Mine Surveyor II™

Operations & Reference Manual

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Preface

Scope and Audience

This manual provides operating instructions and reference material for the Ashtech Mine Surveyor II system. The manual assumes intimate knowledge of mining operations, and some familiarity with GPS principles and procedures.

Setup and configuration instructions are covered in the operations manuals for the GPS equipment included in your system.

This manual uses the single acronym GPS to describe usage of GPS receiver systems as well as GPS+GLONASS receiver systems.

Organization

The manual is organized into five chapters and two appendices.

Chapter 1 - Introduction: An overview and functional description of the system and components.

Chapter 2 - Operation: A discussion of the basic mining operations of offset, cut/fill, pickup/layout, and anchor point, with reference information on file formats and file transfer.

Chapter 3 - Tutorial: — Mine Survey Version

Chapter 4 - Screen References: A detailed discussion of the data and command parameters displayed on the various screens of the handheld controller.

Chapter 5 - Troubleshooting: A brief summary of commonly encountered problems, with suggested solutions.

Appendix A - Datums and Ellipsoids: A listing of reference parameters for datums and ellipsoids used within Mine Surveyor II software.

Appendix B - Global Product Support: Instructions for contacting Ashtech in case you need additional help.

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Introduction

System Overview

The Mine Surveyor II is a real-time GPS positioning system designed for mining environments. The system operates in geodetic or local coordinate systems and allows the user to perform layout or pickup surveys. Data can be stored in the handheld and the receiver depending on the operational mode of the system.

The system can operate in autonomous, RTCM or CPD differential modes. In the real-time modes, the system will display a constant accuracy value which provides the user with real-time quality control.

The Husky handheld software provides the user with several point logging and offset options and offers several different modes of navigation.

The Mine Surveyor II system consists of two main component groups, the Base and the Rover or Remote. The components of the two systems are detailed below.

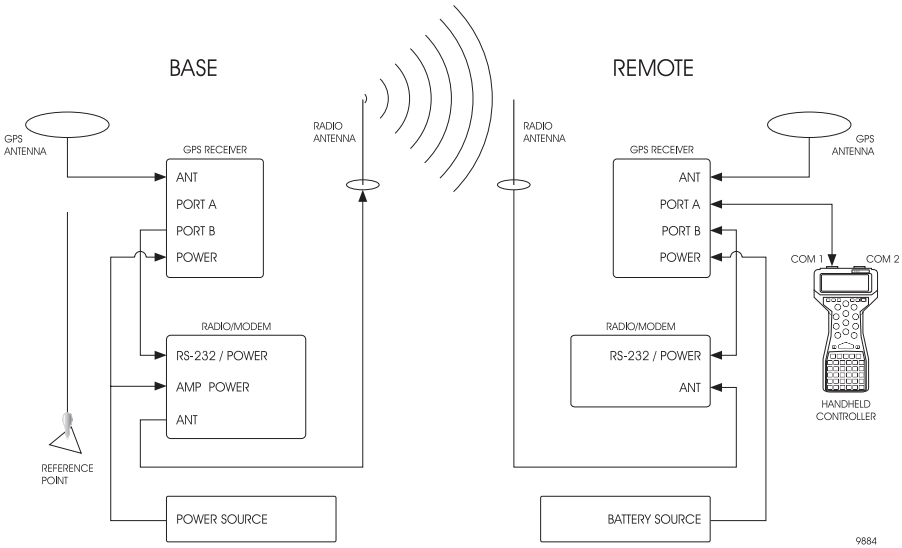

Figure 1.1: Base and Rover Configuration

System Operation

The Base GPS antenna is located over a reference point. The coordinates of the point are entered into the Base receiver. The Base receives satellite measurements from the GPS constellation and uses these measurements to calculate correction data, based on reference point coordinates.

Correction data is sent from the Base GPS to the Base radio via a serial cable. The Base radio broadcasts the correction information through the Base radio antenna.

The Remote radio receives the correction information through the Remote radio antenna and sends the data to the Remote GPS receiver via a serial cable.

The Remote GPS receiver takes measurements from the GPS satellites and applies the correction information from the Base to derive a corrected position for the remote GPS antenna.

The position information is transferred to the Husky controller through a serial cable. Mine Surveyor II software converts the position data into local coordinates using the transformation parameters entered by the user or uploaded with the mission file.

Local coordinates are displayed along with the current positional accuracy. The user can then log points to handheld memory or use the uploaded points in the mission file to navigate to a specific location.

Upon completion of the survey, the information stored in the Husky controller can be downloaded to a PC using the provided HCOM or HTRANS software.

Mission data files used for layout are created using the MCONVERT program or GPSeismic. The files are then uploaded to the Husky using the HCOM/HTRANS transfer program.

The Mine Surveyor II software allows you to access a series of display screens controlled by the function keys. Figure 1.2 shows the routing of the screen flow.

The manual contains figures and tables describing components in each screen. The tables reference the extended function keys with the symbol (⇑) adjacent to the abbreviated name of the function. Extended function keys are accessed by pressing the Shift key.

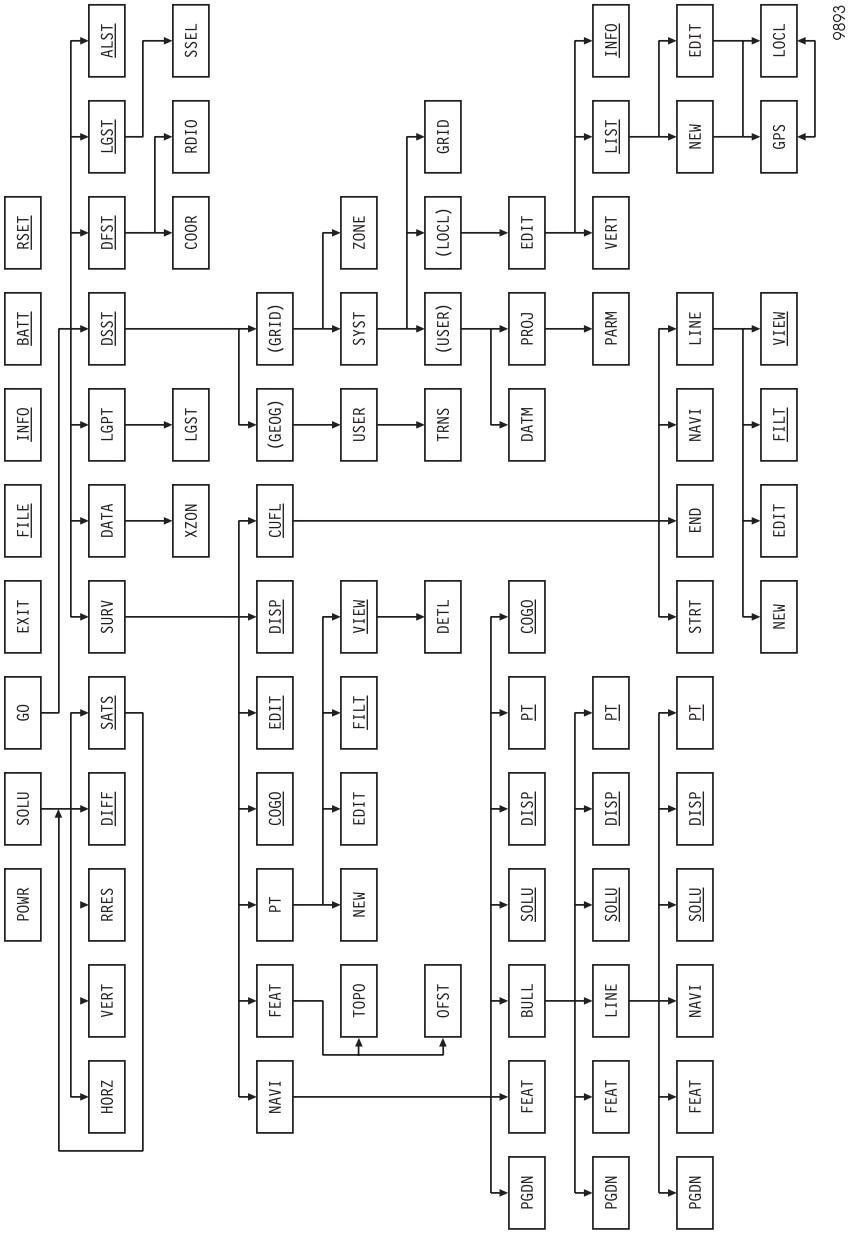

Figure 1.2: Software Flowchart

Husky FS Series Keyboard Layout

Standard keyboard

Figure 1.3: Standard Keyboard

TDS keyboard

Figure 1.4: TDS Keyboard

Keyboard Conventions

- Mine Surveyor II utilizes the top left key on the keyboard for ‘Esc’ key functions.
- Mine Surveyor II utilizes the two keys adjacent to the ‘YES’ key as shift keys.
- The standard layout contains four function keys situated at the top of the keyboard. The ‘Esc’ key is the top left key on the keyboard labeled as ‘Esc’. The shift keys are adjacent to the ‘YES’ key and labeled with up arrows.
- The TDS layout contains five function keys situated at the top of the keyboard. The ‘Esc’ key is the top left key on the keyboard labeled as ‘F1’. The shift keys are adjacent to the ‘YES’ key. The left shift key is labeled ‘Esc’ and the right key is labeled with an up arrow.
- The space key "SP" is used to change values in toggle fields.

Mine Surveyor II makes reference to the ‘Esc’ and shift keys during program operation. Refer to the standard keyboard layout for the location of these keys.

Software Installation

MCONVERT for Windows 95/NT

Insert disk 1 into the floppy disk drive of your computer. From START, select RUN; select browse; select the floppy drive; select SETUP.EXE and follow the on-screen instructions.

DCONVERT for DOS

Create a directory on your computer hard drive. Copy the contents of the DCONVERT disks to the newly created directory.

Data Collector Software

To reinstall the data collector software, copy the contents of the data collector software disk to your computer hard drive. Verify that the MSDATA subdirectory exists on the data collector.

Run HCOM on the data collector. Run either Husky Transfer (HTRANS) in Windows 95/NT or HCOM in DOS to communicate with the data collector. Transfer the program files to the data collector. Transfer the sample mission file (sample.dat) to the MSDATA subdirectory.

Operation

Pickup/Layout

Pickup Operations

Differential GPS offers exceptional productivity and ease of operation for a single-man survey. This section covers a typical pickup operation. Pickup operations consist of the following steps:

GPS Mission Planning

Field Surveying

Downloading Logged Data

Each of the steps are described below:

GPS Mission Planning

A good knowledge of GPS coverage and geometry for the given survey area and time are crucial to a successful survey. Conduct a full review of the satellite situation before each survey.

Field Surveying

GPS Pickup using the Mine Surveyor II system consists of logging position information to the handheld computer. All points are saved in the handheld and tagged with appropriate site information.

Points can be logged as single positions or as a series of points separated by break codes. The description below covers both types of logging. With the Remote unit operational, conduct a typical pickup operation in the following manner:

1. Points are logged in both an ASCII and a binary file in the handheld. The ASCII file is named M.OUT. The system adds new points to the existing file at any time. Erase or rename the existing M.OUT file to start a fresh pickup. The binary file has the same name as the mission file but with the extension ‘OUT’. The binary file is specifically formatted to work with the seismic survey package GPSeismic.
2. Start the Mine Surveyor II software by pressing M and the RETURN key. The logo screen will appear. Press YES to continue.
3. Select the SOLU screen to check on system operation. HRMS and VRMS should be within the accuracy range required for the survey.

4. Select the ALST screen and set any appropriate alarms. The HRMS and VRMS alarms are useful to make sure that you are always within the required accuracy.
5. At a desired pickup point, select the FEAT screen. Enter the appropriate Point Code and press ENTER. The proper descriptor should appear next to the Point Code area.
6. Enter the Point ID number. This value can automatically be incremented or decremented using the CHANGE ID field.
7. Enter the current antenna height in the ANH field.
8. If an offset is required, choose an offset mode by toggling the OFFSET field. Enter the OFST screen and enter the OFFSET values as appropriate.
9. Check to see if the HRMS and VRMS values are acceptable. If they are, press SAVE to log the point. An audible alarm will sound and a message box will pop up to indicate that the point has been logged.
10. To pick up a topographic feature—the toe of a bench, for example—points can be logged dynamically. Enter the desired point code and point ID. Enter the antenna height, select the logging mode (INTERVAL/DISTANCE), and enter a value to set the logging rate. Press TOPO and proceed to pick up the feature. An alarm will sound each time a point is logged. When the feature has been picked up, press ESC to exit topo logging.

Downloading Logged Data

All points are logged to an output file called M.OUT in the handheld memory. This file can be renamed with any valid DOS filename. There is a DOS and a Windows 95/NT version of the download program. Refer to the HTRANS Appendix for further details. Downloading the log file using the DOS HCOM program is completed as follows:

1. Connect the handheld unit to the PC using the Husky-to-PC cable.
2. Run the program HCOM in the handheld by typing HCOM at the DOS prompt and pressing the YES (Enter) key.
3. Run the program HCOM in the PC by typing HCOM and pressing the ENTER key. When the HCOM screen appears, press any key to establish communications to the handheld.
4. In the handheld side of the HCOM screen, highlight the file to be downloaded. Press T to transfer the file to the PC.
5. Press ESC on the PC and handheld to exit HCOM

Downloading the output file using the Windows HTRANS program is completed as follows:

1. Connect the handheld unit to the PC using the Husky-to-PC cable
2. Run the program HCOM in the handheld by typing HCOM from the DOS prompt and pressing the YES (Enter) key.

3. Start the HTRANS program in the PC. Two window panes are displayed. The left pane is the handheld directory and the right pane is the PC directory.
4. In the handheld pane, highlight the file to be downloaded. Drag and drop the file from the left pane to the right pane. You can also use the “Copy to” and “Move to” commands in the FILE menu or the “Copy to” and “Move to” buttons on the tool bar.
5. Exit the HTRANS program on the PC and press ESC on the handheld to exit HCOM.

Layout Operations

Differential GPS offers exceptional layout productivity due to its high accuracy navigation capabilities. This section covers a typical layout operation. Layout operations consist of the following steps:

1. GPS Mission Planning
2. Layout Point Planning
3. Layout Point File Uploading
4. Field Surveying
5. Analysis of Field Results (if required)

Each of these steps are described below.

GPS Mission Planning

A good knowledge of GPS coverage and geometry for the given survey area and time are crucial to a successful survey. A full review of the satellite situation should be undertaken before each survey.

Layout Point Planning

The Mine Surveyor II system works on a series of points uploaded to the handheld and laid out based on the order, in which the points were entered into the file. Planning of the layout logistics and entering the points in the best order for ease of navigation and pickup will provide the most efficient field operation.

Layout Point File Uploading

Mine Surveyor uses a specific file structure which is detailed in *File Formats* on page 27. These files are converted into a binary format for use in the handheld and renamed with a .DAT extension by the MCONVERT/GPSEISMIC program. Once these files are uploaded to the handheld, they are available for use in layout operations. See *MCONVERT Operations* on page 15 for a full explanation of the MCONVERT program..

Uploading the layout file using the DOS file transfer utility HCOM is completed as follows:

1. Connect the handheld unit to the PC containing the file using the Husky-to-PC cable.
2. Run the program in the handheld by typing HCOM at the DOS prompt and pressing the ENTER (yes) key.
3. Run the program in the PC by typing HCOM and pressing the ENTER key. When the HCOM screen appears, press any key to establish communications with the handheld.
4. In the PC side of the HCOM screen, highlight the file to be uploaded. Press "T" to transfer the file to the handheld.
5. Press ESC on the PC and handheld to exit HCOM.

Uploading the log file using the Windows HTRANS program is completed as follows:

1. Connect the handheld unit to the PC using the Husky-to-PC cable.
2. Run the program HCOM in the handheld by typing HCOM and pressing the YES key.
3. Start the HTRANS program in the PC. Two window panes are displayed. The left pane is the handheld directory and the right pane is the PC directory.
4. In the handheld pane, highlight the file to be uploaded. Drag and drop the files from the right pane to the left pane. You can also use the “Copy to” and “Move to” commands under the FILE menu or the “Copy to” and “Move to” buttons on the tool bar.
5. Exit the HTRANS program on the PC and press ESC on the handheld to exit HCOM.

Field Surveying

With the remote unit operational, begin layout operations:

1. Start the Mine Surveyor II software by pressing M and RETURN. The logo screen will appear. Press Yes to continue.
2. Select the SOLU screen to check on system operation. HRMS and VRMS should be within the accuracy range wanted for the survey.
3. Select the DATA screen and load the appropriate layout file.
4. Select the DSST screen and set the most convenient range display. The choices are **distance & course (DTT/CTT) easting & northing (ETT/NTT)**.
5. Select the ALST screen and set any appropriate alarms. The HRMS and VRMS alarms help make sure that you are always within the required

accuracy range. The Reaching Target alarm provides an audio alarm when you are close to the target.

6. Select the SURV screen and decide which direction you will use to select points from the file. You can start at the first point and move down or start at the last point and move up.
7. Select the PT screen and choose the first point to be laid out.
8. Select one of the navigation screens to provide a graphic representation of your position relative to the first point. Use this display to navigate close to the point.
9. When the point has been laid out, use the NEXT function to switch to the next point in the file, or go to the PT screen to select a different point.
10. If a position log is needed at each layout point, choose the FEAT screen and use the SAVE function to log the point.

To save time, you can press Shift + L from any of the navigation screens to log a position.

Analysis of Field Results

If data is saved at each point, an analysis can be made of the layout survey. The log file saved in the handheld can be downloaded as described in *Pickup Operations.* Each of the points can be analyzed to ensure that the required accuracy was attained. Any changes to the layout can also be seen using the log file. Finally, the overall layout operation can be analyzed. Surveying with GPS is largely a question of field procedures. Good procedures equate to more efficient operations. A study of each survey can quickly lead to smoother operations and greater productivity.

Creating Input Files Using MCONVERT

The MCONVERT program converts text files with a specific format into mission files (*.DAT) for use with Mine Surveyor. The layout files contain all the data necessary to perform survey operations in the chosen coordinate system, including all the points for the survey. MCONVERT is the Windows 95/NT version and DCONVERT is the DOS version.

DCONVERT for DOS

DCONVERT for DOS uses command line parameters to configure the binary mission file. The parameters include a unit of measure, a grid coordinate system reference or a local coordinate transformation file, a grid zone (if relevant), and the input filename. An optional configuration file which contains administrative data for the project can be included as a parameter. Configuration file information is transferred to the

editable fields for area, name, and note on the Mission Setup screen. Formats for the input file and the configuration file are discussed in the File formats section of this chapter. The format of the DCONVERT command line is shown below:

> DCONVERT[/f = configuration filename][/u = unit of measure][/local coordinate transformation file] or [/grid coordinate system][/zone] input filename

Configuration File

The configuration file must be named in accordance with DOS filename conventions. If a configuration file is not included in the DCONVERT command line, information for area, name, and note can be entered manually in the Mission Setup screen.

Unit

Unit of measure can be set to any of the following standard lengths referenced to the default length of one meter:

Table 2.1: DCONVERT Standard Lengths

Unit	Definition	Measurement in Meters
uft	U.S. Survey foot	(0.3048006096m)
ift	International foot	(0.3048m)
uyd	U.S. yard	(0.9144018228m)
iyd	International yard	(0.9144m)
ch	Chain	(20.1168m)
rd	Rod	(5.0292m)
lk	Link	(0.201168m)
vr	Vara	(0.8382m)
tv	Texas vara	(0.84666666666667m)

Only meter, U.S. foot, and international foot are supported in MCONVERT for Windows ‘95 / Windows NT.

System

The following coordinate systems are supported in Mine Surveyor:

Table 2.2: MDCONVERT Coordinate Systems

Coordinate Systems		
ALAIN	AMG66	AMG84
BELGIUM	CH3	DENMARK
FINLAND	FRANCE	GEOG
GERMANY	ISG	KOREA
NGO48	SAFRICA	SPAIN
SPC27	SPC83	SWEDEN
UK0	UK01	UK02
UPSN	UPSS	UTMN
UTMS		

Zone

A zone number must be specified for systems that have more than one zone. Please note that zone number is used instead of a zone ID. In the DCONVERT command line example below, zone 403 refers to California area 3 (CA_3). Information tables containing specifications for each datum, projection, and grid coordinate system supported by Mine Surveyor II can be found in Appendix A.

Local

A local coordinate system can be created with Mine Surveyor II's Anchor Point module. The local system can be used in lieu of one of the predefined systems listed above.

SPC27 NADCON

DCONVERT supports the NGS NADCON method to perform coordinate transformations to SPC27. DCONVERT uses shift files named NADGRD.LAS and NADGRD.LOS. If the shift files are not available in the directory in which DCONVERT resides, the program will use the Molodensky transformation method.

The installation disk contains the NGS DOS program NADGRD and the NGS shift files (CONUS, ALASKA, STGEORGE, STLRNC, STPAUL, HAWAII, and PRVI). NADGRD can be used to subdivide the larger shift files into smaller shift files named NADGRD.LAS and NADGRD.LOS. If the NADCON method is preferred, the NADGRD shift files must be transferred to the program file directory of the data collector. If your data collector can support storage of the larger shift files, simply rename the desired files to NADGRD.LAS and NADGRD.LOS.

The NADGRD program and the shift files used by DCONVERT are published and provided by the National Geodetic Survey. For more information regarding the NGS NADCON method, contact NGS at:

National Geodetic Survey

11400 Rockville Pike

Rockville, MD 02852

Phone: (301) 443-8684

or log on to the NGS ftp site at ftp://ftp.ngs.noaa.gov/pub/pcsoft/nadcon/

Input File

The input file must also be named in accordance with DOS filename conventions and must have a .IN extension. Example A below shows an DCONVERT command line which references a predefined grid coordinate system and specifies a U.S. foot as the unit of measure. Note that a configuration file is not included in the command line. Example B shows an DCONVERT command line which references a local grid and includes a configuration file reference. Since a unit of measure is not specified in this example, the default length of one meter will be used. Note that the input file reference is separated from the preceding parameter by a space instead of a forward slash.

a. DCONVERT/u=uft/SPC83/403 MISSION.IN

b. DCONVERT/f=LOCAL.CFG/TOPO.LSY LOCAL.IN

MCONVERT for Windows 95/NT

MCONVERT for Windows 95/NT contains the same functionality as the DOS version. The program contains three main dialogs for coordinate system selection, input file selection, and output file selection. There are three formats of the coordinate system selection dialog. One format is for coordinates based on a defined coordinate system. Another format is for coordinates based on a local coordinate system. The final format is for geographic coordinates displayed in decimal degrees.

Defined Coordinate System

The dialog formatted for a defined coordinate system is shown in Figure 2.1.

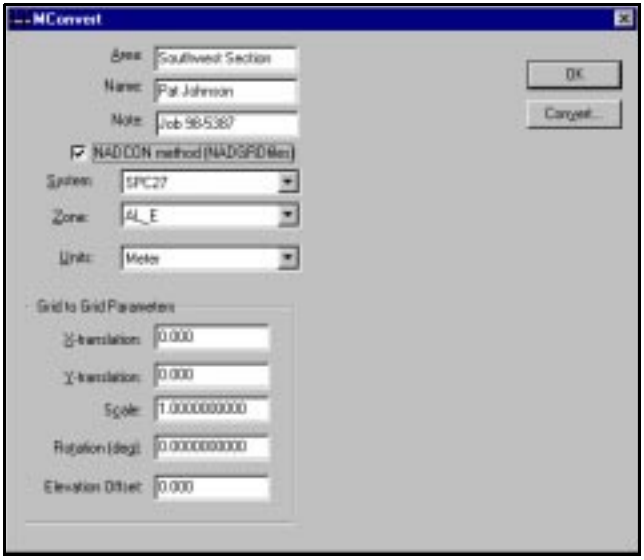

Figure 2.1: MCONVERT Defined Coordinate System Dialog

Table 2.3 describes the components of this dialog.

Table 2.3: MCONVERT Defined Coordinate System Dialog

Item	Description
Area	An editable field displaying the project area up to 20 characters long.
Name	An editable field displaying the operator's name up to 20 characters long.
Note	An editable field displaying a project note up to 20 characters long.

Table 2.3: MCONVERT Defined Coordinate System Dialog (continued)

Item	Description
NADCON method (NADGRD files)	If the system selected is SPC27, check this box to use the NGS NADCON method rather than the Molodensky method. The NGS shift files NADGRD.LAS and NADGRD.LOS must exist in the program directory.
System	A list of coordinate systems to be selected. Certain systems contain zones.
Zone	A list of coordinate system zones to be selected. If a system that does not contain zones is selected, this field is not displayed.
Units	A list of units which include meters, US feet, and international feet.
Grid to Grid Parameters	Parameters to perform a grid to grid transformation from the selected system.
X translation	The shift in the x axis from the selected system to the new grid.
Y translation	The shift in the y axis from the selected system to the new grid.
Scale	The scale value from the selected system to the new grid.
Rotation	The rotation value from the selected system to the new grid.
Elevation Offset	The elevation offset from the selected system to the new grid.
OK	Select to exit.
Convert	Select to continue to the input file select dialog.

The installation disk contains the NGS DOS program NADGRD and the NGS shift files (CONUS, ALASKA, STGEORGE, STLRNC, STPAUL, HAWAII, and PRVI). NADGRD can be used to subdivide the larger shift files into smaller shift files named NADGRD.LAS and NADGRD.LOS. If the NADCON method is preferred, the NADGRD shift files must be transferred to the program file directory of the data collector. If your data collector can support storage of the larger shift files, simply rename the desired files to NADGRD.LAS and NADGRD.LOS.

The NADGRD program and the shift files used by MCONVERT are published and provided by the National Geodetic Survey. For more information regarding the NGS NADCON method, contact NGS at

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Phone: (301) 443-8684

or log on to the NGS ftp site at ftp://ftp.ngs.noaa.gov/pub/pcsoft/nadcon/

Local Coordinate System

The dialog formatted for a local coordinate system is shown in Figure 2.2.

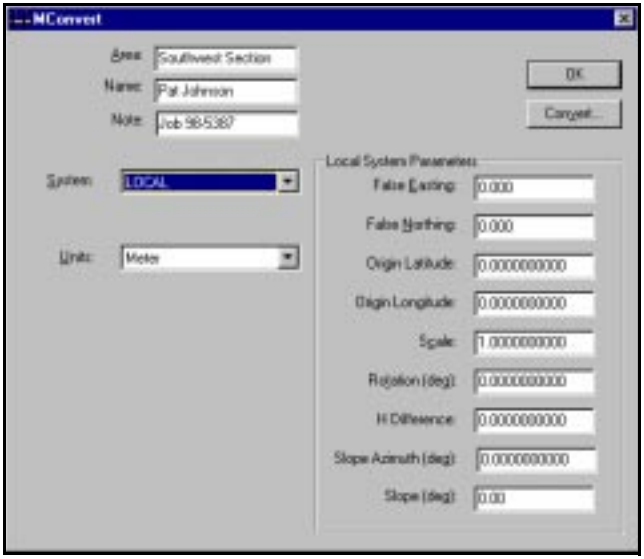

Figure 2.2: MConvert GEOG System Dialog

Table 2.4 describes the components of this dialog.

Table 2.4: MCONVERT Local Coordinate System Dialog

Item	Description
Area	An editable field displaying the project area up to 20 characters long.
Name	An editable field displaying the operator's name up to 20 characters long.
Note	An editable field displaying a project note up to 20 characters long.
System	A list of coordinate systems to be selected.
Units	A list of units which include meters, US feet, and international feet.
Local System Parameters	Parameters to perform a local system transformation.
False Easting	The local coordinate easting origin. The origin is defined as the centroid of the list of local coordinates used in the transformation.
False Northing	The local coordinate northing origin. The origin is defined as the centroid of the list of local coordinates used in the transformation.
Origin Latitude	The WGS84 latitude origin. The origin is defined as the centroid of the list of local coordinates used in the transformation.

Table 2.4: MCONVERT Local Coordinate System Dialog (continued)

Item	Description
Origin Longitude	The WGS84 longitude origin. The origin is defined as the centroid of the list of local coordinates used in the transformation.
Scale	The scale value from the UTM grid to the local grid.
Rotation	The rotation value in degrees from the UTM grid to the local grid.
H Difference	The height difference from the WGS84 ellipsoid height to the local system height.
Slope Azimuth	The direction of slope in degrees from the UTM plane to the local plane.
Slope	The slope value in degrees from the UTM plane to the local plane.
OK	Select to exit.
Convert	Select to continue to the input file select dialog.

The local system parameters can be copied from the parameters in the TOPO.LSY file. The suggested field operation is to perform the local transformation in the field then copy the calculated parameters to the local system parameter fields in the dialog.

Geographic Coordinate System

The dialog formatted for a geographic coordinate system is shown in Figure 2.3.

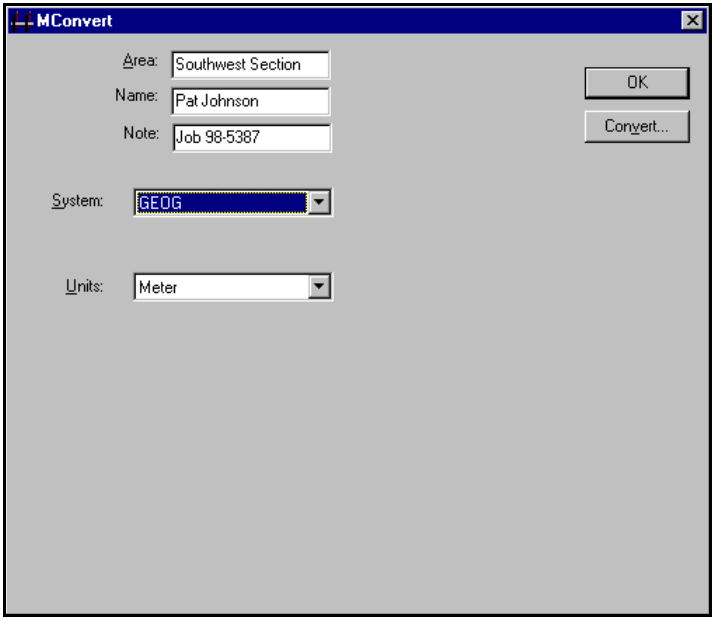

Figure 2.3: MCONVERT Geographic Coordinate System Dialog

Table 2.5 describes the components of this dialog.

Table 2.5: MCONVERT Geographic Coordinate System Dialog

Item	Description
Area	An editable field displaying the project area up to 20 characters long.
Name	An editable field displaying the operator's name up to 20 characters long.
Note	An editable field displaying a project note up to 20 characters long.
System	A list of coordinate systems to be selected.
Units	A list of units which include meters, US feet, and international feet.

The input file geographic coordinate format must be in WGS84 decimal degrees.

The input file select dialog as shown in Figure 2.4 allows you to enter the input file name and the folder in which the file will be saved.

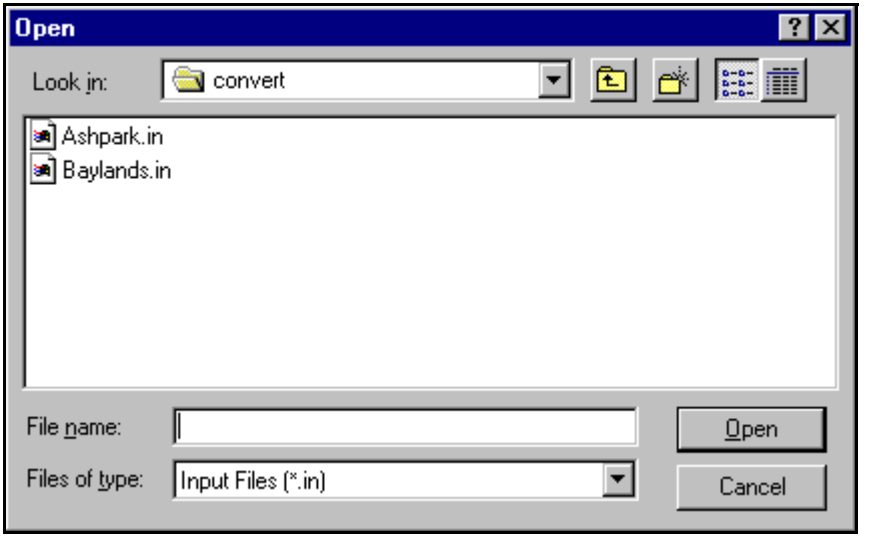

Figure 2.4: Input File Select Dialog

Table 2.6 describes the components of this dialog.

Table 2.6: Input File Select Dialog

Item	Description
Look in	Displays the name of the current folder.
Up One Level	Moves the current folder display up one level.
Create New Folder	Create a new folder under the current folder.
List	List only the filename in the dialog.
Details	List the filename and all system details regarding the file.
File Name	Name of the input filename selected. The filename can also be typed in this field.
Files of Type (*.in)	Displays the file types supported.
Open	Selects the input filename and continues to the output file select dialog.
Cancel	Cancels the input file select dialog and returns to the MConvert dialog.

The output file select dialog as shown in Figure 2.5 allows you to enter the output file name and the folder that the file will be saved.

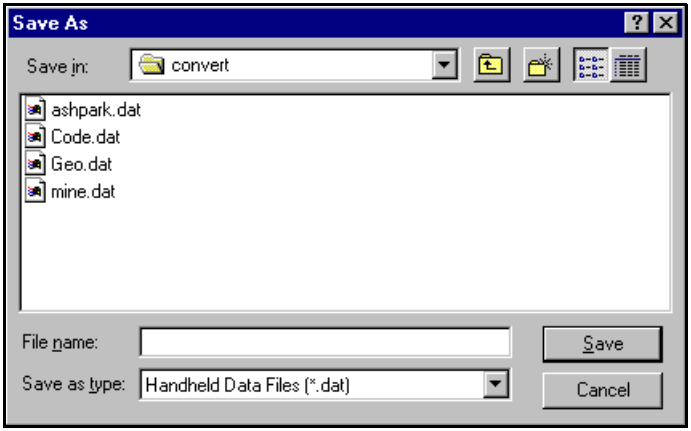

Figure 2.5: Output File Select Dialog

Table 2.7 describes the components of this dialog.

Table 2.7: Input File Select Dialog

Item	Description
Save in	Displays the name of the current folder.
Up One Level	Moves the current folder display up one level.
Create New Folder	Create a new folder under the current folder.
List	List only the filename in the dialog.
Details	List the filename and all system details regarding the file.
File Name	Name of the output filename selected. The filename can also be typed in this field.
Save as type (*.dat)	Displays the file types supported.
Save	Saves the program data into the entered filename and displays the Conversion Succeeded dialog.
Cancel	Cancels the input file select dialog and returns to the MConvert dialog.

The Conversion Successful dialog as shown in Figure 2.6 is displayed when the conversion is completed.

Figure 2.6: Conversion Successful dialog

File Formats

Input File

The input file format (*.IN) is based on the standard data file produced by the MED Mining system. This file is converted to the binary mission file format by using the MCONVERT program. The file is column-delimited in the following format:

```
UTM 11    632836.6259 5412070.0562 1.7658349542 0.9995741389 -0.742
FENC 603   22739.657   151752.313   1671.445
TOE 965   26044.384   152344.309   2497.884
TOE P1_3 23841.233   151949.645   1900.000
TOE P7_10 25052.966   152166.710   2300.000
```

File parameters are described below:

```
UTM 11    632836.6259 5412070.0562 1.7658349542 0.9995741389 -0.742
```

The first line in the example above contains a header for the input file. The header is optional. It is used to effect a conversion from the predefined grid coordinate system to the local coordinate system. The header line typically contains the following parameters:

UTM	- the system to use for conversion of these points.
11	- the UTM zone to be used for conversion.
632836.6259	- the X translation parameter for this conversion.
5412070.0562	- the Y translation parameter for this conversion.
1.7658349542	- the Rotation parameter for this conversion.
0.9995741389	- the Scale Factor used for this conversion.
-0.742	- the Vertical Offset for this conversion.

Each record typically consists of the following:

FENC	- the Point Code for the point (Column 1).
603	- the Point ID for the point (Column 7).
22739.657	- the Easting for the point (Column 16).
151752.313	- the Northing for the point (Column 27).
1671.445	- the Elevation for the point (Column 41).

The file contains coordinates and a point id. The point code is optional.

Configuration File

The configuration file (*.CFG) is a text file with a keyword-oriented format. Each keyword is a four character string terminated with a colon:

"**OUTF:**" – Name of the mission file (*.DAT)

"**AREA:**" – Name of the project area

"**NAME:**" – Name of the operator

"**NOTE:**" – Project note

An ASCII string follows directly after the colon with no spacing between the colon and the first character of the string. Spaces occurring between the first character and the 20th character of the ASCII string are counted as a character. Any string with more than 20 characters is truncated after the 20th character. An example configuration file is shown below:

```
OUTF:MISSION.DAT
AREA:BAY AREA
NAME:J.B. SMITH
NOTE:SAMPLE .CFG FILE
```

The configuration file is optional. It is used only by the DOS version of MCONVERT. If a configuration file is not included in the MCONVERT command line, details for area, name, and note may still be entered manually in the Mission Setup screen.

Code File

The code file is a text file that contains a list of code numbers in conjunction with point descriptors. The code file must be named CODE.DAT in order to be recognized by the handheld program. The purpose of this file is to streamline the entry of point descriptors through the use of short codes. The point code and point descriptor can

have up to four characters each and are space delimited. Only the descriptor is saved in the output files (*.OUT). A sample code file is shown below:

1 FENC

14A PIPE

37 TREE

207 TOE

The first column is the point code which is entered in the handheld software field “point code”. The point code can be up to four characters. The second column is the point descriptor which is the text string associated with the point code. The point descriptor can be up to four characters. The two strings are seperated by a space. The Point code is not saved in the output files (*.OUT).

Output Files

Points logged to the handheld are stored in two files. An ASCII file named M.OUT stores point code, point id, and coordinate data. A binary file with the name of the mission file stores the same data as the ASCII output file along with additional information.

M.OUT ASCII File. This file is created when the software is started. If the file already exists, logged points are appended to the file.

The file is ASCII and can be renamed using any valid DOS filename. The file is similar to the input file but does not contain a header. Four additional fields are added to each point. Each point is logged to a single line.

A typical point format is shown below:

FENC 12345A 25485.880 148772.810 2120.411 0.020 0.040 2.213 *

Where:

FENC	The descriptor associated with the Point Code entered.
12345A	The Point ID entered.
25485.800	The Easting value of the logged point.
148772.810	The Northing value of the logged point.
2120.411	The Elevation value corrected by the Antenna Height.
0.020	The HRMS value for the point logged.
0.040	The VRMS value for the point logged.
2.213	The Antenna Height entered for the point.
*	Indicates that an offset has been applied to the position value.
x	The memo string entered.

Filename.OUT Binary File. Points logged to the handheld are stored in a binary file. This file is created when the mission file (*.DAT) is selected in the handheld program. The file is binary and is given the same name as the mission file selected. This file can be loaded in GPSeismic, a seismic surveying analysis package for data analysis and output.

SEISREAD.EXE

The DOS utility SEISREAD.EXE can be used to convert a binary output file to a comma delimited ASCII file. Program usage is as follows:

SEISREAD MISSION.OUT > MISSION.LST

Where:

seisread is the program name

mission.out is the binary output file

> is the DOS command to pipe to a file

mission.lst is the ascii output file

The ASCII file format is as follows:

ID,forID,Comment,Code,Week,Day,Time,Latitude,Lontude,HAE,Ofs(lat),Ofs(lng),
Ofs(HAE),Delta(HAE),Sats,Soltype,Solifo,ANH,HRMS,VRMS,PDOP,HDOP,VDOP,
|Dev(lat),Dev(lng),Dev(alt),Corr(lat,lng),Corr(lat,alt),Corr(lng,alt),SITE ID

Where:

Table 2.8: Seisread Output

Field	Description
ID	Point id stored.
for ID	For Point id from COGO.
Comment	Memo stored.
Code	Descriptor stored.
Week	GPS week number.
Day	Day of the week.
Time	GMT time of day.
Latitude	Position latitude
Longitude	Position longitude
HAE	Position height
Ofs(lat)	Offset latitude stored from OFFSET.
Ofs(lng)	Offset longitude stored from OFFSET.
Ofs(HAE)	Offset height stored from OFFSET.
Delta(HAE)	Height correction stored from H-CORR.

Table 2.8: Seisread Output (continued)

Field	Description
Sats	Number of satellites used for the position solution.
Sol type	Solution type.
Sol info	Solution grade.
ANH	Antenna height stored.
HRMS	Horizontal RMS.
VRMS	Vertical RMS.
PDOP	PDOP
HDOP	HDOP
VDOP	VDOP
Dev(lat)	Latitude quality indicator.
Dev(lng)	Longitude quality indicator.
Dev(alt)	Altitude quality indicator.
Corr(lat,lng)	Latitude/longitude correlation.
Corr(lat,alt)	Latitude/altitude correlation.
Corr(lng,alt)	Longitude/altitude correlation.
SITE ID	Site id stored in LGPT for post processing.

Offsetting

Points can be offset to allow you to log points that are physically inaccessible, and to survey around locations which would adversely affect GPS (i.e. high walls, large equipment, trees, etc.). When a point is logged with an offset, the logged position is adjusted by the offset value, and an offset indicator appears in the output file (See “File Formats” on page 22).

The Mine Surveyor II system offers several functions for point offsets. These features are found in the Feature Logging (FEAT) screen (for details see *Reference* chapter) and enable you to offset any point or series of points. The offset options are:

- Grid
- Bearing
- Side
- Laser range finder
- From current line

Offset by Grid

In this method, the point is offset in terms of Easting and Northing, as shown in Figure 2.7.

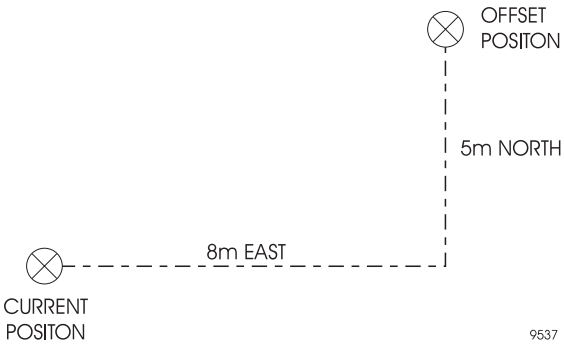

Figure 2.7: Offset by Grid

You can enter any value for easting and northing offset. To offset west or south, negative numbers are used. See the OFST (POINT OFFSET by GRID) screen in the *Reference* chapter for further details.

