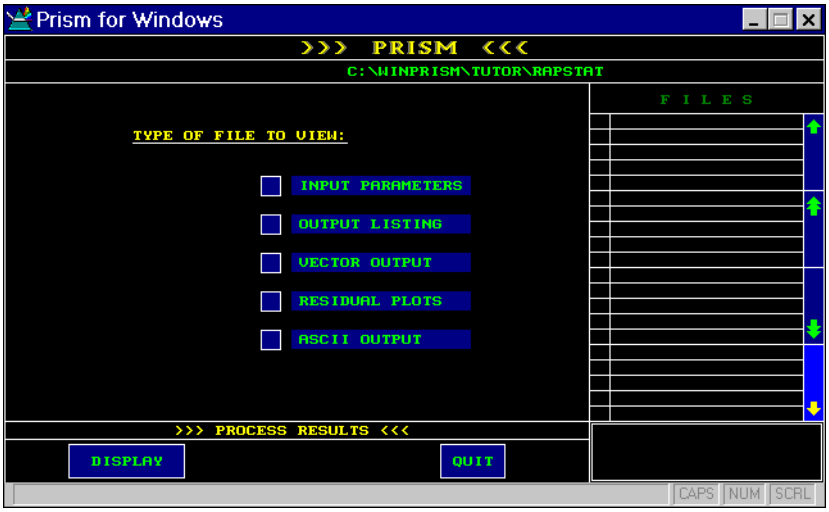

Figure 8.17: Results Screen

The Options Window contains TYPE OF FILE TO VIEW and the FILES panel. At the bottom is the PROCESS RESULTS menu.

Control Button Menu

QUIT returns you to the main PROCESS screen.

DISPLAY displays the content of the file you select from the FILES panel.

FILES Panel

Lists all the files whose names match the FILE MASK for the type of file you select to view (Figure 8.18).

To view a file:

1. Select one TYPE OF FILE TO VIEW (for example INPUT PARAMETERS); once selected the matching files will appear in the FILES panel, typically as shown in Figure 8.18.

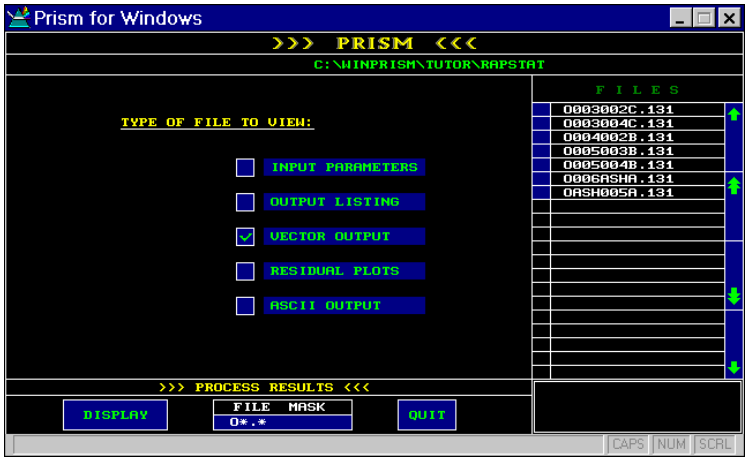

Figure 8.18: Type of File to View

2. Select from the FILES panel one of the listed files.
3. Select DISPLAY; observe, typically, a display as shown in Figure 8.19.

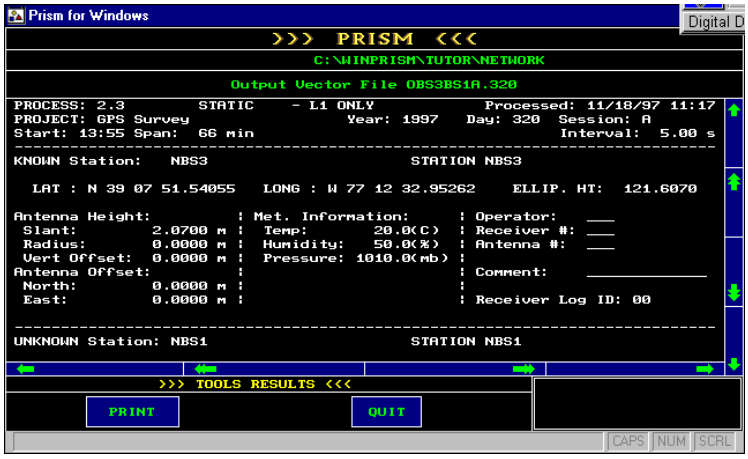

Figure 8.19: Typical File Display

4. This is a window into the first lines of the file; beside the file window is a vertical bar containing up- and down-arrows. If the file is larger than the window can accommodate, you can:
   - Select the ↓ or ↑ to scroll through the file line-by-line, or,
   - Select the double ↓ or double ↑ to scroll through the file a "page" at a time.

   QUIT returns you to the RESULTS screen.

   PRINT allows you to:
   - Print the entire selected file, or,
   - Copy the current file into an ASCII-format file. (The O-file and the I-file are in binary format.)

When you select PRINT, you will get a display similar to Figure 8.20.

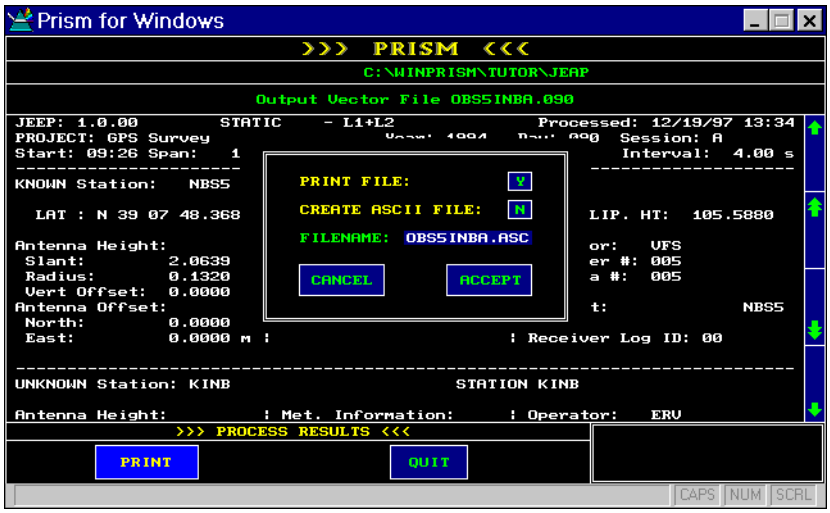

Figure 8.20: Print File Dialog

You can elect to PRINT FILE, CREATE ASCII FILE, specify FILENAME, CANCEL, or ACCEPT.

PRINT FILE toggles between Yes (factory default) and No.

CREATE ASCII FILE toggles between Yes and No (factory default).

FILENAME for the ASCII file created; by default, it is the current filename with the extension .ASC.

CANCEL cancels the operation and returns to the DISPLAY screen.

ACCEPT performs the requested action depending on what you set and then returns to the DISPLAY screen.

RESIDUAL PLOTS DISPLAY

Selecting Residual plots as the type of file to view allows you to view the carrier and code phase residual plot file (P-file) resulting from QUICK processing of static or pseudo-kinematic survey data, or the plot file from GPE processing of kinematic data. To learn more about the QUICK P-file, refer to "QUICK Residual Plots File Analysis" on page 53. The following example is for a QUICK P-file:

1. Select RESIDUAL PLOTS to bring up the matching P-files in the current directory (Figure 8.21).

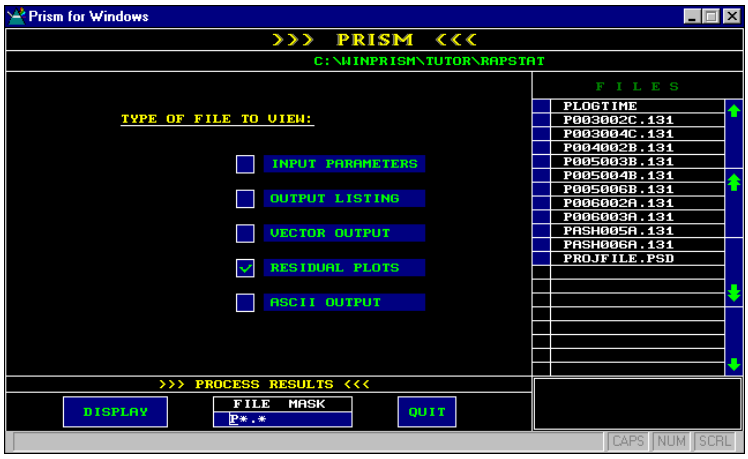

Figure 8.21: P-File Current File Directory

2. Select one of these files.

3. Select DISPLAY to see, typically, the display shown in Figure 8.22.

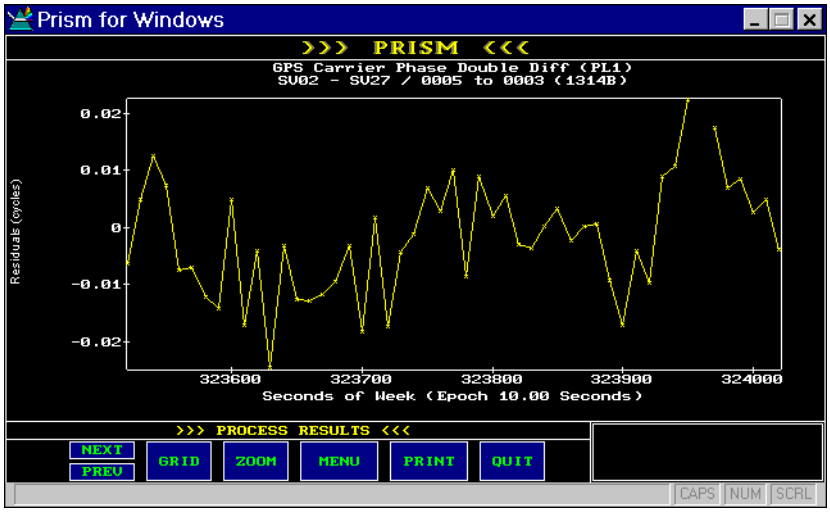

Figure 8.22: Residual Plots

This is the first plot in the file. You can manipulate these graphs by activating crosshairs and with the RESIDUAL PLOTS PROCESS RESULTS menu at the bottom of the screen: NEXT, PREV, GRID, ZOOM, COLORS, PRINT, and QUIT.