When the point is saved, the position for the antenna is read and the offsets applied. The point is stored as an offset position, with an indicator to show that the point was logged with an offset.

Offset by Bearing

In this method, the point is offset in terms of Distance and Azimuth, as shown in Figure 2.8.

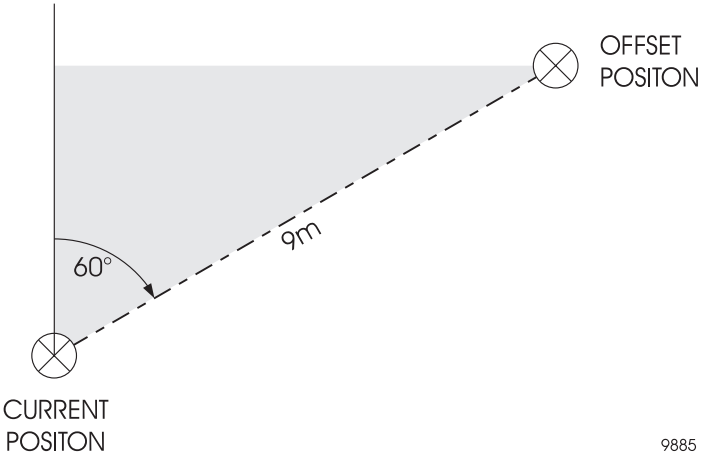

Figure 2.8: Offset by Bearing

You can enter any value for distance and azimuth offset. See OFST (POINT OFFSET by BEARING) screen in the *Reference* chapter for further details.

When the point is saved, the position for the antenna is read and the offsets applied. The point is stored as an offset position, with an indicator to show that the point was logged with an offset.

Offset by Side

In this method, the point or points are offset in terms of Distance and a Side, as shown in Figure 2.9.

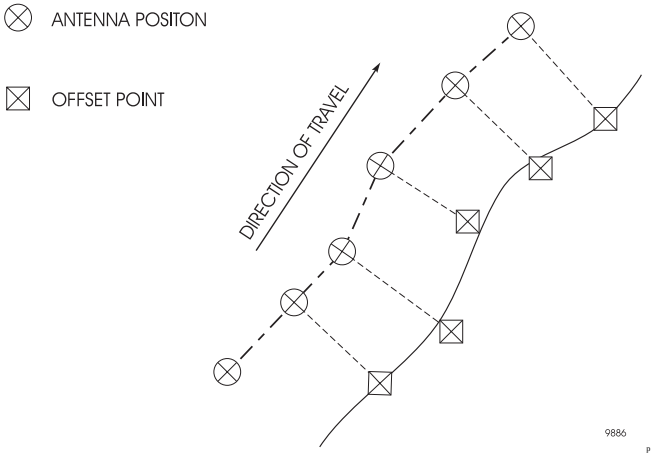

Figure 2.9: Offset by Side

The Offset by Side function calculates the position for the offset point by referencing the previous position. A line is calculated from the previous position (start point) to the current position and the point is offset, perpendicular to this line, in the direction indicated at the distance entered. The side is determined by the direction of travel or by the azimuth of the start point.

The Offset by Side function can be used with the TOPO function or as a single point offset. During TOPO logging, the initial logged position is used as the start point and is not offset. The next point logged, at the TOPO interval or distance, is offset and is then referenced as the start point.

For single-point logging, you must enter the start point. This point can be entered as Last Logged, the current position, or any point defined in the mission file. All logged points are offset perpendicular to the line calculated between the entered start point and the current position.

When the point is saved, the position for the antenna is read and the offsets are applied. The point is stored as an offset position, with an indicator to show that the point was logged with an offset.

Offset by Laser Range Finder (LRF)

In this method, the point is offset in terms of Distance and Azimuth as read from the LRF, as shown in Figure 2.10.

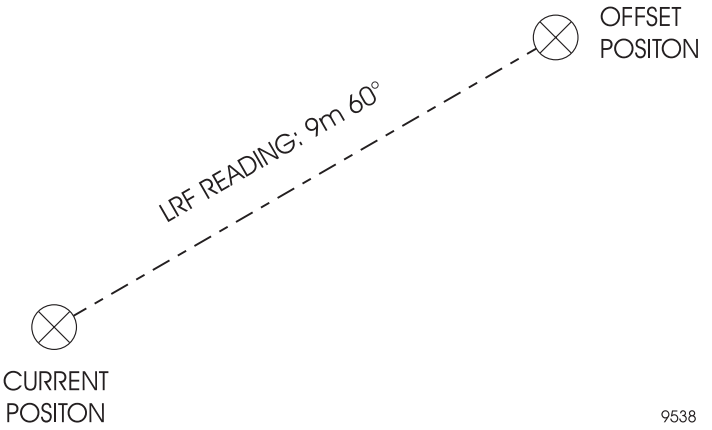

Figure 2.10: Offset by Laser Range Finder (LRF)

The system reads a value for distance and azimuth offset from the LRF unit. You can then accept these values or enter corrected values. See the OFST (POINT OFFSET by LRF) screen in the *Reference* chapter for further details.

When the point is saved, the position for the antenna is read and the offsets are applied. The point is stored as an offset position, with an indicator to show that the point was logged with an offset.

Offset from Current Line

In this method, the point is offset in terms of the currently defined line, as shown in Figure 2.11.

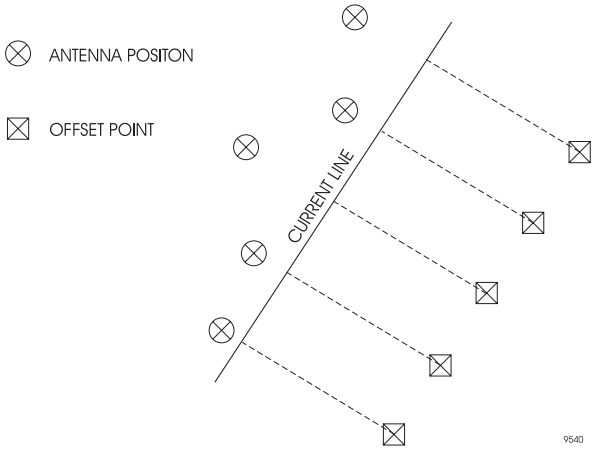

Figure 2.11: Offset from Current Line

The system will offset all points by a distance and direction that you enter, referenced to the line currently defined in the LINE function. The system only considers the location of the antenna position in terms of a perpendicular crossing of the line. See the OFST (POINT OFFSET from CURRENT LINE) screen in the *Reference* chapter for further details.

When the point is saved, the position for the antenna is read and the offsets are applied. The point is stored as an offset position, with an indicator to show that the point was logged with an offset.

The current line, defined within the navigation screens, may contain several solutions. The first time a navigation screen is called, the start point is your current position and the end point is the selected point being navigated. Changes to points being navigated will adjust the order of the points defining the current line. The start point can be changed to your current position by selecting the FRHR button in the LINE navigation screen.

For example, a mission file with points 0001, 0002, and 0003 exists and the selected point being navigated is 0001. The first current line is defined as the current position to point 0001. The NEXT button is pressed to select point 0002 as the point being navigated. The current line is defined as point 0001 to point 0002. To define the current line as your current position to point 0002, press the FRHR button in the LINE navigation screen.

Cut/Fill

The Mine Surveyor II system can perform real-time cut/fill calculations based on a single user-defined grade vector.

The system provides a real-time grade calculation based on points logged, or can be configured to provide cut/fill values based on a desired grade.

The cut/fill function requires the initial definition of a grade vector. This vector provides the reference for all cut/fill calculations, as shown in Figure 2.12.

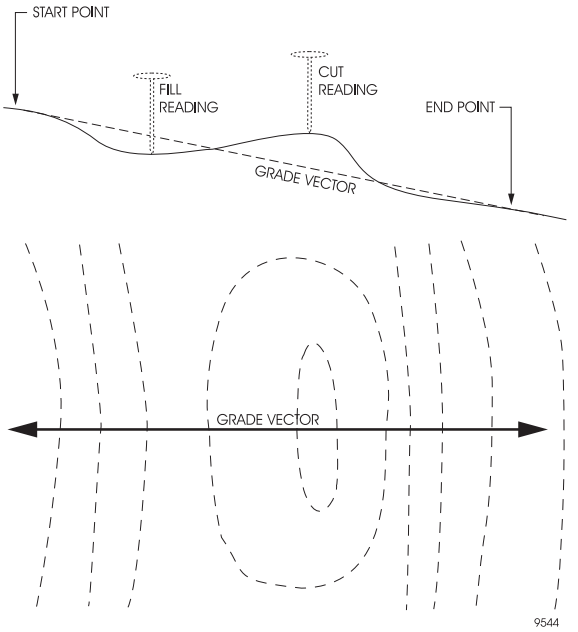

Figure 2.12: Grade Vector Definition

The grade vector can be defined in two ways. The first method is to reference the start and end of the vector from points selected from the current mission file.

The second method allows you to log the start and end points of the vector. An additional feature allows you to log the start and end of the vector over a short distance, and to extend that distance to any length, as shown in Figure 2.13.

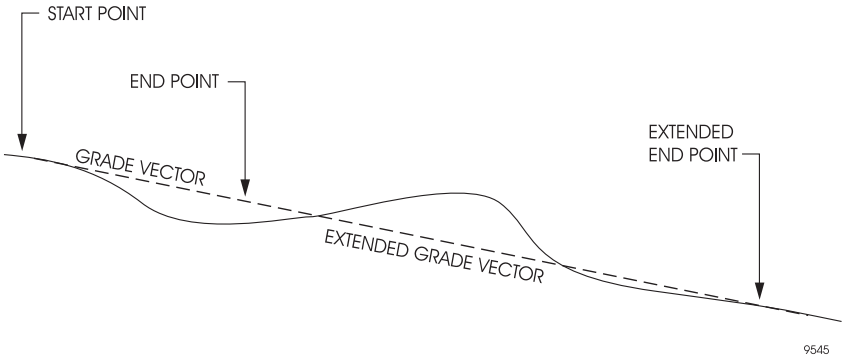

Figure 2.13: Log Start and End Points of Vector

Any grade value calculated from logging the start and end points can be adjusted using the desired grade function. If you change the grade value using this function, the system will reposition the end point in the calculation to reflect the desired grade value.

Once the grade vector has been defined, you can obtain real-time cut/fill readings at any point near the grade vector. If readings are required behind the start point, past the end point, or far from the grade vector location, you should define a new grade vector. See the CUFL (cut/fill) screen in the *Reference* chapter for further details.

Coordinate Geometry

Points for storage in the mission file can be created using coordinate geometry. The Mine Surveyor IIsystem offers several coordinate geometry functions. The options are:

- Location by Azimuth and Distance
- Coordinate Inverse
- Intersection by Point to Line (Point/Azimuth)
- Intersection by Point to Line (Point/Point)
- Intersection by Azimuths
- Intersection by Distances
- Intersection by Distance and Azimuth

The azimuth values in the coordinate geometry functions are grid based.

Location by Azimuth and Distance

In this method, the point is created using a from point and a distance/azimuth, as shown in Figure 2.14.

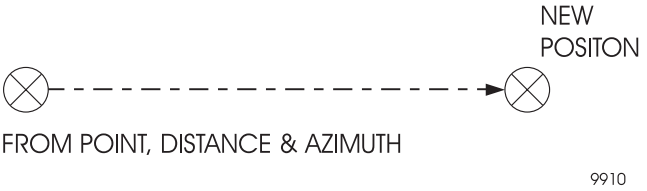

Figure 2.14: Location by Azimuth and Distance

Location by Azimuth and Distance is a three step process. In step 1, enter any value for easting and northing, select an existing point in the mission file, or use the current calculated GPS position. In step 2, enter a distance value and an azimuth value. In step 3, the solution is displayed where you can assign a point id for reference to the mission file. See the LOCATION BY AZIMUTH AND DISTANCE section in the *Reference* chapter for further details.

Coordinate Inverse

In this method, distance and azimuth between two points is returned, as shown in Figure 2.15.

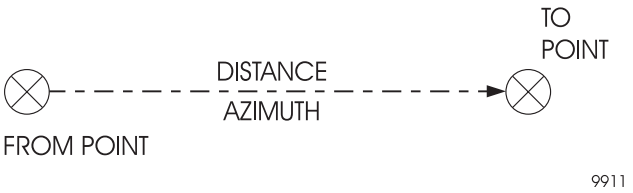

Figure 2.15: Coordinate Inverse

Coordinate Inverse is a three step process. In step 1, you can enter any value for easting and northing or select an existing point in the mission file for the from point. In step 2, you can enter any value for easting and northing or select an existing point in the mission file for the to point. In step 3, the solution is displayed. The solution can be saved for use in other coordinate geometry functions such as Location by

Azimuth and Distance. See the COORDINATE INVERSE section in the *Reference* chapter for further details.

Intersection by Point to Line (Point/Azimuth)

In this method, the new position is created by the intersection of the defined baseline (point/azimuth) and the right angle extension to the from point, as shown in Figure 2.16.

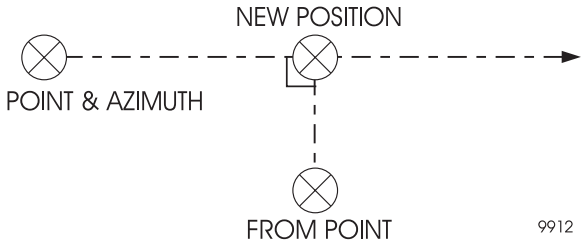

Figure 2.16: Intersection by Point to Line

Intersection by Point to Line (Point/Azimuth) is a three step process. In step 1, you define the baseline using a point and azimuth. You can enter any value for easting and northing or select an existing point in the mission file. Enter an azimuth. In step 2, you enter a from point which will intersect the baseline at a 90 degree angle. You can enter any value for easting and northing or select an existing point in the mission file. In step 3, the solution is displayed where you can assign a point id for reference to the mission file. See the INTERSECTION BY POINT TO LINE (POINT/AZIMUTH) section in the *Reference* chapter for further details.

Intersection by Point to Line (Point/Point)

In this method, the new position is created by the intersection of the defined baseline (point/point) and the right angle extension to the from point, as shown in Figure 2.17.

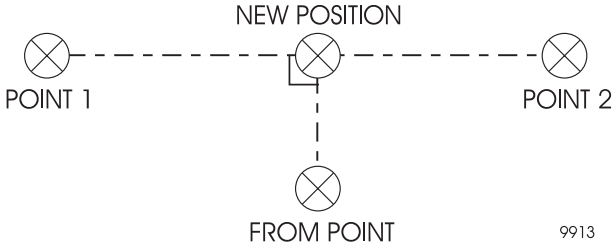

Figure 2.17: Intersection by Point to Line

Intersection by Point to Line (Point/Point) is a four step process. In step 1, you define the first point of the baseline. You can enter any value for easting and northing or select an existing point in the mission file. In step 2, you define the second point of the baseline. You can enter any value for easting and northing or select an existing point in the mission file. In step 3, you enter a from point which will intersect the baseline at a 90 degree angle. You can enter any value for easting and northing or select an existing point in the mission file. In step 4, the solution is displayed where you can assign a point id for reference to the mission file. See the INTERSECTION BY POINT TO LINE (POINT/POINT) section in the *Reference* chapter for further details.

Intersection by Azimuths

In this method, the new position is created by the intersection of two defined baselines (point 1/azimuth and point 2/azimuth), as shown in Figure 2.18

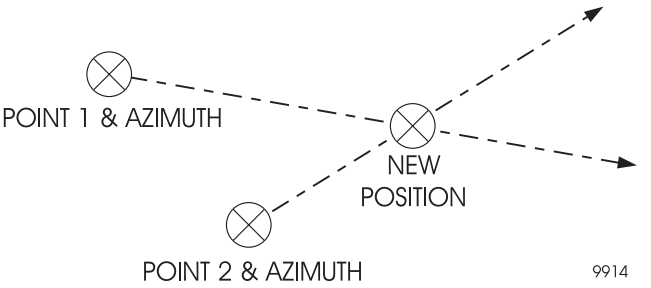

Figure 2.18: Intersection by Azimuths

Intersection by Azimuths is a three step process. In step 1, you define the first line by point and azimuth. You can enter any value for easting and northing or select an existing point in the mission file. In step 2, you define the second line by point and azimuth. You can enter any value for easting and northing or select an existing point in the mission file. In step 3, the solution is displayed where you can assign a point id for reference to the mission file. See the INTERSECTION BY AZIMUTHS section in the *Reference* chapter for further details.

If an intersection between the two point/azimuth lines does not exist, pressing the NEXT button returns an audible beep. Change the coordinate and azimuth values in step 1 or step 2.

Intersection by Distances

In this method, the new position is created by the intersection of two defined circles (point 1/distance and point 2/distance), as shown in Figure 2.19.

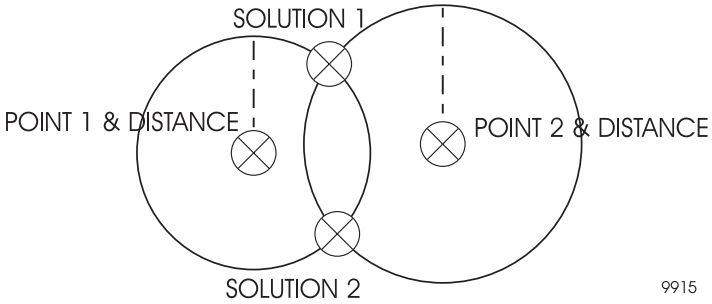

Figure 2.19: Intersection by Distances

Intersection by Distances is a four step process. In step 1, you define the first circle by point and distance. You can enter any value for easting and northing or select an existing point in the mission file. Enter a distance value. In step 2, you define the second circle by point and distance. You can enter any value for easting and northing or select an existing point in the mission file. Enter a distance value. In step 3, the first of two solutions is displayed where you can assign a point id for reference to the mission file. The first solution is calculated as the first intersect which occurs clockwise from 0 degrees on the circle defined by point 1. Another method to determine the solution order is the first solution is on the left side from point 1 to point 2. In step 4, the second of two solutions is displayed where you can assign a point id for reference to the mission file. See the INTERSECTION BY DISTANCES section in the *Reference* chapter for further details.

If an intersection between the two point/distance circles does not exist, pressing the NEXT button returns an audible beep. Change the coordinate and distance values in step 1 or step 2.

Intersection by Distance and Azimuth

In this method, the new position is created by the intersection of a defined line (point 1/distance) and a defined circle (point 2/azimuth), as shown in Figure 2.20.

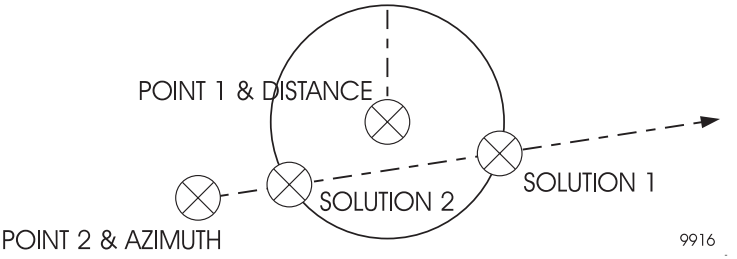

Figure 2.20: Intersection by Distance and Azimuth

Intersection by Distance and Azimuth is a four step process. In step 1, you define the circle by point and distance. You can enter any value for easting and northing or select an existing point in the mission file. Enter a distance value. In step 2, you define the line by point and azimuth. You can enter any value for easting and northing or select an existing point in the mission file. Enter an azimuth value. In step 3, the first of two solutions is displayed where you can assign a point id for reference to the mission file. The first solution is calculated as the first intersect which occurs clockwise from 0 degrees on the circle defined by point 1. In step 4, the second of two solutions is displayed where you can assign a point id for reference to the mission file. See the INTERSECTION BY DISTANCE AND AZIMUTH section in the *Reference* chapter for further details.

If an intersection between the point/distance circle and the point/azimuth line does not exist, pressing the NEXT button returns an audible beep. Change the coordinate and distance values in step 1 or the coordinate and azimuth values in step 2.

The Anchor Point System

Mine Surveyor II has the capability to compute transformation parameters between WGS-84 GPS positions and a local coordinate system. The MCONVERT software (See Creating Input Files Using MCONVERT) is used to input a file containing local points so they can be read by the Mine Surveyor. No mention of this module is made in the Reference Chapter regarding screen function capability other than how to access the Anchor Point system through the System Selection screen (SYST).

You are required to enter the actual geodetic position and the local coordinates for each point. The system then calculates the transformation between systems.

The system can be defined using two methods: **local occupations** or **coordinate list** entry. Additional points can be added at any time to strengthen the calculation.

Procedure

1. In the field run the Anchor Point program on the control points to be used for the transformation.

The local coordinates can only be manually entered. Anchor Point does not read points from the .DAT input file. Therefore, a .DAT file does not need to exist in the data directory prior to doing the Anchor Point procedure.

2. The Anchor Point program will create a TOPO.LSY file. Transfer this file to the directory where the MCONVERT.EXE program resides.

Local Occupation Entry

When the system is operating in real-time mode, local area points can be occupied and entered into the system calculation using the HERE function. The geodetic coordinates for the point are taken from the current GPS position. You can then enter the local coordinates for the point.

Coordinate List Entry

Using the EDIT or NEW functions, you can enter all point information manually, for both the GPS coordinate and the local coordinate.

Local System Definition

The Anchor Point System is accessed by setting FORMAT to GRID in the DSST screen, pressing SYST and then highlighting local as shown in Figure 2.21.

.

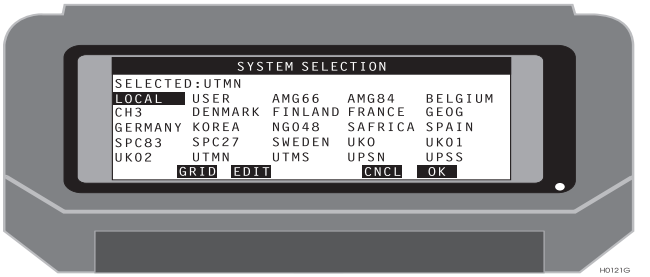

Figure 2.21: System Selection (SYST) screen

Press EDIT to display the Local System Parameters.

If no TOPO.lsy file is found, you will hear a beep and the message "Cannot Open Legal System" file will be displayed. Press enter to continue and a new TOPO.lsy will be created.

Local System Parameters

The local system parameters screen, Figure 2.22, displays parameters which define the local system.

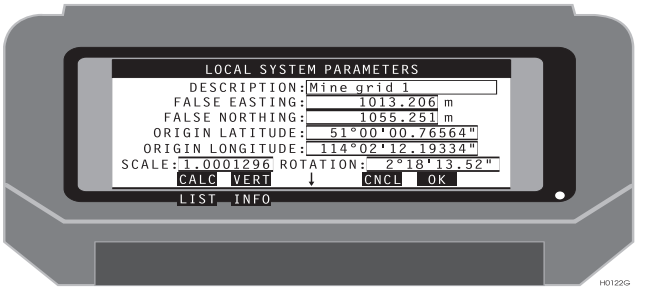

Figure 2.22: Local System Parameters

Table 2.9 describes the items shown on the local system parameters screen.

Table 2.9: Local System Parameters

Item	Description
FALSE EASTING	Editable Field. The False Easting of the local system.
FALSE NORTHING	Editable Field. The False Northing of the local system.
ORIGIN LATITUDE	Editable Field. The Origin Latitude of the local system.
ORIGIN LONGITUDE	Editable Field. The Origin Longitude of the local system.
SCALE	Editable Field. The Scale Factor of the local system.
ROTATION	Editable Field. The Rotation of the local system.
CALC	Calculates new parameters for the local system based on anchor points in the list.
VERT	Calculates new local vertical parameters using the points in the list.
CNCL	Cancels any changes and returns you to the previous screen
OK	Accepts any changes and returns you to the previous screen.
LIST	Selects the Anchor Point List screen.
INFO	Selects the Local System Information screen

Anchor Point List

The anchor point list screen, Figure 2.23, displays the points currently used in the definition.

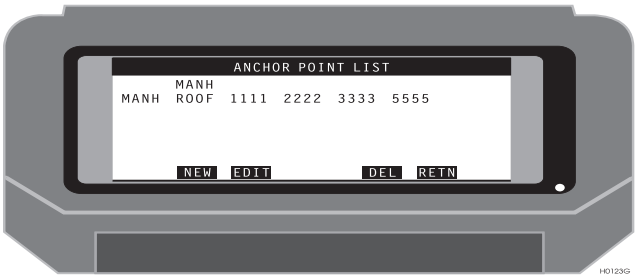

Figure 2.23: Anchor Point List

Table 2.10 describes the items on the anchor point list screen.

Table 2.10: Anchor Points List Parameters

Item	Description
MANH, ROOF, 1111	The names of the points currently used in the definition.
NEW	Selects the EDIT NEW ANCHOR POINT screen

Table 2.10: Anchor Points List Parameters

Item	Description
EDIT	Selects the EDIT ANCHOR POINT screen
DEL	Deletes the highlighted point from the current definition.
RETN	Returns you to the previous screen

Edit Anchor Point (Local)

The edit anchor point screen (local), Figure 2.24, allows you to edit a point in the current point list for local coordinates.

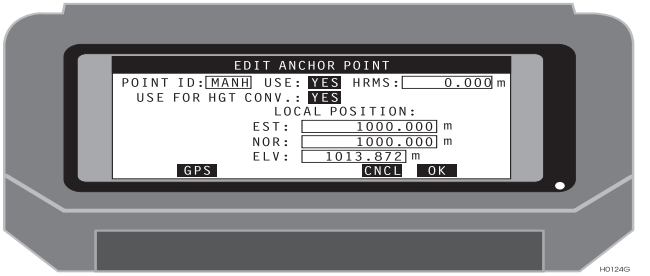

Figure 2.24: Edit Anchor Point (local)

Table 2.11 describes the items on the anchor point screen.

Table 2.11: Anchor Point List Parameters

Item	Description
POINT ID	The name of the current point selected.
USE	Toggle Field. Allows you to select this point for the local system definition.
HRMS	Editable Field. The Horizontal RMS value for this coordinate.
USE FOR HGT CONV	Toggle Field. Lets you to select this point for the local system vertical definition.
EST	Editable Field. The easting value for this point.
NOR	Editable Field. The northing value for this point.
ELV	Editable Field. The elevation value for this point.
GPS	Selects the EDIT ANCHOR POINT screen for GPS coordinates.
CNCL	Cancels any changes and return you to the previous screen
OK	Accepts any changes and return you to the previous screen

Edit Anchor Point (GPS)

The edit anchor point (GPS) screen, Figure 2.25, allows you to edit a point in the current point list for the GPS coordinates.

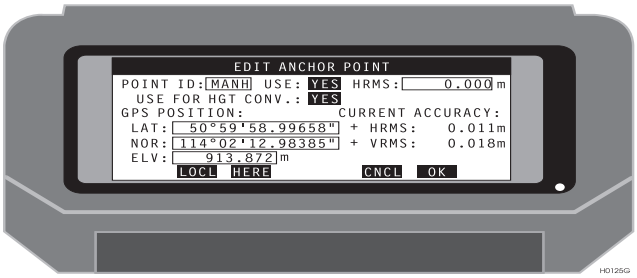

Figure 2.25: Edit Anchor Point (GPS)

Table 2.12 describes the items on the edit anchor point (GPS) screen.

Table 2.12: Edit Anchor Point (GPS) Parameters

Item	Description
POINT ID	The name of the current point selected.
USE	Toggle Field. Lets you to select this point for the local system definition.
HRMS	Editable Field. The horizontal RMS value for this coordinate.
USE FOR HGT CONV	Toggle Field. Lets you to select this point for the local system vertical definition.
LAT	Editable Field. The latitude value for this point.
LNG	Editable Field. The longitude value for this point.
ELV	Editable Field. The elevation value for this point.
CURRENTACCURACY (HRMS/VRMS)	The current horizontal and vertical accuracy for the real-time GPS position.
LOCAL	Selects the EDIT ANCHOR POINT screen for Local coordinates.
HERE	Sets a GPS position and enters it into the LAT, LNG, and ELV fields.
CNCL	Cancels any changes and returns you to the previous screen
OK	Accepts any changes and returns you to the previous screen

Edit New Anchor Point (Local)

The edit new anchor point (local) screen, Figure 2.26, allows you to enter a new point into the definition list.

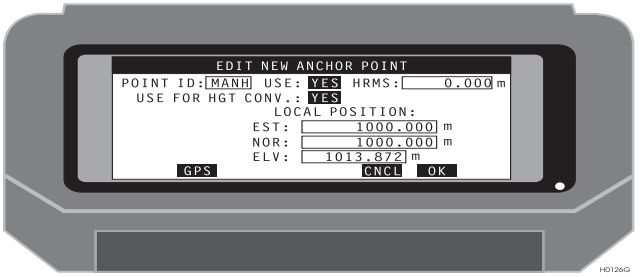

Figure 2.26: Edit New Anchor Point (Local)

Table 2.13 describes the items on the edit new anchor point (local) screen..

Table 2.13: Edit New Anchor Point (Local) Parameters

Item	Description
POINT ID	The name of the current point selected.
USE	Toggle Field. Lets you to select this point for the local system definition.
HRMS	Editable Field. The horizontal RMS value for this coordinate.
USE FOR HGT CONV	Toggle Field. Lets you to select this point for the local system vertical definition.
EST	Editable Field. The easting value for this point.
NOR	Editable Field. The northing value for this point.
ELV	Editable Field. The elevation value for this point.
GPS	Selects the EDIT ANCHOR POINT screen for GPS coordinates.
CNCL	Cancels any changes and returns you to the previous screen
OK	Accepts any changes and returns you to the previous screen

Edit New Anchor Point (GPS)

The edit new anchor point (GPS) screen, Figure 2.27, allows you to enter a new point into the definition.

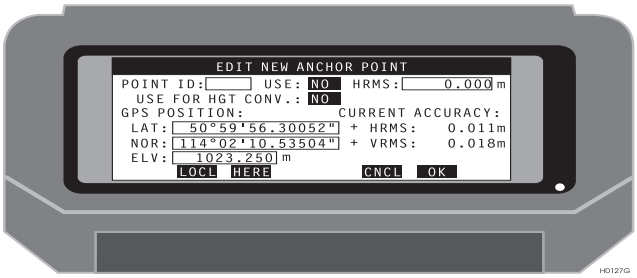

Figure 2.27: Edit New Anchor Point (GPS) Screen

Table 2.14 describes the items on the edit new anchor point (GPS) screen

Table 2.14: Edit New Anchor Point (GPS) Parameters

Item	Description
POINT ID	The name of the current point selected.
USE	Toggle Field. Lets you to select this point for the local system definition.
HRMS	Editable Field. The horizontal RMS value for this coordinate.
USE FOR HGT CONV	Toggle Field. Lets you select this point for the local system vertical definition.
LAT	Editable Field. The latitude value for this point.
LNG	Editable Field. The longitude value for this point.
ELV	Editable Field. The elevation value for this point.
CURRENT ACCURACY (HRMS/VRMS)	The current horizontal and vertical accuracy for the real-time GPS position.
LOCAL	Selects the EDIT ANCHOR POINT screen for Local coordinates.
HERE	Sets a GPS position and enters it into the LAT, LNG, and ELV fields.
CNCL	Cancels any changes and returns you to the previous screen
OK	Accepts any changes and returns you to the previous screen

Local System Information

The local system information screen, Figure 2.28, displays the calculation parameters for the current definition.

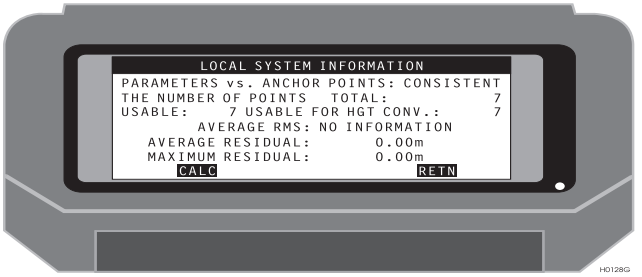

Figure 2.28: Local System Information

Table 2.15 describes the items on the local system information screen.

Table 2.15: Local System Information Parameters

Item	Description
PARAMETERS vs.ANCHOR POINTS	Indicates whether the latest anchor points have been used in the local parameter calculation (consistent). If additional anchor points have been logged, but not added to the local parameter solution, inconsistent will appear.
THE NUMBER OF POINTS TOTAL	The total number points used in the calculation
USABLE	The number of points which can be used in the calculation
USABLE FOR HGT CONV	The number of points which can be used in the height calculation
AVERAGE RMS	The average RMS value for the system calculation
AVERAGE RESIDUAL	The average of the residual for the points used in the calculation
MAXIMUM RESIDUAL	The maximum residual for the points used in the calculations
CALC	Calculates the coordinate conversion using the current points in the definition.
RETN	Returns you to the previous screen.

Local System Vertical Parameters

The local system vertical parameters screen, Figure 2.29, displays the current definition for the local vertical calculation

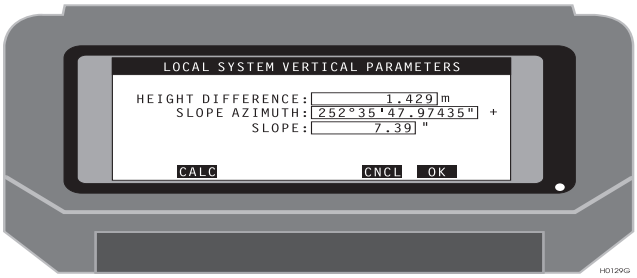

Figure 2.29: Local System Vertical Parameters

Table 2.16 describes the items on the local system vertical parameters screen.

Table 2.16: Local System Vertical Parameters

Item	Description
HEIGHT DIFFERENCE	The height difference for the current local system definition
SLOPE AZIMUTH	The azimuth of the slope for the current local system definition
SLOPE	The slope for the current local system definition
CALC	Calculates a value for the vertical parameters
CNCL	Ignores all changes and returns you to the previous screen
OK	Accepts all changes and returns you to the previous screen

Tutorial

This tutorial steps through the basic functionality of Mine Surveyor II. The following topics are detailed.

- Data Collection for Post Processing
- RTK Setup
- RTK Data Logging
- Offsetting
- Stakeout
- Coordinate Geometry
- RTK Output File

Data Collection for Post Processing

There are three modes of data collection and two modes of processing. Each processing mode requires a specific method of field data collection. Mine Surveyor II supports data collection for WinPrism and Ashtech Office Suite for Survey. The following table details the field methods/file structures and processing modes of the processing packages.

Table 3.1: Field Methods

Data Collection Method	WinPrism Processing Modes	AOSS Processing Modes
Single site static	Static	Static
Multi-site static	Pseudo	Rapid Static
Dynamic	Kinematic	Kinematic

Single Site Static

The single site static method creates a file in the GPS receiver which contains epochs of data with the same site id. This method is typically used for conventional static surveys using most all types of GPS receivers. This method is also used when storing data in a RTK base receiver. Use the static processing mode in both WinPrism and AOSS with this file type.

Check Receiver Memory

Verify that there is free memory available for your survey. Download unnecessary files and erase the files from the receiver. Connect the Husky to the receiver and start Mine

Surveyor II. Go to the FILE MANAGEMENT (FILE) screen. Select a file (SEL). The filename will be displayed in the right pane. Delete the file (DEL). Continue this process to delete unnecessary files. Return to the main menu (RETN).

System Setup

Continue to the MISSION SETUP (GO) screen. Continue to the LOG POINT DATA (LGPT) screen. Continue to the DATALOGGING SETUP (LGST) screen. Set the following parameters;

> RECORD INT, ELEV MASK, ANTENNA HT, OCCUP TIME, DATA TO LOG, and TRAJECTORY.

The RECORD INT parameter is the receiver recording interval. This parameter must be the same between all receivers in the survey. A recording interval of 5 seconds is adequate for most static surveys. Experience over time will dictate what value meets your project needs.

The ELEV MASK parameter is the receiver elevation mask. The default is 10 degrees. This parameter should be the same between all receivers. An elevation mask of 10 degrees is adequate for most surveys.

The ANTENNA HT parameter is the antenna height. Measure the vertical height of the antenna phase center. This value will be input in the post processing software to reduce the GPS measurements from the antenna height to ground height.

The OCCUP TIME parameter is the receiver occupation time. Occupation times vary widely due to type of equipment, length of baseline being measured, level of accuracy desired, and environmental conditions. A good rule of thumb for Z and GG series receivers is 10 minutes for the first 10 km and an additional minute for each km thereafter. Single frequency receivers require substantially more time. A good rule of thumb is 45 minutes for the first 10 km and an additional 5 minutes for each km thereafter. Experience over time will dictate what value meets your project needs. For long occupation times or for unattended operation, enter a value of 0.00. An occupation time of 0.00 will set the receiver to log data continuously. This is ideal for setting a RTK base station to log data for post processing.

The DATA TO LOG parameter is the type of data to be stored in the GPS receiver. There are three available types; carrier phase, pseudo range, and position. Select carrier phase for all post processing data collection tasks.

The TRAJECTORY parameter controls the storage of data between sites. Select NO for static surveys.

Save the parameters and return to the LOG POINT DATA screen (OK).

Log Data

The LOG POINT DATA screen contains fields which may not pertain to your survey. The POINT ID, POINT CODE, and MEMO fields are used by packages developed for specific markets and are not supported by the standard data processing packages.

Enter a site id in the SITE ID field. Valid characters include 0-9, A-Z, (,), ?, &, #, _, -. When numerals are used, the site id will automatically increment by 1.

Begin logging data by pressing LOG. If an occupation time greater than 0.00 was entered, an epoch counter box will be displayed. The remaining epochs and system status is displayed. If an occupation time of 0.00 was entered, a rotating dial is displayed to inform you that the system is logging data to the receiver.

Stop Data Logging and Close the File

Will you power down the receiver between sites or stay powered up between sites? Depending on the length of time between sessions, you might consider turning off the GPS receiver to preserve your battery.

There are two options depending on the occupation time.

1. If an occupation time greater than 0.00 was entered, the system will stop data logging after the occupation time has expired. If an occupation time greater than zero was entered, the data logging process can be stopped at any point by pressing the ‘Esc’ key (standard keyboard) or the ‘F1’ key (TDS keyboard). At this point, you would either pick and move to the next site or if you’re the ‘hinge’ point in a network survey, you’d stay put. Either way, you’ll need close the receiver file before you begin the next session.

   To close the current file you can either turn off the receiver (the receiver will close the current file and automatically open a new one when turned back on) or, if you plan to leave the receiver powered on during the move or the wait between sessions, use the data collector to close the file. To do this, return to the main screen and continue to the FILE MANAGEMENT (FILE) screen. Highlight the last file and press CLOS. The data collector will ask you if you want to close the file; answer yes (Y). A new file with the same site id will be created. At this point, the receiver is not collecting data.

2. If the entered occupation time was 0.00, the receiver will continue to log data until you physically stop it with either the data collector or by turning off the receiver.

   Turn off the receiver if you plan to power down the receiver between sessions. If you plan to leave the receiver powered on during the move or the wait between sessions, use the data collector to close the file. From the LOG POINT DATA screen, continue to the DATALOGGING SETUP screen (LGST). Verify that the TRAJECTORY parameter is set to NO and press OK. This will stop data logging leaving the current file open. Return to the

main screen and continue to the FILE MANAGEMENT (FILE) screen. Highlight the last file and press CLOS. The data collector will ask you if you want to close the file; answer yes (Y). A new file with the same site id will be created. At this point, the receiver is not collecting data.

Multi-site Static

The multi-site static method creates a file in the GPS receiver which contains epochs of data with different site ids. An array of data contains the same site id followed by subsequent arrays of data containing the same site id within the array, but with different site ids than the previous array. This method is typically used for rapid static surveys using Z and GG series GPS receivers. Use the pseudo processing mode in WinPrism or the rapid static mode AOSS with this file type.

Check Receiver Memory

Verify that there is free memory available for your survey. Download unnecessary files and erase the files from the receiver. Connect the Husky to the receiver and start Mine Surveyor II. Go to the FILE MANAGEMENT (FILE) screen. Select a file (SEL). The filename will be displayed in the right pane. Delete the file (DEL). Continue this process to delete unnecessary files. Return to the main menu (RETN).

System Setup

Continue to the MISSION SETUP (GO) screen. Continue to the LOG POINT DATA (LGPT) screen. Continue to the DATALOGGING SETUP (LGST) screen. Set the following parameters;

RECORD INT, ELEV MASK, ANTENNA HT, OCCUP TIME, DATA TO LOG, and TRAJECTORY.

The RECORD INT parameter is the receiver recording interval. This parameter must be the same between all receivers in the survey. A recording interval of 2 seconds is adequate for most rapid static surveys. Experience over time will dictate what value meets your project needs.

The ELEV MASK parameter is the receiver elevation mask. The default is 10 degrees. This parameter should be the same between all receivers. An elevation mask of 10 degrees is adequate for most surveys.

The ANTENNA HT parameter is the antenna height. Measure the vertical height of the antenna phase center. This value will be input in the post processing software to reduce the GPS measurements from the antenna height to ground height.

The OCCUP TIME parameter is the receiver occupation time. Enter a value greater than 0.00. Occupation times vary widely due to type of equipment, length of baseline being measured, level of accuracy desired, and environmental conditions. A good rule of thumb for Z and GG series receivers is 10 minutes for the first 10 km and an

additional minute for each km thereafter. Single frequency receivers are not recommended with this mode of surveying.

The DATA TO LOG parameter is the type of data to be stored in the GPS receiver. There are three available types; carrier phase, pseudo range, and position. Select carrier phase for all post processing data collection tasks.

The TRAJECTORY parameter controls the storage of data between sites. Select NO for rapid static surveys.

Save the parameters and return to the LOG POINT DATA screen (OK).

Log Data

The LOG POINT DATA screen contains fields which may not pertain to your survey. The POINT ID, POINT CODE, and MEMO fields are used by packages developed for specific markets and are not supported by the standard data processing packages.

Enter a site id in the SITE ID field. Valid characters include 0-9, A-Z, (,), ?, &, #, _, -. When numerals are used, the site id will automatically increment by 1.

Begin logging data by pressing LOG. An epoch counter box will be displayed. The remaining epochs and system status is displayed. The system will stop data logging after the occupation time has expired. The data logging process can be stopped at any point by pressing the 'Esc' key (standard keyboard) or the 'F1' key (TDS keyboard).

- Proceed to the next survey point.
- Repeat the site id entry and press LOG.

Close the File

When you've completed the survey, power down the receiver to close the file.

Dynamic

The dynamic method creates a file in the GPS receiver which contains epochs of data with different site ids as well as roving data. You are logging data at all times during the survey; while stationary on a point and while moving between points. An array of data contains the same site id followed by data with the site id '????', then subsequent arrays of data containing the same site id within the array, but with different site ids than the previous array. This method is typically used for dynamic or roving surveys using most all GPS receiver types. Use the kinematic processing mode in both WinPrism and AOSS with this file type.

Check Receiver Memory

Verify that there is free memory available for your survey. Download unnecessary files and erase the files from the receiver. Connect the Husky to the receiver and start Mine Surveyor II. Go to the FILE MANAGEMENT (FILE) screen. Select a file (SEL). The filename will be displayed in the right pane. Delete the file (DEL). Continue this process to delete unnecessary files. Return to the main menu (RETN).

System Setup

Continue to the MISSION SETUP (GO) screen. Continue to the LOG POINT DATA (LGPT) screen. Continue to the DATALOGGING SETUP (LGST) screen. Set the following parameters;

> RECORD INT, ELEV MASK, ANTENNA HT, OCCUP TIME, DATA TO LOG, and TRAJECTORY.

The RECORD INT parameter is the receiver recording interval. This parameter must be the same between all receivers in the survey. A recording interval of 2 seconds is adequate for most dynamic surveys. Experience over time will dictate what value meets your project needs.

The ELEV MASK parameter is the receiver elevation mask. The default is 10 degrees. This parameter should be the same between all receivers. An elevation mask of 10 degrees is adequate for most surveys.

The ANTENNA HT parameter is the antenna height. Measure the vertical height of the antenna phase center. This value will be input in the post processing software to reduce the GPS measurements from the antenna height to ground height.

The OCCUP TIME parameter is the receiver occupation time. Enter a value greater than 0.00. Occupation times vary widely due to type of equipment, length of baseline being measured, level of accuracy desired, and environmental conditions. A good rule of thumb for Z and GG series receivers is 10 minutes for the first 10 km and an additional minute for each km thereafter. Single frequency receivers are not recommended with this mode of surveying.

The DATA TO LOG parameter is the type of data to be stored in the GPS receiver. There are three available types; carrier phase, pseudo range, and position. Select carrier phase for all post processing data collection tasks.

The TRAJECTORY parameter controls the storage of data between sites. Select YES for dynamic surveys.

Save the parameters and return to the LOG POINT DATA screen (OK).

Log Data

The LOG POINT DATA screen contains fields which may not pertain to your survey. The POINT ID, POINT CODE, and MEMO fields are used by packages developed for specific markets and are not supported by the standard data processing packages.

Enter a site id in the SITE ID field. Valid characters include 0-9, A-Z, (,), ?, &, #, _, -. When numerals are used, the site id will automatically increment by 1. For dynamic surveys, you must initialize the survey at the beginning and at the end. To simplify the survey, enter ‘INIT’ as the first and last site ids during the survey.

Begin logging data by pressing LOG. An epoch counter box will be displayed. The remaining epochs and system status is displayed. The system will continue to log data with a site id ‘????’ after the occupation time has expired. Data logging to a site id can

be stopped at any point by pressing the ‘Esc’ key (standard keyboard) or the ‘F1’ key (TDS keyboard). If data logging is stopped prematurely, the site id is changed to ‘????’.

Proceed to the next survey point. Since data continues to be logged with the site id ‘????’, consider keeping the antenna upright during the move.

Repeat the site id entry and press LOG.

When you’ve completed the survey, return to the initialization point and enter the site ‘INIT’. Press LOG to log the ending initialization point.

Close the File

When you’ve completed the survey, power down the receiver to close the file.

Simultaneous Dynamic/RTK

The simultaneous dynamic/RTK method creates a file in the GPS receiver which contains epochs of data with different site ids as well as roving data. Data is also stored in the Husky binary output file. You are logging data in the GPS receiver at all times during the survey; while stationary on a point and while moving between points. An array of data contains the same site id followed by data with the site id ‘????’, then subsequent arrays of data containing the same site id within the array, but with different site ids than the previous array. The last epoch of data is also stored in the Husky binary output file. This method is used for simultaneous data storage; in the receiver for post processing; and the Husky for populating the database of GPSeismic, a seismic surveying PC analysis package. This method is only available for Z and GG series receivers with RTK firmware. Use the kinematic processing mode in both WinPrism and AOSS with this file type. These packages import the Husky binary output file to populate the database with site and preliminary position and preliminary quality information. After post processing, the post processing results are used to update the preliminary position and quality information in the GPSeismic database.

Check Receiver Memory

Verify that there is free memory available for your survey. Download unnecessary files and erase the files from the receiver. Connect the Husky to the receiver and start Mine Surveyor II. Go to the FILE MANAGEMENT (FILE) screen. Select a file (SEL). The filename will be displayed in the right pane. Delete the file (DEL). Continue this process to delete unnecessary files. Return to the main menu (RETN).

System Setup

Continue to the MISSION SETUP (GO) screen. Continue to the LOG POINT DATA (LGPT) screen. Continue to the DATALOGGING SETUP (LGST) screen. Set the following parameters;

> RECORD INT, ELEV MASK, ANTENNA HT, OCCUP TIME, DATA TO LOG, and TRAJECTORY.

The RECORD INT parameter is the receiver recording interval. This parameter must be the same between all receivers in the survey. A recording interval of 2 seconds is adequate for most dynamic surveys. Experience over time will dictate what value meets your project needs.

The ELEV MASK parameter is the receiver elevation mask. The default is 10 degrees. This parameter should be the same between all receivers. An elevation mask of 10 degrees is adequate for most surveys.

The ANTENNA HT parameter is the antenna height. Measure the vertical height of the antenna phase center. This value will be input in the post processing software to reduce the GPS measurements from the antenna height to ground height.

The OCCUP TIME parameter is the receiver occupation time. Enter a value greater than 0.00. Occupation times vary widely due to type of equipment, length of baseline being measured, level of accuracy desired, and environmental conditions. A good rule of thumb for Z and GG series receivers is 10 minutes for the first 10 km and an additional minute for each km thereafter. Single frequency receivers are not recommended with this mode of surveying.

The DATA TO LOG parameter is the type of data to be stored in the GPS receiver. There are three available types; carrier phase, pseudo range, and position. Select carrier phase for all post processing data collection tasks.

The TRAJECTORY parameter controls the storage of data between sites. Select YES for dynamic surveys.

Save the parameters and return to the LOG POINT DATA screen (OK).

Log Data

The LOG POINT DATA screen contains fields which need to be populated to support updating the GPSeismic database. The POINT ID field should be populated with a valid point id from the preplot mission file. The POINT CODE and MEMO fields are optional.

Enter a site id in the SITE ID field. Valid characters include 0-9, A-Z, (,), ?, &, #, _, -. When numerals are used, the site id will automatically increment by 1.

Begin logging data by pressing LOG. An epoch counter box will be displayed. The remaining epochs and system status is displayed. The system will continue to log data with a site id ‘????’ after the occupation time has expired. Data logging to a site id can be stopped at any point by pressing the ‘Esc’ key (standard keyboard) or the ‘F1’ key

(TDS keyboard). If data logging is stopped prematurely, the site id is changed to '????'. The last epoch is stored in the Husky binary output file.

Proceed to the next survey point. Since data continues to be logged with the site id '????', consider keeping the antenna upright during the move.

Repeat the point id and site id entry and press LOG. The point code and memo fields are optional.

Close the File

When you've completed the survey, power down the receiver to close the file.

RTK Setup

RTK data collection is available in the Z and GG series receivers. Two modes of RTK operation are available—Ashtech RTK and RTCM RTK. The Z series receivers are capable of supporting both methods depending on options available in the receiver. The GG series receivers only support RTCM RTK.

Coordinate Display Setup

The data collector stores the last configuration. At the beginning of a new project, the coordinate system display/output should be set if it is different that the previous project.

From the main screen, press GO.

From the MISSION SETUP screen, press DSST.

In the DISPLAY SETUP screen,

- Highlight the FORMAT field.
- Press the SP key to toggle between selections.
- Select GRID. For most applications, grid coordinate display is desired.
- Highlight the QUADRANT field.
- Press the SP key to toggle between selections.
- Select the quadrant you are located. NW is north of the equator and west of the prime meridian.
- Highlight the LINEAR field.
- Press the SP key to toggle between the selections.
- Select the units of measure desired.

From the DISPLAY SETUP screen, press SYST.

In the SYSTEM SELECTION screen,

- Highlight the desired coordinate system.
- Press OK to accept the selection and to return to the DISPLAY SETUP screen.

You can either use the arrow keys to highlight the desired system or press the first characters of the desired system for the data collector to perform a search.

If you selected a coordinate system which does not contains zones, press RETN to accept the settings and to return to the MISSION SETUP screen.

If you selected a coordinate system which contains zones; from the DISPLAY SETUP screen, press ZONE.

In the ZONE SELECTION screen,

- Highlight the desired coordinate system zone.
- Press OK to accept the selection and to return to the DISPLAY SETUP screen.

You can either use the arrow keys to highlight the desired system or press the first characters of the desired system for the data collector to perform a search.

- Coordinate display and output is set.

Ashtech RTK Base Setup

The base setup operation configures the RTK base receiver to broadcast data corrections. Setting the base is done in the DIFFERENTIAL SETUP and BASE STATION COORDINATES screens.

From the main screen, press GO.

From the MISSION SETUP screen, press DFST.

In the DIFFERENTIAL SETUP screen,

- Highlight the RECEIVER MODE field.
- Press the SP key to toggle between selections.
- Select RZ BASE.
- Highlight the RADIO PORT field.
- Press the SP key to toggle between selections. External radio modems should be set to port B.
- Select PORT B.
- Highlight the BAUD RATE field.
- Press the SP key to toggle between selections. Most radio modems should be set to 9600.
- Select 9600.

From the DIFFERENTIAL SETUP screen, press COOR.

In the BASE STATION COORDINATE screen,

- Enter the base station latitude, longitude, and elevation.
- Press OK to accept the entry and to return to the DIFFERENTIAL SETUP screen.

The base station coordinates can entered three ways; the current autonomous position computed by the GPS receiver can be entered by pressing HERE; a point stored in the mission file can be selected from a list by pressing PT; or the WGS84 coordinates can be manually entered in the coordinate fields. If selecting a point from the mission file, the coordinate display/output settings should have been set prior to entering the DIFFERENTIAL SETUP screen.

In the DIFFERENTIAL SETUP screen,

- Press OK to accept the settings and to return to the MISSION SETUP screen.
- The base station is set. Unplug the data collector from the base and connect to the rover.

Ashtech RTK Rover Setup

The rover setup operation configures the RTK rover receiver to receive data corrections from the base station. Setting the rover is done in the DIFFERENTIAL SETUP screen.

From the MISSION SETUP screen, press DFST.

In the DIFFERENTIAL SETUP screen,

- Highlight the RECEIVER MODE field.
- Press the SP key to toggle between selections.
- Select RZ REMOTE.
- Highlight the POSITION TO USE field.
- Press the SP key to toggle between selections.
- Select TRANSMITTED.

The rover can use either the base station position being transmitted or the base station position entered in the BASE STATION COORDINATE screen.

- Highlight the RADIO PORT field.
- Press the SP key to toggle between selections. External radio modems should be set to port B.
- Select PORT B.
- Highlight the BAUD RATE field.
- Press the SP key to toggle between selections. Most radio modems should be set to 9600.

- Select 9600.
- Highlight the MULTIPATH field.
- Press the SP key to toggle between selections. For most environmental conditions, the MEDIUM setting is acceptable. If the system takes long periods of time to initialize, try setting this field to HIGH or SEVERE.
- Select MEDIUM.
- Highlight the DYNAMICS field.
- Press the SP key to toggle between selections. For most survey applications, the WALKING setting is acceptable.
- Highlight the FAST CPD field.
- Press the SP key to toggle between selections. For constant stakeout operations, set this field to ON. For a mix of field operations including pickup and stakeout, set this field to OFF.
- Press OK to accept the settings and to return to the MISSION SETUP screen.

The rover is set. Check the system status before beginning work.

From the MISSION SETUP screen, press RETN to return to the main screen.

From the main screen, press SOLU.

The system should be computing a RTK position. The ambiguity status at the bottom left of the screen should display -F- or -X-. Press DIFF for more information.

In the DIFFERENTIAL MODE STATUS screen,

Check the QA field. This field displays the percent of successful radio messages received.

Check the DL field. This field displays the status of the data link. A ‘+’ represents data is being received and a ‘-‘ represents data not being received.

Check the SV tracking columns for base/rover usage. A ‘BR’ displayed under the SV number represents the base and rover is tracking that satellite. A ‘B’ represents the base is tracking that satellite. A ‘R’ represents the rover is tracking that satellite.

If the base and rover receivers don’t appear to be communicating, check the cable connections and verify that the base and rover setup operations were properly set.

Once the system is operational, press RETN until you reach the main screen.

RTCM RTK Base Setup

The base setup operation configures the RTK base receiver to broadcast data corrections. Setting the base is done in the DIFFERENTIAL SETUP and BASE STATION COORDINATES screens.

From the main screen, press GO.

From the MISSION SETUP screen, press DFST.

In the DIFFERENTIAL SETUP screen,

- Highlight the RECEIVER MODE field.
- Press the SP key to toggle between selections.
- Select RTCM/CPD BASE.
- Highlight the RADIO PORT field.
- Press the SP key to toggle between selections. External radio modems should be set to port B.
- Select PORT B.
- Highlight the BAUD RATE field.
- Press the SP key to toggle between selections. Most radio modems should be set to 9600.
- Select 9600.

From the DIFFERENTIAL SETUP screen, press COOR.

In the BASE STATION COORDINATE screen,

- Enter the base station latitude, longitude, and elevation.
- Press OK to accept the entry and to return to the DIFFERENTIAL SETUP screen.

The base station coordinates can entered three ways; the current autonomous position computed by the GPS receiver can be entered by pressing HERE; a point stored in the mission file can be selected from a list by pressing PT; or the WGS84 coordinates can be manually entered in the coordinate fields. If selecting a point from the mission file, the coordinate display/output settings should have been set prior to entering the DIFFERENTIAL SETUP screen.

In the DIFFERENTIAL SETUP screen,

- Press OK to accept the settings and to return to the MISSION SETUP screen.

The base station is set. Unplug the data collector from the base and connect to the rover.

RTCM RTK Rover Setup

The rover setup operation configures the RTK rover receiver to receive data corrections from the base station. Setting the rover is done in the DIFFERENTIAL SETUP screen.

From the MISSION SETUP screen, press DFST.

In the DIFFERENTIAL SETUP screen,

- Highlight the RECEIVER MODE field.

- Press the SP key to toggle between selections.
- Select RTCM/CPD REMOTE.
- Highlight the RADIO PORT field.
- Press the SP key to toggle between selections. External radio modems should be set to port B.
- Select PORT B.
- Highlight the BAUD RATE field.
- Press the SP key to toggle between selections. Most radio modems should be set to 9600.
- Select 9600.
- Highlight the FAST CPD field.
- Press the SP key to toggle between selections. For constant stakeout operations, set this field to ON. For a mix of field operations including pickup and stakeout, set this field to OFF.
- Press OK to accept the settings and to return to the MISSION SETUP screen.

The rover is set. Check the system status before beginning work.

From the MISSION SETUP screen, press RETN to return to the main screen.

From the main screen, press SOLU.

The system should be computing a RTK position. The ambiguity status at the bottom left of the screen should display -F- or -X-. Press DIFF for more information.

In the DIFFERENTIAL MODE STATUS screen,

Check the QA field. This field displays the percent of successful radio messages received.

Check the DL field. This field displays the status of the data link. A '+' represents data is being received and a '-' represents data not being received.

Check the SV tracking columns for base/rover usage. A 'BR' displayed under the SV number represents the base and rover is tracking that satellite. A 'B' represents the base is tracking that satellite. A 'R' represents the rover is tracking that satellite.

If the base and rover receivers don't appear to be communicating, check the cable connections and verify that the base and rover setup operations were properly set.

Once the system is operational, press RETN until you reach the main screen.

RTK Data Logging

RTK data logging can be accomplished in the feature screen (FEAT) and in all of the navigation/stakeout screens. Point codes can only be entered in the feature screen. In the navigation/stakeout screens, the point code is pre-assigned to the point in the

mission file. A mission file must be selected to access the SURVEY SETUP screen (SURV).

From the main screen, press GO.

From the MISSION SETUP screen, press DATA

In the MISSION FILE SELECTION screen,

- Highlight a mission file.
- Press OK to accept the selected file and to return to the MISSION SETUP screen.
- Press SURV.

From the SURVEY SETUP screen, press FEAT.

The feature screen contains fields for entering a point code, point id, memo, and antenna height. From the feature screen, continuous data logging by time or distance is available. Point offsetting by a grid, bearing, side, current line defined in the line navigation screen, and laser range finder are also available. System status is displayed with HRMS, VRMS, number of SV used in the RTK solution, current RTK position, and ambiguity fix status.

Press SAVE to store the current static position and point data to the output files.

Continuous data logging is available by pressing TOPO. An interval by time or distance value must be entered in the feature screen before pressing TOPO.

Offsetting

Offset functions are accessed from the feature screen (FEAT). Data collection of offset points based on the current position is performed in the feature screen.

From the feature screen (FEAT),

- Highlight the OFFSET field.
- Press the SP key to toggle between selections.
- Select BY GRID.
- Press OFST.

In the POINT OFFSET screen, enter an easting, northing, and/or delta height value. The calculated offset value based on the current position is stored in the output files. Only the offset coordinates are stored. The symbol '*' is stored with the position information in a column of the output files.

Stakeout

Stakeout points are stored in mission files. Mission files are reside in the MSDATA subdirectory where the program files reside on the data collector. An example mission file SAMPLE.DAT resides in the MSDATA subdirectory.

A mission file must exist in the MSDATA subdirectory.

Staking points can be accomplished with four navigation modes. A navigation mode (NAVI) displays off line error left and right, course to target, distance to target, and other navigation aids. A bull's eye mode (BULL) displays a graphical bull's eye with the point being staked centered in the graph, speed over ground, course over ground, course to target, distance to target, and cut/fill value. A line display mode (LINE) displays a line defined from points in the mission file or from the current position to a mission file point, distance traveled down line, distance off line, course to target, distance to target, and cut/fill values. A large font mode displays azimuth and distance from the point being navigated in a large font. This mode is turned on and off using the PgUp and PgDn keys on the data collector.

From the main screen, press GO.

From the MISSION SETUP screen, press DATA

In the MISSION FILE SELECTION screen,

- Highlight a mission file.
- Press OK to accept the selected file and to return to the MISSION SETUP screen.
- Press SURV.

From the SURVEY SETUP screen, press PT to select a point in the mission file.

In the POINT SELECTION screen,

- Highlight a point.
- Press OK to accept the selection and to return to the SURVEY SETUP screen.

You can either use the arrow keys to highlight the desired point or press the first characters of the desired point for the data collector to perform a search.

From the SURVEY SETUP screen, press NAVI.

In the navigation screen, various navigation aids are displayed. The most widely used fields are the course to target (CTT) and distance to target (DTT). As you move, notice the change in these two values. You can navigate to the point using these two fields. An audible alarm will sound when you're within a user defined distance from the target. This parameter is set in the ALARM SETUP screen (ALST).

From the navigation screen, press BULL.

In the bull's eye screen, a graphical bull's eye is displayed. The point being navigated is situated in the center of the graph. Course to target (CTT) and distance to target (DTT) are also displayed to aid navigation. As you move, notice the movement of the cursor displayed in the graph. An audible alarm will sound when you're within a user

defined distance from the target. This parameter is set in the ALARM SETUP screen (ALST).

From the bull's eye screen, press LINE.

In the display line screen, a graphical line is displayed. The point being navigated is situated at the top of the line. The start point, defined as either your current position or a point in the mission file, is situated at the bottom of the line. As you move, notice the movement of the cursor displayed in the graph. An audible alarm will sound when you're within a user defined distance from the target. This parameter is set in the ALARM SETUP screen (ALST).

From the NAVI, BULL, or LINE screens, press PgUp or PgDn to turn on the large font display. Press PgUp or PgUp to turn off the large font display.

The points in the mission file are listed in the order which the points where stored. Press NEXT to select the next point in the mission file. The NEXT feature can be set to select a point down the mission file or up the mission file. This parameter (DIRECTION) is set in the SURVEY SETUP screen.

Points can be added to the mission file or edited in the mission file from the POINT SELECTION screen (PT).

RTK data logging to the output files can be accomplished from the NAVI, LINE, and BULL screen. Press the shift and L keys simultaneously. A memo can be stored to the output file during RTK data logging. Prior to pressing shift+L, press shift+D to call the memo entry screen. When you press shift+L to log the point, the memo string will be stored with the position information. The POINT SELECTION screen (PT) displays the symbol (*) adjacent to those mission points which were logged using shift +L. This signifies that those points have been staked and logged to the output files.

Coordinate Geometry

Coordinate geometry functions are accessed from either the SURVEY SETUP screen or the NAVI, BULL, and LINE navigation mode screens.

From the main screen, press GO.

From the MISSION SETUP screen, press DATA

In the MISSION FILE SELECTION screen,

- Highlight a mission file.
- Press OK to accept the selected file and to return to the MISSION SETUP screen.
- Press SURV.

From the SURVEY SETUP screen, press PT to select a point in the mission file.

In the POINT SELECTION screen,

- Highlight a point.
- Press OK to accept the selection and to return to the SURVEY SETUP screen.

You can either use the arrow keys to highlight the desired point or press the first characters of the desired point for the data collector to perform a search.

From the SURVEY SETUP screen, press COGO.

In the COORDINATE GEOMETRY screen,

- Highlight LOCATION BY AZIMUTH AND DISTANCE.
- Press STRT.

In step 1 of LOCATION BY DISTANCE,

- Enter the FROM POINT coordinates.
- Press NEXT to accept the entry and continue to step 2.

The FROM POINT coordinates can entered three ways; the current RTK computed by the GPS receiver can be entered by pressing HERE; a point stored in the mission file can be selected from a list by pressing PT; or the coordinates can be manually entered in the coordinate fields. If selecting a point from the mission file, the coordinate display/output settings should have been set prior to entering the COORDINATE GEOMETRY screen.

In step 2 of LOCATION BY DISTANCE,

- Enter the DISTANCE component.
- Enter the AZIMUTH component.
- Press NEXT to accept the entry and continue to step 3.

In step 3 of LOCATION BY DISTANCE, you can

- Return to the previous step (PREV),
- Store the calculated coordinates in the mission file (SAVE),
- Cancel the operation (CNCL).

The calculated coordinates are displayed. A POINT ID and FOR point id can be entered. The POINT ID is used for identifying the point in the mission file. The FOR point id is used for cross referencing the COGO calculated point to the FROM POINT.

The FOR point id feature is used in the seismic survey market and only stored in the binary output file.

Points created in COGO are stored in the mission file and can be used for point staking.

RTK Output File

RTK data collection is stored in an ASCII file named M.OUT. Data is continuously stored to this file. If you exit the program and start the program, the data collected will be appended to the existing M.OUT file. It is suggested that you download the output file after each day. The output file consists of one record per line for each site. Each record contains a point code, point id, easting, northing, elevation, HRMS, VRMS, antenna height, an offset position stored flag (if offset is used), and memo string data (if entered). The M.OUT file format is simple and easily imported to various CAD or database packages.

Notes:

Notes:

Reference

General

This chapter presents detailed descriptions of the various screens that the handheld controller can display. You use these screens to monitor operation, change parameters, and enter data. Table 4.1 briefly summarizes the screens.

Table 4.1: Screen Summary

Screen	Mnemonic	Description	Page
Main	MAIN	Allows access to all other screens	74
Solution	SOLU	Displays current position and solution quality	76
Horizontal history	HORZ	Displays 8-minute history of HRMS and HDOP values	77
Vertical history	VERT	Displays 8-minute history of VRMS and VDOP values	78
Residuals	RRES	Displays instantaneous value of satellite range residuals	79
Differential status	DIFF	Displays status of differential operations	80
Satellite constellation	SATS	Displays status of current satellite constellation	84
File management	FILE	Lets you control files stored in receiver	85
Information	INFO	Displays equipment and software information	86
Reset receiver	RSET	Lets you reset various receiver parameters	87
Mission Setup	GO	Lets you start navigation, set up navigation parameters, display solution data, choose layout mission	88
Survey	SURV	Lets you prepare a system for navigation	89
Display setup	DSST	Lets you configure the display format	90
Zone selection	ZONE	Lets you select UTM zone to be used	92
Datum select	DATM	Lets you select the datum to be used	93
User data	USER	Lets you edit a datum translation from WGS-84.	94
Translation	TRNS	Lets you create a datum translation from WGS-84	95
System selection	SYST	Lets you select a system to be displayed	96
Grid to grid	GRID	Displays values downloaded from MINE.DAT file	97
Projection selection	PROJ	Lets you select projection for coordinate computation	98
Projection parameters	PARM	Lets you enter projection-specific parameters	99
Mission data file	DATA	Lets you select a mission for layout from a stored list	100
Alarm setup	ALST	Lets you define user alarms	101

Table 4.1: Screen Summary (continued)

Screen	Mnemonic	Description	Page
Differential setup	DFST	Lets you set up the system for differential operation	104
Base coordinates	COOR	Lets you set up coordinates for the base station	106
Log point	LGPT	Lets you define logging parameters to receiver memory	107
Log	LOG	Displays data logging status while logging to receiver	109
Data logging setup	LGST	Lets you set logging functions	110
Satellite selection	SSEL	Lets you select or deselect satellites used for computation	112
Point selection	PT	Lets you select one of the points currently loaded	113
Enter new point	NEW	Lets you add a point to the current navigation file	114
Edit point	EDIT	Lets you edit a point in the current navigation file	115
Point Measurements	VIEW	Lets you view data stored for a specific point ID.	116
Point Details	DETL	Lets you view additional data stored for a specific point ID.	117
Feature Logging	FEAT	Displays logged point information	118
Point offset	OFST	Lets you offset a point or series of points	120
Cut/fill	CUFL	Provides real-time cut/fill calculations	125
Display points	DISP	Displays currently loaded layout points	127
Navigation	NAVI	Displays status of navigation mission	128
Bullseys	BULL	Displays status of navigation mission	130
Line display	LINE	Displays status of navigation mission	132
Coordinate Geometry	COGO	Lets you perform coordinate geometry on point data.	134
Filter point list	FILT	Lets you filter and sort waypoint list	159

Figure 4.1 is a map showing you how to access the screens. The Mine Surveyor II lets you access a series of display screens controlled by the function keys. The map shows the routing of the screen flow. The underlined functions denote controls which are displayed when the SHIFT key is pressed. The double-underlined functions denote controls which are displayed using the OPTION function with the SHIFT key.

You may also exit the program from any screen by pressing the “SHIFT” + “ESC” key.

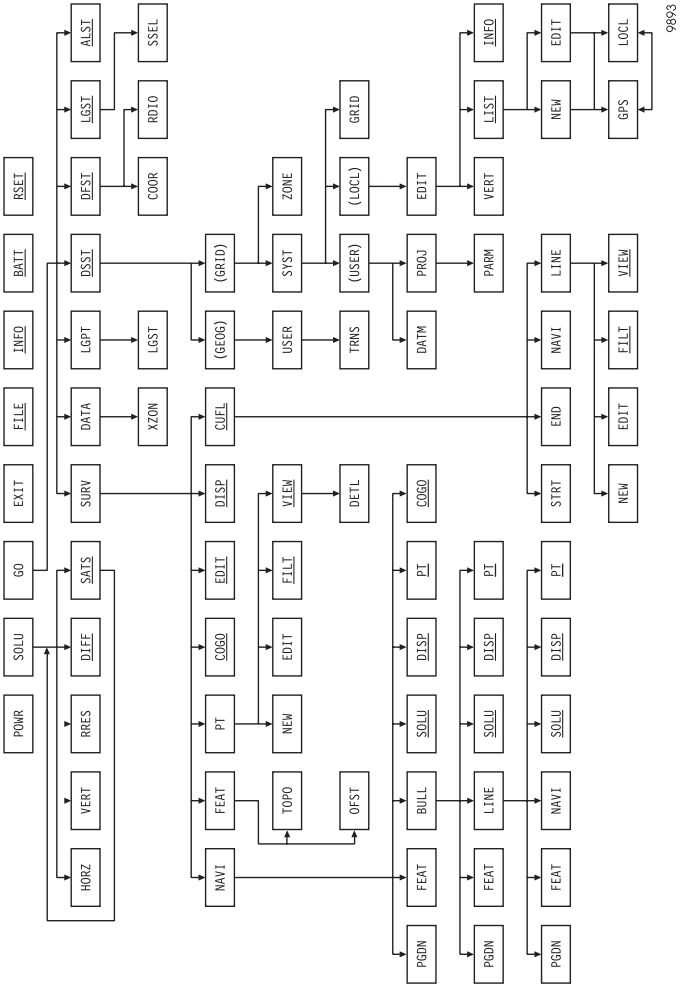

Figure 4.1: Screen Map

Main Screen

Figure 4.2 shows the main screen.

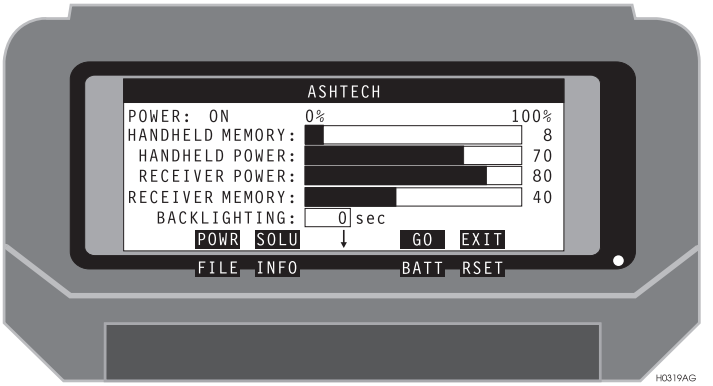

Figure 4.2: Main Screen

Displays memory and power values for the receiver and the handheld controller. Table 4.2 describes the main screen parameters.

Table 4.2: Main Screen Parameters

Item	Description
POWER	ON/OFF: Indicates current power status of the receiver
HANDHELD MEMORY	Displays the percentage of handheld memory remaining
HANDHELD POWER	Displays the percentage of handheld power remaining
RECEIVER MEMORY	Displays the percentage of receiver memory remaining
RECEIVER POWER	Displays the percentage of power remaining
BACKLIGHT-ING	An editable field that sets backlight duration. Default is 120 seconds. To enter a new setting, type in the desired value and press the YES key
POWR	Turns the receiver on or off
SOLU	Calls the Solution Status screen
GO	Calls the Mission Setup screen
EXIT	Exits the program. You may exit the program from any screen by pressing shift ESC

Table 4.2: Main Screen Parameters

Item	Description
FILE ⇑	Calls the Receiver File Management screen
INFO ⇑	Calls the System Information screen
BATT ⇑	Calls the Battery Management screen
RSET ⇑	Calls the Receiver Reset screen.

Solution Screen (SOLU)

The Solution screen, Figure 4.3, displays the current position and solution quality information.

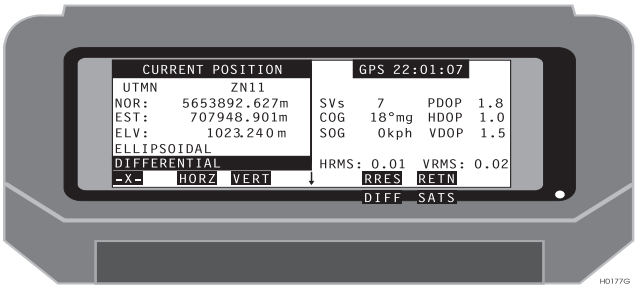

Figure 4.3: Solution Screen

Table 4.3 describes the solution screen parameters.

Table 4.3: Solution Screen Parameters

Item	Description
UTMN ZN11	Displays grid the system/zone or the datum according to which the current position is calculated.
ELLIPSOIDAL	Displays the elevation mode being used in the current position. Choices are ellipsoidal or orthometric.
DIFFERENTIAL	Displays the current position mode. AUTONOMOUS is displayed when the receiver is not configured for differential operation.
COG	Displays current Course Over Ground. A “tr” indicates true north; an “mg” indicates magnetic north.
SOG	Displays current Speed Over Ground. Choices are kph, mph, and kn (knots).
-X-, -F-, -A-	Indicates whether the current position solution is fixed (-X-), float (-F-), or autonomous (-A-).
HORZ	Calls the Horizontal Precision History screen.
VERT	Calls the Vertical Precision History screen.
RRES	Calls the Satellite Residuals screen.
RETN	Calls the Solution screen.
DIFF ⇑	Calls the Differential Status screen.
SATS ⇑	Calls the Satellite Status screen.

Horizontal Precision History Values Screen (HORZ)

The horizontal precision history value screen, Figure 4.4, displays an 8-minute history of the HRMS and HDOP values.

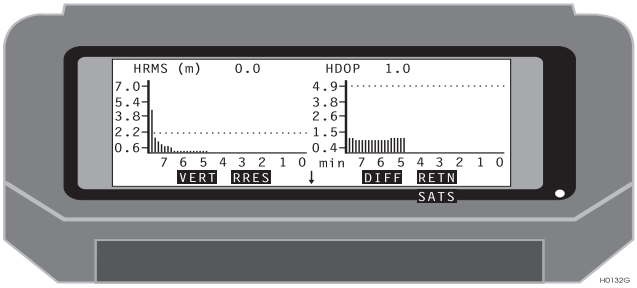

Figure 4.4: Horizontal Precision History Value Screen

Table 4.4 describes the horizontal precision history parameters.

Table 4.4: Horizontal Precision History Parameters

Item	Description
HRMS Graph	The X axis represents time in minutes. The Y axis represents horizontal RMS value. The dashed line represents the HRMS cutoff value as selected in the Alarm Setup screen.
HDOP Graph	The X axis represents time in minutes. The Y axis represents horizontal DOP value. The dashed line represents the HDOP cutoff value as selected in the Alarm Setup screen.
VERT	Calls the Vertical Precision History screen.
RRES	Calls the Satellite Residuals screen.
DIFF	Calls the Differential Status screen.
RETN	Calls the Solution screen.
SATS ⇑	Calls the Satellite Status screen.

Vertical Precision History Values Screen (VERT)

The vertical precision history value screen, Figure 4.5, displays an 8-minute history of the VRMS and VDOP values.

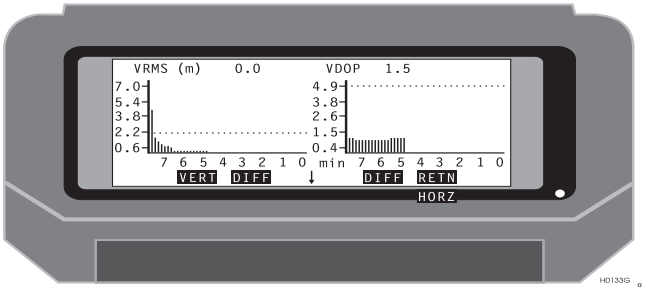

Figure 4.5: Vertical Precision History Values Screen

Table 4.5 describes the vertical precision history parameters

Table 4.5: Vertical Precision History Parameters

Item	Description
VRMS Graph	The X axis represents time in minutes. The Y axis represents vertical RMS value. The dashed line represents the VRMS cutoff value as selected in the Alarm Setup screen.
VDOP Graph	The X axis represents time in minutes. The Y axis represents vertical DOP value. The dashed line represents the VDOP cutoff value as selected in the Alarm Setup screen.
RRES	Calls the Satellite Residuals screen.
DIFF	Calls the Differential Status screen.
SATS	Calls the Satellite Status screen.
RETN	Calls the Solution screen.
HORZ ⇑	Calls the Horizontal Precision History screen.

Residuals Screen (RRES)

The residuals screen, Figure 4.6, displays the instantaneous value of the range residuals for each satellite.

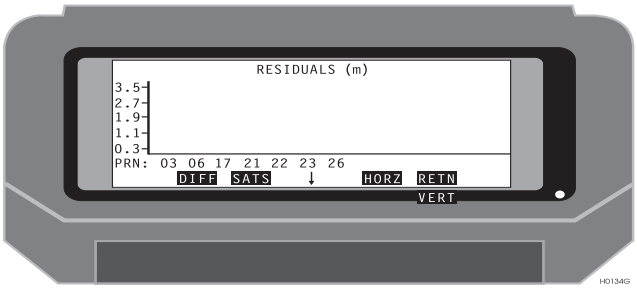

Figure 4.6: Residuals Screen

Table 4.6 describes the residuals parameters.

Table 4.6: Residual Parameters

Item	Description
Range Residual Graph	Displays the current range residual for each satellite being tracked. The graph is updated once a second. The X axis shows the PRN numbers of the satellites being tracked. The Y axis shows the value of the range residual in meters.
DIFF	Calls the Differential Status screen.
SATS	Calls the Satellite Status screen.
HORZ	Calls the Horizontal Precision History screen.
RETN	Calls the Solution screen.
VERT⇑	Calls the Vertical Precision History screen.

Remote Differential Status Screen (DIFF) for Code Phase Differential

The Differential Status screen, Figure 4.7, displays the status of the RCTM differential operations.

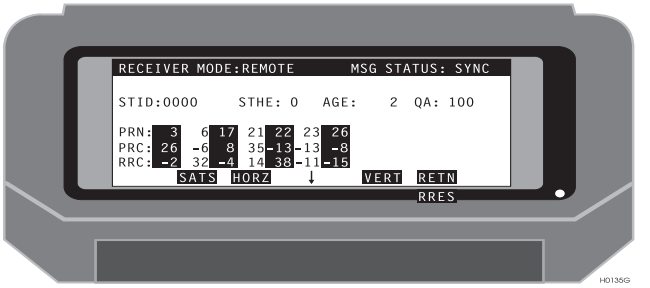

Figure 4.7: Differential Status Screen

Table 4.7 describes the differential status parameters.

Table 4.7: Differential Status Parameters

Item	Description
Receiver Mode	Displays the receiver's current mode setting.
MSG Status	Displays the receiver's synchronization status with the latest RTCM message. SYNC is displayed when the receiver is synchronized with at least one RTCM message. s not true for the Z-12. DCS 585 details shortcomings with correct reading of receiver parameters. I will have to know what
STID	Displays a user-defined base station ID number. The ID can be set to any number from zero to 1023. Base and remote stations must be set with the same ID number in order to communicate. The default ID number is zero.
STHE	Displays the health code being transmitted by the base station.
AGE	Displays the age of the received RTCM message in seconds.
QA	Displays a percentage value for communication quality defined as 100 * (number of good messages/total number of messages).
PRN	Displays the pseudo-random noise (PRN) code number of each satellite for which the remote receiver has obtained a correction. Each satellite transmits its own distinct pseudo-random noise code.
PRC	Displays the pseudo-range correction value in meters of each satellite for which the remote receiver has obtained a correction.

Table 4.7: Differential Status Parameters (continued)

Item	Description
RRC	Displays the range-rate correction in centimeters per second of each satellite for which the remote receiver has obtained a correction.
SATS	Calls the Satellite Status screen.
HORZ	Calls the Horizontal Precision History screen.
VERT	Calls the Vertical Precision History screen.
RETN	Calls the Solution screen.
RRES⇑	Calls the Satellite Residuals screen.

Remote Differential Status Screen (DIFF) for Carrier Phase Differential

The Differential Mode Status screen for carrier phase differential (CPD), Figure 4.8, displays the current status of carrier phase differential operations.

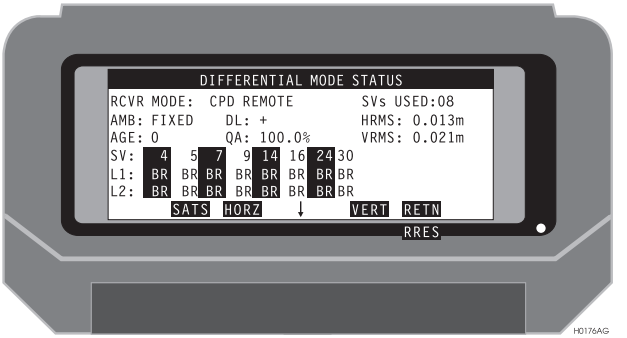

Figure 4.8: CPD Remote Differential Screen

Table 4.8 describes the CPD remote differential parameters.

Table 4.8: CPD Remote Differential Parameters

Item	Description
SVS USED	Displays the number of satellites used in CPD computations.
AMB	Displays the status of carrier phase ambiguities. FIXED is displayed when ambiguities have been solved. FLOAT is displayed when ambiguities have not been solved.
HRMS	Displays the horizontal RMS value of the current position.
VRMS	Displays the vertical RMS value of the current position.
AGE	Displays the age in seconds of the received differential correction.
DL	Displays data link activity. A plus sign (+) is displayed when differential corrections are registered in the receiver's data port. A minus sign (-) is displayed when no differential corrections are detected.
QA	Displays a percentage value for communication quality defined as 100 * (number of good messages/total number of messages).
SV	Displays the PRN code number of each satellite for which the remote receiver has obtained a correction. Each satellite transmits its own distinct pseudo-random noise code

Table 4.8: CPD Remote Differential Parameters (continued)

Item	Description
L1	Displays L1 signal lock status for each satellite being tracked by the base and remote receivers. The BR appearing under the SV number indicates that both base and remote are tracking a given satellite.
L2	Displays L2 signal lock status for each satellite being tracked by the base and remote receivers. The BR appearing under the SV number indicates that both base and remote are tracking a given satellite.
← / →	An arrow appearing in the bottom right or left corner of the display indicates that more satellites are being tracked than can be displayed. Pressing the right or left arrow key will scroll the display to show the additional satellites.
SATS	Calls the Satellite Status screen.
RRES	Calls the Satellite Residuals screen.
HORZ	Calls the Horizontal Precision History screen.
RETN	Calls the Solution screen.
VERT⇑	Calls the Vertical Precision History screen.