Crosshairs and X/Y Coordinate Box

appear when you move the pointer into the X- and Y-coordinate display, as shown in Figure 8.23.

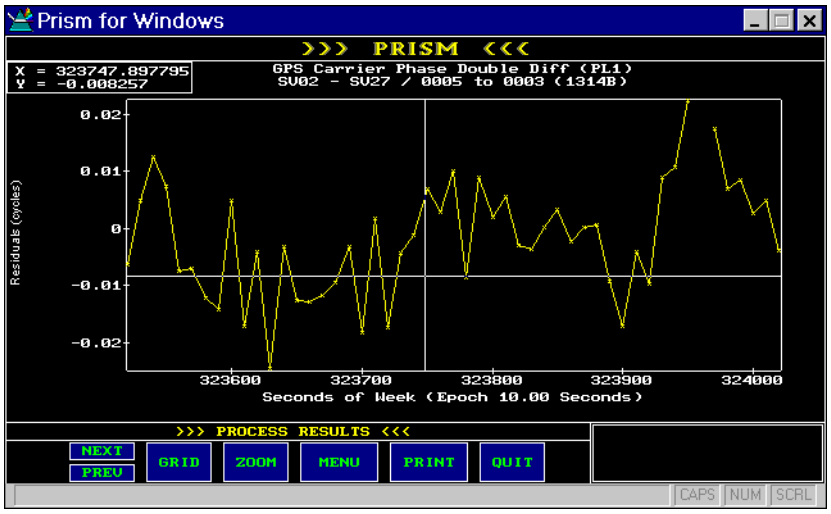

Figure 8.23: X and Y Coordinate Display

With the pointer in the display area, if you click the left mouse button the crosshairs lock onto the nearest data point; clicking the right mouse button releases the lock. When the crosshairs are locked, the coordinate box reads the coordinate of each point

as you move the pointer horizontally, as shown in the following sequence (Figure 8.24)

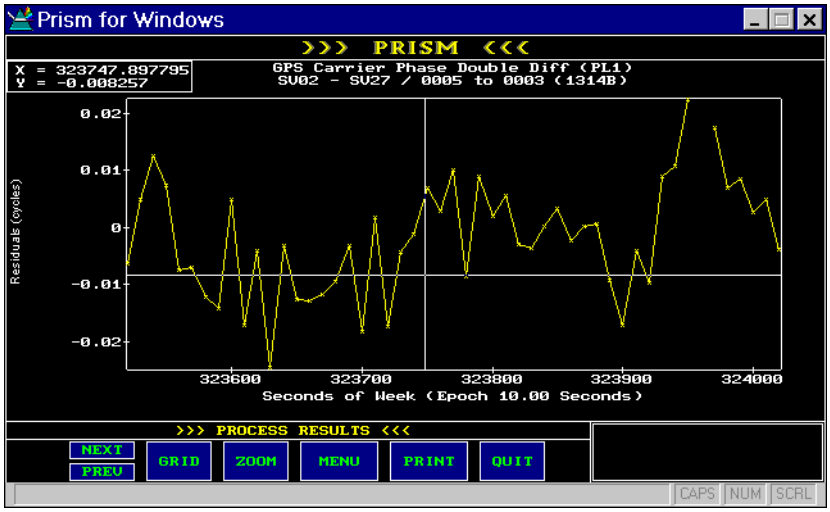

Figure 8.24: Horizontal Coordinates Display

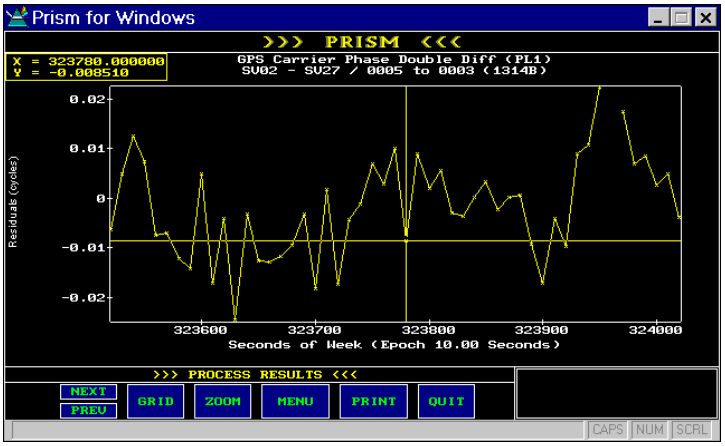

Figure 8.25: Next Menu

NEXT from the RESIDUAL PLOTS/PROCESS/RESULTS menu takes you forward to the next plot in the file, typically similar to Figure 8.26.

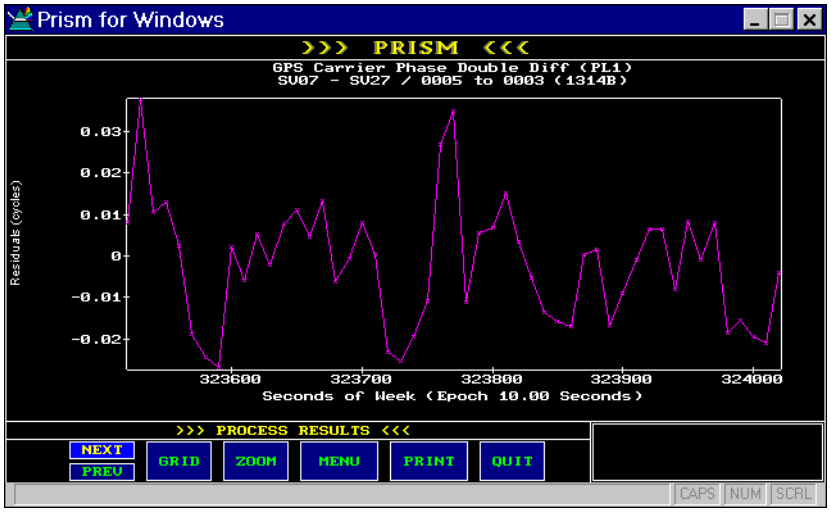

Figure 8.26: Residual Cycles

PREVfrom the RESIDUAL menu takes you to the previous menu, Figure 8.27,

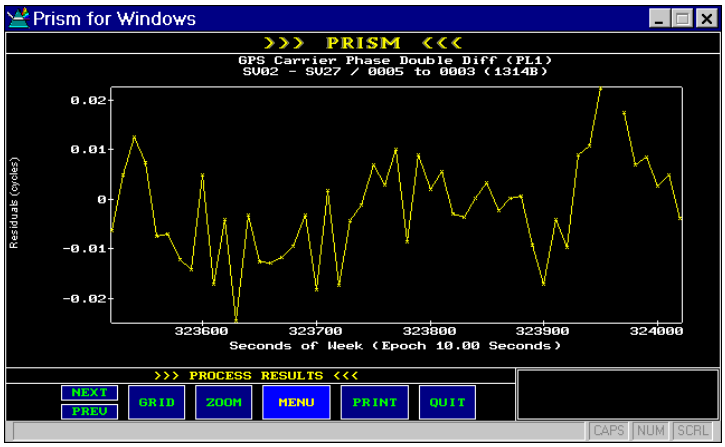

Figure 8.27: Prev Menu

or, if selected when the first plot is displayed, PREV shows the last plot in the file, as shown in this case.

GRID from the RESIDUAL menu is a toggle that superimposes a grid over the X- and Y- coordinate display, for example as shown in Figure 8.28.