Satellite Constellation Screen (SATS)

The Satellite Constellation screen, Figure 4.9, displays the status of the current satellite constellation.

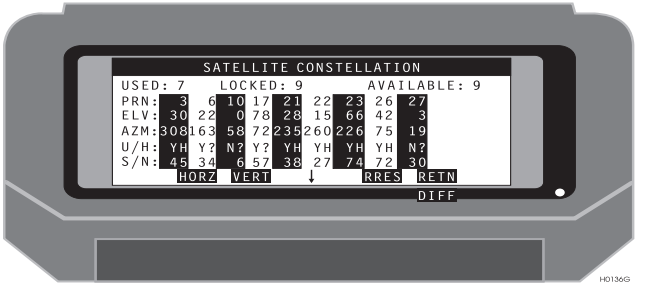

Figure 4.9: Satellite Constellation Screen

Table 4.9 describes the satellite constellation parameters.

Table 4.9: Satellite Constellation Parameters

Item	Description
PRN	The number assigned to a satellite's pseudo-random noise code. Each satellite transmits its own distinct pseudo-random noise code.
ELV	Displays the elevation in degrees above the horizon for each satellite being tracked.
AZM	The azimuth for each satellite being tracked referenced to true north.
Y/H	Displays the health status of each satellite being tracked and whether a given satellite will be used. A "Y" indicates that a satellite can be used in calculating the position. An "N" indicates that a satellite will not be used. An "H" indicates that a given satellite is healthy. U denotes an unhealthy satellite.
S/N	Displays the signal-to-noise ratio for each satellite being tracked.
← / →	An arrow appearing in the bottom right or left corner of the display indicates that more satellites are being tracked than can be displayed. Pressing the right or left arrow key will scroll the display to show the additional satellites.
HORZ	Calls the Horizontal Precision History screen.
VERT	Calls the Vertical Precision History screen.
RRES	Calls the Satellite Residuals screen.
RETN	Calls the Solution Screen
DIFF⇑	Calls the Differential Status screen.

Receiver File Management (FILE)

The Receiver File Management screen, Figure 4.10, displays a list of the files stored in the receiver. This screen allows you to delete existing files and close the file currently being recorded. Only one file at a time can be selected. When the current file is closed, a new file is opened automatically.

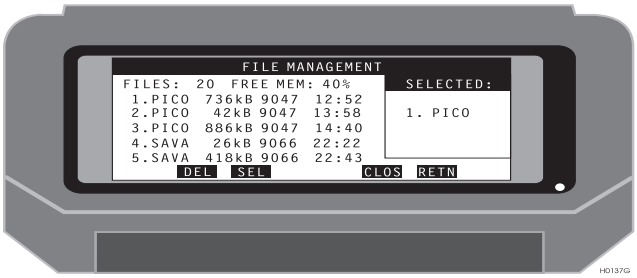

Figure 4.10: Receiver File Management Screen

Table 4.10 describes the file management parameters.

Table 4.10: Receiver File Management Parameters

Item	Description
FREE MEM	Displays the percentage of receiver memory still available.
DEL	Deletes the selected file. Only a file displayed in the “SELECTED:” box can be deleted.
SEL	Selects the highlighted file and displays it in the “SELECTED:” box. Pressing select again deselects the file. Only one file can be selected at a time.
CLOS	Closes the file currently being recorded and automatically opens a new file.
RETN	Returns to the Main screen.

Information Screen (INFO)

The Information screen, Figure 4.11, displays options and serial numbers for the hardware and version numbers for the software and firmware.

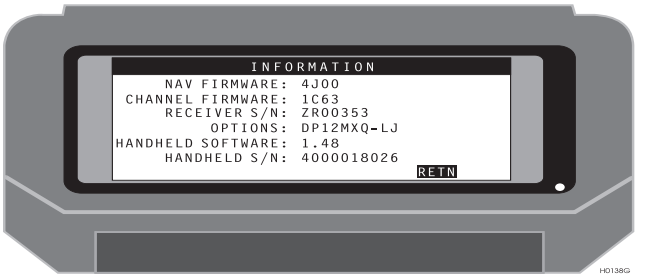

Figure 4.11: Information Screen

Table 4.11 describes the information parameters.

Table 4.11: Information Screen Parameters

Item	Description
NAV FIRMWARE	Displays the receiver's navigation firmware version number.
CHANNEL FIRMWARE	Displays the receiver's channel firmware version number.
RECEIVER S/N	Displays the serial number of the receiver.
OPTIONS	Displays the options that are installed in the receiver.
HANDHELD SOFTWARE	Displays the version number of the handheld software.
HANDHELD S/N	Displays the serial number of the handheld
RETN	Returns to the Main screen.

Receiver Reset Screen (RSET)

The receiver reset screen, Figure 4.12, allows you to reset the receiver with default parameters and clear receiver memory.

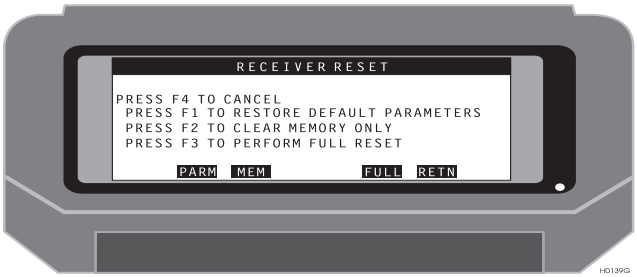

Figure 4.12: Reset Receiver Screen

Table 4.12 describes the reset parameters.

Table 4.12: Reset Parameters

Item	Description
PARM	Resets the receiver with default parameters.
MEM	Clears receiver memory but does not change receiver parameters.
FULL	Clears receiver memory and resets the receiver with default parameters
RETN	Returns to the Main screen.

The TDS keyboard layout does not coincide with the text instructions in this screen. Refer to the functions keys located under the program menu solutions.

Mission Setup Screen (GO)

The Mission Setup screen, Figure 4.13, lets you configure the system for survey operation.

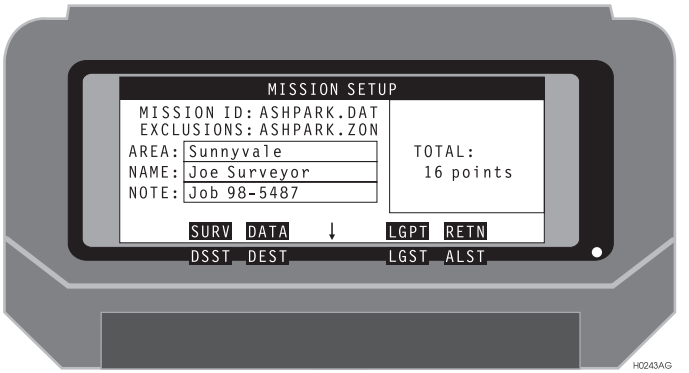

Figure 4.13: Mission Setup Screen

Table 4.13 describes the mine screen parameters

Table 4.13: Mission Setup Screen Parameters

Item	Description
MISSION ID	Displays the currently selected mission file (*.DAT).
EXCLUSIONS	Displays the currently selected exclusion zone file (*.ZON).
AREA	An editable field used for the entry of a project area name (up to 20 characters).
NAME	An editable field used for the entry of a project operator's name (up to 20 characters).
NOTE	An editable field used for the entry of remarks on the project (up to 20 characters).
TOTAL	Displays the total number of points contained in the mission file.
SURV	Calls the Survey Setup screen.
DATA	Calls the Mission File Selection screen.
LGPT	Calls the Log Point screen.
RETN	Returns to the Main screen.
DSST ⇑	Calls the Display Setup screen.
DFST ⇑	Calls the Differential Setup screens.
LGST ⇑	Calls the Logging Setup screen.
ALST ⇑	Calls the Alarm Setup screen.

Survey Screen (SURV)

The survey screen, Figure 4.14, lets you configure the system for a layout survey.

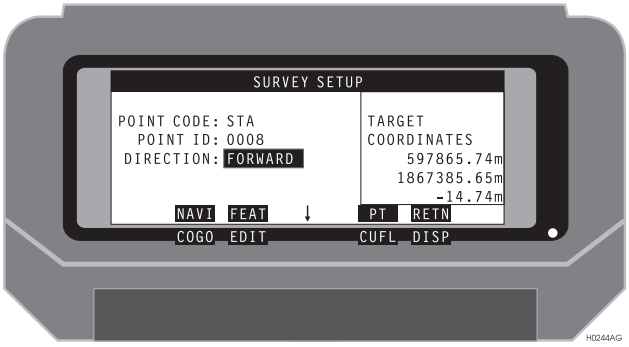

Figure 4.14: Survey Screen

Table 4.14 describes the survey parameters.

Table 4.14: Survey Screen Parameters

Item	Description
POINT CODE	Displays the point code of the currently selected navigation point.
POINT ID	Displays the ID number of the currently selected navigation point.
DIRECTION	A toggle field for setting the direction by which you will move through the list of points. FORWARD indicates that you will move through the list of points in the order they appear in the mission file. BACKWARD indicates that you will move through the list of points in reverse order.
TARGET COORDINATES	Displays the coordinates of the currently selected navigation point.
NAVI	Calls the Navigation screen.
FEAT	Calls the Feature Logging screen.
PT	Calls the Point Selection screen.
RETN	Returns to the Mission Setup screen.
COGO⇑	Calls the Coordinate Geometry screen.
CUFL⇑	Calls the Cut/Fill screen.
DISP⇑	Calls the Mission Display screen.

Display Setup Screen (DSST)

The Display Setup screen, Figure 4.15, lets you configure the coordinate display format.

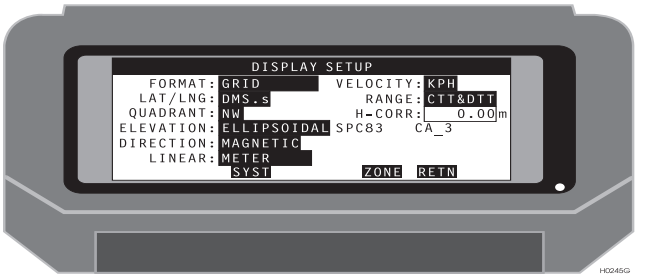

Figure 4.15: Display Setup Screen

Table 4.15 describes the display setup parameters.

Table 4.15: Display Setup Parameters

Item	Description
FORMAT	Toggle field that allows you to select the coordinate display format. Choices are GEOGRAPHIC or GRID.
LAT/LNG	Toggle field that allows you to select the display format for geographic coordinates. Format choices are D.d, DM.m, or DMS.s.
QUADRANT	Toggle field that allows you to set the appropriate quadrant for displaying positive latitude and longitude.
ELEVATION	Toggle field that allows you to select the elevation reference. Choices are ELLIPSOIDAL or ORTHOMETRIC. See notes on ELEVATION on page 91.
DIRECTION	Toggle field for selection of the north reference. Choices are TRUE for true north or MAGNETIC for magnetic north.
LINEAR	Toggle field for selection of a linear unit reference. Choices are meter, U.S. foot, international foot, U.S. yard, international yard, rod, chain, VARA, or Texas VARA. Meter is the default unit.
VELOCITY	Toggle field for selection of a velocity unit reference. Choices are KPH, MPH, or KN (knots).
RANGE	Toggle field for selection of the range/vector format. Choices are course and distance to target (CTT/DTT) or easting and northing to target (ETT/NTT).
H-CORR	Editable field that allows you set an offset value for the elevation. See notes on H-CORR on page 91.

Table 4.15: Display Setup Parameters (continued)

Item	Description
SPC83 CA_3	Information on the currently selected coordinate system is displayed here. If format is set to GEOGRAPHIC, the reference datum is displayed. If format is set to GRID and a predefined grid system has been selected, the name of the system and the zone (if applicable) are displayed. If format is GRID and the system is user-defined, the selected datum, ellipsoid, and projection are displayed.
DATM	Calls the Datum Selection screen. This key is present only when the selected format is GEOGRAPHIC or when format is set to GRID and the system is set to USER.
SYST	Calls the System Selection screen. This key is present only when the format is set to GRID.
ZONE	Calls the Zone Selection screen. This key is present only when the format is set to GRID and a predefined grid coordinate system with more than one zone has been selected.
PROJ	Calls the Projection Selection screen. This key is present only when the format is grid and the grid system is user-defined.
RETN	Returns to the Mission Setup screen.

ELEVATION

The ORTHOMETRIC setting applies the geoid separation to the ellipsoid elevation in select areas of the program. The solution screen (SOLU), feature screen (FEAT), and coordinates logged to the ASCII output file display elevations adjusted with the receiver geoid model. The ORTHOMETRIC setting uses the geoid model installed in the GPS receiver. This model is coarse and based on the 1991 world model. The use of this feature is not recommended for high accuracy elevation requirements.

The following table explains the ELEVATION field and when to set the field to ELLIPSOIDAL or ORTHOMETRIC.

Table 4.16: Elevation Parameter Usage

Situation	ELLIPSOIDAL	ORTHOMETRIC
Base station coordinates are ellipsoidal and desired rover output is ellipsoid heights.	X	
Base station coordinates are ellipsoidal and desired rover output is orthometric heights.		X
Base station coordinates are mean sea level and desired rover output is mean sea level.	X	

H-CORR

The H-CORR setting applies a height separation to the ellipsoid elevation in all areas of the program. The binary output file does not store elevations with the elevation correction applied, but stores the H-CORR value separately.

Zone Selection Screen (ZONE)

The zone selection screen, Figure 4.16, allows you to select the appropriate zone for the survey area.

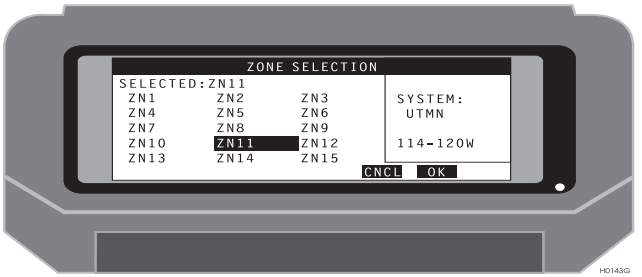

Figure 4.16: Zone Selection Screen

Table 4.17 describes the zone selection parameters.

Table 4.17: Zone Selection Parameters

Item	Description
SELECTED	Displays the currently selected grid zone.
SYSTEM	Displays the predefined grid coordinate system that is currently selected.
ZN1-ZN15	Displays the list of zones for the relevant predefined grid system.
CNCL	Cancels any changes and returns to the Display Setup screen.
OK	Saves any changes and returns to the Display Setup screen.

Datum Selection Screen (DATM)

The datum selection screen, Figure 4.17, allows you to select the appropriate datum for your project. See Appendix A for datum information tables.

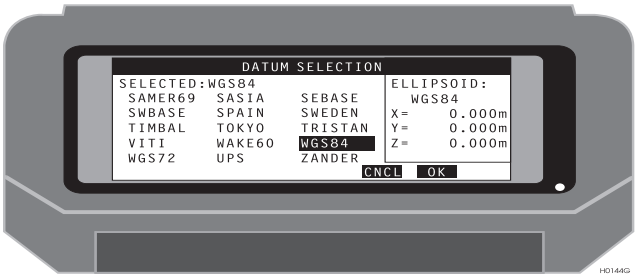

Figure 4.17: Datum Selection Screen

Table 4.18 describes the datum selection parameters.

Table 4.18: Datum Selection Parameters

Item	Description
CNCL	Cancels any changes and returns to the Display Setup screen.
OK	Saves any changes and returns to the Display Setup screen.

User Data Definition Screen (USER)

The user-defined datum screen, Figure 4.18, allows you to define X, Y and Z translations from WGS84 based on a screen which has been omitted for your convenience. This screen is present only when the coordinate format is set to GRID and the system is set to USER.

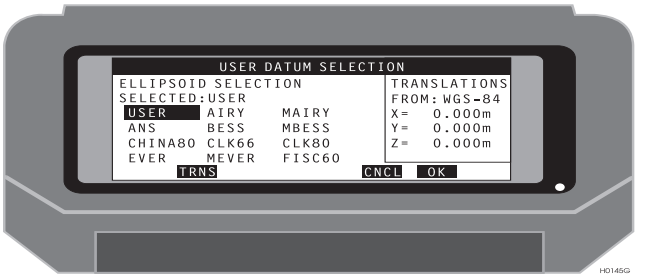

Figure 4.18: User Data Definition Screen

Table 4.19 describes the user data definition parameters.

Table 4.19: User Data Definition Parameters

Item	Description
SELECTED	Displays the currently selected screen.
X	Displays the value of the X translation from WGS84.
Y	Displays the value of the Y translation from WGS84.
Z	Displays the value of the Z translation from WGS84.
TRNS	Calls the Translations screen.
CNCL	Cancels any changes and returns to the Datum Selection screen
OK	Saves any changes and returns to the Datum Selection screen.

Translations Screen (TRNS)

The Translations screen, Figure 4.19, allows you define a translation from the WGS84 datum. This screen is only available when the coordinate format is set to GRID and the system is set to USER.

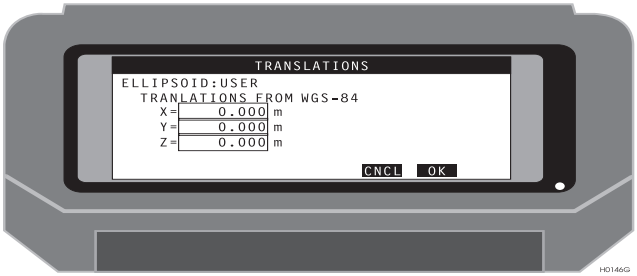

Figure 4.19: Translations Screen

Table 4.20 describes the translations parameters.

Table 4.20: Translations Parameters

Item	Description
SELECTED	Displays the currently selected ellipsoid.
X	Editable field for the entry of a value for the X translation from WGS84.
Y	Editable field for the entry of a value for the Y translation from WGS84.
Z	Editable field for the entry of a value for the Z translation from WGS84.
CNCL	Cancels any changes and returns to the User Datum Definition screen.
OK	Saves any changes and returns to the User Datum Definition screen.

System Selection Screen (SYST)

The coordinate system selection screen, Figure 4.20, allows you to select the appropriate grid coordinate system for your survey.

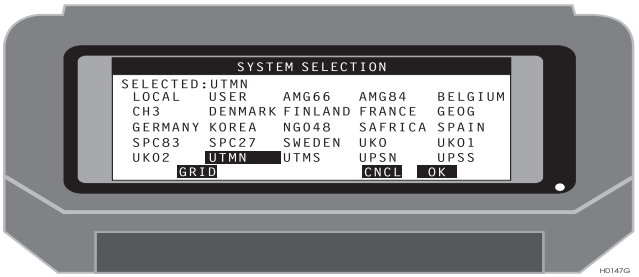

Figure 4.20: System Selection Screen

Table 4.21 describes the system selection parameters.

Table 4.21: System Selection Parameters

Item	Description
SELECTED	Displays the currently selected grid coordinate system. Selections are made by highlighting the desired system and pressing OK. A quick selection method allows you to highlight the system you want by typing in the first few letters of the system name. Typing “DE”, for example, will cause the highlight to be positioned over the Denmark system.
GRID	Calls the Grid-to-Grid conversion screen.
EDIT	Calls the Local System Parameters screen. This key is present only when the selected system is LOCAL.
CNCL	Cancels any changes and returns to the System Selection screen
OK	Saves any changes and returns to the System Selection screen.

Grid-to-Grid Screen (GRID)

The grid-to-grid screen, Figure 4.21, displays parameters for a conversion from a predefined grid coordinate system to a local grid coordinate system as specified in the mission file (*.DAT). If these parameters are not included in the mission file, they can be entered manually in this screen.

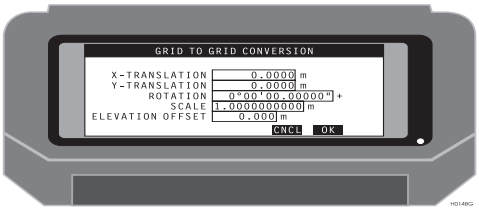

Figure 4.21: Grid-to-Grid Screen

Table 4.22 describes the grid-to-grid parameters.

Table 4.22: Grid-to-Grid Parameters

Item	Description
X-TRANSLATION	Editable field for the translation value of the X component in the grid to grid conversion.
Y-TRANSLATION	Editable field for the translation value of the Y component in the grid to grid conversion.
ROTATION	Editable field for the rotation value of the grid to grid conversion.
SCALE	Editable field for the scale factor used in the grid to grid conversion.
ELEVATION OFFSET	Editable field for the vertical offset used in the grid to grid conversion.
CNCL	Cancels any changes and returns to the System Selection screen
OK	Saves any changes and returns to the System Selection screen.

$$\begin{bmatrix} X_L \\ Y_L \end{bmatrix} = S^{-1} \begin{bmatrix} \cos(R) & \sin(R) \\ -\sin(R) & \cos(R) \end{bmatrix} \begin{bmatrix} X_s & -\Delta X \\ Y_s & -\Delta Y \end{bmatrix}$$

(X_L, Y_L) = (X (Easting) of Local System, Y (Northing) or local System)

(X_S, Y_S) = (X (Easting) of built in grid system , Y (Northing) of built in grid system.

$(\Delta X, \Delta Y)$ = (X-Translation, Y-Translation)

(R) = Rotation

s = Scale

$Z_L = Z_S$-Elevation Offset

Projection Selection Screen (PROJ)

The Projection Selection Screen, Figure 4.22, allows you to select a map projection that will be used as a reference for your grid coordinate computations.

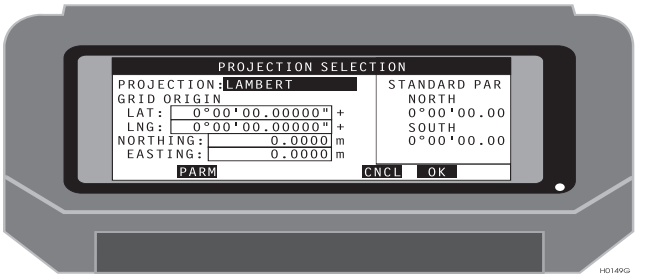

Figure 4.22: Projection Selection Screen

Table 4.23 describes the projection selection parameters.

Table 4.23: Projection Selection Parameters

Item	Description
PROJECTION	Toggle field that allows you to select a map projection. Choices are Lambert Conformal, Transverse Mercator, Oblique Mercator, Polar Stereographic.
LAT / LNG	Editable fields used for entering the coordinates of the grid origin.
NORTHING / EASTING	Editable fields used for entering the coordinates of the false origin.
RIGHT PANE DISPLAY	Displays additional details for the currently selected projection.
PARM	Calls the Projection Parameters screen.
CNCL	Cancels any changes and returns to the Display Setup screen.
OK	Saves any changes and returns to the Display Setup screen.

Projection Parameters Screen (PARM)

The Projection Parameters screen, Figure 4.23, allows you to enter projection-specific parameters.

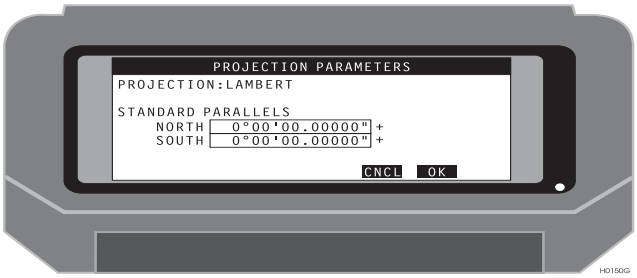

Figure 4.23: Projection Parameters Screen

Table 4.24 describes the projection parameters.

Table 4.24: Projection Parameters

Item	Description
PROJECTION	Displays the name of the currently selected projection.
EDITABLE FIELDS	The Projection Parameters screen will contain different editable fields for entry of projection parameters depending on which projection has been chosen: • Standard parallels for Lambert projection • Central meridian & inverse scale for Transverse Mercator projection • Tangent of axis azimuth and inverse scale for Oblique Mercator • Scale for Polar Stereographic projection
CNCL	Cancels any changes and returns to the Projection Selection screen.
OK	Saves any changes and returns to the Projection Selection screen.

Mission Data File Selection Screen (DATA)

The mission file selection screen, Figure 4.24, allows you to select a mission file (*.DAT) for your survey project.

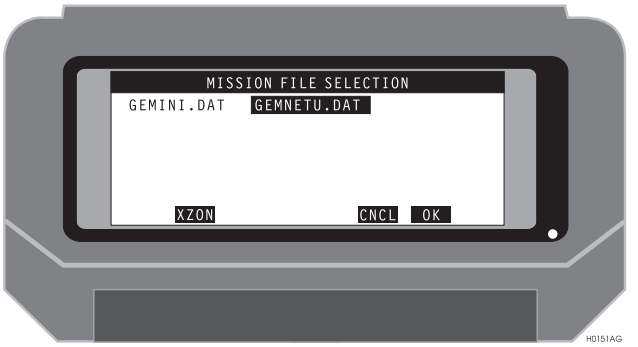

Figure 4.24: Mission Data File Selection Screen

Table 4.25 describes the mission data file selection parameters.

Table 4.25: Mission Data File Selection Parameters

Item	Description
MISSION FILE LIST	Displays all mission files (*.DAT) stored on the handheld controller. Select the file you want by highlighting it and pressing OK.
XZON	Calls the Exclusion Zone file selection screen.
CNCL	Cancels any changes and returns to the Mission Setup screen.
OK	Saves any changes and returns to the Mission Setup screen.

Exclusion Zones Screen (XZON)

The exclusion zones screen, Figure 4.25, allows you to select exclusion zone files (*.ZON) for your project. Exclusion zones are used to define areas within the project area that are offlimits.

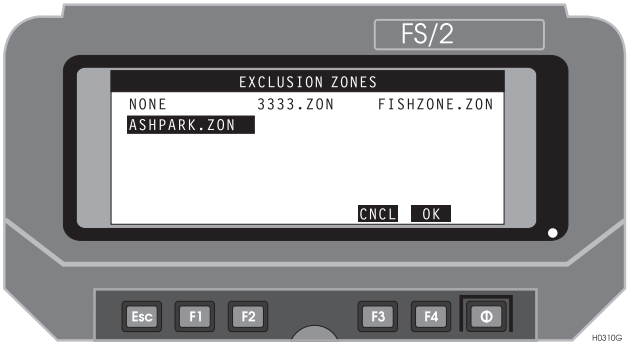

Figure 4.25: Exclusion Zone File Selection Screen

Table 4.26 describes the exclusion zone selection parameters.

Table 4.26: Exclusion Zone Selection Parameters

Item	Description
EXCLUSION ZONE FILE LIST	Displays all exclusion zone files (*.ZON) stored on the handheld controller. Select the file you want by highlighting it and pressing OK.
CNCL	Cancels any changes and returns to the Mission File Selection screen.
OK	Saves any changes and returns to the Mission File Selection screen.

Alarm Setup Screen (ALST)

The alarm setup screen, Figure 4.26, allows you to configure each of the alarms supported.

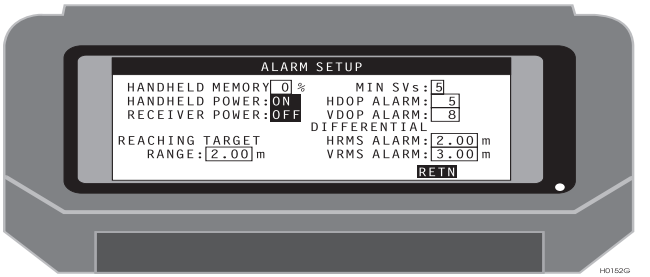

Figure 4.26: Alarm Setup Screen

Table 4.27 describes the alarm setup parameters.

Table 4.27: Alarm Setup Parameters

Item	Description
HANDHELD MEMORY	Editable field. Handheld beeps when the handheld memory remaining reaches the value entered.
HANDHELD POWER	Toggle values are ON and OFF. If HANDHELD POWER is ON, handheld will signal low power of the computer.
RECEIVER POWER	Toggle values are ON and OFF. If RECEIVER POWER is ON, handheld will signal low power warning.
REACHING TARGET RANGE	Handheld will beep when you are closer to the target point than the range value entered. The tone and frequency of the alarm will change as you approach the point.
MIN SVs	Minimum number of satellites used in position fix. Zero indicates no alarm.
HDOP ALARM	Editable field where you enter a threshold value for horizontal DOP. If this value is reached or exceeded, an alarm is indicated. Valid values for this field are blank and 0 - 99. Zero indicates no alarm.
VDOP ALARM	Editable field where you enter a threshold value for vertical DOP. If this value is reached or exceeded, an alarm is indicated. Valid values for this field are blank and 0 - 99. Zero indicates no alarm.
HRMS ALARM	Editable field where you enter a threshold value for horizontal RMS. If this value is reached or exceeded, an alarm is indicated. Valid values for this field are blank and 0 - 999. Zero indicates no alarm.

Table 4.27: Alarm Setup Parameters (continued)

Item	Description
VRMS ALARM	Editable field where you enter a threshold value for vertical RMS. If this value is reached or exceeded, an alarm is indicated. Valid values for this field are blank and 0 - 999. Zero indicates no alarm.
RETN	Recalls the previous screen.

Differential Setup Screen (DFST)

The Differential Setup screen, Figure 4.27, is used to set up the system for differential operation.

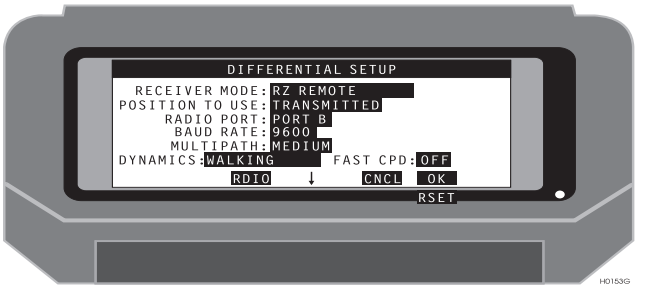

Figure 4.27: Differential Setup Screen

Table 4.28 describes the differential setup parameters.

Table 4.28: Differential Setup Parameters

Item	Description
RECEIVER MODE	Toggle field indicating the mode of operation. The toggle values are AUTONOMOUS, REMOTE, BASE, RZ REMOTE, RZ BASE, RTCM/CPD BASE, and RTCM/CPD REMOTE.
BASE STATION ID	RTCM modes only. Editable field allowing you to enter ID of the base station. Valid values are 0 - 1023. Default value is 0. If the receiver operates as a base station, this ID is sent out along with differential corrections. If the receiver operates as a remote station and this value is zero, the receiver will accept differential corrections from any base station. If the receiver operates as a remote station and this value is not zero, the receiver will accept differential corrections only from a base station with this ID.
RADIO PORT	Remote station only. Toggle allowing you to select the port for collection of differential corrections. Toggle values are PORT A, PORT B, PORT C, and PORT D. Default is PORT B. If an internal radio modem is installed in the GPS receiver select Port D.
BAUD RATE	Toggle allowing you to select the baud rate for collection (remote station) or output (base station) of differential corrections. Toggle values are 300, 600, 1200, 2400, 4800, 9600, 19200 and 38400. Default is 9600.
FAST CPD	Toggleable field allowing you to set the Fast CPD mode ON or OFF.

Table 4.28: Differential Setup Parameters (continued)

Item	Description
POSITION TO USE	Real-time-Z remote station only. Toggle allowing you to select which coordinates to use in position computation: transmitted from base station or entered in the remote (via the COOR key). Toggle values are TRANSMITTED and ENTERED. Default is TRANSMITTED.
MULTIPATH	Real-time Z remote station only. Toggle allowing you to select multipath conditions. Toggle values are: • NONE (ideal conditions) • LOW (open field, forest ground), • MEDIUM, HIGH (water surface, buildings) • SEVERE (forest, urban canyon). Default is MEDIUM.
DYNAMICS	Real-time Z remote station only. Toggle allows you to select dynamics of the remote receiver. Toggle values are: • STATIC (antenna on tripod) • QUASISTATIC (antenna on manual pole) • WALKING • CAR • AIRCRAFT Default is WALKING.
COOR	Calls the Base Station Coordinates Screen. This option is not accessible for autonomous operation or any REMOTE modes.
RDIO	Calls the Radio Setup screen. This option is not accessible in autonomous mode of receiver operation.
CNCL	Recalls previous screen without any changes in receiver settings.
OK	Accepts current settings and recalls the previous screen.
RSET	When Real-time Z remote setup is active, resets position computation parameters in the Real-time Z remote station.

Base Station Coordinates Screen (COOR)

The Base Station Coordinates screen, Figure 4.28, lets you set up the coordinates of the base station. Base station coordination can only be entered as WGS84 geographic coordinates.

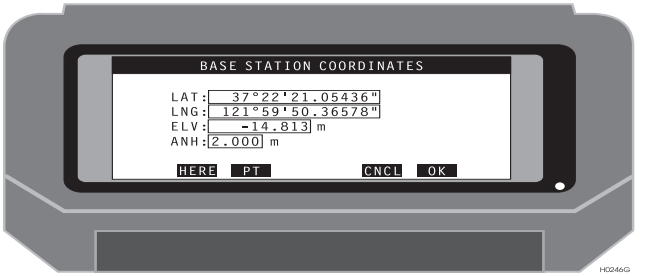

Figure 4.28: Base Station Coordinates Screen

Table 4.29 describes the base station coordinates.

Table 4.29: Base Station Coordinates Screen

Item	Description
LAT	Editable field allows you to enter latitude of the base station
LNG	Editable field allows you to enter longitude of the base station
ELV	Editable field allows you to enter elevation of the base station
ANH	Editable field allows you to enter antenna height of the base station
HERE	Sets LAT, LNG, and ELV fields to current position.
CNCL	Recalls the previous screen without any changes in base station coordinates.
PT	Calls the point selection screen.
OK	Accepts entered values, sets coordinates of the base station, and recalls the previous screen.

The elevation of the base station should always be an ellipsoidal height.

Log Point Screen (LGPT)

The Log Point screen, Figure 4.29, allows you to define the site parameters for simultaneous data logging to the receiver memory and data collector.

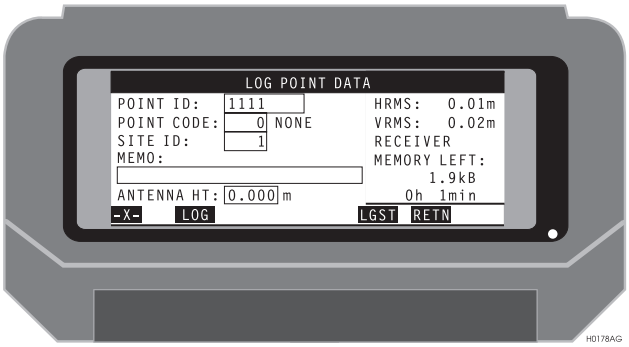

Figure 4.29: Log Point Screen

Table 4.30 describes the log point parameters.

Table 4.30: Log Point Parameters

Item	Description
POINT ID	Editable field allowing you to enter any alphanumeric description.
POINT CODE	Editable field allows you to enter a point code defined in the CODE.DAT file. If a valid point code is entered, the description is displayed to the right of this field.
SITE ID	Editable field. Allowable characters include 0-9, A-Z, (,), &, #, _, -, and ?. When the site ID contains only numerals, the site ID increments by 1.
MEMO	Editable field allows you to enter a memo up to 25 characters.
ANTENNA HEIGHT	Editable field. Height of the antenna which will be stored in the receiver memory. Default value is set on Datalogging Setup screen.
RECEIVER MEMORY LEFT	Displays how much of memory is left for data collection. Number of hours depends on the number of satellites and recording interval.
-X-, -F-, -A-	Indicates whether the current position is a Fixed (-X-), Float (-F-), or Autonomous (-A-) solution.

Table 4.30: Log Point Parameters (continued)

Item	Description
LOG	After LOG is pressed, data is logged to the receiver memory and the last epoch is stored in the ASCII and binary output files. Site ID is stored in the receiver. During loading data to the receiver, a box with the countdown counter is displayed on the screen. Time of observation and epoch interval is set on the Data-logging Setup screen. If short observation is required, you may stop logging data by pressing the Escape key.
LGST	Calls the Datalogging Setup screen.
RETN	Recalls the previous screen.

Log Screen (LOG)

The Log screen, Figure 4.30, is displayed during data logging to the receiver memory.

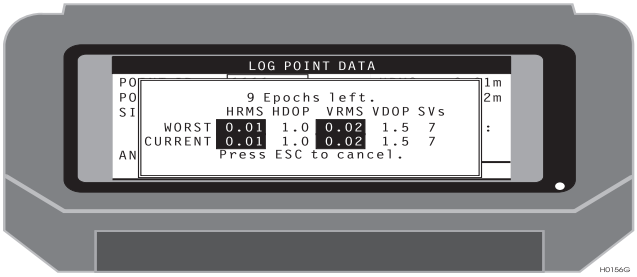

Figure 4.30: Log Screen

Table 4.31 describes the log parameters.

Table 4.31: Log Parameters

Item	Description
Epochs left	Displays the number of epochs remaining to be logged, based on the value input in the LGST screen.
HRMS	The worst and current horizontal RMS values.
HDOP	The worst and current horizontal dilution of precision.
VRMS	The worst and current vertical RMS values.
VDOP	The worst and current vertical dilution of precision.
SVs	The worst and current number of satellites.
ESC	ESC ends the data logging session

The TDS keyboard layout does not coincide with text instructions in this screen. The ESC key is labeled "ESC" in the standard layout and "F1" in the TDS layout.

Data Logging Setup Screen (LGST)

The Data Logging Setup screen, Figure 4.31, allows you to set all logging functions.

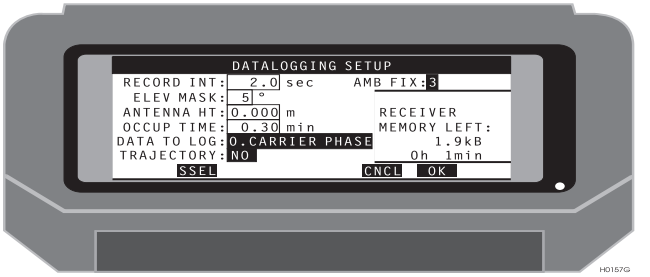

Figure 4.31: Data Logging Setup Screen

Table 4.32 describes the data logging setup parameters.

Table 4.32: Data Logging Setup Parameters

Item	Description
RECORD INT	Editable field to enter the data recording interval. Valid values are 0.5 to 999.5 seconds. Default is 2.0 seconds.
ELEVATION MASK	Editable field used to set the elevation mask for position computation.
ANTENNA HT	Editable field allows you to enter the antenna height. Valid values are 0 - 99.9 meters.
OCCUP TIME	Editable field allows you to enter the amount of time to spend on a static station. Valid values for this field are 0 - 99.9 minutes. The number of epochs collected should be rounded up to the nearest whole epoch. At least one epoch should always be collected. Default value is 1 minute.
DATA TO LOG	Toggle field. Toggle values are: 0 - CARRIER PHASE 1 - PSEUDO RANGES 2 - P OSITION ONLY
TRAJECTORY	Toggle field. Toggle values are: NO = do not log trajectory data YES = log trajectory data. Default is NO.
AMB FIX	Editable field which sets the ambiguity fix mode used in CPD operation.
RECEIVER MEMORY LEFT	Displays how much receiver memory is left for data collection.

Table 4.32: Data Logging Setup Parameters (continued)

Item	Description
SSEL	Calls the Satellite Selection screen.
CNCL	Calls the previous screen without any changes in receiver settings.
OK	Accepts current settings and recalls the previous screen.

Satellite Selection Screen (SSEL)

The Satellite Selection screen, Figure 4.32, allows you to select/deselect satellites used in position computation.

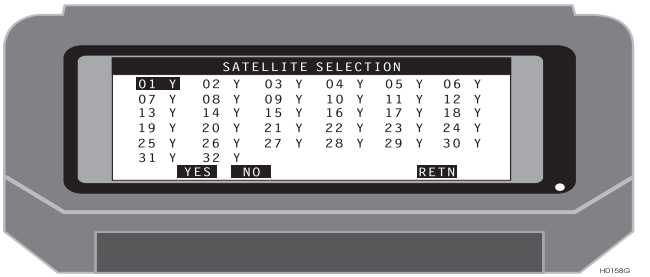

Figure 4.32: Satellite Selection Screen

When connected to a GG receiver, the screen will display SV's 1 through 56. The first 32 represent GPS satellites while 33 through 56 represent GLONASS satellites.

Table 4.33 describes the satellite selection parameters.

Table 4.33: Satellite Selection Parameters

Item	Description
YES	Selects highlighted satellite. Select using arrow keys.
NO	Deselects highlighted satellite. Use arrow keys.
RETN	Recalls the previous screen.

Point Selection Screen (PT)

The Point Selection screen, Figure 4.33, allows you to select one of the points from the currently loaded mission.

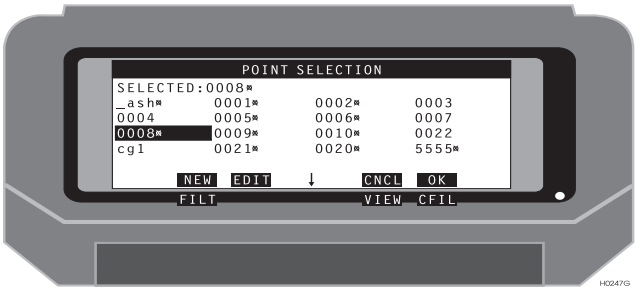

Figure 4.33: Point Selection Screen

Table 4.34 describes the point selection parameters.

Table 4.34: Point Selection Parameters

Item	Description
SELECTED	The point currently selected. To choose a point, highlight the point and press OK.
5555*	A point ID with a "*" symbol indicates this point has been surveyed.
NEW	Calls the New Point screen.
EDIT	Calls the Edit Point screen.
CNCL	Cancels any changes and recalls the previous screen.
OK	Accepts any changes and recalls the previous screen.
FILT⇑	(Filter) Calls the Filter Point List screen.
VIEW⇑	Calls the Point Measurements screen. This function can only be used when a survey point is highlighted. Surveyed points are displayed with a "*" symbol.
CFIL⇑	(Clear Filter) Clears the currently filtered point list.

Enter New Point Screen (NEW)

The Enter New Point screen, Figure 4.34, allows you to enter a new point to be added to the current navigation file.

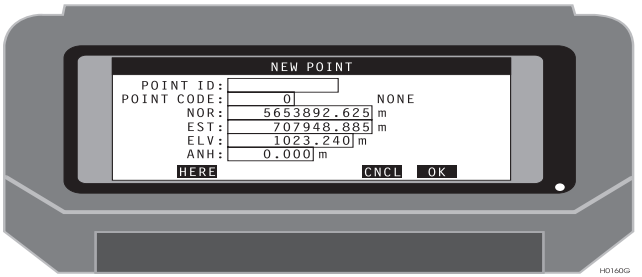

Figure 4.34: New Point Screen

Table 4.35 describes the new point parameters.

Table 4.35: New Point Parameters

Item	Description
POINT ID	Editable field allows you to enter a new point ID.
POINT CODE	Editable field allows you to enter a new point code.
NOR	Editable field allows you to enter a new northing value for the new point
EST	Editable field allows you to enter a new easting value for the new point
ELV	Editable field allows you to enter a new elevation value for the new point
ANH	Editable field allows you to enter the current antenna height.
HERE	Enters the current value into the coordinate fields.
CNCL	Cancels all changes and recalls the previous screen.
OK	Accepts any changes and recalls the previous screen.

Edit Point Screen (EDIT)

The Edit Point screen, Figure 4.35, lets you edit an existing point from the current mission file.

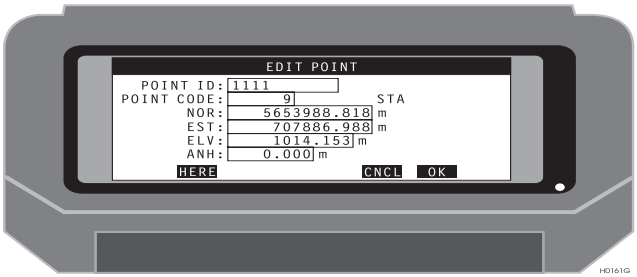

Figure 4.35: Edit Point Screen

Table 4.36 describes the edit point parameters.

Table 4.36: Edit Point Parameters

Item	Description
POINT ID	Editable field allows you to edit the point ID.
POINT CODE	Editable field allows you to edit the point code.
LAT or NOR	Editable field allows you to edit the northing value for the point.
LON or EST	Editable field allows you to edit the easting value for the point.
ELV	Editable field allows you to edit the elevation value for the point.
ANH	Editable field allows you to enter the current antenna height
HERE	Enters the current value into the coordinate fields.
CNCL	Cancels all changes and recalls the previous screen.
OK	Accepts any changes and recalls the previous screen.

Point Measurements (VIEW)

The Point Measurements screen, Figure 4.36, lets you view the data stored for the point ID.

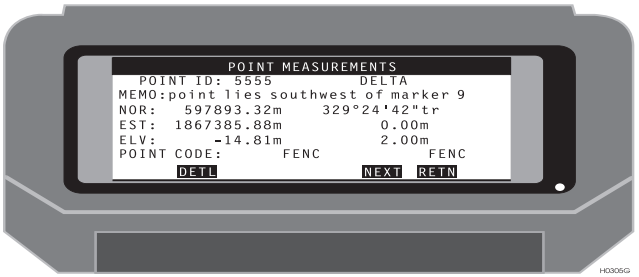

Figure 4.36: Point Measurements Screen

Table 4.37 describes the point measurements screen display.

Table 4.37: Point Measurements Screen

Item	Description
POINT ID	Displays the point ID.
MEMO	Displays the memo stored for the referenced point ID.
NOR or LAT	Displays the northing or latitude for the referenced point ID.
EST or LNG	Displays the easting or longitude for the referenced point ID.
ELV	Displays the elevation stored for the referenced point ID.
POINT CODE	The point code stored for the referenced point ID.
DELTA	Displays azimuth, distance, and height offset information. In an offset point, the difference between the origin point and the stored offset point. If a navigated point, the difference between the point navigated and the point collected.
DETL	Calls the point details screen.
NEXT	Calls the next point with the same point ID in the database. This is only available if multiple occupations were made with the same point ID.
RETN	Recalls the previous screen.

Point Details (DETL)

The Point Details screen, Figure 4.37, lets you view the additional data stored for the point ID.

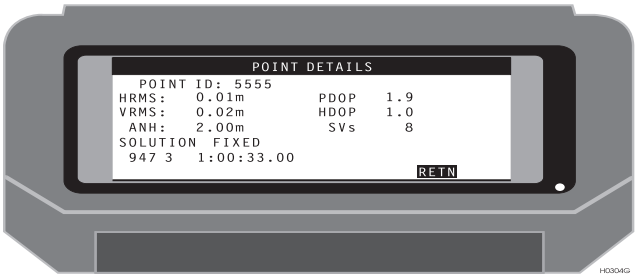

Figure 4.37: Point Details Screen

Table 4.38 describes the point details screen display.

Table 4.38: Point Details Screen

Item	Description
POINT ID	Displays the point ID.
HRMS	Displays the stored HRMS of the referenced point ID.
VRMS	Displays the stored VRMS of the referenced point ID.
ANH	Displays the stored antenna height of the referenced point ID.
SOLUTION	Displays the point solution (FIXED, FLOAT, or AUTONOMOUS)
DATE/TIME	Displays the GPS week number, day of the week, and the time of day.
PDOP	Displays the stored PDOP of the referenced point ID.
HDOP	Displays the stored HDOP of the referenced point ID.
VDOP	Displays the stored VDOP of the referenced point ID.
SVs	Displays the stored number of satellites used for position computation of the referenced point ID.
RETN	Recalls the previous screen.

Feature Screen (FEAT)

The Feature screen, Figure 4.38, lets you enter information to be associated with points logged to the handheld controller.

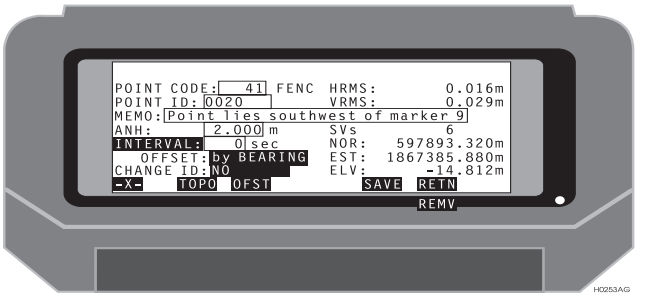

Figure 4.38: Feature Screen

Table 4.39 describes the Feature parameters.

Table 4.39: Feature Screen Parameters

Item	Description
POINT CODE	Editable field allows you to enter the point code which will be logged with the next point. Point code descriptions are associated with the definitions in the CODE.DAT file. The description associated with the chosen point code is displayed to the right of this field.
POINT ID	The point ID which will be logged with the next point.
MEMO	Editable field allows you to enter a memo up to 32 characters.
ANH	Antenna height to be applied to and logged with next point. All real-time elevation displays are adjusted by this height.
INTERVAL	The interval for logging during the TOPO function. Can be toggled to “DISTANCE” using the <space> key.
INTERVAL/ DISTANCE	Editable field. The time interval or distance value for TOPO logging.
OFFSET	The current offset function selected.
CHANGE ID	The function which will be applied to the point ID after logging, i.e., INCREMENT will increment the point ID after logging. DECREMENT will decrement the point ID after logging. NO will leave the point ID the same after logging a position. The applicable only to numeric port IDs.
HRMS	Displays the current horizontal RMS.
VRMS	Displays the current vertical RMS.

Table 4.39: Feature Screen Parameters (continued)

Item	Description
SVs	Displays the current number of SVs used in the solution.
NOR	Displays the current northing value.
EST	Displays the current easting value.
ELV	Displays the current elevation value.
-X-, -F-, -A-	Indicates whether the current position is a Fixed (-X-), Float (-F-), or Autonomous (-A-) solution.
TOPO	Starts logging points, at the interval entered in the INTERVAL/DISTANCE field, to the output file.
OFST	Calls the Offset screen, if an offset mode has been selected.
SAVE	Logs the current position to the output file if the format is selected GRID on the Display Setup screen.
RETN	Recalls the previous screen.
REMV⇑	Removes the last logged point from the binary output file. The ASCII output file M.OUT is not affected.

Any of the editable fields (POINT CODE, POINT ID, MEMO, ANH and INTERVAL) can be cleared by moving the cursor to the desired field and pressing SHIFT+U.

Point Offset By Grid Screen (OFST)

This screen, Figure 4.39, allows you to provide the offset distance for a point or series of points.

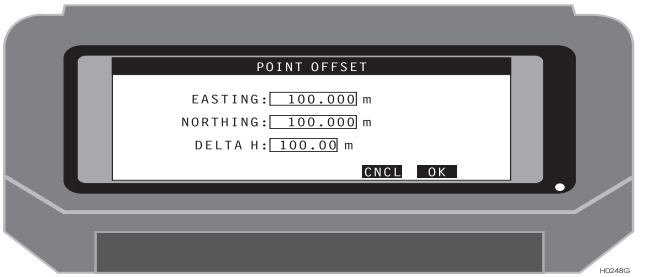

Figure 4.39: Point Offset by Grid Screen

Table 4.40 describes the point offset parameters.

Table 4.40: Point Offset Parameters

Item	Description
EASTING	Editable field. The point logged is offset by the value entered here.
NORTHING	Editable field. The point logged is offset by the value entered here.
DELTA H	Editable field. The point logged is offset by the value entered here.
CNCL	Cancels any changes to this screen and recalls the previous screen.
OK	Accepts any changes made to this screen and recalls the previous screen.

Point Offset By Bearing Screen (OFST)

The Point Offset by Bearing screen, Figure 4.40, lets you provide the offset distance and azimuth for a point or series of points.

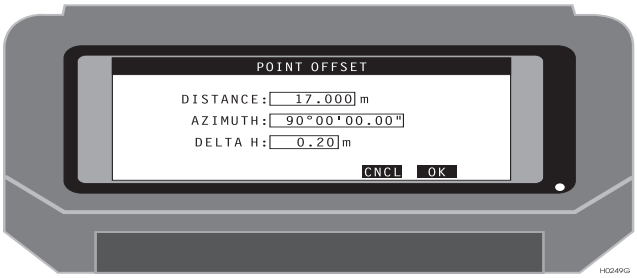

Figure 4.40: Point Offset by Bearing Screen

Table 4.41 describes the point offset by bearing parameters.

Table 4.41: Offset by Bearing Parameters

Item	Description
DISTANCE	Editable field. The point logged is offset by the value entered here.
AZIMUTH	Editable field. The point logged is offset by the value entered here.
DELTA H	Editable field. The point logged is offset by the value entered here.
CNCL	Cancels any changes to this screen and recalls the previous screen.
OK	Accepts any changes made to this screen and recalls the previous screen.

Point Offset By Side Screen (OFST)

The Point Offset by Side screen, Figure 4.41, allows the user to provide the offset distance for a point or series of points.

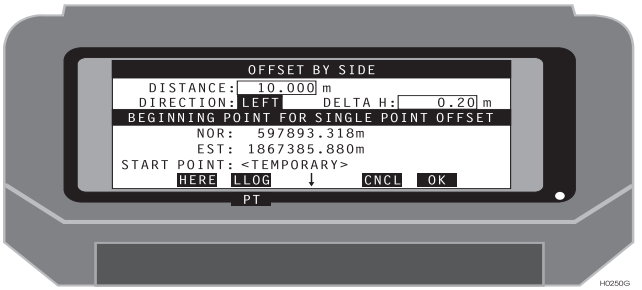

Figure 4.41: Point Offset by Side Screen

Table 4.42 describes the point offset by side parameters.

Table 4.42: Point Offset by Side Parameters

Item	Description
DISTANCE	Editable field. The point logged is offset by the value entered here.
DIRECTION	Toggle field. The point logged is offset to the side entered here.
DELTA H	Editable field. The point logged is offset by the value entered here.
BEGINNING POINT...	Entered using HERE or LLOG. This point provides the reference for single point, by side offsets.
START POINT	The descriptor for the reference point. This point is chosen with the PT function.
HERE	Sets the currently calculated position as the reference point.
LLOG	Sets the last logged point as the reference point.
CNCL	Cancels any changes to this screen and recalls the previous screen.
OK	Accepts any changes made to this screen and recalls the previous screen.
PT⇑	Selects the Point Selection screen

Point Offset By LRF Screen (OFST)

The Point Offset by LRF (Laser Rangefinder) screen, Figure 4.42, lets you provide the offset distance for a point or series of points using data collected from a Laser Range Finder (LRF).

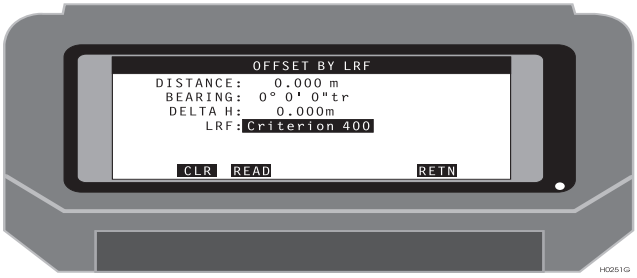

Figure 4.42: Point Offset by LRF Screen

Table 4.43 describes the point offset by LRF parameters.

Table 4.43: Point Offset by LRF

Item	Description
DISTANCE	Editable field. The point logged is offset by the value collected from the LRF or entered manually.
BEARING	Editable field. The point logged is offset by the value collected from the LRF or entered manually.
DELTA H	Editable field. The point logged is offset by the value entered here.
LRF	Toggle field. You can select the model of LRF currently interfaced.
CLR	Resets the DISTANCE and BEARING fields to zero.
READ	Obtains a new value from the LRF. Criterion models only.
RETN	Recalls the previous screen.

Point Offset From Current Line Screen (OFST)

The Point Offset from Current Line screen, Figure 4.43, lets you provide the offset distance for a point or series of points from the currently defined line.

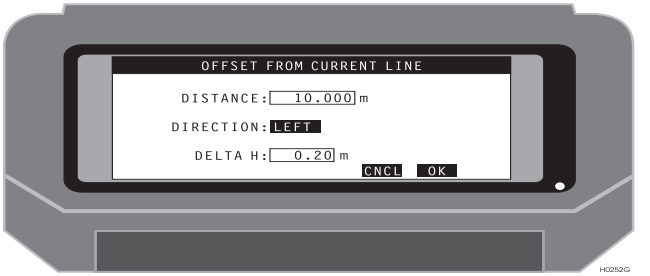

Figure 4.43: Point Offset from Current Line Screen

Table 4.44 describes the point offset from current line parameters.

Table 4.44: Point Offset from Current Line Parameters

Item	Description
DISTANCE	Editable field. The point logged is offset by the value entered here.
DIRECTION	Toggle field. The point logged is offset to the side entered here.
DELTA H	Editable field. The point logged is offset by the value entered here.
CNCL	Cancels any changes to this screen and recalls the previous screen.
OK	Accepts any changes made to this screen and recalls the previous screen

Cut/Fill Screen (CUFL)

The Cut/Fill screen, Figure 4.44, provides you with real-time cut/fill calculations.

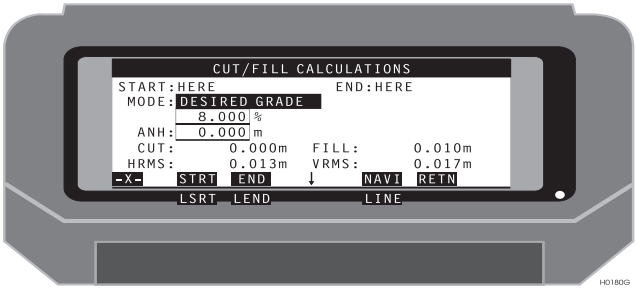

Figure 4.44: Cut/Fill Screen

Table 4.45 describes the cut/fill parameters.

Table 4.45: Cut/Fill Parameters

Item	Description
START	The name of the point from which the cut/fill vector begins.
END	The name of the point of the end of the cut/fill vector.
MODE	Toggle field. DESIRED GRADE allows you to change the grade calculated from the START and END points, and adjusts the END coordinate elevation to reflect the desired grade. EXTENDED GRADE indicates that the vector used for the cut/fill vector is extended through the START and END points for a distance indicated in the DIST field.
DIST	Editable field. Allows you to extend the grade calculation vector through the END point for the distance entered.
CUT	The calculated cut value for the current position.
FILL	The calculated fill value for the current position.
HRMS	Current horizontal RMS value.
VRMS	Current vertical RMS value
-X-, -F-, -A-	Indicates whether the current position is a Fixed (-X-), Float (-F-), or Autonomous (-A-) solution.
STRT	Allows you to choose the starting point from which the cut/fill vector begins.
END	Allows you to choose the end point from which the cut/fill vector will be calculated.
NAVI	Calls the Navigation screen.
RETN	Recalls the previous screen.

Table 4.45: Cut/Fill Parameters (continued)

Item	Description
LSRT⇑	Allows you to log the current position as the START location for the cut/fill vector.
LEND⇑	Allows you to log the current position as the END location for the cut/fill vector.
LINE⇑	Allows you to display a graphic representation of the grade vector.

Display Points Screen (DISP)

The Display Points screen, Figure 4.45, displays the currently loaded layout points.

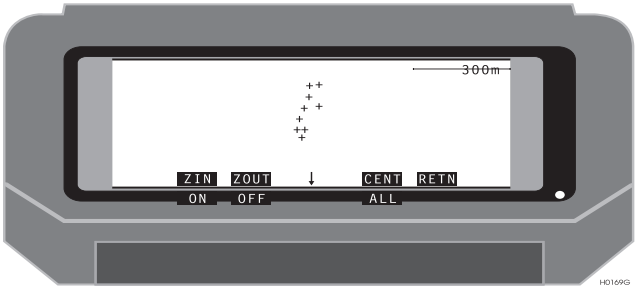

Figure 4.45: Display Points Screen

Table 4.46 describes the display points parameters.

Table 4.46: Display Points Parameters

Item	Description
ZIN	Causes the display to zoom in.
ZOUT	Causes the display to zoom out.
CENT	Centers the display on the current position.
RETN	Recalls the previous display.
ON⇑	Displays the names of the points.
OFF⇑	Turns off the name display.
ALL⇑	Zooms the display out until all points are displayed.

Navigation Screen (NAVI)

The Navigation screen, Figure 4.46, displays the status of the navigation mission with a horizontal line display showing your location with reference to the true line. Your perspective is from a cross section of the line looking forward to the next waypoint.

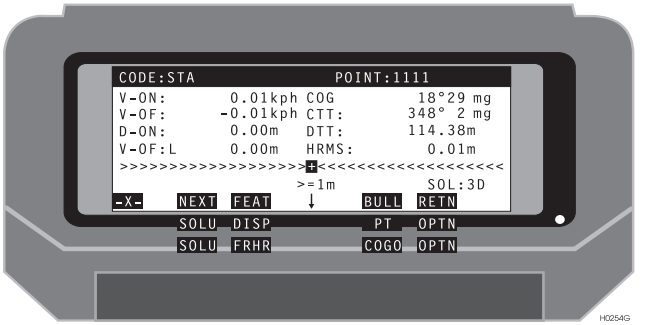

Figure 4.46: Navigation Screen

Table 4.47 describes the navigation parameters.

Table 4.47: Navigation Parameters

Item	Description
TOP LINE	Displays ID and code of the current navigation point.
V-ON	This field indicates the velocity in the direction of the line.
V-OF	This field indicates the velocity in the direction perpendicular to the line if you are travelling off line.
D-ON	This field indicates the distance travelled down the line, referenced to the From waypoint.
D-OF	This field indicates your distance off line (cross track error). If you are off line to the right of line, there will be an R after the off line amount indicating off line to the right. There will be an L if you are off line to the left.
COG	Display of course over ground; tr indicates true north, mg indicates magnetic north.
CTT	Displays the course to target. The target is the next waypoint being navigated; tr indicates true north, mg indicates magnetic north.
DTT	Displays the distance to target. The target is the currently selected point.
HRMS	Displays current horizontal RMS value.

Table 4.47: Navigation Parameters (continued)

Item	Description
Off-Line Error Display	The off-line error display indicates how far off line you are. The + indicates on line. The ⇔ on the display indicates your position with reference to the line. If the ⇔ is on left side of the +, then you must go right to get back on line. Each > indicates a certain distance off line. The value of each > changes depending upon how far off line you are. **>=100 m** Indicates the scale of each >. If the ⇔ is on the 4th > to the left of the +, this indicates that you are left of line by 400 meters and you must go right to get back on line. The scale changes automatically.
-X-, -F-, -A-	Indicates whether the current position is a Fixed (-X-), Float (-F-), or Autonomous (-A-) solution.
SHIFT+D	Shift+D calls the memo screen where you can enter a 32 character memo. The memo is stored when Shift+L is used to log the point.
SHIFT+U	Shift+U is available when in the memo screen via Shift+D. Shift+U clears the memo screen.
SHIFT+L	Shift+L logs the current position to the output file if the format selected is GRID on the Display Setup Screen.
PGUP/PGDN	Pressing the PGUP or PGDN keys toggles between the large font display and the current navigation screen. Shift+D/U/L are not available in this screen.
NEXT	Switches to the next point in the file.
FEAT	Calls the Feature Log screen.
BULL	Calls the Bullseye screen.
RETN	Recalls the previous screen.
SOLU⇑	Calls the Solution screen (when first option set is active).
DISP⇑	Calls the Display screen (when first option set is active).
PT⇑	Calls the Point Selection screen (when first option set is active).
OPTN⇑	Changes the list of the function buttons.
FRHR⇑	Selects the currently computed position as the starting point (when the second option set is active).
COGO⇑	Calls the Coordinate Geometry screen.

Bullseye Screen (BULL)

The Bullseye screen, Figure 4.47, displays the status of the navigation mission in the form of a bullseye where the position being navigated to is at the center of the screen.

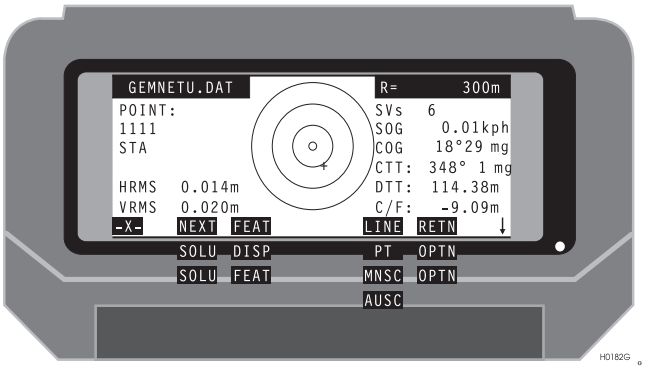

Figure 4.47: Bullseye Screen

Your perspective is from above. The top of the bullseye is north. Table 4.48 describes the bullseye parameters.

Table 4.48: Bullseye Parameters

Item	Description
MISSION NAME	Displays ID of current mission.
POINT	Displays name of the waypoint.
R	Displays the radius of the bullseye. This value becomes editable when you select manual scaling (MNSC).
SVs	Indicates the number of satellites used in the computation of the displayed position.
SOG	Display of speed over ground.
COG	Display of course over ground; tr indicates true north, mg indicates magnetic north.
CTT	Displays the course to target; tr indicates true north, mg indicates magnetic north.
DTT	Displays the distance to target.
C/F	Displays the difference in height from the position you are navigating to minus your actual position.
HRMS	Displays current horizontal RMS value.

Table 4.48: Bullseye Parameters (continued)

Item	Description
VRMS	Displays current vertical RMS value.
-X-, -F-, -A-	Indicates whether the current position is a Fixed (-X-), Float (-F-), or Autonomous (-A-) solution.
SHIFT+D	Shift+D calls the memo screen where you can enter a 32 character memo. The memo is stored when Shift+L is used to log the point.
SHIFT+U	Shift+U is available when in the memo screen via Shift+D. Shift+U clears the memo screen.
SHIFT+L	Shift+L logs the current position to the output file if the format selected is GRID on the Display Setup Screen.
PGUP/PGDN	Pressing the PGUP or PGDN keys toggles between the large font display and the current navigation screen. Shift+D/U/L are not available in this screen.
NEXT	Switches to the next point in the file.
FEAT	Calls the Mine Logging screen.
LINE	Calls the Line screen.
RETN	Recalls the previous screen.
SOLU⇑	Calls the Solutions screen (when first or second option set is active).
DISP⇑	Calls the Display screen (when first option set is active).
PT⇑	Calls the Point Selection screen (when first option set is active).
OPTN⇑	Changes the functions of SHIFT+F1, SHIFT+F2, and SHIFT+F3.
FEAT⇑	Calls the Feature Logging screen (when second option set is active).
MNSC⇑	(when second option set is active) Toggles the receiver from automatic scaling of the bullseye display to manual scaling. In manual mode, MNSC, you must enter the scale of the display. In automatic mode, AUSC, the display scale changes as you get closer to the point being navigated.
Bullseye Display	The center of this display is the location of the point being navigated to. Your current position is indicated by +. A dashed line indicates your trajectory travelled. The radius indicates the size of the outer ring. The AUSC function changes the scale as the trajectory enters the inner ring.
Spinning Arrow	This indicator points to the target if speed over ground is greater than 1 kph.

Line Display Screen (LINE)

The Line Display screen, Figure 4.48, displays the current position in relation to a line. The line is defined from points in the data file or from the current position to a data file point. The perspective is from above the line being navigated, with the direction of travel at the top of the screen.

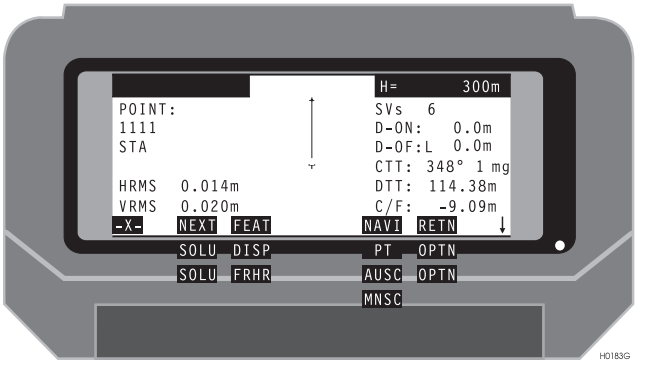

Figure 4.48: Line Display Screen

Table 4.49 describes the line display parameters.

Table 4.49: Line Display Parameters

Item	Description
POINT	Displays name of the currently selected point.
H	Indicates the scale (height) of the line display. This value becomes editable when you select MNSC.
D-ON	This field indicates the distance travelled down the line, referenced to the start point.
D-OF	This field indicates the distance you are off line (cross track error). R indicates off line to the right, L indicates off line to the left.
CTT	Displays the course to target. The target is the next waypoint being navigated.
DTT	Displays the distance to target. The target is the next waypoint being navigated.
C/F	Displays the difference in height from the position you are navigating to minus your actual position. The exception is when you access this screen from the cut/fill screen (CUFL). In this case, this field displays the cut or fill value. Where cut is displayed positively and fill is displayed negatively.
HRMS	Displays current horizontal RMS value.
VRMS	Displays current vertical RMS value.

Table 4.49: Line Display Parameters (continued)

Item	Description
-X-, -F-, -A-	Indicates whether the current position is a Fixed (-X-), Float (-F-), or Autonomous (-A-) solution.
SHIFT+D	Shift+D calls the memo screen where you can enter a 32 character memo. The memo is stored when Shift+L is used to log the point.
SHIFT+U	Shift+U is available when in the memo screen via Shift+D. Shift+U clears the memo screen.
SHIFT+L	Shift+L logs the current position to the output file if the format selected is GRID on the Display Setup Screen.
PGUP/PGDN	Pressing the PGUP or PGDN keys toggles between the large font display and the current navigation screen. Shift+D/U/L are not available in this screen.
NEXT	Selects the next point in the file.
FEAT	Calls the Mine Logging screen.
NAVI	Calls the Navigation screen.
RETN	Recalls the previous screen.
SOLU⇑	(when first option set is active) Calls the Solutions screen.
DISP⇑	(when first option is active) Calls the Display Screen.
PT⇑	(when first option set is active) Calls the Point Selection screen.
OPTN⇑	Changes the list of the function buttons.
FRHR⇑	(when second option set is active) Selects the currently computed position as the starting point..
MNSC⇑	(when second option set is active) Toggles the receiver from automatic scaling of the line display to manual scaling. In manual mode, MNSC, you must enter the scale of the line display. In automatic mode, AUSC, the line display scale changes as you get closer to the line being navigated.
Line Display (center of screen)	This display shows the line being navigated. The line is shown with the end point at the top and the start point at the bottom. The current position is indicated by +. The dashed line displays your trajectory.

Coordinate Geometry (COGO)

The coordinate geometry selection screen, Figure 4.49, allows you to select a COGO function. There are seven options available. Scroll down to view the remaining option.

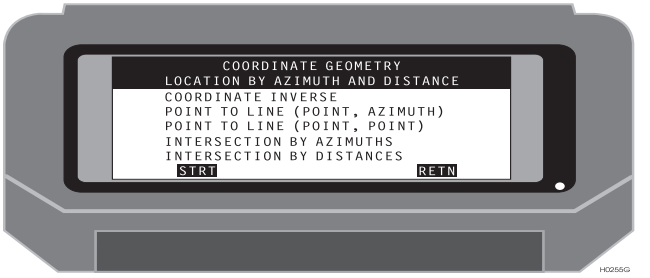

Figure 4.49: Coordinate Geometry Selection Screen

Table 4.50 describes the coordinate geometry selection parameters. Refer to the specific option in this manual for further details.

Table 4.50: Coordinate Geometry Selection Options

Item	Description
STRT	Calls the coordinate geometry function displayed in reverse video.
RETN	Recalls the previous screen.

Coordinate Geometry - Location by Azimuth and Distance

The location by azimuth and distance function is a three screen process. Screen 1, Figure 4.50, prompts for a from point.

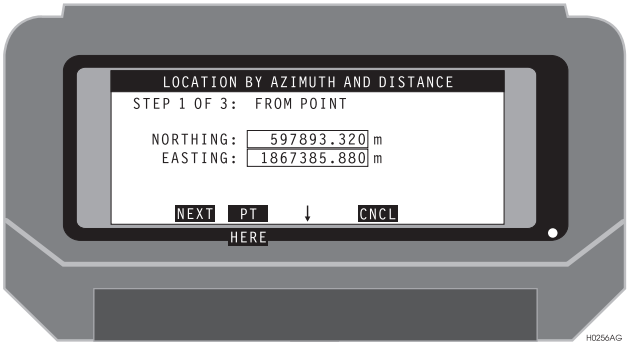

Figure 4.50: Location by Azimuth and Distance - Screen 1

Table 4.51 describes the first screen for location by azimuth and distance.

Table 4.51: Location by Azimuth and Distance - Screen 1

Item	Description
NORTHING	The northing value for the coordinate.
EASTING	The easting value for the coordinate.
NEXT	Calls Screen 2.
PT	Calls the Point Selection Screen.
CNCL	Cancels the current entry and returns to the Coordinate Geometry (COGO) Screen.
HERE⇑	Enters the current calculated position as the from point.

Screen 2, Figure 4.51, prompts for a distance and azimuth value.

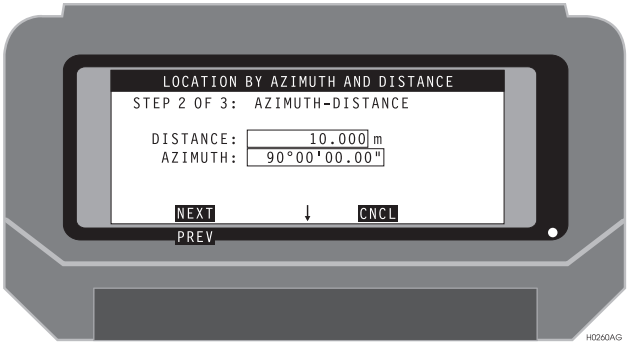

Figure 4.51: Location by Azimuth and Distance - Screen 2

Table 4.52 describes the second screen for location by azimuth and distance.

Table 4.52: Location by Azimuth and Distance - Screen 2

Item	Description
DISTANCE	The distance value from the from point.
AZIMUTH	The azimuth value from the from point.
NEXT	Calls Screen 3.
CNCL	Cancels the current entry and returns to the Coordinate Geometry (COGO) Screen.
PREV	Recalls Screen 1.

Screen 3, Figure 4.52, displays the solution.

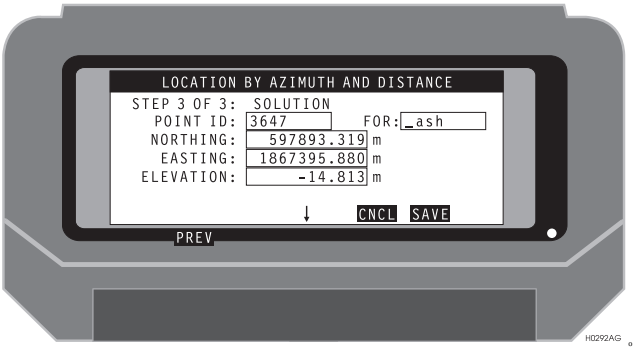

Figure 4.52: Location by Azimuth and Distance - Screen 3

Table 4.53 describes the third screen for location by azimuth and distance.

Table 4.53: Location by Azimuth and Distance - Screen 3

Item	Description
POINT ID	The point identifier for the point being stored in the mission file.
NORTHING	The northing value for the coordinate.
EASTING	The easting value for the coordinate.
ELEVATION	The elevation value for the coordinate.
FOR	The FOR point is derived in the FROM POINT selection in the first COGO screen. If the PT screen is used to select a FROM POINT, then the FOR point ID is the point ID selected. If the PT screen is not used, the point ID is the current point ID in the navigation screen.
CNCL	Cancels the current entry and returns to the Coordinate Geometry (COGO) Screen.
SAVE	Saves the point in the mission file.
PREV⇑	Recalls Screen 2.

Coordinate Geometry - Coordinate Inverse

The coordinate inverse function is a three screen process. Screen 1, Figure 4.53, prompts for a from point.

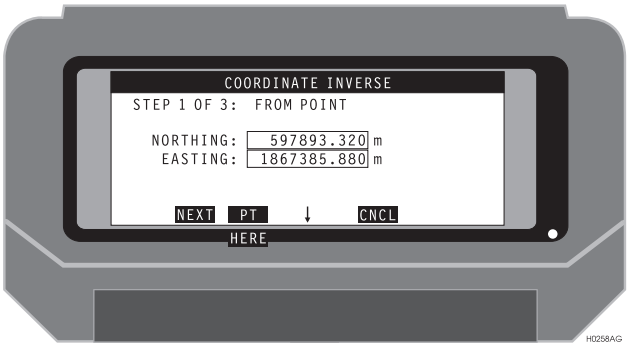

Figure 4.53: Coordinate Inverse - Screen 1

Table 4.54 describes the first screen for a coordinate inverse.

Table 4.54: Coordinate Inverse - Screen 1

Item	Description
NORTHING	The northing value for the coordinate.
EASTING	The easting value for the coordinate.
NEXT	Calls Screen 2.
PT	Calls the Point Selection Screen.
CNCL	Cancels the current entry and returns to the Coordinate Geometry (COGO) Screen.
HERE⇑	Enters the current calculated position as the from point.

Screen 2, Figure 4.54, prompts for a to point.

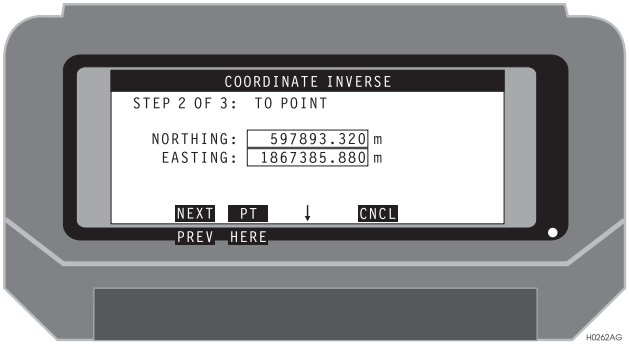

Figure 4.54: Coordinate Inverse - Screen 2

Table 4.55 describes the second screen for a coordinate inverse.

Table 4.55: Coordinate Inverse - Screen 2

Item	Description
NORTHING	The northing value for the coordinate.
EASTING	The easting value for the coordinate.
NEXT	Calls Screen 3.
PT	Calls the Point Selection Screen.
CNCL	Cancels the current entry and returns to the Coordinate Geometry (COGO) Screen.
PREV⇑	Recalls Screen 1.
HERE⇑	Enters the current calculated position as the from point.

Screen 3, Figure 4.55, displays the solution.

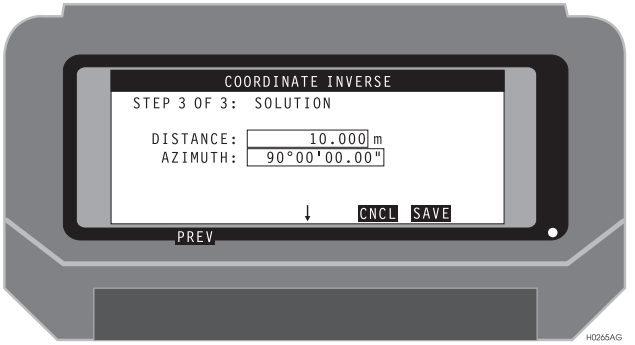

Figure 4.55: Coordinate Inverse - Screen 3

Table 4.56 describes the third screen for a coordinate inverse.

Table 4.56: Coordinate Inverse - Screen 3

Item	Description
DISTANCE	The distance value from the points entered in Screens 1 and 2.
AZIMUTH	The azimuth value from the from point entered in Screen 1 to the to point entered in Screen 2.
CNCL	Cancels the current entry and returns to the Coordinate Geometry (COGO) Screen.
SAVE	Saves the distance and azimuth values in memory. These values are displayed in the distance and azimuth fields in the second screen of the Location by Azimuth and Distance function.
PREV⇑	Recalls Screen 1.

Coordinate Geometry - Location by Point to Line (Point, Azimuth)

The location by point to line (point, azimuth) function is a three screen process. Screen 1, Figure 4.56, prompts for data to define the line.

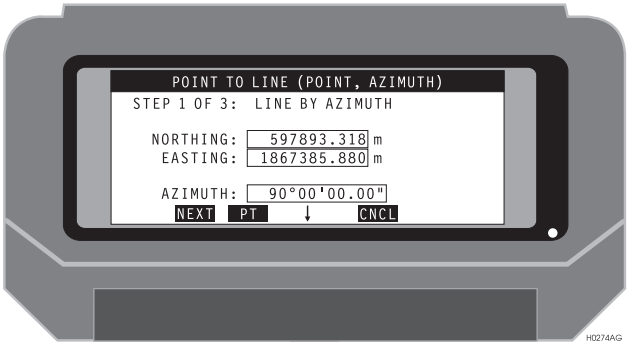

Figure 4.56: Location by Point to Line (Point, Azimuth) - Screen 1

Table 4.57 describes the first screen for location by point to line (point, azimuth).

Table 4.57: Location by Point to Line (Point, Azimuth) - Screen 1

Item	Description
NORTHING	The northing value for the coordinate.
EASTING	The easting value for the coordinate.
AZIMUTH	The azimuth value to define the line.
NEXT	Calls Screen 2.
PT	Calls the Point Selection Screen.
CNCL	Cancels the current entry and returns to the Coordinate Geometry (COGO) Screen.
HERE	Enters the current calculated position as the from point.

Screen 2, Figure 4.57, prompts for a from point.

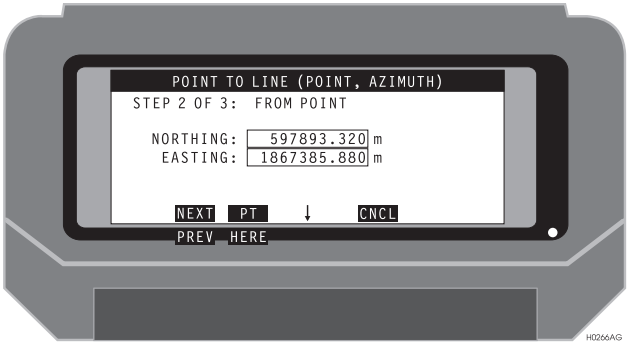

Figure 4.57: Location by Point to Line (Point, Azimuth) - Screen 2

Table 4.58 describes the second screen for location by point to line (point, azimuth).

Table 4.58: Location by Point to Line (Point, Azimuth) - Screen 2

Item	Description
NORTHING	The northing value for the coordinate.
EASTING	The easting value for the coordinate.
NEXT	Calls the screen 3 Screen.
PT	Calls the Point Selection Screen.
CNCL	Cancels the current entry and returns to the Coordinate Geometry (COGO) Screen.
PREV⇑	Recalls the screen 1 screen.
HERE⇑	Enters the current calculated position as the from point.

Screen 3, Figure 4.58, displays the solution.

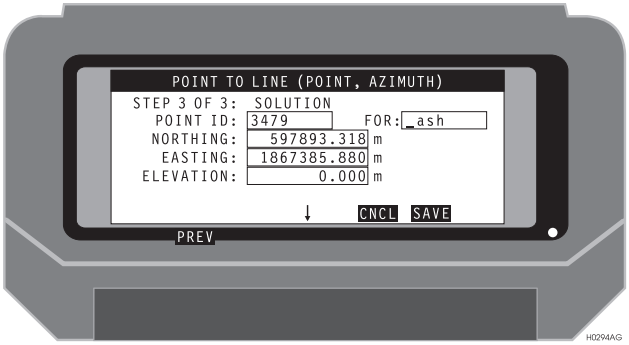

Figure 4.58: Location by Point to Line (Point, Azimuth) - Screen 3

Table 4.59 describes the third screen for location by point to line (point, azimuth).

Table 4.59: Location by Point to Line (Point, Azimuth) - Screen 3

Item	Description
POINT ID	The point identifier for the point being stored in the mission file.
NORTHING	The northing value for the coordinate.
EASTING	The easting value for the coordinate.
ELEVATION	The elevation value for the coordinate.
FOR	The FOR point is derived in the FROM POINT selection in the first COGO screen. If the PT screen is used to select a FROM POINT, then the FOR point ID is the point ID selected. If the PT screen is not used, the point ID is the current point ID in the navigation screen.
CNCL	Cancels the current entry and returns to the Coordinate Geometry (COGO) Screen.
SAVE	Saves the point in the mission file.
PREV⇑	Recalls Screen 2.

Coordinate Geometry - Location by Point to Line (Point, Point)

The location by point to line (point, point) function is a four screen process. Screen 1, Figure 4.59, prompts for data to define the first point on the line.