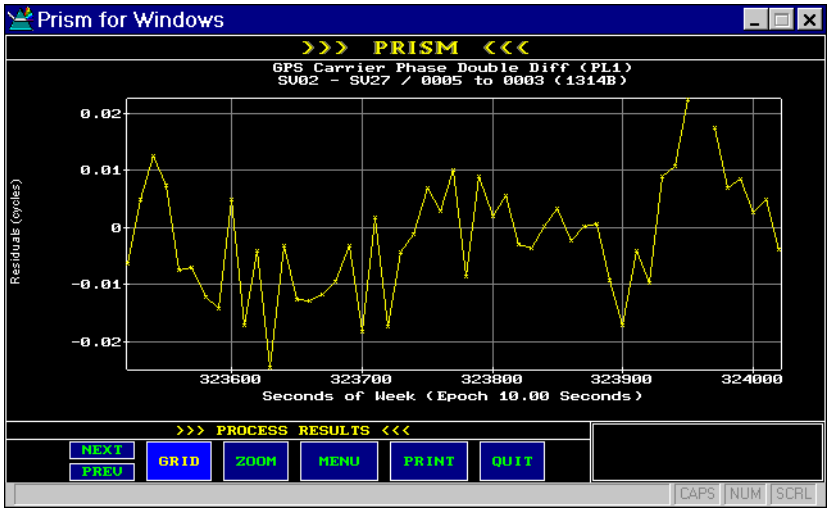

Figure 8.28: Residual Cycles

Select GRID again to turn off the grid.

ZOOMfrom the RESIDUAL menu reveals a ZOOM/PROCESS/RESULTS submenu: X*2, Y*2, ORIGINAL SIZE, HOLD ALL and QUIT. It also enables the pointer zoom window.

When the zoom level of the graph is anything but the original scale, observe a bright box in the lower right corner of the plot display area.

Pointer Zoom Window

1. To zoom in on a section of the plot display, click and hold the mouse button on one corner of the area desired.

2. Drag the mouse to create a box around the area, as shown in Figure 8.29.

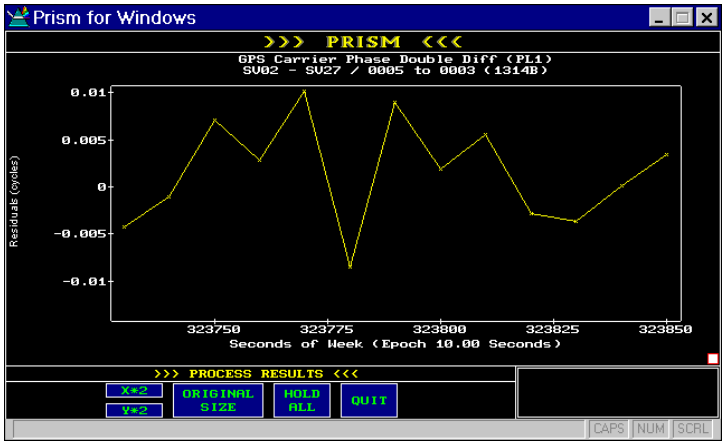

Figure 8.29: Plot Display (Zoom Window)

3. When you release the mouse button, the boxed area expands to fill the plot display, as shown in Figure 8.30.

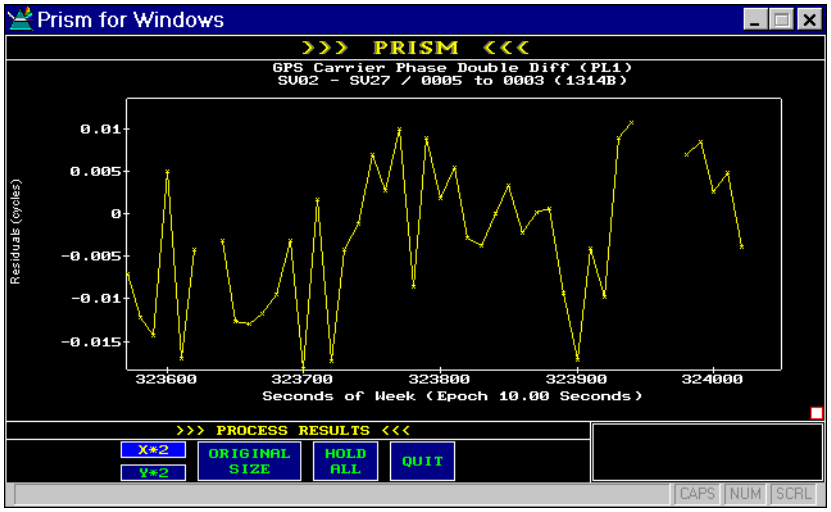

Figure 8.30: Plot Display

X*2from the ZOOM/PROCESS/RESULTS submenu expands the X-axis two-fold, as shown in Figure 8.31.

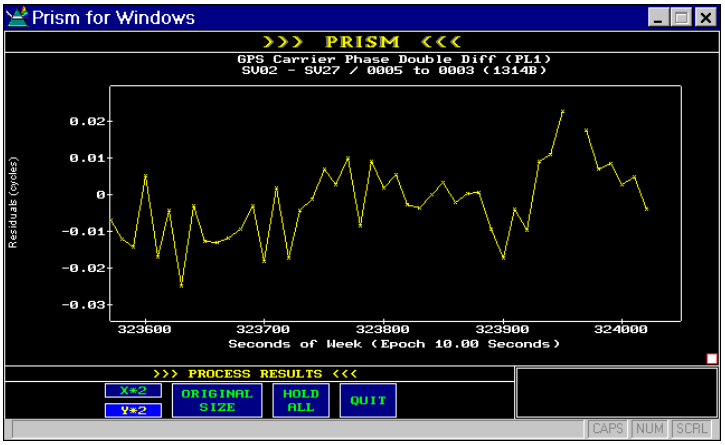

Figure 8.31: X-Axis Screen

Y*2from the ZOOM/PROCESS/RESULTS submenu expands the Y-axis two-fold, as shown in Figure 8.32.

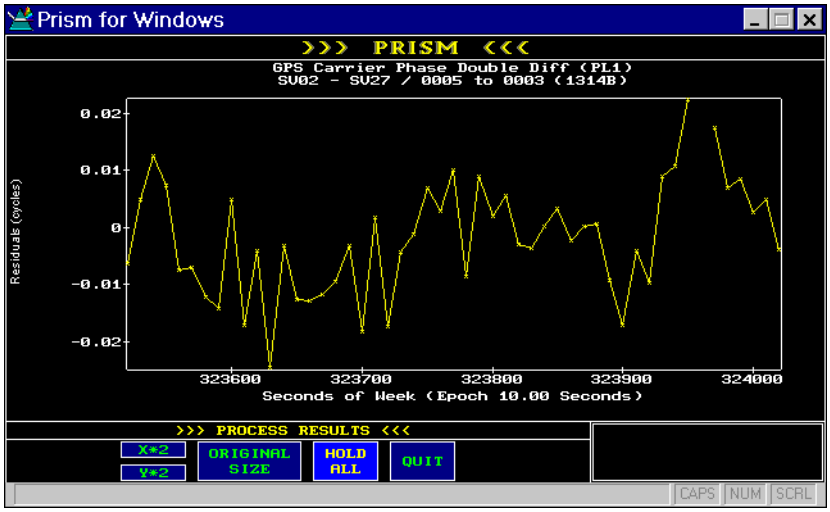

Figure 8.32: Y-Axis Screen

ORIGINAL SIZEfrom the ZOOM/PROCESS/RESULTS submenu restores X- and Y-axes to their original scales, as shown in Figure 8.33.

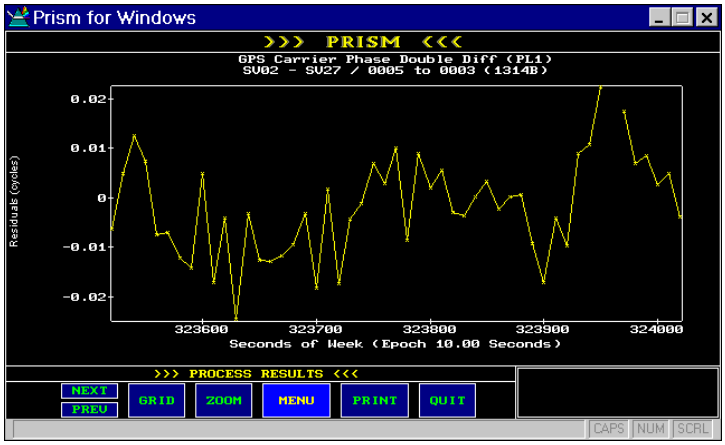

Figure 8.33: X and Y Original Scale

HOLD ALL from the ZOOM/PROCESS/RESULTS submenu returns you to the main RESIDUAL PLOTS screen while retaining the prevailing display scale changes for all of the graphs until you reset the zoom level.

QUIT from the ZOOM/PROCESS/RESULTS submenu returns you to the previous screen while retaining the prevailing display scale changes for the current graph only; when you view the next plot, it reverts to the original scale.

PRINT from the RESIDUAL menu prints the currently displayed plot screen.

QUIT from the RESIDUAL menu returns you to the main RESULTS screen.

ASCII Output

allows you to view data in a standard American Standard Code for Information Interchange (ASCII) format.

1. Select ASCII OUTPUT to display, in the FILES panel, the matching output files in the current directory.
2. Select a file, typically:
3. Select DISPLAY to display the data.

4. In the PROCESS RESULTS/DISPLAY control button menu, select QUIT to return to the main PROCESS RESULTS screen.

Setup Option

SETUP allows you to establish the default parameters that apply to various phases of PROCESS for static or pseudo-kinematic data. (For kinematic data, this icon is inactive.) When you change these defaults in SETUP, they will be used during the current PROCESS session and will be saved for your next use of PROCESS (as part of the WinPrism setup file called AIO_SET.UP). These parameters are used as is by the PROCESS/AUTOMATIC function unless you modify them through the EDIT RUNTIME icon during the current PROCESS session.