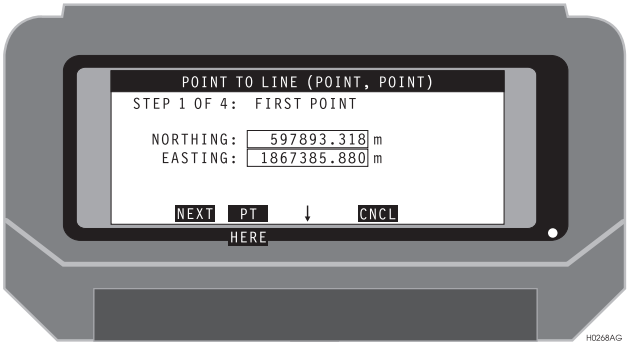

Figure 4.59: Location by Point to Line (Point, Point) - Screen 1

Table 4.60 describes the first screen for location by point to line (point, point).

Table 4.60: Location by Point to Line (Point, Point) - Screen 1

Item	Description
NORTHING	The northing value for the coordinate.
EASTING	The easting value for the coordinate.
NEXT	Calls Screen 2.
PT	Calls the Point Selection Screen.
CNCL	Cancels the current entry and returns to the Coordinate Geometry (COGO) Screen.
HERE⇑	Enters the current calculated position as the first point.

Screen 2, Figure 4.60, prompts for the second point to define the line.

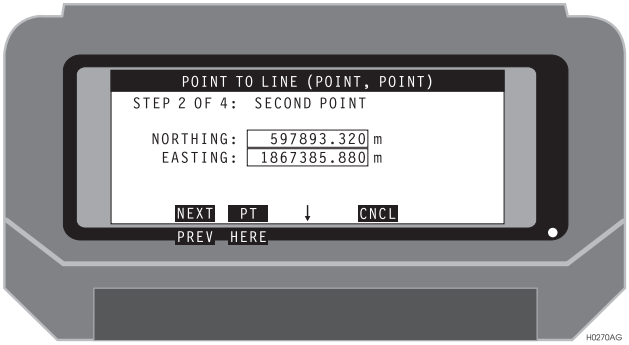

Figure 4.60: Location by Point to Line (Point, Point) - Screen 2

Table 4.61 describes the second screen for location by point to line (point, point).

Table 4.61: Location by Point to Line (Point, Point) - Screen 2

Item	Description
NORTHING	The northing value for the coordinate.
EASTING	The easting value for the coordinate.
NEXT	Calls Screen 3.
PT	Calls the Point Selection Screen.
CNCL	Cancels the current entry and returns to the Coordinate Geometry (COGO) Screen.
PREV⇑	Recalls Screen 1.
HERE⇑	Enters the current calculated position as the from point.

Screen 3, Figure 4.61, prompts for the from point.

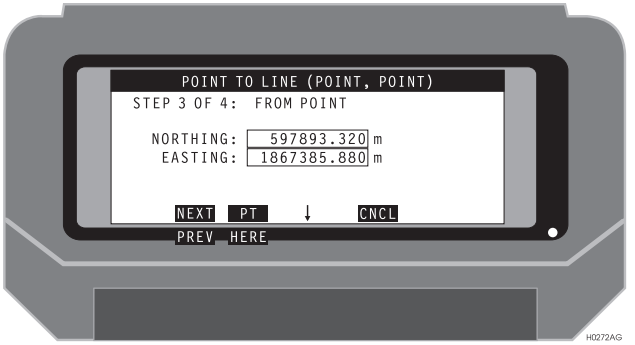

Figure 4.61: Location by Point to Line (Point, Point) - Screen 3

Table 4.62 describes the third screen for location by point to line (point, point).

Table 4.62: Location by Point to Line (Point, Point) - Screen 3

Item	Description
NORTHING	The northing value for the coordinate.
EASTING	The easting value for the coordinate.
NEXT	Calls Screen 4.
PT	Calls the Point Selection Screen.
CNCL	Cancels the current entry and returns to the Coordinate Geometry (COGO) Screen.
PREV⇑	Recalls Screen 2.
HERE⇑	Enters the current calculated position as the from point.

Screen 4, Figure 4.62, displays the solution.

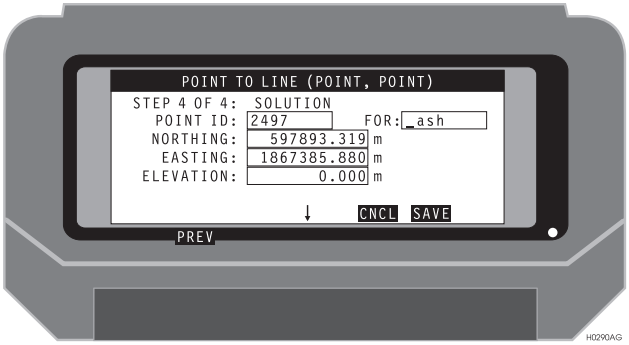

Figure 4.62: Location by Point to Line (Point, Point) - Screen 4

Table 4.63 describes the fourth screen for location by point to line (point, point).

Table 4.63: Location by Point to Line (Point, Point) - Screen 4

Item	Description
POINT ID	The point identifier for the point being stored in the mission file.
NORTHING	The northing value for the coordinate.
EASTING	The easting value for the coordinate.
ELEVATION	The elevation value for the coordinate.
FOR	The FOR point is derived in the FROM POINT selection in the first COGO screen. If the PT screen is used to select a FROM POINT, then the FOR point ID is the point ID selected. If the PT screen is not used, the point ID is the current point ID in the navigation screen.
CNCL	Cancels the current entry and returns to the Coordinate Geometry (COGO) Screen.
SAVE	Saves the point in the mission file.
PREV⇑	Recalls Screen 3.

Coordinate Geometry - Location via Intersection by Azimuths

The location via intersection by azimuths function is a three screen process. Screen 1, Figure 4.63, prompts for data to define the first line.

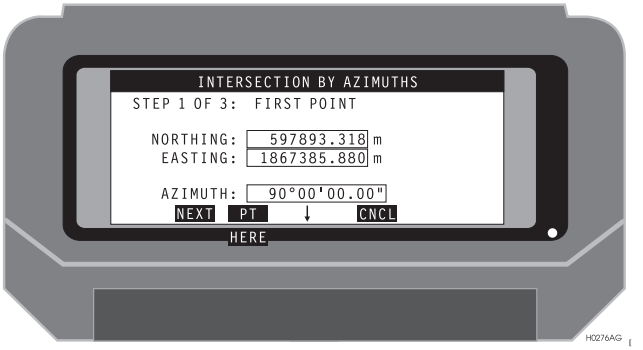

Figure 4.63: Location via Intersection by Azimuths - Screen 1

Table 4.64 describes the first screen for location via intersection by azimuths.

Table 4.64: Location via Intersection by Azimuths - Screen 1

Item	Description
NORTHING	The northing value for the coordinate.
EASTING	The easting value for the coordinate.
AZIMUTH	The azimuth value to define the line.
NEXT	Calls Screen 2.
PT	Calls the Point Selection Screen.
CNCL	Cancels the current entry and returns to the Coordinate Geometry (COGO) Screen.
HERE⇑	Enters the current calculated position as the first point.

Screen 2, Figure 4.64, prompts for a from point.

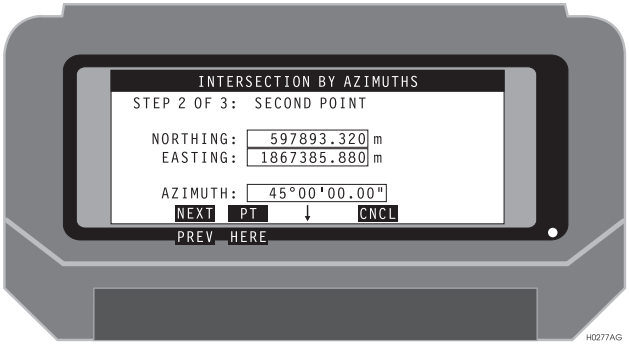

Figure 4.64: Location via Intersection by Azimuths - Screen 2

Table 4.65 describes the second screen for Location via Intersection by Azimuths.

Table 4.65: Location via Intersection by Azimuths - Screen 2

Item	Description
NORTHING	The northing value for the coordinate.
EASTING	The easting value for the coordinate.
AZIMUTH	The azimuth value to define the line.
NEXT	Calls Screen 3.
PT	Calls the Point Selection Screen.
CNCL	Cancels the current entry and returns to the Coordinate Geometry (COGO) Screen.
PREV⇑	Recalls Screen 1.
HERE⇑	Enters the current calculated position as the first point.

Screen 3, Figure 4.65, displays the solution.

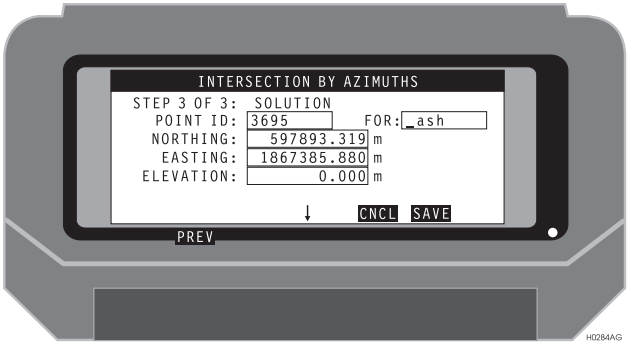

Figure 4.65: Location via Intersection by Azimuths - Screen 3

Table 4.66 describes the third screen for location via intersection by azimuths.

Table 4.66: Location via Intersection by Azimuths - Screen 3

Item	Description
POINT ID	The point identifier for the point being stored in the mission file.
NORTHING	The northing value for the coordinate.
EASTING	The easting value for the coordinate.
ELEVATION	The elevation value for the coordinate.
FOR	The FOR point is derived in the FROM POINT selection in the first COGO screen. If the PT screen is used to select a FROM POINT, then the FOR point ID is the point ID selected. If the PT screen is not used, the point ID is the current point ID in the navigation screen.
CNCL	Cancels the current entry and returns to the Coordinate Geometry (COGO) Screen.
SAVE	Saves the point in the mission file.
PREV⇑	Recalls Screen 2.

Coordinate Geometry - Location via Intersection by Distances

The location via intersection by distances is a four screen process. Screen 1, Figure 4.66, prompts for data to define the first point radius.

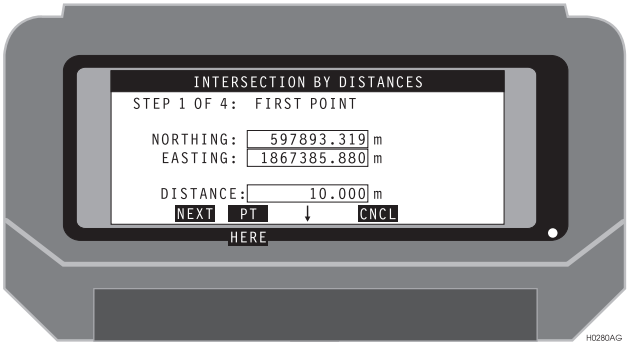

Figure 4.66: Location via Intersection by Distances - Screen 1

Table 4.67 describes the first screen for location via intersection by distances.

Table 4.67: Location via Intersection by Distances - Screen 1

Item	Description
NORTHING	The northing value for the coordinate.
EASTING	The easting value for the coordinate.
DISTANCE	The distance value defining the radius for point 1.
NEXT	Calls Screen 2.
PT	Calls the Point Selection Screen.
CNCL	Cancels the current entry and returns to the Coordinate Geometry (COGO) Screen.
HERE⇑	Enters the current calculated position as the first point.

Screen 2, Figure 4.67, prompts for data to define the second point radius.

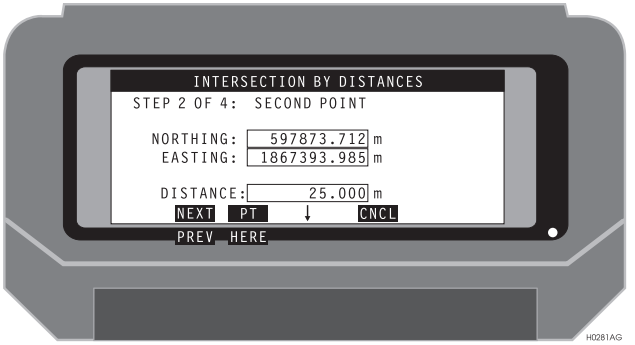

Figure 4.67: Location via Intersection by Distances - Screen 2

Table 4.68 describes the second screen for location via intersection by distances.

Table 4.68: Location via Intersection by Distances - Screen 2

Item	Description
NORTHING	The northing value for the coordinate.
EASTING	The easting value for the coordinate.
DISTANCE	The distance value defining the radius for point 2.
NEXT	Calls Screen 3.
PT	Calls the Point Selection Screen.
CNCL	Cancels the current entry and returns to the Coordinate Geometry (COGO) Screen.
PREV⇑	Recalls Screen 1.
HERE⇑	Enters the current calculated position as the from point.

Screen 3, Figure 4.68, displays the first of two solutions.

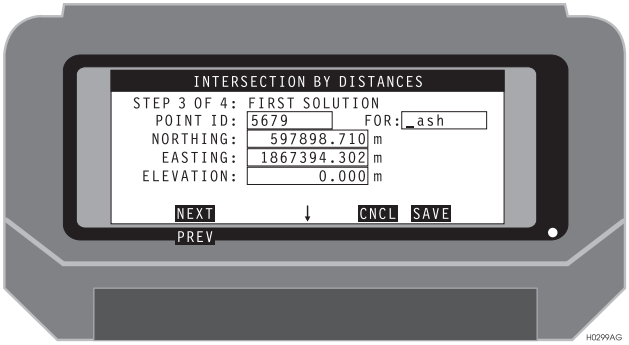

Figure 4.68: Location via Intersection by Distances - Screen 3

Table 4.69 describes the third screen for location via intersection by distances.

Table 4.69: Location via Intersection by Distances - Screen 3

Item	Description
POINT ID	The point identifier for the point being stored in the mission file.
NORTHING	The northing value for the coordinate.
EASTING	The easting value for the coordinate.
ELEVATION	The elevation value for the coordinate.
FOR	The FOR point is derived in the FROM POINT selection in the first COGO screen. If the PT screen is used to select a FROM POINT, then the FOR point ID is the point ID selected. If the PT screen is not used, the point ID is the current point ID in the navigation screen.
NEXT	Calls Screen 4.
CNCL	Cancels the current entry and returns to the Coordinate Geometry (COGO) Screen.
SAVE	Saves the point in the mission file.
PREV⇑	Recalls the screen 2 Screen.

Screen 4, Figure 4.69, displays the second of two solutions.

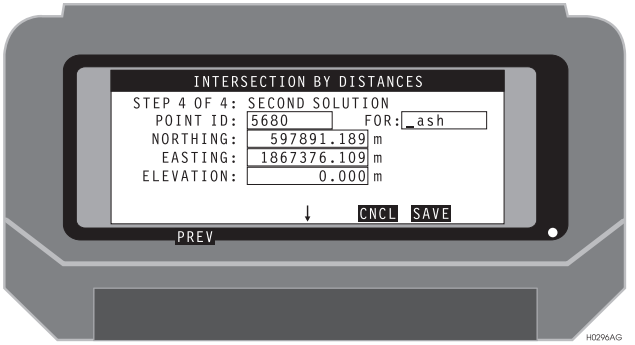

Figure 4.69: Location via Intersection by Distances - Screen 4

Table 4.70 describes the fourth screen for location via intersection by distances.

Table 4.70: Location via Intersection by Distances - Screen 4

Item	Description
POINT ID	The point identifier for the point being stored in the mission file.
NORTHING	The northing value for the coordinate.
EASTING	The easting value for the coordinate.
ELEVATION	The elevation value for the coordinate.
FOR	The FOR point is derived in the FROM POINT selection in the first COGO screen. If the PT screen is used to select a FROM POINT, then the FOR point ID is the point ID selected. If the PT screen is not used, the point ID is the current point ID in the navigation screen.
CNCL	Cancels the current entry and returns to the Coordinate Geometry (COGO) Screen.
SAVE	Saves the point in the mission file.
PREV⇑	Recalls Screen 3.

Coordinate Geometry - Location via Intersection by Distance and Azimuth

The location via intersection by distance and azimuth is a four screen process. Screen 1, Figure 4.70, prompts for data to define the first point radius.

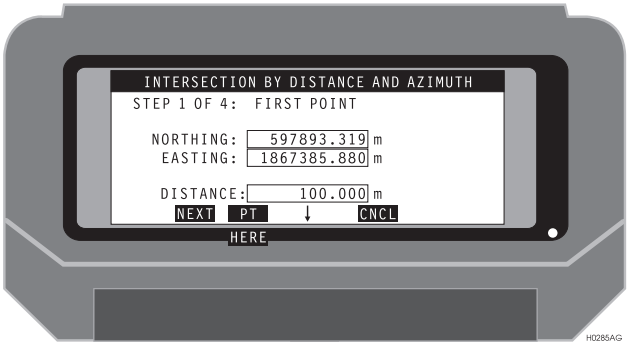

Figure 4.70: Location via Intersection by Distance and Azimuth - Screen 1

Table 4.71 describes the first screen for location via intersection by distance and azimuth.

Table 4.71: Location via Intersection by Distance and Azimuth - Screen 1

Item	Description
NORTHING	The northing value for the coordinate.
EASTING	The easting value for the coordinate.
DISTANCE	The distance value defining the radius for point 1.
NEXT	Calls Screen 2.
PT	Calls the Point Selection Screen.
CNCL	Cancels the current entry and returns to the Coordinate Geometry (COGO) Screen.
HERE⇑	Enters the current calculated position as the first point.

Screen 2, Figure 4.71, prompts for data to define the intersecting line.

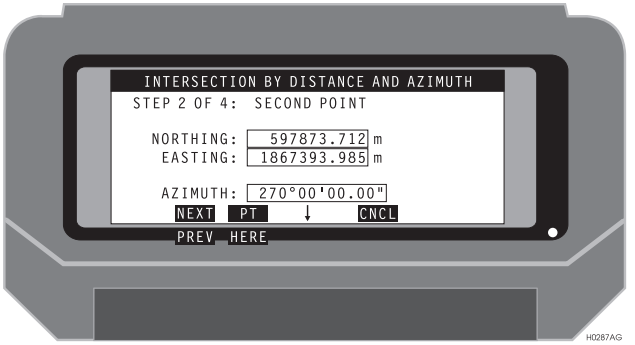

Figure 4.71: Location via Intersection by Distance and Azimuth - Screen 2

Table 4.72 describes the second screen for location via intersection by distance and azimuth.

Table 4.72: Location via Intersection by Distance and Azimuth - Screen 2

Item	Description
NORTHING	The northing value for the coordinate.
EASTING	The easting value for the coordinate.
AZIMUTH	The azimuth value to define the line.
NEXT	Calls Screen 3.
PT	Calls the Point Selection Screen.
CNCL	Cancels the current entry and returns to the Coordinate Geometry (COGO) Screen.
PREV⇑	Recalls Screen 1.
HERE⇑	Enters the current calculated position as the first point.

Screen 3, Figure 4.72, displays the first of two solutions.

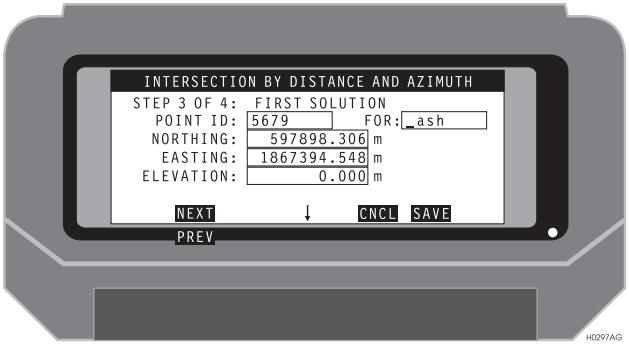

Figure 4.72: Location via Intersection by Distance and Azimuth - Screen 3

Table 4.73 describes the third screen for location via intersection by distance and azimuth.

Table 4.73: Location via Intersection by Distance and Azimuth - Screen 3

Item	Description
POINT ID	The point identifier for the point being stored in the mission file.
NORTHING	The northing value for the coordinate.
EASTING	The easting value for the coordinate.
ELEVATION	The elevation value for the coordinate.
FOR	The FOR point is derived in the FROM POINT selection in the first COGO screen. If the PT screen is used to select a FROM POINT, then the FOR point ID is the point ID selected. If the PT screen is not used, the point ID is the current point ID in the navigation screen.
NEXT	Calls Screen 4.
CNCL	Cancels the current entry and returns to the Coordinate Geometry (COGO) Screen.
SAVE	Saves the point in the mission file.
PREV⇑	Recalls Screen 2.

Screen 4, Figure 4.73, displays the second of two solutions.

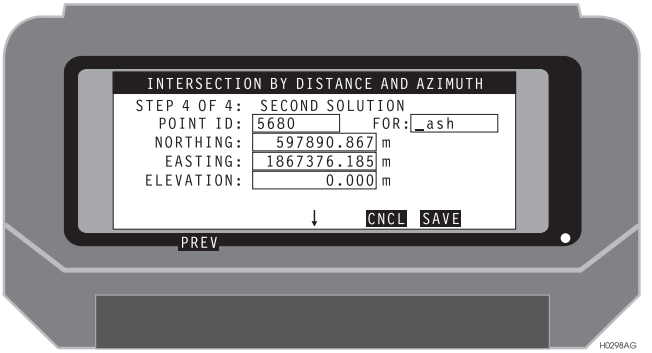

Figure 4.73: Location via Intersection by Distance and Azimuth - Screen 4

Table 4.74 describes the fourth screen for location via intersection by distance and azimuth.

Table 4.74: Location via Intersection by Distance and Azimuth - Screen 4

Item	Description
POINT ID	The point identifier for the point being stored in the mission file.
NORTHING	The northing value for the coordinate.
EASTING	The easting value for the coordinate.
ELEVATION	The elevation value for the coordinate.
FOR	The FOR point is derived in the FROM POINT selection in the first COGO screen. If the PT screen is used to select a FROM POINT, then the FOR point ID is the point ID selected. If the PT screen is not used, the point ID is the current point ID in the navigation screen.
CNCL	Cancels the current entry and returns to the Coordinate Geometry (COGO) Screen.
SAVE	Saves the point in the mission file.
PREV⇑	Recalls Screen 3.

Filter Point List (FILT)

The Filter Point List screen, Figure 4.74, lets you sort and filter the data points to a lesser number of points based on the filter criteria.

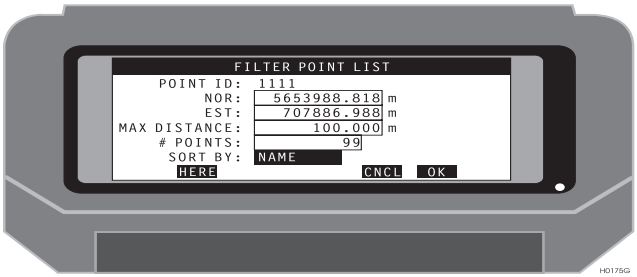

Figure 4.74: Filter Point List Screen

Table 4.75 describes the filter point list parameters..

Table 4.75: Filter Point List Parameters

Item	Description
POINT ID	This field indicates the currently selected point of reference.
NOR or LAT	Editable field displays the northing or latitude of the point of reference.
EST or LON	Editable field displays the easting or longitude of the point of reference.
MAX DISTANCE	Editable field displays the maximum distance to be considered when sorting by distance.
# POINTS	Editable field displays the maximum number of points to be included in the filtered points selection.
SORT BY	Toggle field. This field toggles between DISTANCE and NAME. Sorting by distance will include all points within the data file which are located within the distance specified in MAX DISTANCE. Sorting by name will include all points within the data file which are closest to the point name chosen, up to the limit is set in # POINTS.
HERE	Selects the current calculated position as the reference point.
CNCL	Discards any changes and recalls the previous screen.
OK	Accepts any changes and returns to the previous screen.

Troubleshooting

General

The Mine Surveyor II is a differential system consisting of two GPS receivers linked by a radio data link. To obtain high-accuracy readings, all system components must be operating optimally. This appendix discusses some of the operational problems that may occasionally be encountered with a differential GPS system, and suggested remedies.

Handheld Reboot

The handheld controller may sometimes lock up, preventing communication with the receiver or PC. If a hard reboot is necessary, press the following key combination:

Both ↑ keys and red power key with the standard keyboard layout.

The ESC and ↑ keys and red power key with the TDS keyboard layout.

This should only be necessary if the handheld completely locks up and does not respond to a normal soft boot.

Handheld Power Management

If you are getting a *Warning Battery Level Low* message and the Husky keeps turning off, follow these steps to get the FS/2 working again:

1. Exit normally. You may have to keep turning the FS/2 back on after each keystroke, but get to the DOS prompt. Do not reboot the FS/2 to get to the DOS prompt unless you cannot exit normally.
2. Press the **Paw** and **H** keys together. The **Paw** key is the key directly below the **Yes** key. It has a green paw symbol on it.
3. Press the right arrow key twice to highlight **Power** and then press the **Yes** key to access to the Power Parameters screen.
4. On the Power Parameters screen, use the up or down arrow keys to toggle the Advanced Power management selection screen to **Yes** then press the **Yes** key.
5. Use the up or down arrow keys to increase the **Power Remaining** to a value 5% above the **Low Power** warning onset. Press the **Yes** key to accept the changes, then press the **Esc** key to return to the DOS prompt. The **low power** warning should not be present.

Operational Troubleshooting

The GPS system is designed as a line-of-sight system with measurements based on a direct signal from the satellite to the GPS antenna. High accuracy can only be obtained with proper satellite geometry. Care must be taken to ensure the best satellite coverage is available at all times when high accuracy is required.

Satellite coverage is easily predicted using the Mission Planning software and current satellite almanacs. The software gives you an accurate overview of predicted satellite coverage and geometry for several days.

Additionally, the Mission Planning software allows you to model the effects of obstructions (i.e. high walls, heavy equipment, topography, etc.) on the satellite coverage and geometry.

Proper planning with current satellite data will offer the best results under any conditions.

In order to obtain high accuracy, the system must use phase corrections to resolve carrier phase ambiguities. This requires good satellite coverage at both the base and the remote sites, and good correction data via the radio link. Once ambiguities have been resolved, the system should maintain high accuracy for the entire survey. Initial resolution times are usually 1 to 2 minutes under good conditions.

If the system loses lock during the survey, the ambiguity resolution, and high accuracy, should return quickly (usually 30 seconds or less). When the HRMS and VRMS are in the centimeter range the system is again ready for high accuracy survey.

Certain conditions can prevent initial resolution. For example, in a high multi-path area, carrier phase readings will vary greatly, causing the software to have difficulty reaching initial ambiguity resolution. Moving even a few meters away from the current position will usually improve the readings and ambiguity resolution.

After a loss of lock, especially after a long period of good surveying, the re-resolution time may be very long. This is caused by a filter in the processing software constantly trying to improve the position estimate. This position estimate process may become constricted, causing long resolution times.

A switch allows you to open up the position estimate. By pressing the "↑" and "Ins" keys, you reset the search filter parameter, and resolution is often immediately improved.

To obtain the best efficiency in the field, you must pay close attention to the operation of the system. Too few satellites, poor geometry, or lack of correction data can all degrade the system performance.

The Remote Differential Screen (DIFF) screen of the Mine Surveyor II software, displays the operational status of the differential system. By checking this screen when poor field operation occurs, you can see exactly what is causing the problem.

You should first check that the base station corrections are being received. Second, check to see that the remote unit is tracking enough satellites.

If the remote unit is not tracking enough satellites, it may be possible to use lower elevation satellites by lowering the elevation mask to 5 degrees. This is found on the .“Data Logging Setup Screen (LGST)” on page 110.

Next, check to see if the solution is float (F) or fixed (X). If the solution is float, resetting the search filter (see previous page) may aid in resolution.

Radio Link

The differential GPS system sends corrections from the base GPS receiver to the remote or field unit through a radio/modem link. The corrections are applied to GPS measurements at the remote unit to obtain high accuracy positions. Loss of the radio telemetry will degrade the position accuracy. The system is designed to allow for the loss of some of the corrections, while still offering high accuracy.

You may notice that under some conditions the radio telemetry is intermittent, but by carefully monitoring the reported HRMS and VRMS, you can still complete a survey.

The system warns when problems exist with the radio link. The handheld software will first report a poorer solution, and when too many corrections have been missed, it will report "**Old Coordinates**".

If the telemetry link is intermittent or cut off, real-time high-accuracy readings are not possible. Some areas of the survey area may restrict the operation of the real-time differential GPS system. These areas can still be surveyed with GPS, however, this requires post-processing of data and these techniques are not covered in this manual.

Multipath

Multipath is a broad term which describes the effect when a GPS signal is interfered with on the way to the GPS antenna. This interference is usually caused by reflection of the signal from a surface or by an object blocking the GPS signal.

Multipath will create false or poor measurements from one or more satellites. These measurements will then affect the GPS position solution, causing poor accuracies or failure of resolution.

You must be aware of possible causes of multipath and avoid operations in these areas. Common causes are reflections from vehicles, equipment or buildings, or signal degradation due to interference by trees or radio sources.

If you are experiencing poor results or long resolution times, multipath may be the cause of these problems. Moving even a few meters from a problem area may solve the interference problem. Areas of likely multipath (i.e. close to large buildings or equipment, operations in heavy tree cover) should be surveyed using offsets, to allow for proper system operation.

GPS Mission Planning

As noted elsewhere, good knowledge of GPS coverage and satellite geometry for the given survey area and time are crucial to a successful survey. A full review of the satellite situation should be undertaken before each survey.

Fast Carrier Phase Differential (Fast CPD)

Fast CPD is a mode which allows you to navigate very quickly between points. Fast CPD resolves to an accuracy of approximately one decimeter almost instantaneously. The solution may gradually improve to a few centimeters over time, but will generally remain at the decimeter level. Fast CPD offers several advantages for lower accuracy survey: With the fast CPD mode operating, the screen update for position display shows little

or no delay. After a loss of lock, fast CPD returns to decimeter accuracy within a few seconds and maintains this level under poor conditions. Navigation functions are faster by at least a factor of two.

This mode of operation can offer a significant increase in the speed of production for lower accuracy work. Fast CPD can be switched ON or OFF at any time from the RZ Remote Differential Setup (DFST) screen.

Handheld Program

Q: I log a point, but the Point Selection Screen does not display an asterisk adjacent to the point id.

A: An asterisk is displayed adjacent to a point id only when the point is logged via Shift+L in one of the navigation screens. The purpose of the asterisk is to inform you that the point has been surveyed as well staked.

Handheld Transfer

Overview

Handheld Transfer provides communication between a PC and a handheld controller, giving you an easy and quick way to copy, move, and delete files, and to change the current drive and directories on the handheld and PC. This version of **Handheld Transfer** supports the Husky FS/2 or FS/3 and the Psion WorkAbout handheld controllers.

Getting Started

Before Using Handheld Transfer

At this point you need to do some preliminary setup operations that depend upon whether you are using a FS/2 or a FS/3.

Setup

1. Connect FS/2 or FS/3 serial port 1 to a COM port on your PC using the appropriate serial data cable.
2. Turn on the PC.
3. Turn on the FS/2 or FS/3 by pressing the red power key ⏻.
4. If the FS/2 or FS/3 is being used for the first time, or if the FS/2 or FS/3 has been rebooted since its last use, the FS/2 or FS/3 opening screen appears as shown in Figure A.1. If this is the case, go to step 7, otherwise go to step 5.

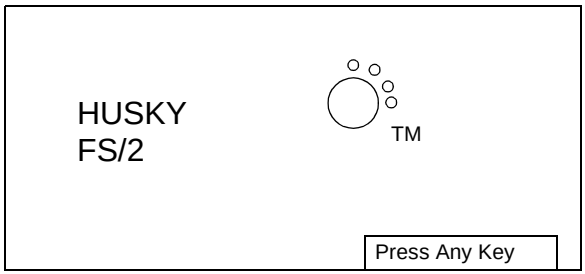

Figure A.1: FS/2 or FS/3 Opening Screen

To reboot the FS/2 or FS/3, simultaneously pressing SHIFT+SHIFT+POWER (both shift keys and red power key) and holding for about 2 seconds.

5. If the FS/2 or FS/3 has been recharged, or if a power interruption has occurred (e.g., the batteries were replaced), then the FS/2 or FS/3 power parameters screen may appear, similar to Figure A.2 . If this is the case, change the settings as appropriate (continue or stop recharging), then press **ESC** until you get a DOS prompt, and continue with step 7, otherwise go to step 6.

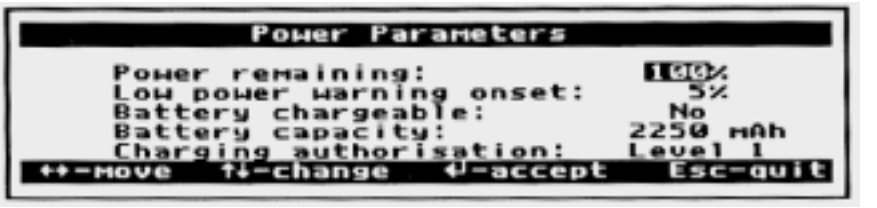

Figure A.2: FS/2 or FS/3 Power Parameters Screen

The FS/2 or FS/3 is recharged as follows: 1. With the DOS prompt on the screen, press the PAW key and the H key to access the FS/2 or FS/3 setup screen. 2. Press the right arrow twice and press YES to access the power parameters screen. 3. Set ADVANCED POWER MANAGEMENT (APM) to YES (up or down arrow as necessary, then YES). 4. Press right or left arrow until CHARGING AUTHORIZATION is highlighted. 5. Use up or down arrow to select LEVEL 3. 6. Press YES. 7. Press red power key to turn off FS/2 or FS/3. 8. Connect FS/2 or FS/3 power adapter to facility power and to power port on bottom of FS/2 or FS/3; message "CHARGING IN PROGRESS" appears on the FS/2 or FS/3 screen. When charging is complete, the message "CHARGING COMPLETED" appears.

6. If the FS/2 or FS/3 were running a program when last powered off, the program will resume when the FS/2 or FS/3 is turned back on. If this is the case, exit the program and go to step 7.
7. The FS/2 or FS/3 should now be displaying the DOS prompt **C:\>**. Start the file transfer utility that is built into the FS/2 or FS/3 by typing **HCOM**, and then press **Yes**. The FS/2 or FS/3 file transfer utility screen appears, as shown in Figure A.3 (your version and date may be different). This screen

indicates that the file transfer program is running, and the FS/2 or FS/3 is ready for communication with the PC.

```
FS/2 File Transfer Utility
Version 1.02    20th Nov. 1992
(c) Copyright Husky Computers Ltd.
```

Figure A.3: FS/2 or FS/3 File Transfer Utility (HCOM) Screen

8. Press the **Esc** key on the FS/2 or FS/3 to exit the file transfer utility and return to the DOS prompt.

CAUTION
If any of the above conditions is not fulfilled, Handheld Transfer displays the warning message"Remote was not found".

Using Handheld Transfer

The Main Window on the PC

1. Double-click the **Handheld Transfer** icon on the PC. The main window appears, as shown in Figure A.4.

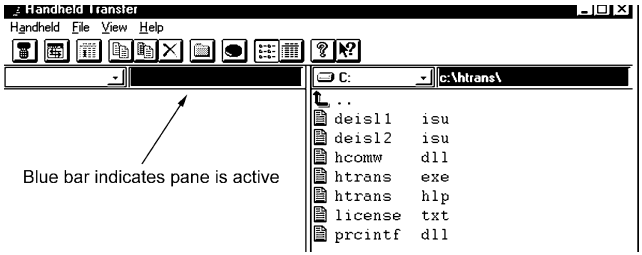

Figure A.4: Handheld Transfer Main Window

The left half of the display is the datalogger pane, which shows the files, if any, in the handheld. The right half of the display is the PC pane, which shows the files, if any, in the indicated directory of the PC. The blue bar along the top edge of the pane shows

that the pane is active (in the illustration above, the blue bar indicates the datalogger (left) pane is active).

You use these two panes to transfer files from datalogger (handheld) to PC, or from PC to datalogger. The files may be data collected from a GPS receiver, executable files, or any kind of information that must be transferred between units.

Operation

Switching Between Panes

To switch between panes, use one of the following methods:

1. Click the pane you want to be the current pane.
2. Use the **Tab** key on your keyboard.
3. Click the **Change pane** button on the toolbar.

Connecting a Handheld

Handheld Transfer provides two methods to connect a handheld: **Connect** and **Auto Connect**.

Connect Method

1. Click on **Handheld**. The Handheld drop-down menu appears, as shown in Figure A.5.

Figure A.5: Handheld Drop-down Menu - Connect Method

2. Choose **Connect** from the **Handheld** menu or click the **Connect** button. The Connect to Handheld dialog box opens, as shown in Figure A.6.

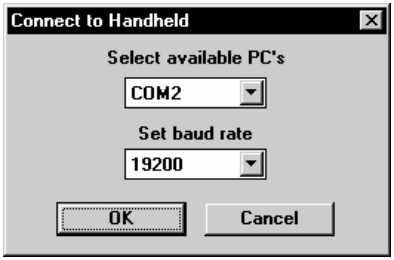

Figure A.6: Connect to Handheld Dialog Box

3. In the **Select available PC's** box, click the down arrow and select the PC COM port that you want to use.
4. In the **Set baud rate** box, click the down arrow and select a baud rate from the list box. When connecting to a Husky FS/2 or FS/3, select 38400.
5. Press **OK**. The Handheld Transfer software now connects your handheld to the PC using the parameters that you selected.

Auto Connect Method

1. Switch to the **Handheld** pane on the PC display.
2. Choose **Auto connect** from the **Handheld** drop-down menu, Figure A.7.

Figure A.7: Handheld Drop-down Menu - Auto Connect Method

Once the handheld is connected, a Disconnect option becomes available in the Handheld menu.

Viewing a List of Files and Directories

You can change the appearance of files and directories using the **Brief** or **Full** options from the **View** menu.

- **Brief** displays files and directories as a list

• **Full** displays files and directories with information about size and day of last modified.

Selecting a Drive

Handheld Transfer displays files and directories on one of the drives of your computer or handheld. To change the current drive:

1. Locate the mouse cursor at the handheld or the PC pane depending on the drives you want to change.
2. Click on **the Drive** button**,** Figure A.8. The Drive list appears.

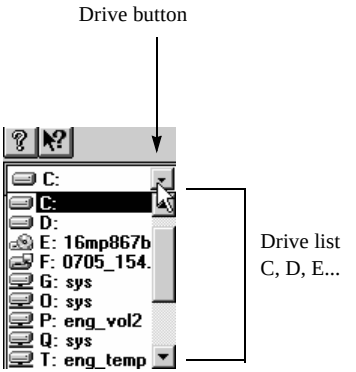

Figure A.8: Drive List

3. Click the letter of the drive. The dialog box closes. You can see the files and directories on the selected drive. The current disk drive is shown in the main window title.

Copying and Moving Files

The following paragraphs summarize the ways in which **Handheld Transfer** allows you to select a single file or multiple files. Once items have been selected, if you change your mind, you can unselect the items by clicking anywhere on the screen. After selecting, press **OK**.

Handheld Transfer allows you to copy a file or multiple files from the handheld current directory to the PC current directory or vice versa.

To copy a file do the following:

1. Make sure the destination directory is visible and the source directory is current.

2. Select the file or multiple files you want to copy as described above.
3. Choose **Copy to** from the **File** menu or press the **Copy to** button on the toolbar.

You can copy files by using the pop-up menu. Use the right mouse button to click the selected file. Choose COPY TO from the menu that appears.

To move a file or multiple files from the handheld current directory to the PC current directory, or vice versa, do the following:

1. Make sure the destination directory is visible and the source directory is active.
2. Select the file or multiple files you want to move, as described above.
3. Choose **Move to** from the **File** menu or press the **Move to** button on the toolbar

You can move files by using the pop-up menu. Use the right mouse button to click the selected file. Choose MOVE TO from the menu that appears.

FSRadio

Configuring the Pacific Crest Radio Modem with the Data Collector

The Pacific Crest UHF/VHF radio modems can be programmed from the data collector. Mine Surveyor II supports programming of channel, sensitivity, and link rate for the majority of radios through the radio setup screen (RDIO). However, recent changes in radio firmware have affected compatibility with the RDIO screen. In light of this, a stand-alone radio configuration program (FSRADIO) is available for radio programming in those few cases where the RDIO screen cannot be used. FSRADIO supports the Pacific Crest radio modems and the Ashtech Spread Spectrum Radio. The following details the FSRADIO interface to the Pacific Crest radio modems. For information regarding the Ashtech Spread Spectrum Radio, refer to the *SSRadio Operations Manual; part number 630173-01*.

FSRADIO.EXE is located in the program files directory with Mine Surveyor II. Verify the radio is connected to the GPS receiver and powered when programming a base station radio. Disable data transmission before attempting to program the radio. From the data collector DOS prompt, type FSRADIO and press the YES key. If you are connecting directly to the radio, type FSRADIO /D at the prompt. Please not that a space must be inserted between the last letter of the first word (“O”) and the forward slash (“/”).

The FSRADIO program menu is character based, requiring you to select items from menus. The data collector can program the following parameters:

- Daisy Chain Mode
- Sensitivity
- Channel
- Link Speed

The initial screen displays the following (Figure B.1):

Figure B.1: Main Screen

Daisy Chain Through Screen

Once the data collector has established communications with the GPS receiver, the **Daisy Chain Through** screen, Figure B.2, lets you connect the data collector to the radio through a receiver serial port.

Figure B.2: Daisy Chain Through Screen

The selections on this screen are B, C, and D. These are the serial ports on the GPS receiver. Port A (or whatever port the data collector is connected) on the receiver is not available, as it is used by the data collector. A valid port selection calls the Connect To screen, and the program then activates the daisy chain mode in the receiver using the selected port. If your GPS receiver has an internal radio installed, Port D should be selected.

When direct connection is used, the Daisy Chain Through screen is bypassed.

Connect To Screen

The Connect To screen, Figure B.3, lets you configure a Pacific Crest radio or an SSRadio (not covered in this manual).