IMPORTANT
Do not modify the parameters denoted "For expert use only" until you understand the ramifications.

Control Button Menu

ACCEPT - accepts the changes made in this screen.

CANCEL - cancels the changes made in this screen.

Bringing Up SETUP

Select the SETUP icon; the program presents a display similar to Figure 8.34.

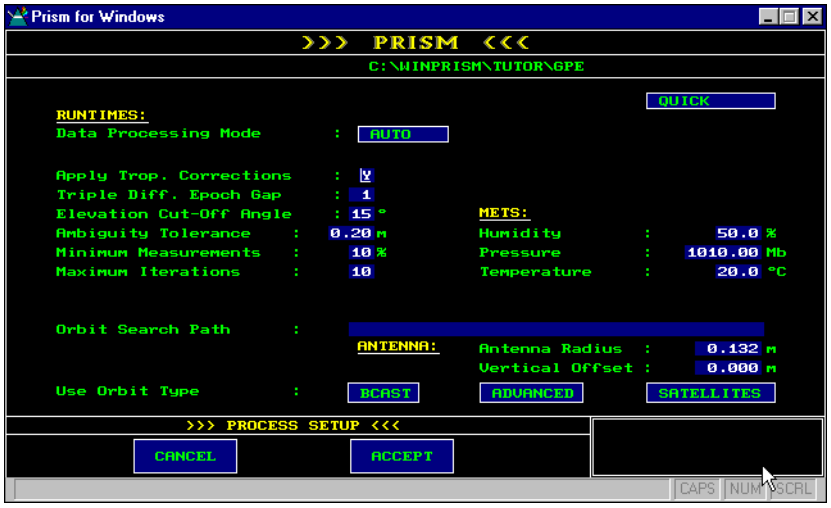

Figure 8.34: Setup Parameters

The parameters and parameter groups are RUNTIMES, ANTENNA, METS (meteorological), and ADVANCED (runtime). The values displayed above are the factory defaults. Any parameters you change in this screen will constitute the new permanent defaults until you change them again in this screen.

When you type into the data entry fields in this screen, WinPrism automatically places the decimal points. In the ADVANCED screen, however, you must type decimal points.

RUNTIMES Parameters

Data Processing Mode

allows you to select the data processing mode. The button cycles through the modes listed in Table 8.3.

Table 8.3: Different Processing Modes - Various Type of Static Data

Processing Mode	Description
L1 only	Used for processing data from L1 only receivers
L2 only	For research purposes only - not recommended
L1 C	L1 corrected, creates an ionosphere free, biases free solution using dual band data. Generally used on very long baselines where biases cannot be fixed.
L1 - L2	For research purposes only - not recommended
L1 + L2	For research purposes only - not recommended
L1 & L2	Bias fixed, dual band solution. Generally used on short baselines where the ionosphere error is assumed to be small.
L1 & L2 C	Bias fixed, ionosphere free dual band solution. Generally used on longer (> 10 km) baselines where the ionosphere error may be significant.
AUTO	An all encompassing solution that dynamically changes the Quick engine runtime parameters for each baseline.

Apply Trop. Corrections

accepts typed Yes or No. For expert use only. If Y (factory default), WinPrism uses the temperature, pressure and humidity of both stations from the Project File to compute a tropospheric delay correction that is applied to the computation of the baseline vector. If the temperature, pressure and humidity are not entered into the Project File either manually or via the S-file downloaded from the receiver, WinPrism uses the default values from this screen. If N is specified, WinPrism does not compute the tropospheric delay correction and ignores any temperature, pressure, and humidity values.

Triple Diff. Epoch Gap

factory default 1, range 0 to 99. This parameter is the number of epochs to skip between the epochs that are triple-differenced.

Elevation Cut-Off Angle

factory default 15 (degrees), range 0 to 90. This parameter specifies the elevation angle below which WinPrism ignores data. Generally, you should not decrease this value because data at elevations below 15° is subject to increased noise. If there is a long data set and the results are not acceptable, try increasing this value to eliminate some of the noise in the lower elevation data. Ashtech recomments that you plan observation sessions using a 15° cutoff for L1 and L2.

Ambiguity Tolerance

Not used.

Minimum Measurements

factory default 10, range 0 to 99. This parameter lets you specify the percentage of measurements (compared to the reference satellite) below which WinPrism automatically omits any satellite from processing. At the factory default 10, WinPrism omits from processing any satellite with less than 10 percent of the measurements of the reference satellite. Sometimes, a satellite with just a few measurements causes an undue influence on the solution, degrading the solution. This parameter helps avoid that problem.

Maximum Iterations

factory default 10, range 0 to 99. This parameter specifies that the QUICK program will perform up to this maximum number of iterations unless it converges on a solution before performing this number of iterations.

Orbit Search Path

provides the location of precise orbit files. When no path is entered, the current directory is used.

Use Orbit Type

toggles the following orbit types: BCAST (factory default), SP3, or EF18. If you select SP3 or EF18, the program uses precise orbit files instead of the E-file broadcast orbit data from the common navigation file to compute the satellite positions. For details, see the Information on Precise Orbits chapter.

ANTENNA Parameters

Antenna Radius

This parameter specifies the distance from the center to the edge of the antenna. Set the radius to match the type of antenna used.

Vertical Offset

This parameter specifies any additional vertical offset between:

- The plane where the slant is measured and the actual antenna phase center, or
- The point from which the slant antenna height is measured and the actual station mark; factory default 0.000.

METS Parameters

allows you to set the default meteorological parameters.

Humidity

(factory default 50.0%) is the relative humidity computed from the standard dry-bulb/ wet-bulb hygrometer temperatures.

Pressure

(factory default 1010.00 Mb) is the standard sea-level pressure in millibars.

Temperature

(factory default 20°C) is the standard sea-level Celsius actual (dry-bulb) temperature.

ADVANCED Runtime Parameters

This button accesses a popup screen for modifying additional runtime parameters used by the QUICK program. To edit these for the QUICK engine, click on the ADVANCED button. This brings up the dialog shown in Figure 8.35.

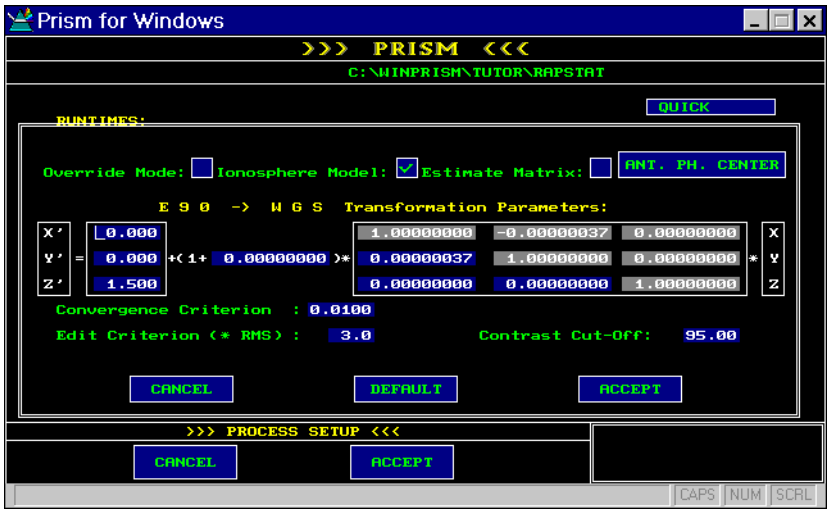

Figure 8.35: Process SETUP/ADVANCED Screen

The following controls are available:

Override Mode

The minimum safe time limitation has been implemented to prevent incorrect fixing in very short observation times.

For data with very short observation times, it is possible, although extremely rare, that QUICK will select an incorrect set of integer ambiguities, because lack of data will give unreliable statistics. To prevent this, a minimum safe time limitation has been

implemented. This time limit is a function of baseline length; the longer the baseline, the more data that is required. This amount of time is far below the amount of time normally required to fix biases, and should not interfere at all with most users. If QUICK determines that there is not enough data, the program will automatically use a float solution, will not attempt to fix biases and will write a message to the message.log file generated during processing.

Refer to Table 8.4 for the minimum safe observation time limits in minutes for both L1 only data and dual band (L1/L2) data. The numbers assume a recording interval of at least 5 seconds. If you are recording at a longer interval, increase the amount of time accordingly.

Table 8.4: Minimum Safe Obs. Time (min) by Baseline Length

Baseline Length (km)	1	5	10	15	20	25	30
L1 only data	5.5	7.5	10	12.5	15	17.5	20
L1/L2 data	2.5	3.5	4.5	6	7	8.5	9.5
GPS/GLONASS data	2.5	3.5	4.5	6	7	8.5	9.5

E90 to WGS Transformation Parameters

GPS and GLONASS use two different reference systems. This section allows you to change the transformation parameters between the two. The transformation is a standard seven parameter one with three translations, a scale differential, and three rotations, expressed here as a rotation matrix.

Ionospheric Model

The Quick engine has been enhanced with the addition of an Ionospheric model capability. When processing dual band data, the model will usually help fix biases at long baselines. The toggle has no effect on single band data.

The model is toggled on and off by means of a checkbox. The default is on. On very short baselines it is possible that it is inappropriate to apply an ionospheric model because there is no difference in the ionosphere between the base and the rover. Under these conditions, the Iono model should be switched to off. The Auto processing mode automatically disables the ionospheric model on baselines shorter than 1 kilometer.

Estimate Matrix

The default setting of this checkbox is OFF, meaning that QUICK will use a priori values for the covariance matrix of observations. Activating this option by checking the box will cause QUICK to actually estimate the covariance matrix using the

sample of observations in the dataset—this is an advanced setting and, particulary on short datasets, can cause unpredictable results.

Antenna Phase Center

An Antenna Map dialog, Figure 8.36, is accessed via the Antenna Phase Center button. This dialog allows the user to assign a specific antenna type to each file that is used in a processing session. The list of antenna types is read from the antenna.inf file that was copied to the WinPrism directory when you installed WinPrism. The antenna.inf file contains phase center offset information for a variety of antennae. The offset information is available for both the L1 and L2 bands at evenly spaced elevations through 90 degrees.

To assign an antenna to a file, highlight the file by clicking the it with the mouse. Then highlight the appropriate antenna type. If you make a mistake, choose Restore to undo the last antenna assigned. If you want to undo all of the antennae that you have assigned, choose Restore All. Choosing OK saves your assignments and returns you to the Advanced Runtime Parameters dialog.

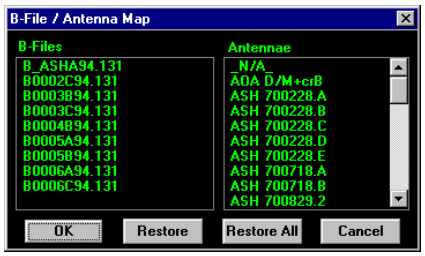

Figure 8.36: Antenna Map Dialog

Edit Criterion

This value is used to determine the data to be edited during processing. At the default value (3.0) and epoch where the carrier phase residual is greater than 3.0 times the RMS value is not used in the solution.

Contrast Cutoff

This value is used to determine if an ambiguity is correctly fixed. At the default value of 95.0, if the program is not 95% sure that the ambiguity is fixed, to the correct integer, then the ambiguity is not fixed.

Cancel

Cancels any changes you have made.

Accept

Accepts any changes you have made.

Default

Resets the values to the factory defaults.

Satellites Button

Allows acess to runtime parameters specific to the QUICK engine. Clicking this button brings up the dialog shown in Figure 8.37.

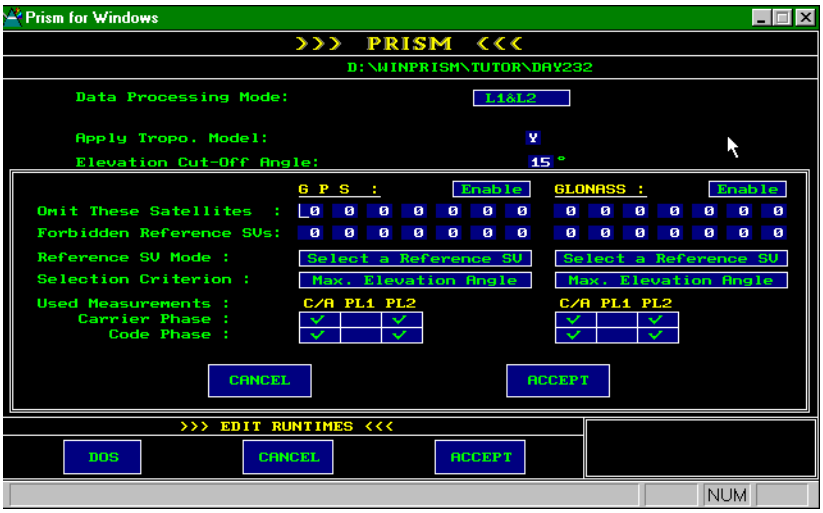

Figure 8.37: QUICK Satellite Selection

In this screen you are able to manually select satellites and observables used in the current processing run. Table 8.5 lists the controls that are available.

Table 8.5: Screen Controls

Buttons	Description
GPS Enable/Disable	This toggle button allows you to choose between using or ignoring all GPS satellites available in the current dataset.
GLONASS Enable/Disable	Thus toggle button allows you to choose between using or ignoring all GPS satellites available in the current dataset. By default, the GLONASS is disabled.
Omit These Satellites	You may enter the PRN numbers of up to 7 GPS and 7 GLONASS satellites to omit in processing. the seven entry fields under the GPS header are for GPS satellites and the seven fields under the GLONASS header refer to GLONASS satellites. this is a useful feature if you know that a particular satellite is unhealthy or is affected by bad multipath etc. and want to ensure that it is not used during processing.
Forbidden Reference SVs	You may enter the PRN numbers of up to 7 GPS and 7 GLONASS satellites if you do not want them to be used as the reference satellite during processing. The seven entry fields under the GPS header refer to GLONASS satellites. This is a useful feature if you know that a particular satellite is unhealthy or is affected by bad multipath etc. Note that these fields are disabled if you choose “Optimal Coupling” as the Reference SV mode described below.
Reference SV Mode/Optimal Coupling	You may toggle between two options here. The first mode “Select a Reference SV” means that the software scans the data files and automatically selects one satellite to be used as the reference satellite. Only one satellite is selected per session and if it sets below the horizon during data collection (possible with long datasets) the remaining data is not used. In Optimal Coupling mode, the concept of a reference SV is invalid. Instead double differences are performed in an optimal manner and therefore there is no consideration as to whether a reference SV sets before the end of the dataset. When Optimal Coupling is selected, the Forbidden Reference SVs fields are disabled.
Selection Criteria	In the current implementation the reference SV selection criterion is solely by maximum elevation angle.
Used Measurements	This is a matrix where you may select exactly which observables to use. Simply make a checkmark in the appropriate box to use that observable. If a chosen observable is not in your dataset, the observable will simply be ignored during processing. By default, the code phase is disabled. Code phase can often improve the programs ability to fix biases.
Cancel	Cancels any changes you have made.
Accept	Accepts all changes.

Automatic Option

AUTOMATIC initiates batch processing to calculate baseline vectors between the associate sites for static and pseudo-kinematic survey types. The processing uses the data stored in the corresponding project file and the runtime parameters from the SETUP screen or runtime parameter modifications from the EDIT RUNTIME screen. Resulting from AUTOMATIC processing are Input Parameter files (I-files), Output Listing files (L-files), Vector Output files (O-files), Residual Plots files (P-files), and the Summary Output file.

1. QUICK creates an I-file based on the current runtime parameters and the data in the project file. Using the I-file, QUICK then processes the data to compute the baseline vectors using triple-difference, float double-difference, and fixed double-difference algorithms. QUICK produces O-files, L-files, and P-files. For pseudo-kinematic data, QUICK also uses the LOGTIMES file to determine common processing times. After PROCESSing is complete the current directory also contains the file SUMMARY.OUT, a summary of all the baseline vector solutions.

IMPORTANT
To view the SUMMARY.OUT file after exiting the AUTOMATIC option, you must use the WinPrism/TOOLS/RESULTS option. When you select AUTOMATIC, WinPrism clears any existing SUMMARY.OUT file.

Bringing Up AUTOMATIC

1. Select AUTOMATIC.
2. For static data you will get a display similar to Figure 8.38.
3. For the pseudo-kinematic data, observe a series of updating messages such as:

   ```
   Number Of Pairs Tested: 46
   Number Of Pairs Found:  17
   ```

   as PROCESS tests the sites in the Project Site List against the common times in the LOGTIMES file for valid pseudo-kinematic data. When testing is complete, observe a display similar to that shown above for survey type static.

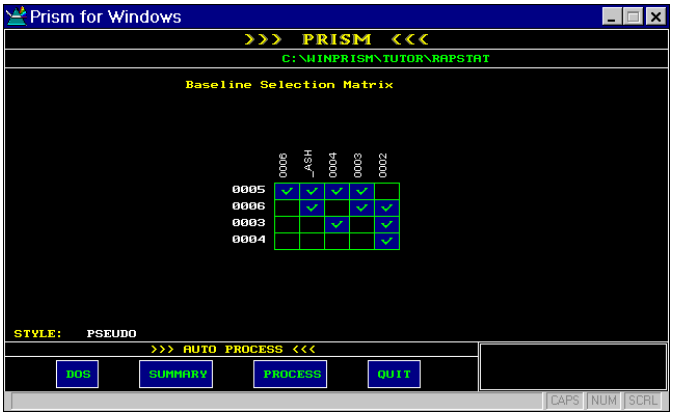

Figure 8.38: Static Screen

4. The screen contains: a Baseline Selection Matrix For Session box. At the bottom is the control button menu with the function buttons DOS, SUMMARY, PROCESS, and QUIT. All these display elements are discussed in detail in the following paragraphs.

Baseline Selection Matrix For Session

This box allows you to select from any of the sessions selected in the Project Site List. The initial display is the default session A. If the Project Site List contains no site line items in session A, you'd see Baseline Selection Matrix For Session: A Not Available, and the Baseline Matrix would be absent.

Baseline Matrix

This display element shows all possible sets of vectors you can process into baseline vectors for the displayed session. The combinations displayed are all sites in the current directory with site line items coded Y in the Project Site List. The labels on the matrix are the site names (from the Project Site List). A check mark in a box means the baseline between the corresponding site pairs is selected for processing. To exclude a vector from processing, toggle the check mark off in the appropriate box (by clicking on the box with the mouse). The default is to process all possible site pairs.