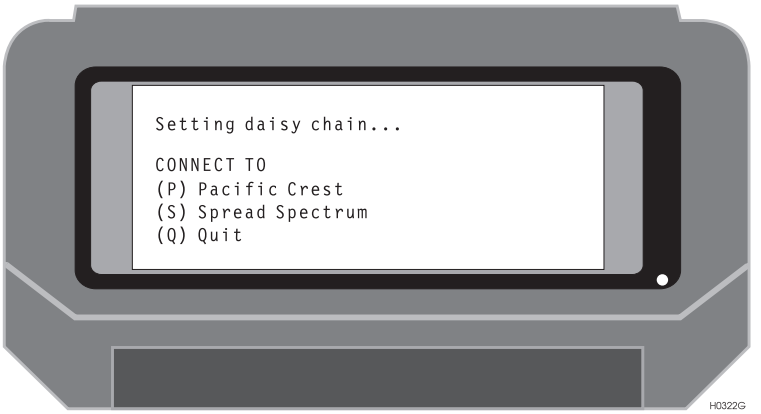

Figure B.3: Connect To Screen

The selections in this screen are:

P – Calls the Pacific Crest radio configuration screen.

S – Calls the SSRadio Status Screen.

Q – Quits the program.

Press the appropriate key to make the desired connection.

Radio Status Screen

The **Radio Status** screen, Figure B.4 and Figure B.5, allows you to view the current configuration, return to the 'Connect To screen' or advance to the 'Change Parameters screen'.

If the radio firmware supports the software break function, the software will communicate directly with the radio. The program will display the communication attempt, then display the current configuration as shown in Figure B.4.

Figure B.4: Radio Status with Software Break Function

If the radio firmware does not support the software break function, the software will prompt you to cycle power on the radio. The program will display the communication attempt, then display the current configuration as shown in Figure B.5.

Figure B.5: Radio Status without Software Break Function

The selections in this screen are:

C – Change parameters of the radio. This selection calls the 'Change Parameters' screen.

Q – Return to the 'Connect To' screen.

Change Parameters Screen

The **Change Parameters** screen, Figure B.6, lets you change settings of the radio.

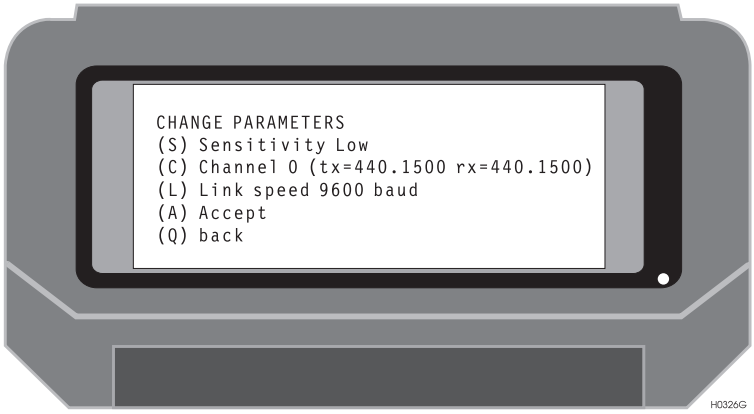

Figure B.6: Change Parameters Screen

The selections on this screen are:

S – Calls the ‘Select Sensitivity’ screen.

C – Calls the ‘Select Channel’ screen.

L – Calls the ‘Select Transmission Speed’ screen.

A – Accepts selected parameters and programs the radio.

Q – Returns to the ‘Radio Status’ screen.

Select Sensitivity Screen

The **Select Sensitivity** screen, Figure B.7, lets you change the radio sensitivity setting.

Figure B.7: Select Sensitivity Screen

The selections on this screen are:

H – This sets the radio sensitivity to high. Use this setting when long distances are expected between the base and rover radios.

M – This sets the radio sensitivity to moderate. Use this setting when medium to long distances are expected between the base and rover radios.

L – This sets the radio sensitivity to low. Use this setting when short distances are expected between the base and rover radios. This is the preferred setting for the base radio.

After you make a selection, the program returns to the ‘Change Parameters’ screen.

Select Channel Screen

The **Select Channel** screen, Figure B.8, lets you change the radio channel setting. Up to 16 channels are available in the radio.

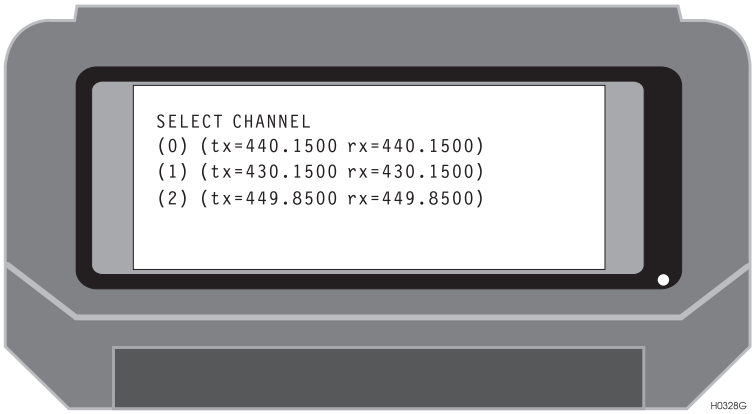

Figure B.8: Select Channel Screen

The selections on this screen are:

0-15 – This sets the radio channel to the selected setting.

After you make a selection, the program returns to the ‘Change Parameters’ screen.

Select Transmission Speed Screen

The **Select Transmission Speed** screen, Figure B.9, lets you change the radio transmission speed setting. 9600 baud is recommended for most RTK applications.

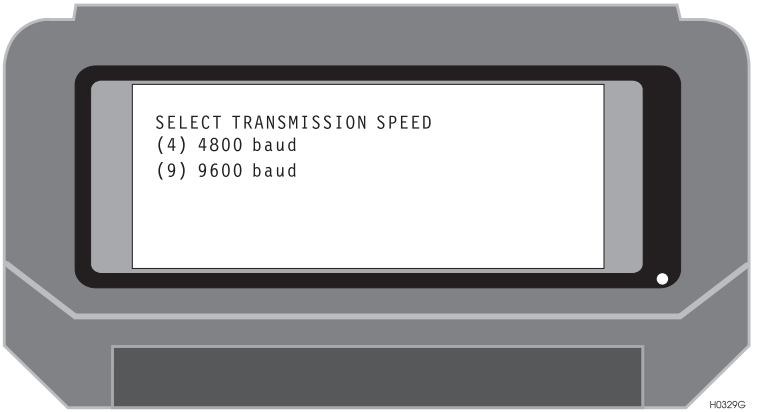

Figure B.9: Select Transmission Speed Screen

The selections on this screen are:

4 – This sets the radio transmission speed to 4800 baud.

9 – This sets the radio transmission speed to 9600 baud.

After you make a selection, the program returns to the ‘Change Parameters’ screen.

Programming the Changed Parameters

After all necessary parameters have been changed, program the radio with the new settings from the ‘Change Parameters’ screen (Figure B.10).

Select ‘Accept’ to program the changed parameters.

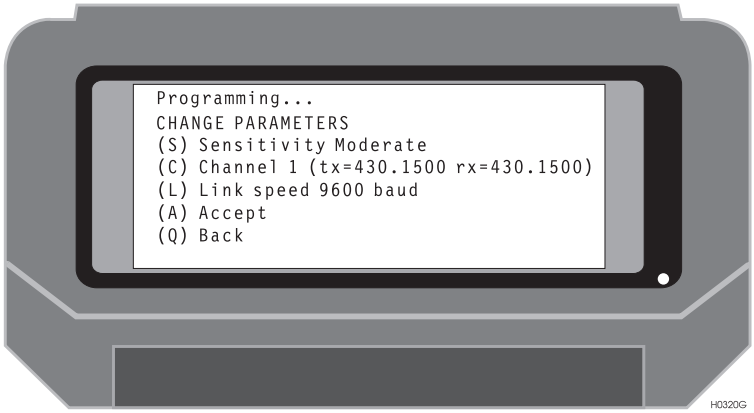

Figure B.10: Change Parameters Screen

After the radio is programmed, the current parameters are displayed in the ‘Change Parameters’ screen as shown in Figure B.11.

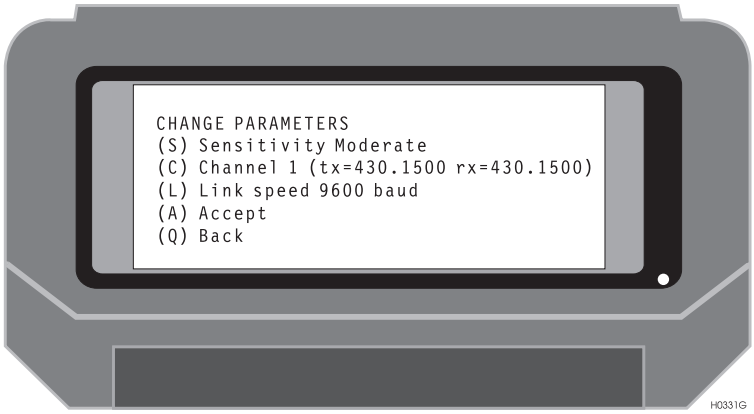

Figure B.11: Change Parameters Screen

- Press ‘Q’ to return to the ‘Radio Status’ screen.
- Press ‘Q’ to return to the ‘Connect To’ screen.
- Press ‘Q’ to exit the program.

It is necessary to exit the program completely in order to disable the daisy chain mode.

Supplementary Information

Ellipsoids

Table C.1: Ellipsoids

ID	Name	a	1/f
AIRY	Airy	6377563.396	299,3249646
MAIRY	Modified Airy	6377320.189	299.3249646
ANS	Australian National	6378160	298.25
BESS	Bessel 1841	6377397.155	299,1528128
MBESS	Modified Bessel	6377397.155	299,152012050
CHINA80	China Geodetic Ref. Sys. 1980	6378140	298.257
CLK66	Clarke 1866	6378206.4	294,9786982
CLK80	Clarke 1880	6378249.145	293.465
EVER	Everet	6377276.345	300.8017
MEVER	Modified Everest	6377304.063	300.8017
MFISC60	Fischer 1960 (Mercury)	6378166	298.3
GRS80	Geodetic Ref. Sys. 1980	6378155	298.3
HELM	Helmert 1906	6378150	298.3
HOUGH	Hough	6378270	297
INTL	International	6378388	297
KRASS	Krassovsky	6378245	298.3
SA1969	South America 1969	6378160	298.25
WGS60	World Geodetic Sys. 1960	6378165	298.3
WGS66	World Geodetic Sys. 1966	6378145	298.25
WGS72	World Geodetic Sys. 1972	6378135	298.26
WGS84	World Geodetic Sys. 1984	6378137	298.257223563

Datums

Table C.2: Datums

ID	Name	Ellips ID	Dx	DY	DZ	RX	RY	RZ	DELTA SCALE
ADINDAN	Adindan	CLK80	-162	-12	206	0	0	0	0
AFG	Somalia	KRASS	-43	-163	45	0	0	0	0
ADG66	Austrial	ANS	-137.882	-42.583	162.284	0.015	0.591	0.298	1.017
AIN1970	Ain El Abd 1970	INTL	-150	-251	-2	0	0	0	0
ANNA	Anna Astro 1965	ANS	-491	-22	435	0	0	0	0
ARC 1950	ARC 1950 Mean Value	CLK80	-143	-90	-294	0	0	0	0
ARC 1960	ARC 1960 Mean Value	CLK80	-160	-8	-300	0	0	0	0
ASC 1958	Ascension Island 1958	INTL	-207	107	52	0	0	0	0
ASTROBE	Astro Beacon “E”	INTL	145	75	-272	0	0	0	0
ASTROPO	Astro Pos 71/4	INTL	-320	550	-494	0	0	0	0
ASTRO52	Astronom, Station 1952	INTL	124	-234	-25	0	0	0	0
BELGIUM	Belgium	INTL	0	0	0	0	0	0	0
BELLE	Bellevue (GN	INTL	-127	-769	472	0	0	0	0
BERMU	Bermuda Islands 1957	CLK66	-73	213	296	0	0	0	0
BOGOTA	Bogota Observatory	INTL	307	304	-318	0	0	0	0
CAMPO	Campo Inchauspe	INTL	-148	136	90	0	0	0	0
CANTON	Canton is 1966	INTL	298	-304	-375	0	0	0	0
CAPE	Cape South Africa	CLK80	-136	-108	-292	0	0	0	0
CAPEUK	Cape South Africa	CLK80	-135.4	-106,6	-291.7	0	0	0	0
CAPECL	Cape Canaveral Mean Value	CLK66	-2	150	181	0	0	0	0
CARTHAG	Carthage Tunisia	CLK80	-263	6	431	0	0	0	0
CH1954	Beijing 1954	KRASS	0	0	0	0	0	0	0
CHATHAM	Chatham Island	INTL	175	-38	113	0	0	0	0
CHUA	Chua Astro	INTL	-134	229	-29	0	0	0	0
CORREGO	Corrego Alegre, Brazil	INTL	-206	172	-6	0	0	0	0
DENMARK	Denmark	INTL	0	0	0	0	0	0	0
DJAKART	Djakarta, Sumatra	BESS	-377	681	-50	0	0	0	0
DOS 1968	Dos 1968, Gizo Island	INTL	230	-199	-752	0	0	0	0
EASTER	Denmark	INTL	0	0	0	0	0	0	0
EURO50	European 1950 Mean Value	INTL	-87	-98	-121	0	0	0	0
EURO79	European 1979 Mean Value	INTL	-86	-98	-119	0	0	0	0
FINLAND	Finland	INTL	0	0	0	0	0	0	0
GANDA	Gandajika Base	INTL	-133	-321	50	0	0	0	0
GEOD49	Geodetric Datum 1949	INTL	84	-22	209	0	0	0	0
GERMANY	Germany	BESS	0	0	0	0	0	0	0
KRA4GER	Germany	KRASS	24.0	-123.0	-94.0	-0.02	0.25	0.13	1.1
GUAM63	Guam Island 1963	CLK66	-100	-248	259	0	0	0	0
GUX	Gux 1 Astro	INTL	252	-209	-751	0	0	0	0

Table C.2: Datums (continued)

ID	Name	Ellips ID	Dx	DY	DZ	RX	RY	RZ	DELTA SCALE
HJORSEY	Hjorsey 1955, Iceland	INTL	-73	46	-86	0	0	0	0
HKONG	Hong Kong 1963	INTL - 156	-271	-189	0	0	0	0	0
INDIAN1	Indian, Thailand and Vietname	EVER	214	836	303	0	0	0	0
INDIAN2	India, Bangladesh and Nepal	EVER	289	734	257	0	0	0	0
IRELAND	Ireland 1965	MAIRY	506	-122	611	0	0	0	0
ISTS	Ists 073 Astro 1969	INTL	208	-435	-229	0	0	0	0
JOHNST	Johnston Island 1961	INTL	191	-77	-204	0	0	0	0
KANDA	Kandawala, Sri Lanka	EVER	-97	787	86	0	0	0	0
KERUGE	Kergueken Island	INTL	145	-187	103	0	0	0	0
KERTAU	Kertau 1948	MEVER	-11	851	5	0	0	0	0
KOREA	Korea	BESS	-125.90	478.38	658.76	-1.87	2.28	2.166	1.84
LAREUN	La Reunion, Mascarene Island	INTL	94	-948	-1262	0	0	0	0
LCASTRO	L. C. 5 Astro	CLK66	42	124	147	0	0	0	0
LIBERIA	Liberia 1964	CLK80	-90	40	88	0	0	0	0
LUZON	Luzon, Phillippines	CLK66	-133	-77	-51	0	0	0	0
MAHE	Mahe Island 1971	CLK80	41	-220	-134	0	0	0	0
MARCO	Marco Astro, Salvage Island	INTL	-289	-124	60	0	0	0	0
MASSAWA	Massawa, Eritrea	BESS	639	405	60	0	0	0	0
MERCHI	Merchich, Morocco	CLK80	31	146	47	0	0	0	0
MIDWAY	Midway Astro 1961	INTL	912	-58	1227	0	0	0	0
MINNA	Minna, nigeria	CLK80	-92	-93	122	0	0	0	0
NAHRWA1	Nahrwan, Masirah Island	CLK80	-247	-148	369	0	0	0	0
NAHRWA2	Nahrwan, United Arab Emirates	CLK80	-249	-148	369	0	0	0	0
NAHRWA3	Nahrwan, Saudi Arabia	CLK80	-231	-196	482	0	0	0	0
NAMIBIA	Nambia	BESS	616	97	-251	0	0	0	0
NAPARI	Naparima, BWI	INTL	-2	374	172	0	0	0	0
NAD27	North American	CLK66	-8	160	176	0	0	0	0
NORWAY	Norway	MBESS	337	-210	564	0	0	0	0
NTF	Referential Geodelique Associe	CLK80	-168	-60	320	0	0	0	0
AK27	Alaska 1927	CLK66	-5	135	172	0	0	0	0
BAH27	Bahamas 1927	CLK66	-4	154	178	0	0	0	0
SAL27	San Salvador	CLK66	1	140	165	0	0	0	0
CAN27	Canada 1927	CLK66	0	125	201	0	0	0	0
CARIB27	Caribbeam 1927	CLK66	-7	152	178	0	0	0	0
CAMER27	Central America 1927	CLK66	0	125	194	0	0	0	0

Table C.2: Datums (continued)

ID	Name	Ellips ID	Dx	DY	DZ	RX	RY	RZ	DELTA SCALE
CUBA27	Cuba 1927	CLK66	-9	152	178	0	0	0	0
GRNLD27	Greenland 1927	CLK66	11	114	195	0	0	0	0
MEX27	Mexico 1927	CLK66	-12	130	190	0	0	0	0
NAD83 (GRS80)	North American 1983	GRS80	0	0	0	0	0	0	0
OBSERV	Observatorio 1966	INTL	-425	-169	81	0	0	0	0
OLDEGYP	Old Egyptian 1930	HELM	-130	110	-13	0	0	0	0
OLDHW	Old Hawaiian	CLK66	61	-285	-181	0	0	0	0
OMAN	Oman	CLK80	-346	-1	224	0	0	0	0
OSGB2	Ordnance Sur. of Great Britian	AIRY	445.2	-161.8	542.6	-0.73	0.28	1.61	-20.7
OSGB1	Ordnance Sur. of Great Britain	AIRY	375	-111	431	0	0	0	0
PICO	Pico De Las Nieves	INTL	-307	-92	127	0	0	0	0
PITCRN	Pitcairn Astro 1967	INTL	185	165	42	0	0	0	0
PROCHIL	Provision S. Chilean 1963	INTL	16	196	93	0	0	0	0
PROAMER	Provisional S. Ameri-can 1956	INTL	-288	175	-376	0	0	0	0
PRV127	Puerto Rico and Virgin Islands	CLK66	11	72	-101	0	0	0	0
QATAR	Qatar National	INTL	-128	-283	22	0	0	0	0
QORNOQ	Qornoq. South Green-land	INTL	164	138	-189	0	0	0	0
ROME	Rome 1940	INTL	-225	-65	-9	0	0	0	0
SANTABR	Santa Braz	INTL	-203	141	53	0	0	0	0
SAPPER	Sapper Hill 1943	UBTK	-355	16	74	0	0	0	0
SAMER69	South American 1969	SA1969	-57	1	-41	0	0	0	0
SASIA	South Asia, Singapore	MFISC60	7	-10	-26	0	0	0	0
SEBASE	South East Base	INTL	-499	-249	314	0	0	0	0
SWBASE	South West Base	INTL	-104	167	-38	0	0	0	0
SPAIN	Spain	INTL	0	0	0	0	0	0	0
SWEDEN	Sweden	BESS	0	0	0	0	0	0	0
TIMBAL	Timbalai 1948	EVER	-689	691	-46	0	0	0	0
TOKYO	Tokyo Mean Value	BESS	-128	481	664	0	0	0	0
TRISTAN	Tristan Astro 1968	INTL	-632	438	-609	0	0	0	0
VITI	Viti Levu 1916	CLK80	51	391	-36	0	0	0	0
WAKE60	Waje-Ebuwetij 1960	HOUGH	101	52	-39	0	0	0	0
WGS84	World Geodetic Sts, 1984	WGS84	0	0	0	0	0	0	0
WGS72	World Geodetic Sys. 1972	WGS72	0	0	4.5	0	0	0.814	0
UPS	Univ. Polar Stero-graphic	INTL	0	0	0	0	0	0	0
ZANDER	Zanderij, Suriname	INTL	-265	120	-358	0	0	0	0

Projections

Table C.3: Projections

ID	Name
TM83	Transverse Mercator
MERC	Equatorial Mercator
OM83	Oblique Mercator
LC83	Lambert Conformal
TM27	Transverse Mercator 27
LC27	Lambert Conformal 27
AK01	Alaska Zone 1 (SPC27)
AK29	Alaska Zones 2-9 (SPC27)
STER	Sterographic

Systems

Table C.4: Systems

System ID	Zone Family	Datum ID	Proj Type	Name	*Field 1	*Field 2	*Field 3	*Field 4	*Field 5	*Field 6
AMG	UTM6	ANS84	TM83	Aust Map Grid	0	0.999.6	0	0	500000	1000000
AMG66	UTM6	AGD66	TM83	Aust Map Grid 1966	0	0.9996	0	0	500000	0
AMG84	UTM6	AGD84	TM83	Aust Map Grid 1990	0	0.9996	0	0	500000	0
BEL-GIUM	GEN	Belgium	LC83	Belgium	495000	501000	42124.983	500000	150000	5400000
CH3	UTM3	CH1954	TM83	1954 Beijing Coord	0	0.9999	0	0	500000	0
DEN-MARK	UTM6	Denmark	TM83	Denmark	0	0.9996	0	0	500000	0
FINLAND		Finland	TM83	Finland	210000	2	210000	0	1500000	0
France	France	NTF	LC83	Frabce	483554.682	502345.282	22014.025	493000	600000	200000
GEOG	GEOG	WGS84	TM83	Geogr. Coord.						
GER-MANY	GERM	Germany	TM83	Germany	60000	1	60000	0	2500000	0
ISG	ISG	AGD66	TM83	Integ. Survey Grid	1400000	0.99994	1400000	0	300000	500000.0
KOREA	KOREA	Korea	TM83	Korea	1250000	1	1250000	380000	200000	500000
NGO48	NGO48	Norway	TM83	Norway	104322.5	1	104322.5	580000	0	0
SAFRICA	SAFR	CAPEUK	TM83	SAfrica	0	1	0	0	0	0
SPAIN	UTM6	Spain	TM83	Spain	0	0.9996	0	0	50000	0
SP83	SPC83	GRS80	“	StatePlnae Coord. 1983						
SPC27	SPC27	NAD27	“	State Plan Coord 1983						
SWEDEN		Sweden	TM83	Sweden	154829.8	1	154829.8	0	1500000	0
UKO	GEN	OSGB36	TM83	U.K.	-20000	0.99960127	-2000	490000	400000	-100000
UKO1	GEN	OSGB1	TM83	U.K.	-20000	0.99960127	-2000	490000	400000	-100000
UK02	GEN	OSGB2	TM83	U.K.	-20000	0.99960127	-2000	490000	400000	-100000
UTMN	UTM6	WGS84	TM83	Univ. Trans-verse Merc.(N)	0	0.9996	0	0	500000	0
UTMS	UTM6	WGS84	TM83	Univ. Trans-verse Merc. (S)	0	0.9996	0	0	500000	1000000
UPSN		UPS	STER	Univ. Polar Sterographic (N)	900000	0	0.994	200000	200000	
UPSS		UPS	STER	Univ. Polar Sterographic (S)	-900000	0	0.994	200000	200000	

* Field type is determined by the PRJTYPE and PROJECTIONS. Refer to PROJECTIONS table.
** Refer to SPC27 and SPC83 Sections.

Korea

Table C.5: Korea

System ID	Zone Family	Datum ID	Proj Type	Zone #	Name	Cm	Scale	Lon0	Lat0	E0	N0
West	KOREA	Korea	TM83	1	Zone 1 (West)	1250000	1	1250000	380000	200000	500000
Central	KOREA	Korea	TM83	2	Zone 2 (Cent,)	1250000	2	1270000	380000	200000	500000
East	KOREA	Korea	TM83	3	Zone 3 (East)	1250000	3	1270000	380000	200000	500000

Finland

Table C.6: Finland

System ID	Zone Family	Datum ID	Proj Type	Zone #	Name	Cm	Scale	Lon0	Lat0	E0	N0
FIN_1	FINLAND	Finland	TM83	1	Finland Zone 1	210000	1	210000	0	1500000	0
FIN_2	FINLAND	Finland	TM83	2	Finland Zone 2	240000	1	240000	0	2500000	0
FIN_3	FINLAND	Finland	TM83	3	Finland Zone 3	270000	1	270000	0	3500000	0
FIN_4	FINLAND	Finland	TM83	4	Finland Zone 4	300000	0	300000	0	4500000	0

France

Table C.7: France

System ID	Zone Family	Datum ID	Proj Type	Zone #	Name #	South Lat	North Lat	Lon0	Lt0	E0	N0
LAMBERT1	FRANCE	NTF	LC83	1	Lmb1	483554.682	502345.282	22014.025	493000	600000	200000
LAMBERT2	FRANCE	NTF	LC83	2	Lmb2	455356.108	474145.652	22014.025	464800	600000	200000
LAMBERT3	FRANCE	NTF	LC83	3	Lmb3	431157.449	445945.938	22014.025	440600	600000	200000
LAMBERT4	FRANCE	NTF	LC83	4	Lmb4	413337.396	424603.588	22014.025	420954	234.358	185861.369

Germany

Table C.8: Germany

System ID	Zone Family	Datum ID	Proj Type	Zone #	Name #	CM	Scale	Lon0	Lat0	E0	N0
BESSEL1	GERM	GERMANY	TM83	1	Germ. Zone1	60000	1	60000	0	2500000	0
BESSEL2	GERM	GERMANY	TM83	2	Germ Zone2	90000	1	90000	0	3500000	0
BESSEL3	GERM	GERMANY	TM83	3	Bessel Zone3	120000	1	120000	0	4500000	0
KRASS_3	GERM	GERMANY	TM83	4	Bessel Zone4	150000	1	150000	0	5500000	0
BESSEL4	GERM	GERMANY	TM83	4	Bessel Zone4	150000	1	150000	0	5500000	0
KRASS_4	GERM	GERMANY	TM83	4	Krass-ovsky Zone4	150000	1	150000	0	5500000	0

ISG

Table C.9: ISG

System ID	Zone Family	Datum ID	Proj Type	Zone #	Name #	CM	Scale	Lon0	Lat0	E0	N0
54/2	ISG	AGD66	TM83	1	Zone 140- 142E	1410000	0.99994	1410000	0	300000	5000000
54/3	ISG	AGD66	TM83	2	Zone 142-144E	1430000	0.99994	1430000	0	300000	5000000
55/1	ISG	AGD66	TM83	1	Zone 144-146E	1450000	0.99994	1450000	0	300000	5000000
55/2	ISG	AGD66	TM83	1	Zone 144-148E	1470000	0.99994	1470000	0	300000	5000000
55/3	ISG	AGD66	TM83	1	Zone 148-150E	1490000	0.99994	1490000	0	300000	5000000
56/1	ISG	AGD66	TM83	1	Zone 150-152E	1510000	0.99994	1510000	0	580000	5000000
56/2	ISG	AGD66	TM83	1	Zone 152-154E	1530000	0.99994	1530000	0	30000	5000000

NG048

Table C.10: NG048

System ID	Zone Family	Datum ID	Proj Type	Zone #	Name #	CM	Scale	Lon0	Lat0	E0
Zone_1	NGO48	Norway	TM83	1	Axis I	60322.5	1	60322.5	580000	0
Zone_2	NGO48	Norway	TM83	2	Axis II	60322.5	1	60322.5	580000	0
Zone_3	NGO48	Norway	TM83	3	Axis III	104322.5	1	104322.5	580000	0
Zone_4	NGO48	Norway	TM83	4	Axis IV	131322.5	1	131322.5	580000	0
Zone_5	NGO48	Norway	TM83	5	Axis V	165322.5	1	165322.5	580000	0
Zone_6	NGO48	Norway	TM83	6	Axis VI	205322.5	1	205322.5	580000	0
Zone_7	NGO48	Norway	TM83	7	Axis VII	245322.5	1	245322.5	580000	0
Zone_8	NGO48	Norway	TM83	8	Axis VIII	290322.5	1	290322.5	580000	0

SAFR

Table C.11: SAFR

Zn ID	Zone Family	Datum ID	Proj Type	Zone #	Name #	CM	Scale	Lon0	Lat0	E0	N0
SAFR13	SAFR	CAPEUK	T83	13	Zone 1 3-12E to 14E	130000	1	130000	0	0	0
SAFR15	SAFR	CAPEK	T83	15	Zone 15-14E to 16E	150000	1	150000	00	0	0
SAFR17	SAFR	CAPEUK	T83	17	Zone 17-16E to 18E	170000	1	170000	0	0	0
SAFR19	SAFR	CAPEUK	T83	19	Zone 19-18E to 20E	190000	1	190000	0	0	0
SAFR21	SAFR	CAPEUK	T83	21	Zone 21-20E to 22E	210000	1	210000	0	0	0
0	SAFR	CAPEUK	T83	23	Zone 23-22E to 24E	230000	1	230000	0	0	0
SAFR25	SAFR	CAPEUK	T83	25	Zone 25-24E to 26E	250000	1	250000	0	0	0
SAFR27	SAFR	CAPEUK	T83	27	Zone 27-26E to 28E	270000	1	270000	0	0	0
SAFR29	SAFR	CAPEUK	T83	29	Zone 29-28E to 30E	290000	1	290000	0	0	0
SAFR31	SAFR	CAPEUK	T83	31	Zone 31-30E to 32E	310000	1	310000	0	0	0
SAFR33	SAFR	CAPEUK	T83	33	Zone 33-32E to 34E	330000	1	330000	0	0	0

UTM3

Table C.12: UTM3

Zn ID	Zone Family	Datum ID	Proj Type	Zone #	Name #	CM	Scale	Lon0	Lat0	E0	N0
ZN_1	UTM3	CH1954	TM83	1	Zone 1-0E to 3E	13000	0.9999	130000	0	500000	0
ZN_2	UTM3	CH1954	TM83	2	Zone 2-3E to 6E	43000	0.9999	43000	0	500000	0
ZN-3	UTM3	CH1954	TM83	3	Zone 3-6E to 9E	73000	0.9999	73000	0	500000	0
ZN_4	UTM3	CH1954	TM83	4	Zone 4-9E to 12E	103000	0.9999	103000	0	500000	0
ZN_5	UTM3	CH1954	TM83	5	Zone 5-12E to 15E	133000	0.9999	13000	0	500000	0
ZN-6	UTM3	CH1954	TM83	6	Zone 6-15E to 18E	163000	0.9999	163000	0	500000	0
ZN_7	UTM3	CH1954	TM83	7	Zone 7-18E to 21E	193000	0.9999	193000	0	500000	0
ZN_8	UTM3	CH1954	TM83	8	Zone 8-21E to 24E	223000	0.9999	223000	0	500000	0
ZN_9	UTM3	CH1954	TM83	9	Zone 9-24E to 27E	253000	0.9999	253000	0	500000	0
ZN_10	UTM3	CH1954	TM83	10	Zone 10-27E to 30E	283000	0.9999	283000	0	500000	0
ZN_11	UTM3	CH1954	TM83	11	Zone 11-30E to 33E	313000	0.9999	313000	0	500000	0
ZN_12	UTM3	CH1954	TM83	12	Zone 12-33E to 36E	343000	0.9999	343000	0	500000	0
ZN_13	UTM3	CH1954	TM83	13	Zone 13-36E to 39E	373000	0.9999	373000	0	500000	0
ZN_14	UTM3	CH1954	TM83	14	Zone 14-39E to 42E	403000	0.9999	403000	0	500000	0
ZN_15	UTM3	CH1954	TM83	15	Zone 15-42E to 45E	433000	0.9999	433000	0	500000	0
ZN_16	UTM3	CH1954	TM83	16	Zone 16-45E to 48E	463000	0.9999	463000	0	500000	0
ZN_17	UTM3	CH1954	TM83	17	Zone 17-48E to 51E	493000	0.9999	493000	0	500000	0
ZN_18	UTM3	CH1954	TM83	18	Zone 18-51E to 54E	523000	0.9999	523000	0	500000	0
ZN_19	UTM3	CH1954	TM83	19	Zone 19-54E to 57E	553000	0.9999	553000	0	500000	0
ZN_20	UTM3	CH1954	TM83	20	Zone 20-57E to 60E	583000	0.9999	583000	0	500000	0
ZN_21	UTM3	CH1954	TM83	21	Zone 21-60E to 63E	613000	0.9999	613000	0	500000	0
ZN_22	UTM3	CH1954	TM83	22	Zone 22-63E to 66E	643000	0.9999	643000	0	500000	0
ZN_23	UTM3	CH1954	TM83	23	Zone 23-66E to 69E	673000	0.9999	673000	0	500000	0
ZN_24	UTM3	CH1954	TM83	24	Zone 24-69E to 72E	703000	0.9999	703000	0	500000	0
ZN_25	UTM3	CH1954	TM83	25	Zone 25-72E to 75E	733000	0.9999	733000	0	500000	0
ZN_26	UTM3	CH1954	TM83	26	Zone 26-75E to 78E	763000	0.9999	763000	0	500000	0
ZN_27	UTM3	CH1954	TM83	27	Zone 27-78E to 81E	793000	0.9999	793000	0	500000	0
ZN_28	UTM3	CH1954	TM83	28	Zone 28-81E to 84E	823000	0.9999	823000	0	500000	0
ZN_29	UTM3	CH1954	TM83	29	Zone 29-84E to 87E	853000	0.9999	853000	0	500000	0
ZN_30	UTM3	CH1954	TM83	30	Zone 30-87E to 90E	883000	0.9999	883000	0	500000	0
ZN_31	UTM3	CH1954	TM83	31	Zone 31-90E to 93E	913000	0.9999	913000	0	500000	0
ZN_32	UTM3	CH1954	TM83	32	Zone 32-93E to 96E	943000	0.9999	943000	0	500000	0
ZN-33	UTM3	CH1954	TM83	33	Zone 33-96E to 99E	973000	0.9999	973000	0	500000	0
ZN-34	UTM3	CH1954	TM83	34	Zone 34-99E to 102E	1003000	0.9999	1003000	0	500000	0
ZN_35	UTM3	CH1954	TM83	35	Zone 35-102E to 105E	1033000	0.9999	1003000	0	500000	0
ZN_36	UTM3	CH1954	TM83	36	Zone 36-105E to 108E	1063000	0.9999	1063000	0	500000	0
ZN_37	UTM3	CH1954	TM83	37	Zone 37-108E to 111E	1093000	0.9999	1093000	0	500000	0
ZN_38	UTM3	CH1954	TM83	38	Zone 38-111E to 114E	1123000	0.9999	1123000	0	500000	0
ZN_39	UTM3	CH1954	TM83	39	Zone 39-114E to 117E	1153000	0.9999	1153000	0	500000	0
ZN_40	UTM3	CH1954	TM83	40	Zone 40-117E to 120	1183000	0.9999	1183000	0	500000	0
ZN_41	UTM3	CH1954	TM83	41	Zone 41-120E to 123E	1213000	0.9999	1213000	0	500000	0
ZN_42	UTM3	CH1954	TM83	42	Zone 42-123E to 126E	1243000	0.9999	1243000	0	500000	0
ZN_43	UTM3	CH1954	TM83	43	Zone 43-126E to 129E	1273000	0.9999	1273000	0	500000	0
ZN_44	UTM3	CH1954	TM83	44	Zone 44-129E to 132E	1303000	0.9999	1303000	0	500000	0
ZN_45	UTM3	CH1954	TM83	45	Zone 45-132E to 135E	1333000	0.9999	1333000	0	500000	0
ZN_46	UTM3	CH1954	TM83	46	Zone 46-135E to 138E	1363000	0.9999	1363000	0	500000	0
ZN_47	UTM3	CH1954	TM83	47	Zone 47-138E to 141E	1393000	0.9999	1393000	0	500000	0
ZN_48	UTM3	CH1954	TM83	48	Zone 48-141E to 144E	1423000	0.9999	1423000	0	500000	0
ZN_49	UTM3	CH1954	TM83	49	Zone 49-144E to 147E	1453000	0.9999	1453000	0	500000	0
ZN_50	UTM3	CH1954	TM83	50	Zone 50-147E to 150E	1483000	0.9999	1483000	0	500000	0

Table C.12: UTM3 (continued)

Zn ID	Zone Family	Datum ID	Proj Type	Zone #	Name #	CM	Scale	Lon0	Lat0	E0	N0
ZN_51	UTM3	CH1954	TM83	51	Zone 51-150E to 153E	1513000	0.9999	1513000	0	500000	0
ZN_52	UTM3	CH1954	TM83	52	Zone 52-153E to 156E	1543000	0.9999	1543000	0	500000	0
ZN_53	UTM3	CH1954	TM83	53	Zone 53-156E to 159E	1573000	0.9999	1573000	0	500000	0
ZN_54	UTM3	CH1954	TM83	54	Zone 54-159E to 162E	1603000	0.9999	1603000	0	500000	0
ZN_55	UTM3	CH1954	TM83	55	Zone 55-162E to 165E	1633000	0.9999	1633000	0	500000	0
ZN_56	UTM3	CH1954	TM83	56	Zone 56-165E to 168E	1663000	0.9999	1663000	0	500000	0
ZN_57	UTM3	CH1954	TM83	57	Zone 57-168E to 171E	1693000	0.9999	1693000	0	500000	0
ZN_58	UTM3	CH1954	TM83	58	Zone 58-171E to 174E	1723000	0.9999	1723000	0	500000	0
ZN_59	UTM3	CH1954	TM83	59	Zone 59-174E to 177E	1753000	0.9999	1753000	0	500000	0
ZN_60	UTM3	CH1954	TM83	60	Zone 60-177E to 180E	1783000	0.9999	1753000	0	500000	0

UTM6

Table C.13: UTM6

Zn ID	Zone Family	Datum ID	Proj Type	Zone #	Name #	CM	Scale	Lon0	Lat0	E0	N0
ZN_1	UTM6	WGS84	TM83	1	Zone 1-180W to 174W	-1770000	0.9999	-1770000	0	500000	0
ZN_2	UTM6	WGS84	TM83	2	Zone 2-174W to 168W	-1710000	0.9999	-1710000	0	500000	0
ZN-3	UTM3	WGS84	TM83	3	Zone 3-168W to 162W	-1650000	0.9999	-1650000	0	500000	0
ZN_4	UTM6	WGS84	TM83	4	Zone 4-162W to 156W	-1590000	0.9999	-1590000	0	500000	0
ZN_5	UTM6	WGS84	TM83	5	Zone 5-156W to 150W	-1530000	0.9999	-1530000	0	500000	0
ZN-6	UTM6	WGS84	TM83	6	Zone 6-150W to 144W	-1470000	0.9999	-1470000	0	500000	0
ZN_7	UTM6	WGS84	TM83	7	Zone 7-144W to 138W	-1410000	0.9999	-1410000	0	500000	0
ZN_8	UTM6	WGS84	TM83	8	Zone 8-138W to 132W	-1350000	0.9999	-1350000	0	500000	0
ZN_9	UTM6	WGS84	TM83	9	Zone 9-132W to 126W	-1290000	0.9999	-1290000	0	500000	0
ZN_10	UTM6	WGS84	TM83	10	Zone 10-126W to 120W	-1230000	0.9999	-1230000	0	500000	0
ZN_11	UTM6	WGS84	TM83	11	Zone 11-120W to 114W	-1170000	0.9999	-1170000	0	500000	0
ZN_12	UTM6	WGS84	TM83	12	Zone 12-114W to 108W	-1110000	0.9999	-111000	0	500000	0
ZN_13	UTM6	WGS84	TM83	13	Zone 13-108W to 102W	-1050000	0.9999	-1050000	0	500000	0
ZN_14	UTM6	WGS84	TM83	14	Zone 14-102W to 96W	-990000	0.9999	-990000	0	500000	0
ZN_15	UTM6	WGS84	TM83	15	Zone 15-96W to 90W	-930000	0.9999	-930000	0	500000	0
ZN_16	UTM6	WGS84	TM83	16	Zone 16-90W to 84W	-870000	0.9999	-870000	0	500000	0
ZN_17	UTM6	WGS84	TM83	17	Zone 17-84W to 78W	-810000	0.9999	-810000	0	500000	0
ZN_18	UTM6	WGS84	TM83	18	Zone 18-78W to 72W	-750000	0.9999	-750000	0	500000	0
ZN_19	UTM6	WGS84	TM83	19	Zone 19-72W to 66W	-690000	0.9999	-690000	0	500000	0
ZN_20	UTM6	WGS84	TM83	20	Zone 20-66W to 60W	-630000	0.9999	-630000	0	500000	0
ZN_21	UTM6	WGS84	TM83	21	Zone 21-60W to 54W	-570000	0.9999	-570000	0	500000	0
ZN_22	UTM6	WGS84	TM83	22	Zone 22-54W to 48W	-510000	0.9999	-510000	0	500000	0
ZN_23	UTM6	WGS84	TM83	23	Zone 23-48w to 42W	-450000	0.9999	-450000	0	500000	0
ZN_24	UTM6	WGS84	TM83	24	Zone 24-42W to 36W	-390000	0.9999	-390000	0	500000	0
ZN_25	UTM6	WGS84	TM83	25	Zone 25-36W to 30W	-330000	0.9999	-330000	0	500000	0
ZN_26	UTM6	WGS84	TM83	26	Zone 26-30W to 24W	-270000	0.9999	-270000	0	500000	0
ZN_27	UTM6	WGS84	TM83	27	Zone 27-24W to 18W	-210000	0.9999	-210000	0	500000	0
ZN_28	UTM6	WGS84	TM83	28	Zone 28-18W to 12W	-150000	0.9999	-150000	0	500000	0
ZN_29	UTM6	WGS84	TM83	29	Zone 29-12W to 6W	-90000	0.9999	-90000	0	500000	0
ZN_30	UTM6	WGS84	TM83	30	Zone 30-6W to 0W	-30000	0.9999	-30000	0	500000	0
ZN_31	UTM6	WGS84	TM83	31	Zone 31-0E to 6E	30000	0.9999	30000	0	500000	0
ZN_32	UTM6	WGS84	TM83	32	Zone 32-6E to 12E	90000	0.9999	900000	0	500000	0
ZN-33	UTM6	WGS84	TM83	33	Zone 33-12E to 18E	150000	0.9999	150000	0	500000	0
ZN-34	UTM6	WGS84	TM83	34	Zone 34-18E to 24E	210000	0.9999	210000	0	500000	0
ZN_35	UTM6	WGS84	TM83	35	Zone 35-24E to 30E	270000	0.9999	270000	0	500000	0
ZN_36	UTM6	WGS84	TM83	36	Zone 36-30E to 36E	330000	0.9999	330000	0	500000	0
ZN_37	UTM6	WGS84	TM83	37	Zone 37-36E to 42E	390000	0.9999	390000	0	500000	0
ZN_38	UTM6	WGS84	TM83	38	Zone 38-42E to 48E	450000	0.9999	450000	0	500000	0
ZN_39	UTM6	WGS84	TM83	39	Zone 39-48E to 54E	510000	0.9999	510000	0	500000	0
ZN_40	UTM6	WGS84	TM83	40	Zone 40-54E to 60E	570000	0.9999	570000	0	500000	0
ZN_41	UTM6	WGS84	TM83	41	Zone 41-60E to 66E	630000	0.9999	630000	0	500000	0
ZN_42	UTM6	WGS84	TM83	42	Zone 42-66E to 72E	690000	0.9999	690000	0	500000	0
ZN_43	UTM6	WGS84	TM83	43	Zone 43-72E to 78E	750000	0.9999	750000	0	500000	0
ZN_44	UTM6	WGS84	TM83	44	Zone 44-78E to 84E	810000	0.9999	810000	0	500000	0
ZN_45	UTM6	WGS84	TM83	45	Zone 45-84E to 90E	870000	0.9999	870000	0	500000	0
ZN_46	UTM6	WGS84	TM83	46	Zone 46-90E to 96E	930000	0.9999	930000	0	500000	0
ZN_47	UTM6	WGS84	TM83	47	Zone 47-96E to 102E	990000	0.9999	990000	0	500000	0
ZN_48	UTM6	WGS84	TM83	48	Zone 48-102E to 108E	1050000	0.9999	1050000	0	500000	0
ZN_49	UTM6	WGS84	TM83	49	Zone 49-108E to 114E	1110000	0.9999	1110000	0	500000	0
ZN_50	UTM6	WGS84	TM83	50	Zone 50-114E to 120E	1170000	0.9999	1170000	0	500000	0