Control Button Menu

DOS

shells out temporarily to the DOS prompt; typing EXIT<ENTER> at the DOS prompt returns you to WinPrism.

QUIT

returns you to the main WinPrism PROCESS screen.

SUMMARY

allows you to view the processing summary file called SUMMARY.OUT after processing is complete.

PROCESS

begins the computation of baseline vectors.

The SUMMARY and PROCESS buttons are described in detail in the following paragraphs.

SUMMARY Button

allows you to view the summary results file called SUMMARY.OUT after the current processing session is complete. When you select AUTOMATIC, PROCESS clears any existing SUMMARY.OUT in the current directory.

When you select SUMMARY after processing, observe, typically as shown in Figure 8.39.

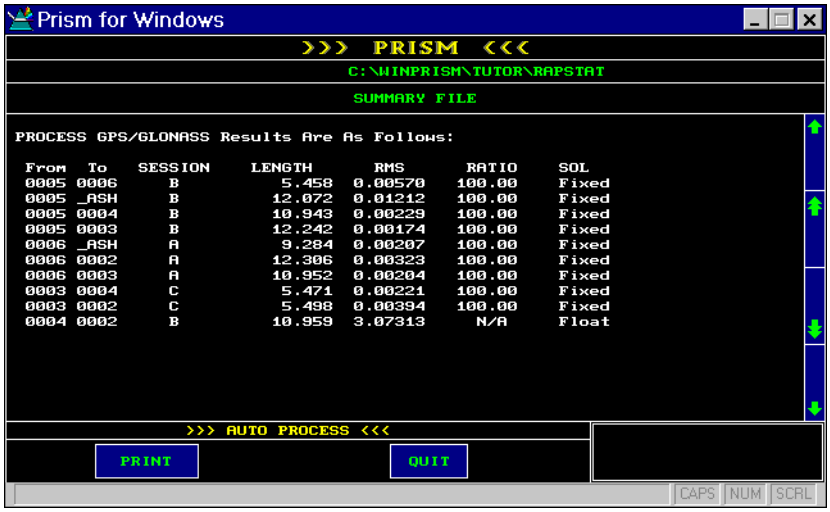

Figure 8.39: Summary Screen

If you select SUMMARY before processing, observe:

WARNING
Summary File Is Empty, Cannot Display.

Elements of the Summary File

This display gives you a quick indication of the strength of the all the baseline vector solutions from the current processing session. You will see a list of vectors, with the two sites for each vector identified and the session letter. Also, for each baseline, the length and RMS error are shown. SOL/ Fixed means the fixed solution is the final solution. Strong solutions are fixed, consistent RMS residual (compared with other vectors in the summary), and high ratio or contrast (greater than 95[%]). A problem solution might have an RMS that differs from the other vectors by 50%. Use the printout of the current SUMMARY.OUT as a guide to finding outlying vectors during network adjustment.

AUTO PROCESS/SUMMARY Control Button Menu

Figure 8.40 shows the Auto Process control buttons.

Figure 8.40: Auto Process Control Buttons

QUIT Button

returns you to the main AUTO PROCESS screen.

PRINT Button

allows you to print the entire selected file or copy the current file into an ASCII-format file.

When you select PRINT, the program presents a display typically as shown in Figure 8.41.

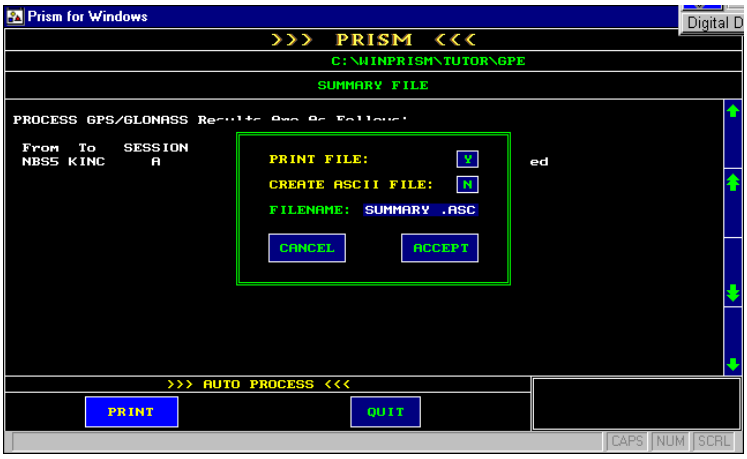

Figure 8.41: Auto Process Print Screen

You can elect to PRINT FILE, CREATE ASCII FILE, specify FILENAME, CANCEL, or ACCEPT.

PRINT FILE

toggles between Yes (factory default) and No.

CREATE ASCII FILE

toggles between Yes and No (factory default). Use this if you want to rename the summary file so that WinPrism will not overwrite it in subsequent processing.

FILENAME

for the ASCII file created; by default it is SUMMARY.ASC.

CANCEL Button

cancels the operation and returns to the Summary screen.

ACCEPT Button

performs the requested action depending on what you set and then returns to the Summary screen.

Manual Option

The manual option processes vectors one by one, allowing you to specify unique runtime parameters for each baseline. In addition, you can specify that only a portion of the data available for a given baseline should be processed. Although rare, it may occasionally be useful to do this, as a way of excluding particularly noisy data.

Bringing Up Manual

To enter the Manual screen, select the MANUAL icon from the PROCESS screen. The Manual screen appears, similar to Figure 8.42.

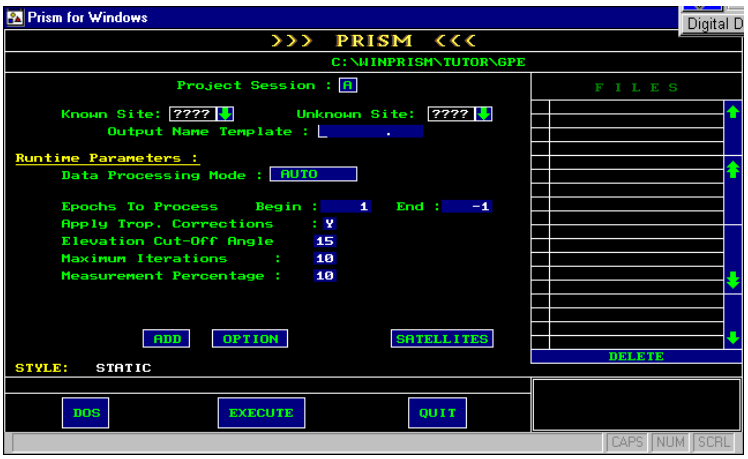

Figure 8.42: Typical Manual Screen

FILES

The FILES panel lists the file template names you have added for processing by QUICK. If you want to delete a template name in the panel before QUICK processes it, click on the line item, and select DELETE.

Station Pairs Area

Project Session

This data entry field allows you to cycle among the data collection sessions represented by the project file in the current directory. The initial value (in this case A) is the first session in the project file in the current directory. Only sites that were collected during the selected session appear for your selection in the Known Site and Unknown Site fields.

Known Site

The initial default ???? prompts you to use the down-arrow button to display and select the known site from a popup list of available site names obtained from the current Project Site List, as shown in Figure 8.43.

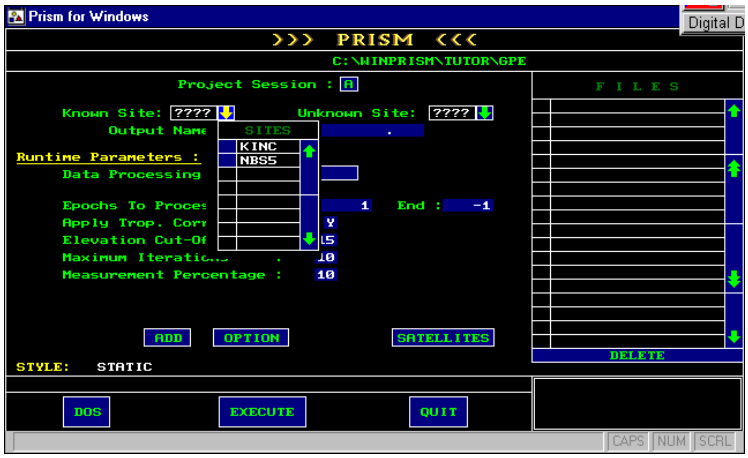

Figure 8.43: Known Site List Selection

Unknown Site

The initial default ???? prompts you to use the down-arrow button to select the unknown site from a popup list of available site names obtained from the current Project File.

Continuing the example Figure 8.44):

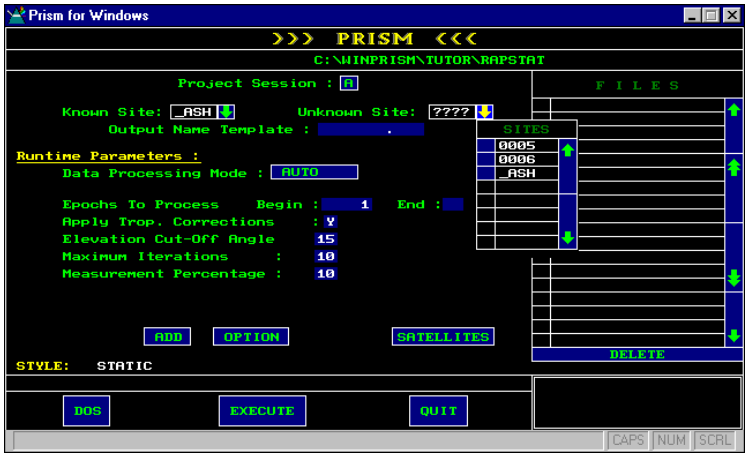

Figure 8.44: Unknown Site List Selection

Output Name Template

This data entry field is initially blank until you select the known and unknown site identifier pairs; then QUICK automatically formulates an output file template (for the I-, L-, O- and P-files) shown in the example above. (The template format is based on the selected site names, and the collection session and date as described in the Looking Into Prism manual). You can choose to type in a new template. If an input parameter file (I-file) already exists, Prism asks whether to use it.

Runtime Parameters Area

Do not modify the parameters denoted "For expert use only" until you understand the ramifications.

Data Processing Mode

allows you to select the data processing mode. The button cycles through the modes listed in Table 8.6.

Table 8.6: Different Processing Modes - Various Type of Static Data

Processing Mode	Description
L1 only	Used for processing data from L1 only receivers
L2 only	For research purposes only - not recommended
L1 C	L1 corrected, creates an ionosphere free, biases free solution using dual band data. Generally used on very long baselines where biases cannot be fixed.
L1 - L2	For research purposes only - not recommended
L1 + L2	For research purposes only - not recommended
L1 & L2	Bias fixed, dual band solution. Generally used on short baselines where the ionosphere error is assumed to be small.
L1 & L2 C	Bias fixed, ionosphere free dual band solution. Generally used on longer (> 10 km) baselines where the ionosphere error may be significant.
AUTO	An all encompassing solution that dynamically changes the Quick engine runtime parameters for each baseline.

The Automode overrides all runtime paramters set below except the epochs to process and the availiable satellites.

Epochs To Process Begin

allows you to identify the epoch upon which you wish processing to begin. By default, processing begins with the first epoch 1. Type another value if you wish to skip some of the initial data collected, for example, if the initial data is particularly noisy.

Epochs To Process End

allows you to identify the epoch upon which you wish processing to end. By default, processing ends with the last epoch -1. Type another value if you wish to skip some of the final data collected, for example, if the final data is particularly noisy.

Apply Trop. Corrections

accepts typed Yes or No. For expert use only. If Y (factory default), Prism uses the temperature, pressure and humidity of both stations from the Project File to compute a tropospheric delay correction that is applied to the computation of the baseline vector. If the temperature, pressure and humidity are not entered into the Project File either manually or via the S-file downloaded from the receiver, Prism uses the

default values from the PROCESS Setup screen. If N is specified, Prism does not compute the tropospheric delay correction and ignores any temperature, pressure, and humidity values.

Elevation Cut-Off Angle

factory default 15 (degrees), range 0 to 99. This parameter specifies the elevation angle below which Prism ignores data. Generally, you should not decrease this value because data at elevations below 15(is subject to increased tropospheric delay. If there is a long data set and the results are not acceptable, try increasing this value to eliminate some of the tropospheric delay in the lower elevation data. We recommend that you plan observation sessions using a 15-degree cutoff for L1 and L2. You set the default in the PROCESS/SETUP and PROCESS/EDIT RUNTIME screens.

Maximum Iterations

factory default 10, range 0 to 99; type your choice in the field. This parameter specifies the maximum number of iterations that QUICK will perform if it does not converge on a solution. You set the default in the PROCESS/SETUP and PROCESS/EDIT RUNTIME screens.

Measurement Percentage

factory default 10, range 0 to 99. This parameter lets you specify the percentage of measurements (compared to the reference satellite) below which Prism automatically omits any satellite from processing. At the factory default 10, Prism omits from processing any satellite with less than 10 percent of the measurements of the reference satellite. Sometimes, a satellite with just a few measurements causes an undue influence on the solution, degrading the solution. This parameter helps avoid that problem. You set this parameter’s default as Minimum Measurements in the PROCESS/SETUP and PROCESS/EDIT RUNTIME screens.

Editing Buttons

Figure 8.45 shows the manual editing buttons.

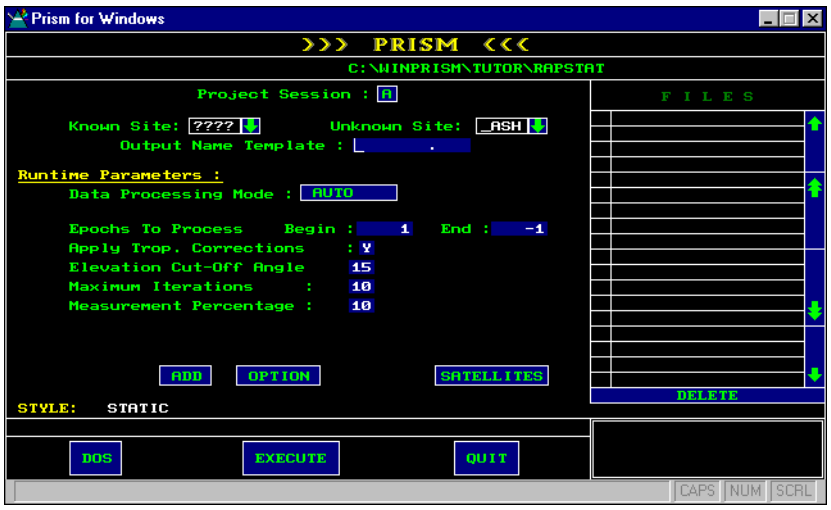

Figure 8.45: Button Row Options

These buttons (ADD, OPTION, SATELLITES) enable you, once you have selected a site pair, to ADD it to the list of pairs QUICK will process, select OPTIONs of additional runtime parameters and other prerequisites, and set satellite parameters.

The button row beneath the FILES panel enables you to DELETE a previously added site pair from the FILES panel.

ADD Button

adds, to the FILES panel, the currently selected site pair with the values of Runtime Parameters, OPTIONS, and Satellite criteria which you have set via this screen. WinPrism then returns all of the data entry fields to their default values so that you may set up another site pair. Once you have added to the list all of the site pairs that you wish to process, and select EXECUTE. QUICK calculates the baseline vectors between all the items in the list.

OPTION Button

accesses a popup screen for modifying additional runtime parameters and prerequisites.

Select OPTION; observe, typically (Figure 8.46).

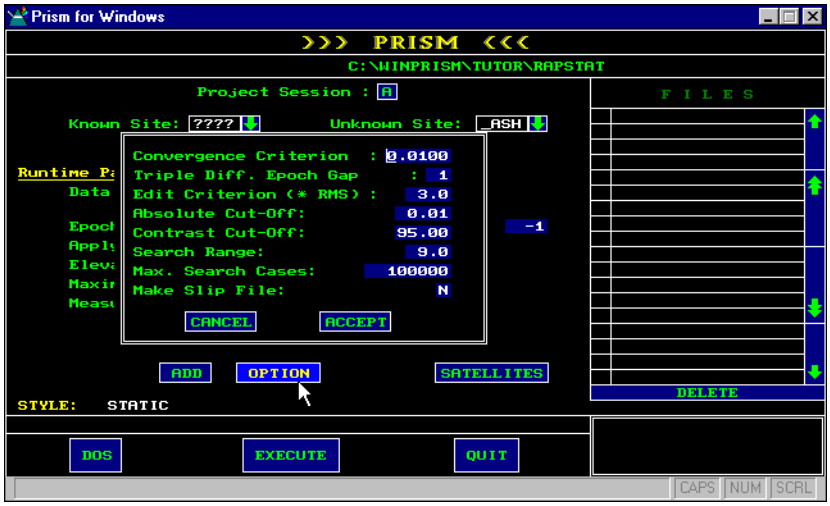

Figure 8.46: Runtime Options

These elements are: Convergence Criteria, Triple Diff. Epoch Gap, Edit Criterion (* RMS), Absolute Cut-Off, Contrast Cut-Off, Search Range, Max. Search Cases, and Make Slip File. You can:

ACCEPT the displayed values or

CANCEL any changes and remove the popup screen.

Convergence Criteria

factory default 0.0100, range 0.0000 to 9.0000; specifies the amount of change (in meters) allowed between the position computed in the previous iteration and the position computed in the current iteration, defining convergence for the differencing algorithms. The triple differencing convergence is defined by the specified value; the double differencing convergence is 100 times smaller. For example, with the factory default, the triple convergence occurs when the position of the current iteration changes from the position of the previous iteration by one centimeter (0.01) or less, and the double differencing convergence occurs when the position changes by a tenth of a millimeter (0.0001) or less. If this criterion is met before the maximum number of iterations occur, the differencing routine will end. If it is not met, the software will continue until the maximum iterations occur. You set the default in the PROCESS/SETUP and PROCESS/EDIT RUNTIME screens.

Triple Diff. Epoch Gap

factory default 1, range 0 to 99. This parameter is the number of epochs to skip between the epochs that are triple-differenced. You set the default in the PROCESS/SETUP and PROCESS/EDIT RUNTIME screens.

Edit Criterion (* RMS)

factory default 3.0, range 0.0 to 99.0. If the RMS of an epoch phase measurement is greater than this edit criterion times the average RMS in the last iteration, Prism considers the epoch phase measurement invalid and does not use it.

Absolute Cut-Off

Not used.

Contrast Cut-Off

factory default 95.00, range 0.00 to 99.0. This parameter specifies how confident WinPrism should be to conclude that it has chosen the solution with the best set of bias integers as compared with the solution with the second best set of bias integers. If the contrast is below the contrast cut-off percentage, Quick will not fix the biases to integers and uses the float solution as the final solution. You set the default in the PROCESS/SETUP screen only.

Search Range

Not used.

Max. Search Cases

Not used.

Satellites Button

Allows acess to runtime parameters specific to the QUICK engine. Clicking this button brings up the dialog shown in Figure 8.47.

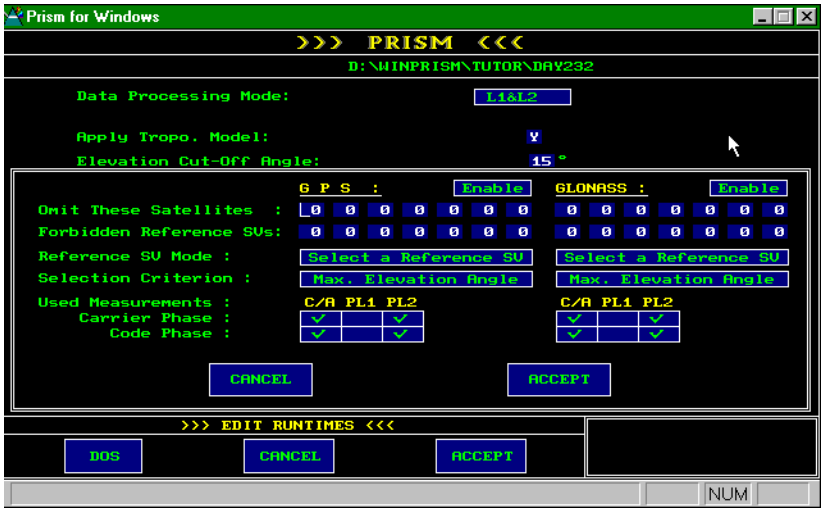

Figure 8.47: QUICK Satellite Selection

In this screen you are able to manually select satellites and observables used in the current processing run. Table 8.7 lists the controls that are available.

Table 8.7: Screen Controls

Buttons	Description
GPS Enable/Disable	This toggle button allows you to choose between using or ignoring all GPS satellites available in the current dataset.
GLONASS Enable/Disable	Thus toggle button allows you to choose between using or ignoring all GPS satellites available in the current dataset. By default, the GLONASS is disabled.
Omit These Satellites	You may enter the PRN numbers of up to 7 GPS and 7 GLONASS satellites to omit in processing. the seven entry fields under the GPS header are for GPS satellites and the seven fields under the GLONASS header refer to GLONASS satellites. this is a useful feature if you know that a particular satellite is unhealthy or is affected by bad multipath etc. and want to ensure that it is not used during processing.

Table 8.7: Screen Controls (continued)

Buttons	Description
Forbidden Reference SVs	You may enter the PRN numbers of up to 7 GPS and 7 GLONASS satellites if you do not want them to be used as the reference satellite during processing. The seven entry fields under the GPS header refer to GLONASS satellites. This is a useful feature if you know that a particular satellite is unhealthy or is affected by bad multipath etc. Note that these fields are disabled if you choose “Optimal Coupling” as the Reference SV mode described below.
Reference SV Mode/Optimal Coupling	You may toggle between two options here. The first mode “Select a Reference SV” means that the software scans the data files and automatically selects one satellite to be used as the reference satellite. Only one satellite is selected per session and if it sets below the horizon during data collection (possible with long datasets) the remaining data is not used. In Optimal Coupling mode, the concept of a reference SV is invalid. Instead double differences are performed in an optimal manner and therefore there is no consideration as to whether a reference SV sets before the end of the dataset. When Optimal Coupling is selected, the Forbidden Reference SVs fields are disabled.
Selection Criteria	In the current implementation the reference SV selection criterion is solely by maximum elevation angle.
Used Measurements	This is a matrix where you may select exactly which observables to use. Simply make a checkmark in the appropriate box to use that observable. If a chosen observable is not in your dataset, the observable will simply be ignored during processing. By default, the code phase is disabled. Code phase can often improve the programs ability to fix biases.
Cancel	Cancels any changes you have made.
Accept	Accepts all changes.

Manual Control Button Menu

Figure 8.48 shows the Manual Control buttons.

Figure 8.48: Manual Mode Control Buttons

DOS

shells out temporarily to the DOS prompt; typing EXIT<ENTER> at the DOS prompt returns you to WinPrism.

EXECUTE

accepts the current site pair selections and the current values of the runtime parameters, runs LINECOMP for the those stations, and returns you to the MANUAL PROC screen.

QUIT

returns you to the MANUAL PROC screen without running the program or accepting changes to the parameters.

Tools Option

TOOLS provides access to the following utilities and data manipulation programs: EDIT FILETOOL, TIMESYS, TRANSFORM, BLUEBOOK, RESULTS, BAR-CODE, and RINEX and D+PTS. This icon is an alternate route to the Option Grid screen described in detail in the Tools User's Guide; see that manual for usage instructions.

9

Error Messages

Select Directory

Before you can access functions of PROCESS that manipulate survey data files, you must change the current directory to one containing such files. Use the DIRECTORY button as described in the Looking Into WinPrism manual, Getting Started chapter, Directory Selection section.

1. If you attempt to select an icon such as EDIT PROJECT which requires a project list to manipulate, and the current directory contains no survey data files, PROCESS prompts:

   You must change to a directory with survey files before proceeding further into such an icon.

2. If you change to a directory containing survey data files, and you select an icon such as EDIT PROJECT (which requires a project list to manipulate), PROCESS prompts:
   a. Use Existing STATIC PROJFILE?

      if a project file exists for a static project, or:

   b. Use Existing PSEUDO PROJFILE?

      if a project file exists for a pseudo-kinematic project.

   c. If you answer YES, WinPrism uses the corresponding project file.

   d. If you answer NO, WinPrism creates a new project file from the B-files and S-files in the current directory

3. You can access some PROCESS functions (such as PROCESS/SETUP) without specifying a directory containing survey data files; others such as EDIT PROJECT require such a specification. In any case, if you select PROCESS without first changing to a directory with data files, PROCESS prompts:

   ```
   ERROR:  No data files are found in current directory
   Press mouse button to continue ...
   ```

   instead of the control button menu.

Edit Logtime Option

1. If the SURVEY TYPE you have selected is STATIC, when you select EDIT LOGTIME, PROCESS prompts:

   ```
   LOGTIMES Not Available In STATIC mode
   Press mouse button to continue ...
   ```

2. If you have selected PSEUDO, and the current directory has no data files, PROCESS prompts:

   ```
   WARNING: Logtimes List Is Empty
   Press mouse button to continue ...
   ```

3. Change to a directory with data files.

10

Information on Precise Orbits

If you set the Use Precise Orbits runtime parameter SP3 or EF18, the QUICK engine uses NGS precise orbit (precise ephemeris) files instead of the E-file broadcast orbit data from the common navigation file. The precise orbit files must be in the current directory or in the Oribit Search Path directory listed in the Process Setup dialog:

The precise orbit will have the following naming convention:

ECFyyww

where:

yy is the last two digits of the year.

ww is the week of the year, 00-52.

If the precise orbit data is in ASCII format, (such as SP3 from the GPS Information Center bulletin board run by the United States Coast Guard), it is automatically converted.

The easiest way to obtain precise orbit data:

- Download the EF18BIN.www file (where www is the GPS week number) from GPSIC.
- Run the conversion program EF18_SP3.EXE to convert the file into the SP3 ASCII format.

The conversion program EF18_SP3.EXE is available from the GPSIC bulletin board.

- GPSIC BBS703-313-5910

300 through 14,400 Baud

No parity, 8 data bits, 1 stop bit

(For more information on the GPSIC BBS, refer to The US Coast Guard GPS Information Center (GPSIC) at the end of the Tools User's Guide.)

11

Customer Support

If you have any problems or need further help, the Ashtech customer support team can be reached by telephone. Before you call, please refer to the documentation that came with your system (both receiver and software manuals). Many common problems are identified within the documentation and suggestions are offered for solving them.

- Check cables and power supplies. Many hardware problems are related to these simple problems.
- If the problem seems to be with your computer, reboot it to clear the system's RAM memory.
- If you are experiencing receiver problems and have already downloaded receiver files, reset the receiver as documented in the system commands section of the receiver manual. Note that the reset command clears receiver memory and resets operating parameters to factory default values.

If none of these suggestions solves the problem, contact the Ashtech customer support team. Before calling, please fill in the information listed in Table 11.1.

Table 11.1: Information Required for Customer Support

Information Category	Your Actual Numbers
Receiver Model	
Receiver Serial #	
Software Version #	
Software Serial #	
Firmware Version #	
A clear, concise description of the problem.	

Customer Support Numbers:

Voice: 1-800-229-2400
Email: support@ashtech.com
Web: www.ashtech.com

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