Table C.13: UTM6 (continued)

Zn ID	Zone Family	Datum ID	Proj Type	Zone #	Name #	CM	Scale	Lon0	Lat0	E0	N0
ZN_51	UTM6	WGS84	TM83	51	Zone 51-120E to 126E	1230000	0.9999	1230000	0	500000	0
ZN_52	UTM6	WGS84	TM83	52	Zone 52-126E to 132E	1290000	0.9999	1290000	0	500000	0
ZN_53	UTM6	WGS84	TM83	53	Zone 53-132E to 138E	1350000	0.9999	1350000	0	500000	0
ZN_54	UTM6	WGS84	TM83	54	Zone 54-138E to 144E	1410000	0.9999	1410000	0	500000	0
ZN_55	UTM6	WGS84	TM83	55	Zone 55-144E to 150E	1470000	0.9999	1470000	0	500000	0
ZN_56	UTM6	WGS84	TM83	56	Zone 56-150E to 156E	1530000	0.9999	1530000	0	500000	0
ZN_57	UTM6	WGS84	TM83	57	Zone 57-156E to 162E	1590000	0.9999	1590000	0	500000	0
ZN_58	UTM6	WGS84	TM83	58	Zone 58-162E to 168E	1650000	0.9999	1650000	0	500000	0
ZN_59	UTM6	WGS84	TM83	59	Zone 59-168E to 174E	1710000	0.9999	1710000	0	500000	0
ZN_60	UTM3	WGS84	TM83	60	Zone 60-174E to 180E	1770000	0.9999	1770000	0	500000	0

SPC83

Table C.14: SPC83

Zn ID	Zone Family	Datum ID	Proj Type	Zone #	Name #	*Field 1	*Field 2	*Field 3	*Field 4	*Field 5	*Field 6
AL_E	SPC83	GRS80	TM83	101	Alabama (East)	-855000	25000	0855000	303000	200000	0
AL_W	SPC83	GRS80	TM83	102	Alabama (West)	-873000	15000	-873000	300000	600000	0
AK_1	SPC83	GRS80	OM83	5001	Alaska (Zone 1)	-0.75	10000	-1334000	-570000	5000000	-5000000
AK_2	SPC83	GRS80	TM83	5002	Alaska (Zone 2)	-14200000	10000	-14200000	540000	500000	0
AK_3	SPC83	GRS80	TM83	5003	Alaska (Zone 3)	-1460000	10000	-1460000	540000	500000	0
AK_4	SPC83	GRS80	TM83	5004	Alaska (Zone 4)	-1500000	10000	-1500000	540000	500000	0
AK_5	SPC83	GRS80	TM83	5005	Alaska (Zone 5)	-1540000	10000	-1540000	540000	500000	0
AK_6	SPC83	GRS80	TM83	5006	Alaska (Zone 6)	-1580000	10000	-1580000	540000	500000	0
AK_7	SPC83	GRS80	TM83	5007	Alaska (Zone 7)	-1620000	10000	-1620000	540000	500000	0
AK_8	SPC83	GRS80	TM83	5008	Alaska (Zone 8)	-1660000	10000	-1660000	540000	500000	0
AK_9	SPC83	GRS80	TM83	5009	Alaska (Zone 9)	-1700000	10000	-1700000	540000	500000	0
AK_10	SPC83	GRS80	LC83	5010	Alaska (Zone 10)	515000	535000	-1760000	510000	1000000	0
AZ_E	SPC83	GRS80	TM83	201	Arizona (East)	-1101000	10000	-11301000	310000	213360	0
AZ_C	SPC83	GRS80	TM83	202	Arizona (Central)	-1115500	10000	01115500	310000	213360	0
AZ_W	SPC83	GRS80	TM83	203	Arizona (West)	-1134500	15000	-1134500	31000	213360	0
AR_N	SPC83	GRS80	LC83	301	Arkansas (North)	345600	361400	-920000	432000	400000	0
AR_S	SPC83	GRS80	LC83	302	Arkansas (South)	331800	344600	-9200000	324000	400000	400000
CA_1	SPC83	GRS80	LC83	401	California (Zone 1)	400000	414000	-1220000	392000	2000000	500000
CA_2	SPC83	GRS80	LC83	402	California (Zone 2)	382000	395000	-1220000	374000	2000000	500000
CA_3	SPC83	GRS80	LC83	403	California (Zone 3)	370400	382600	-1203000	363000	2000000	500000
CA_4	SPC83	GRS80	LC83	404	California (Zone 4)	360000	371500	-1190000	352000	2000000	500000
CA_5	SPC83	GRS80	LC83	405	California (Zone 5)	340200	352800	-1180000	333000	2000000	500000
CA_6	SPC83	GRS80	LC83	406	California (Zone 6)	324700	335300	-1161500	32100	2000000	500000
CO_N	SPC83	GRS80	LC83	501	Colorado (North)	394300	404700	-1053000	392000	914401.8289	304800.6096
CO_C	SPC83	GRS80	LC83	502	Colorado (Central)	382700	394500	-105300	375000	914401.8289	304800.6096
CO_S	SPC83	GRS80	LC83	503	Colorado (South)	371400	382600	-1053000	36400	914401.8289	304800.6096
CT_	SPC83	GRS80	LC83	600	Connecticut	411200	415200	-724500	40500	304800.6096	152400.3048
DE_	SPC83	GRS80	TM83	700	Delaware	-752500	200000	-752500	380000	200000	0
FL_E	SPC83	GRS80	TM83	901	Florida (East)	-810000	17000	-810000	242000	200000	0
FL_W	SPC83	GRS80	TM83	902	Florida (West)	-820000	17000	-820000	242000	200000	0
FL_N	SPC83	GRS80	LC83	903	Florida (North)	293500	304500	-843000	290000	600000	0
GA_E	SPC83	GRS80	TM83	1001	Georgia (East)	-821000	10000	-821000	300000	200000	0
GA_W	SPC83	GRS80	TM83	1002	Georgia (West)	-841000	10000	-841000	300000	700000	0
HI_1	SPC83	GRS80	TM83	5101	Hawaii (Zone 1)	-1553000	30000	-1553000	185000	500000	0
HI_2	SPC83	GRS80	TM83	5102	Hawaii (Zone 2)	-1564000	30000	-1564000	202000	500000	0
HI_3	SPC83	GRS80	TM83	5103	Hawaii (Zone 3)	-1580000	100000	-1580000	211000	500000	0
HI_4	SPC83	GRS80	TM83	5104	Hawaii (Zone 4)	-1593000	10000	-1593000	215000	500000	0
HI_5	SPC83	GRS80	TM83	5105	Hawaii (Zone 5)	-1601000	0	-1601000	214000	500000	0
ID_E	SPC83	GRS80	TM83	1101	Idaho (East)	-1121000	19000	-1121000	414000	200000	0
ID_C	SPC83	GRS80	TM83	1102	Idaho (Central)	-1140000	19000	-1140000	414000	500000	0
ID_W	SPC83	GRS80	TM83	1103	Idaho (West)	-1154500	15000	-1154500	414000	800000	0
IL_E	SPC83	GRS80	TM83	1201	Illinois (East)	-882000	40000	-882000	364000	300000	0
IL_W	SPC83	GRS80	TM83	1202	Illinois (West)	-901000	17000	-901000	364000	700000	0
IN_E	SPC83	GRS80	TM83	1301	Indiana (East)	-854000	30000	-854000	373000	100000	250000
IN_W	SPC83	GRS80	TM83	1302	Indiana (West)	-870500	30000	-870500	373000	900000	250000
IA_N	SPC83	GRS80	LC83	1401	Iowa (North)	420400	431600	-933000	413000	1500000	1000000

Table C.14: SPC83 (continued)

Zn ID	Zone Family	Datum ID	Proj Type	Zone #	Name #	*Field 1	*Field 2	*Field 3	*Field 4	*Field 5	*Field 6
IA_S	SPC83	GRS80	LC83	1402	Iowa (South)	403700	414700	-933000	400000	500000	0
KS_N	SPC83	GRS80	LC83	1501	Kansas (North)	384300	394700	-980000	382000	400000	0
KS_S	SPC83	GRS80	LC83	1502	Kansas (South)	371600	383400	-983000	364000	400000	400000
KY_N	SPC83	GRS80	LC83	1601	Kentucky (North)	375800	385800	-841500	373000	500000	0
KY_S	SPC83	GRS80	LC83	1602	Kentucky (South)	364400	375600	-854500	362000	500000	500000
LA_N	SPC83	GRS80	LC83	1701	Louisiana (North)	311000	324000	-923000	303000	1000000	0
LA_S	SPC83	GRS80	LC83	1702	Louisiana (South)	291800	304200	-912000	283000	1000000	0
LASH	SPC83	GRS80	LC83	1703	Louisiana (Offshore)	261000	275000	-912000	253000	1000000	0
ME_E	SPC83	GRS80	TM83	1801	Main (East)	-683000	10000	0683000	434000	300000	0
ME_W	SPC83	GRS80	TM83	1802	Maine (West)	-701000	30000	-701000	425000	900000	0
MD_	SPC83	GRS80	LC83	1900	Maryland	381800	392799	-770000	374000	400000	0
MA_M	SPC83	GRS80	LC83	2001	Massachusetts (Mainland)	414300	424100	-713000	410000	200000	750000
MA_I	SPC83	GRS80	LC83	2002	Massachusetts (Island)	411700	412900	-703000	410000	500000	0
MI_N	SPC83	GRS80	LC83	2111	Michigan (North)	452900	470500	-870000	444700	8000000	0
MI_C	SPC83	GRS80	LC83	2112	Michigan (Central)	441100	454200	-842200	431900	6000000	0
MI_S	SPC83	GRS80	LC83	2113	Michigan (South)	420600	434000	-842200	413000	4000000	0
MN_N	SPC83	GRS80	LC83	2201	Minnesota (North)	470200	483800	-930600	463000	800000	100000
MN_C	SPC83	GRS80	LC83	2202	Minnesota (Central)	453700	470300	-941500	450000	800000	100000
MN_S	SPC83	GRS80	LC83	2203	Minniesota (South)	434700	451200	-940000	430000	800000	100000
MS_E	SPC83	GRS80	TM83	2301	Mississippi (East)	-885000	20000	-885000	293000	300000	0
MS_W	SPC83	GRS80	TM83	2303	Mississippi (West)	-902000	20000	-902000	293000	700000	0
MO_E	SPC83	GRS80	TM83	2401	Missouri (East)	-903000	15000	-903000	355000	250000	0
MO_C	SPC83	GRS80	TM83	2402	Missouri (Central)	-923000	15000	-923000	355000	500000	0
MO_W	SPC83	GRS80	TM83	2403	Missouri (West)	-943000	17000	-943000	361000	850000	0
MT_	SPC83	GRS80	LC83	2500	Montana	450000	490000	-1093000	441500	600000	0
NE_	SPC83	GRS80	LC83	2600	Nebraska	400000	430000	-1000000	395000	500000	0
NV_E	SPC83	GRS80	TM83	2701	Nevada (East)	-1153500	10000	-1153500	344500	200000	8000000
NV_C	SPC83	GRS80	TM83	2702	Nevada (Central)	-1164000	10000	-1164000	344500	500000	6000000
NV_W	SPC83	GRS80	TM83	2703	Nevada (West)	-1183500	10000	-1183500	344500	800000	4000000
NH_	SPC83	GRS80	TM83	2800	New Hampshire	-714000	3000	-714000	423000	300000	0
NJ_	SPC83	GRS80	TM83	2900	New Jersey	-743000	10000	-743000	385000	150000	0
NM_E	SPC83	GRS80	TM83	3001	New Mexico (East)	-1042000	11000	-1042000	310000	165000	0
NM_C	SPC83	GRS80	TM83	3002	New Mexico (Central)	-1061500	10000	-1061500	310000	500000	0
NM_W	SPC83	GRS80	TM83	3003	New Mexico (West)	-1075000	12000	-1075000	31000	830000	0
NY_E	SPC83	GRS80	TM83	3101	New York (East)	-743000	10000	-743000	385000	150000	0
NY_C	SPC83	GRS80	TM83	3102	New York (Central)	-7635000	16000	-763500	400000	250000	0
NY_W	SPC83	GRS80	TM83	3103	New York (West)	-783500	1600	-783500	400000	350000	0
NY_L	SPC83	GRS80	LC83	3104	New York (Long Island)	404000	410200	-740000	401000	300000	0
NC_	SPC83	GRS80	LC83	3200	North Caroina	342000	361000	-790000	334500	609601.22	0
ND_N	SPC83	GRS80	LC83	3301	North Dakota (North)	472600	484400	-1003000	470000	600000	0
ND_S	SPC83	GRS80	LC83	3302	North Dakota (South)	461100	472900	-1003000	454000	600000	0

Table C.14: SPC83 (continued)

Zn ID	Zone Family	Datum ID	Proj Type	Zone #	Name #	*Field 1	*Field 2	*Field 3	*Field 4	*Field 5	*Field 6
OH_N	SPC83	GRS80	LC83	3401	Ohio (North)	402600	414200	-823000	394000	600000	0
OH_S	SPC83	GRS80	LC83	3402	Ohio (South)	384400	400200	-823000	380000	500000	0
OK_N	SPC83	GRS80	LC83	3501	Oklahoma (North)	353400	364600	-980000	350000	600000	0
OK_S	SPC83	GRS80	LC83	3502	Oklahoma (South)	335600	351400	-980000	332000	600000	0
OR_N	SPC83	GRS80	LC83	3601	Oregon (North)	442000	460000	-1203000	434000	2500000	0
OR_S	SPC83	GRS80	LC83	3602	Oregon (South)	422000	440000	-1203000	414000	1500000	0
PA_N	SPC83	GRS80	LC83	3701	Pennsylvania (North)	405300	415700	-774500	401000	600000	0
PA_S	SPC83	GRS80	LC83	3702	Pennsylvania (South)	395600	405800	-774500	392000	600000	0
RI_	SPC83	GRS80	TM83	3800	Rohde Island	-713000	160000	-713000	410500	100000	0
SC_	SPC83	GRS80	LC83	3900	South Carolina	323000	345000	-810000	315000	609600	0
SD_N	SPC83	GRS80	LC83	4001	South Dakota (North)	442500	454100	-1000000	43500	600000	0
SD_S	SPC83	GRS80	LC83	4002	South Dakota (South)	425000	442400	-1002000	422000	600000	0
TN_	SPC83	GRS80	LC83	4100	Tennessee	351500	362500	-860000	342000	600000	0
TX_N	SPC83	GRS80	LC83	4201	Texas (North)	343900	361100	-1013000	340000	200000	1000000
TX_NC	SPC83	GRS80	LC83	4202	Texas (North Central)	320800	335800	-983000	314000	600000	2000000
TX_C	SPC83	GRS80	LC83	4203	Texas (Central)	300700	315300	-1002000	294000	700000	3000000
TX_SC	SPC83	GRS80	LC83	4204	Texas (South Central)	282300	301700	-990000	275000	600000	4000000
TX_S	SPC83	GRS80	LC83	4205	Texas (South)	261000	275000	-983000	254000	300000	5000000
UT_N	SPC83	GRS80	LC83	4301	Utah (North)	404300	414700	-1113000	402000	500000	1000000
UT_C	SPC83	GRS80	LC83	4302	Utah (Central)	390100	403900	-113000	382000	500000	2000000
UT_S	SPC83	GRS80	LC83	4303	Utah (South)	371300	382100	-1113000	364000	500000	3000000
VT_	SPC83	GRS80	TM83	4400	Vermont	-723000	28000	-723000	423000	500000	0
VA_N	SPC83	GRS80	LC83	4501	Virginia (North)	380200	391200	-783000	374000	3500000	2000000
VA_S	SPC83	GRS80	LC83	4502	Virginia (South)	364600	378500	-783000	362000	3500000	1000000
WA_N	SPC83	GRS80	LC83	4601	Washington (North)	473000	484400	-1205000	470000	500000	0
WA_S	SPC83	GRS80	LC83	4602	Washington (South)	455000	472000	-1203000	452000	500000	0
WV_N	SPC83	GRS80	LC83	4701	West Virginia (North)	390000	401500	-793000	383000	600000	0
WV_S	SPC83	GRS80	LC83	4702	West Virginia (South)	379200	385300	-810000	370000	600000	0
WI_N	SPC83	GRS80	LC83	4801	Wisconsin (North)	453400	464600	-900000	451000	600000	0
WI_C	SPC83	GRS80	LC83	4802	Wisconsin (Central)	441500	453000	-900000	435000	600000	0
WI_S	SPC83	GRS80	LC83	4803	Wisconsin (South)	424400	440400	-900000	420000	600000	0
WY_E	SPC83	GRS80	TM83	4901	Wyoming (East)	-1051000	16000	-1051000	403000	200000	0
WYEC	SPC83	GRS80	TM83	4902	Wyoming (East Central)	-1072000	16000	-1072000	403000	400000	100000
WYWC	SPC83	GRS80	TM83	4903	Wyoming (West Central)	-1084500	16000	-1084500	403000	600000	0
WY_W	SPC83	GRS80	TM83	4904	Wyoming (West)	-1100500	16000	-1100500	403000	800000	100000
PR_	SPC83	GRS80	LC83	5200	Puerto Rico and Virgin Islands	180200	182600	-662600	175000	200000	200000

SPC27

Table C.15: SPC27

Zn ID	Zone Family	Datum ID	Proj Type	Zone #	Name #	*Field 1	*Field 2	*Filed 3	*Field 4	*Field 5	*Field 6	*Field 7	*Field 8	*Field 9	*Field 10	*Field 11
AL_E	SPC27	NAD27	TM27	101	Alabama (East)	500000	-309000	1822	21.00903	0.99996	0.3827065					
AL_W	SPC27	NAD27	TM27	102	Alabama (West)	50000	-315000	1792	25.53386	0.9999333333	0.3817477					
AK_1	SPC27	AK27	AK01	5001	Alaska (Zone 1)	6388906.01513	1.00029977273	0.00447599131	6386352.67013	0.327015517176	0.0945018968871	0.3460412203	1.0015773595	0.08227185422003	2.7182818284 59045	-365450.51319
AK_2	SPC27	AK27	AK29	5002	Alaska (Zone 2)	500000	-511200									
AK_3	SPC27	AK27	AK29	5003	Alaska (Zone 3)	500000	-525600									
AK_4	SPC27	AK27	AK29	5004	Alaska (Zone 4)	500000	-540000									
AK_5	SPC27	AK27	AK29	5005	Alaska (Zone 5)	500000	-554400									
AK_6	SPC27	AK27	AK29	5006	Alaska (Zone 6)	500000	-568800									
AK_7	SPC27	AK27	AK29	5007	Alaska (Zone 7)	700000	-583200									
AK_8	SPC27	AK27	AK29	5008	Alaska (Zone 8)	500000	-597600									
AK_9	SPC27	AK27	AK29	5009	Alaska (Zone 9)	600000	-612000									
AK10	SPC27	AK27	LC27	5010	Alaska (Zone 10)	3000000	-633600	15893950.36	16564628.77	0.9998480641	0.7969223940	3161	47.87068	3.79919	5.9155	44
AZ_E	SPC27	NAD27	TM27	201	Arizona (East)	500000	-396600	1852	16.62358	0.9999	0.3816485					
AZ_C	SPC27	NAD27	TM27	202	Arizona (Central)	500000	-402900	1852	16.62358	0.9999	0.3816485					
AZ_W	SPC27	NAD27	TM27	203	Arizona (West)	500000	-409500	1852	16.62358	0.9999333333	0.3815948					
AR_N	SPC27	NAD27	LC27	301	Arkansas (North)	2000000	-33120	29277593.61	29732882.87	0.9999359370	0.5818991407	2126	46.35656	3.81452	3.26432	0
AR_S	SPC27	NAD27	LC27	302	Arkansas (South)	2000000	-33120	31014039.23	31511724.2	0.9999184698	0.5596906871	2033	56.94711	3.8155	3.08256	0

Supplementary

Table C.15: SPC27 (continued)

Zn ID	Zone Family	Datum ID	Proj Type	Zone #	Name #	*Field 1	*Field 2	*Filed 3	*Field 4	*Field 5	*Field 6	*Field 7	*Field 8	*Field 9	*Field 10	*Field 11
CA_1	SPC27	NAD27	LC27	401	California (Zone 1)	2000000	-439200	24245358.05	24792436.23	0.9998946358	0.6538843192	2441	26.75847	3.80992	3.93575	0
CA_2	SPC27	NAD27	LC27	402	California (Zone 2)	2000000	-439200	25795850.31	26312257.65	0.9999146793	0.6304679732	2336	30.81964	3.81147	3.70114	0
CA_3	SPC27	NAD27	LC27	403	California (Zone 3)	2000000	-433800	27057475.85	27512992.04	0.9999291792	0.6122320427	2256	35.52018	3.81265	3.52998	27512992.04
CA_4	SPC27	NAD27	LC27	404	California (Zone 4)	200000	-428400	28182405.33	28652931.96	0.9999407628	0.5965871443	2189	10.35494	3.81362	3.3902	0
CA_5	SPC27	NAD27	LC27	405	California (Zone 5)	2000000	-424800	30194145.54	30649424.27	0.9999221227 7	0.5570011021 9	2076	52.10305	3.81523	3.16593	0
CA_6	SPC27	NAD27	LC27	406	California (Zone 6)	2000000	-418500	31846570.92	32271267.72	0.9999541438	0.5495175982	1992	0.16335	3.81642	3.00292	0
CA_7	SPC27	NAD27	LC27	407	California (Zone 7)	4186692.58	-426000	30891382.10	35055396.31	0.9999885350	0.5612432071	2040	22.88096	3.81572	3.0952	0
CO_N	SPC27	NAD27	LC27	501	Colorado (North)	2000000	-379800	24751897.68	25086068.20	0.9999568475	0.6461334829	2406	24.62308	3.81044	3.8561	0
CO_C	SPC27	NAD27	LC27	502	Colorado (Central)	2000000	-379800	2581376.91	26243052.74	0.9999359117	0.6306895773	2337	29.651.62	3.81146	3.70326	0
CO_S	SPC27	NAD27	LC27	503	Colorado (South)	2000000	-379800	26977133.89	27402231.82	0.9999453995	0.6133780528	2261	34.26662	3.81257	3.54046	0
CT_	SPC27	NAD27	LC27	600	Connecticut	600000	-261900	23659233.56	23914389.02	0.9999831405	0.6630594147	2483	19.6798	3.80929	200000	0
DE_	SPC27	NAD27	TM27	700	Delaware	500000	-271500	2271	30.53702	0.9999950281	0.3811454				200000	0
FL_E	SPC27	NAD27	TM27	901	Florida (East)	500000	-291600	1453	26.09287	0.9999411765	0.382109				200000	0
FL_W	SPC27	NAD27	TM27	902	Florida (West)	500000	-295200	1453	26.09287	0.9999411765	0.382109				600000	0
FL_N	SPC27	NAD27	LC27	903	Florida (North)	2000000	-304200	36030443.05	36454924.53	0.9999484343	0.5025259				200000	0
GA_E	SPC27	NAD27	TM27	1001	Georgia (East)	500000	-295800	1792	25.53386	0.9999	0.3817593				700000	0
GA_W	SPC27	NAD27	TM27	1002	Georgia (West)	500000	-30300	1792	25.53386	0.9999	0.3817593				500000	0
HI_I	SPC27	NAD27	TM27	5101	Hawaii (Zone 1)	500000	-559800	1124	39.52714	0.9999666667	0.3826496				500000	0
HI_2	SPC27	NAD27	TM27	5102	Hawaii (Zone 2)	500000	-564000	1214	18.21554	0.9999666667	0.3825762				500000	0

Table C.15: SPC27 (continued)

Zn ID	Zone Family	Datum ID	Proj Type	Zone #	Name #	*Field 1	*Field 2	*Filed 3	*Field 4	*Field 5	*Field 6	*Field 7	*Field 8	*Field 9	*Field 10	*Field 11
HI_3	SPC27	NAD27	TM27	5103	Hawaii (Zone 3)	500000	-568800	1264	6.77497	0.99999	0.3825176				500000	0
HI_4	SPC27	NAD27	TM27	5104	Hawaii (Zone 4)	50000	-574200	1303	57.83623	0.99999	0.3824812				500000	0
HI_5	SPC27	NAD27	TM27	5105	Hawaii (Zone 5)	500000	-576600	1294	0.05280	0.9999999999	0.3824867				200000	0
ID_E	SPC27	NAD27	TM27	1101	Idaho (East)	500000	-403800	2491	18.35156	0.9999473684	0.3807624				500000	0
ID_C	SPC27	NAD27	TM27	1102	Idaho (Central)	500000	-410400	2491	18.35156	0.9999473684	0.3807624				800000	0
ID_W	SPC27	NAD27	TM27	1103	Idaho (West)	500000	-416700	2491	18.35156	0.9999333333	0.3806227				300000	0
IL_E	SPC27	NAD27	TM27	1201	Illinois (East)	500000	-318000	2191	37.04639	0.999975	0.3811074				700000	0
IL_W	SPC27	NAD27	TM27	1202	Illinois (West)	500000	-324600	2191	37.04639	0.9999411765	0.3811332				100000	250000
IN_E	SPC27	NAD27	TM27	1301	Indiana (East)	500000	-308400	2241	32.84965	0.9999666667	0.3811064				900000	250000
IN_W	SPC27	NAD27	TM27	1302	Inidana (West	500000	-313500	2241	32.84965	0.9999666667	0.3811064				1500000	1000000
IA_N	SPC27	NAD27	LC27	1401	Iowa (North)	2000000	-336600	22736950.34	23162461.59	0.9999453686	0.6777445518	2551	20.02265	3.80827	4.19479	0
IA_S	SPC27	NAD27	LC27	1402	Iowa (South)	2000000	-336600	23936585.11	24374096.67	0.9999483705	0.6587010213	2463	22.59905	3.80959	3.98630	0
KS_N	SPC27	NAD27	LC27	1501	Kansas (North)	2000000	-352800	25644959.12	25979068.57	0.9999568556	0.6327148646	2346	27.97215	3.81133	3.72376	0
KS_S	SPC27	NAD27	LC27	1502	Kansas (South)	2000000	-354600	26896024.48	27351521.50	0.9999359200	0.6145281068	2266	34.4102	3.8125	3.55102	0
KY_N	SPC27	NAD27	LC27	1601	Kentucky (North)	2000000	-303300	26371820.68	26724051.82	0.9999620817	0.6220672671	2299	30.63364	3.81202	3.62113	0
KY_S	SPC27	NAD27	LC27	1602	Kentucky (South)	2000000	-308700	27467860.75	27832235.64	0.9999453808	0.6064623718	2231	36.57874	3.81301	3.47771	0
LA_N	SPC27	NAD27	LC27	1701	Louisiana (North)	2000000	-333000	33624568.36	34079629.33	0.9999147417	0.5287006734	1907	12.68515	3.81758	2.84511	0
LA_S	SPC27	NAD27	LC27	1702	Louisiana (South)	2000000	-328800	36271389.35	36756553.45	0.9999257458	0.5000126971	1792	28.55026	3.81911	2.63885	0
LASE	SPC27	NAD27	LC27	1703	Louisiana (Offshore)	2000000	-328800	41091749.54	41576762.39	0.9998947956	0.4540068519	1612	59.30342	3.82138	2.27436	25

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Table C.15: SPC27 (continued)

Zn ID	Zone Family	Datum ID	Proj Type	Zone #	Name #	*Field 1	*Field 2	*Filed 3	*Field 4	*Field 5	*Field 6	*Field 7	*Field 8	*Field 9	*Field 10	*Field 11
ME_E	SPC27	NAD27	TM27	1801	Maine (East)	2000000	-246600	2621	15.15187	0.9999	0.380618					0
ME_W	SPC27	NAD27	TM27	1802	500000	-252600	2561	16.25668	0.999966667	0.3806575						
MD_	SPC27	NAD27	LC27	1900	Maryland	800000	-277100	25989474.99	16369112.76	0.9999498485	0.6276341196	2323	59.69369	3,81166	3.67392	0
MA_M	SPC27	NAD27	LC27	2001	Massachu-setts (Main-land)	600000	-257400	23111975.14	23549477.32	0.9999645506	0.6717286561	2523	19.53138	3.8087	4.12738	0
MA_I	SPC27	NAD27	LC27	2002	Massachu-setts (Island)	200000	-253800	23784678.44	23924398.02	0.9999984844	0.6610953994	2474	19.47463	3.80943	4.01174	0
MITE	SPC27	NAD27	TM27	2101	Michigan (East)	500000	-301200	2481	18.72150	0.9999428571	0.3807283					
MITC	SPC27	NAD27	TM27	2102	Michigan (Central)	500000	-308700	2481	18.72150	0.9999090909	0.3807541					
MITW	SPC27	NAD27	TM27	2103	Michigan (West)	500000	-319500	2481	18.72150	0.9999090909	0.3805361					
MILN	SPC27	NAD27	LC27	2111	Michigan (North)	200000	-31320	20041716.18	20589420.09	0.9999410344	0.7227899381	2768	22.25085	3.80501	4.6843	36
MILC	SPC27	NAD27	LC27	2112	Michigan (Central)	200000	-303600	21001715.22	21594768.40	0.9999509058	0.70640741	2687	50.76661	3.80622	4.46875	35
MILS	SPC27	NAD27	LC27	2113	Michigan (South)	200000	-303600	22564848.51	23069597.22	0.9999450783	0.6805292633	2564	22.23938	3.80808	4.15706	35
MN_N	SPC27	NAD27	LC27	2201	Minnesota (North)	200000	-335160	18984319.62	19471398.75	0.9999028166	0.7412196637	2861	24.63011	3.80362	5.01609	0
MN_C	SPC27	NAD27	LC27	2202	Minnesota (Central)	200000	-339300	20006679.72	20493457.15	0.9999220223	0.7233880702	2771	20.89747	3.80497	4.76197	0
MN_S	SPC27	NAD27	LC27	2203	Minnesota (South)	200000	-338400	21327006.06	21874349.14	0.9999220448	0.7009277824	2661	20.12517	3.80662	4.46959	0
MS_E	SPC27	NAD27	TM27	2301	Mississippi (East)	500000	-319800	1772	28.62716	0.99996	0.3817257					
MS_W	SPC27	NAD27	TM27	2302	Mississippi (West)	500000	-325200	1822	21.00903	0.9999411765	0.3816986					
MO_E	SPC27	NAD27	TM27	2401	Missouri (East)	500000	-325800	2141	41.66790	0.9999333333	0.3812643					
MO_C	SPC27	NAD27	TM27	2402	Missouri (Central)	50000	-333000	2141	41.66790	0.9999333333	0.3812422					
MO_W	SPC27	NAD27	TM27	2403	Missouri (West)	500000	-340200	2161	39.76857	0.9999411765	0.3812362					

Table C.15: SPC27 (continued)

Zn ID	Zone Family	Datum ID	Proj Type	Zone #	Name #	*Field 1	*Field 2	*Filed 3	*Field 4	*Field 5	*Field 6	*Field 7	*Field 8	*Field 9	*Field 10	*Field 11
MT_N	SPC27	NAD27	LC27	2501	Montana (North)	2000000	-394200	18689498.40	19157874.26	0.9999714855	0.7464518080	2888	20.21285	3.80322	5.0949	0
MT_C	SPC27	NAD27	LC27	2502	Montana (Central)	2000000	-394200	19432939.76	19919806.36	0.9999229151	0.7333538278	2821	21.96779	3.80422	4.90135	0
MT_S	SPC27	NAD27	LC27	2503	Montana (South)	2000000	-394200	20500650.51	21096820.93	0.9999107701	0.7149012442	2729	21.1582	3.8056	4.64814	0
NE_N	SPC27	NAD27	LC27	2601	Nebraska (North)	2000000	-360000	23004346.29	23368977.46	0.9999645501	0.6734507906	2531	19.30504	3.80858	4.14653	0
NE_S	SPC27	NAD27	LC27	2602	Nebraska (South)	2000000	-358200	24104561.06	24590781.86	0.9999220725	0.6560764003	2451	24.68139	3.80977	3.95865	0
NV_E	SPC27	NAD27	TM27	2701	Nevada (East)	500000	-416100	2076	48.30429	0.9999	0.3812311					
NV_C	SPC27	NAD27	TM27	2702	Nevada (Central)	500000	-420000	2076	48.0429	0.9999	0.3812311					
NV_W	SPC27	NAD27	TM27	2703	Nevada (West)	500000	-426900	2076	48.30429	0.9999	0.3812311					
NH_	SPC27	NAD27	TM27	2800	New Hampshire	500000	-258000	2541	16.76677	0.9999666667	0.3807327					
NJ_	SPC27	NAD27	TM27	2900	New Jersey	2000000	-268800	2321	27.02745	0.9999750295	0.3810845					
NM_E	SPC27	NAD27	TM27	3001	New Mexico (East)	500000	-375600	1852	16.62358	0.9999090909	0.3816135					
NM_C	SPC27	NAD27	TM27	3002	New Mexico (Central)	500000	-382500	1852	16.62358	0.9999	0.3816204					
NM_W	SPC27	NAD27	TM27	3003	New Mexico (West)	500000	-388200	1852	16.62358	0.9999166667	0.3816288					
NY_E	SPC27	NAD27	TM27	3101	New York (East)	500000	-267600	2391	22.84247	0.9999666667	0.3808377					
NY_C	SPC27	NAD27	TM27	3102	New York (Central)	500000	-275700	2391	22.84247	0.9999375	0.380845					
NY_W	SPC27	NAD27	TM27	3103	New York (West)	500000	-282900	2391	22.84247	0.9999375	0.380875					
NY_L	SPC27	NAD27	LC27	3104	New York (Long Island)	2000000	-266400	24235000.8	24462545.38	0.99999.49	0.654082095	2442	20.6424	3.8099	3.9378	0
NC_	SPC27	NAD27	LC27	3200	North Carolina	2000000	-284400	29637059.47	30183611.25	0.999872551	0.57717077	2106	51.60353	3.8148	3.22483	0

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Table C.15: SPC27 (continued)

Zn ID	Zone Family	Datum ID	Proj Type	Zone #	Name #	*Field 1	*Field 2	*Filed 3	*Field 4	*Field 5	*Field 6	*Field 7	*Field 8	*Field 9	*Field 10	*Field 11
ND_N	SPC27	NAD27	LC27	3301	North Dakota (North)	2000000	-361800	18819849.05	19215516.01	0.9999358426	0.7441333961	2876	22.5795	3.80339	5.05972	0
ND_S	SPC27	NAD27	LC27	3302	North Dakota (South)	2000000	-361800	19661027.79	20086977.18	0.9999358523	0.7293826040	2801	20.45445	3.80452	4.845504	0
OH_N	SPC27	NAD27	LC27	3401	Ohio (North)	2000000	-297000	24048738.51	24559158.47	0.9999359346	0.6569503193	2455	23.48125	3.80971	3.96783	0
OH_S	SPC27	NAD27	LC27	3402	Ohio (South)	2000000	-297000	25522875.81	26027071.12	0.9999359346	0.6345195439	2354	28.63705	3.81121	3.74048	0
OK_N	SPC27	NAD27	LC27	3501	Oklahoma (North)	2000000	-352800	28657871.66	29082831.7	0.9999454101	0.5901470744	2161	42.56887	3.81402	3.3344	0
OK_S	SPC27	NAD27	LC27	3502	Oklahoma (South)	2000000	-352800	30382831,06	30838032.96	0.9999359432	0.5676166927	2066	52.48935	3.81537	3.14645	0
OR_N	SPC27	NAD27	LC27	3601	Oregon (North)	2000000	-433800	20836250.94	21383852.48	0.9998945810	0.7091860222	2701	22.08858	3.80602	4.57382	0
OR_S	SPC27	NAD27	LC27	3602	Oregon (South)	2000000	-433800	22341309.43	22888667.15	0.9998946058	0.6841473833	2581	22.74104	3.80782	4.26823	0
PA_N	SPC27	NAD27	LC27	3701	Pennsylvania (North)	2000000	-279900	23755351.27	24211050.37	0.9999568410	0.6615397363	2476	21.57953	3,8094	4.01753	0
RI_	SPC27	NAD27	TM27	3800	Rohde Island	500000	-257400	2456	19.72344	0.99999375	0.380922					
SC_N	SPC27	NAD27	LC27	3901	South Carolina (North)	2000000	-291600	30630125.53	31127724.75	0.9999454207	0.5644973800	2053	53.44099	3.81555	3.12127	0
SC_S	SPC27	NAD27	LC27	3902	South Carolina (South)	2000000	-291600	32252126.30	32676887.65	0.9999326284	0.5446515700	1972	3.57839	3.81669	2.94381	0
SD_N	SPC27	NAD27	LC27	4001	South Dakota (North)	2000000	-360000	20922704.09	21366697.03	0.9999391116	0.7077381841	2694	18.93392	3.80612	4.55529	0
SD_S	SPC27	NAD27	LC27	4002	South Dakota (South)	2000000	-361200	21993575.61	22461937.05	0.9999068931	0.6898519579	2608	21.5437	3.80742	4.33519	0
TN_	SPC27	NAD27	LC27	4100	Tennessee	2000000	-309600	29010231.09	29535149.91	0.9999484030	0.5854397296	2141	44.28313	3.81431	3.29422	0
TX_N	SPC27	NAD27	LC27	4201	Texas (North)	2000000	-365400	2945607.29	29972959.94	0.9999108771	0.5795358654	2116	48.58548	3.81466	3.24452	0
TXNS	SPC27	NAD27	LC27	4202	Texas (North Central)	2000000	-351000	32187809.58	32691654.54	0.9998726224	0.5453944146	1975	5.95074	3.81665	2.97107	0

Table C.15: SPC27 (continued)

Zn ID	Zone Family	Datum ID	Proj Type	Zone #	Name #	*Field 1	*Field 2	*Filed 3	*Field 4	*Field 5	*Field 6	*Field 7	*Field 8	*Field 9	*Field 10	*Field 11
TX_C	SPC27	NAD27	LC27	4203	Texas (Central)	2000000	-361200	34851703.46	35337121.23	0.9998817443	0.5150588857	1852	21.62181	3.81832	2.7455	0
TXSC	SPC27	NAD27	LC27	4204	Texas (South Central)	2000000	-356400	37261509.20	37807440.38	0.9999863243	0.4899126408	1752	37,19059	3.81962	2.56899	0
TX_S	SPC27	NAD27	LC27	4205	Texas (South)	2000000	-354600	41091749.54	41576762.39	0.9998947956	0.4540068519	1612	59.30342	3.82138	2.33094	0
UT_N	SPC27	NAD27	LC27	4301	Utah (North)	2000000	-401400	23894872.45	24229110.29	0.9999568422	0.6593554910	2466	21.96231	3.80955	3.99323	0
UT_C	SPC27	NAD27	LC27	4302	Utah (Central)	200000	-401400	25117176.75	25664114.42	0.9998988207	0.6405785926	2381	29.30066	3.81081	3.80024	0
UT_S	SPC27	NAD27	LC27	4303	Utah (South)	2000000	-401400	27025955.35	27432812.88	0.9999512939	0.6126873424	2268	34.16878	3.81262	3,53414	0
VT_	SPC27	NAD27	TM27	4400	Vermount	50000	-261000	2541	16.76677	0.9999642857	0.3807420					0
VA_N	SPC27	NAD27	LC27	4501	Virginia (North)	2000000	-282600	26230200.09	26576444.45	0.9999483859	0.6241178597	2308	30.78682	3.81189	3.64047	0
VA_S	SPC27	NAD27	LC27	4502	Virgina (South)	2000000	-282600	27434800.06	27811312.71	0.9999454027	0.6069248249	2233	36.41072	3.81298	3,48187	0
WA_N	SPC27	NAD27	LC27	4601	Washington (North)	2000000	-435000	18798081.67	19205863.43	0.9999422551	0.7445203390	2878	22.15711	3.80336	5.06556	0
WA_S	SPC27	NAD27	LC27	4602	Washington (South)	2000000	-433800	19832653,52	20289119.6	0.9999145875	0.7263957947	2786	21.72121	3.80474	4.80336	0
WV_N	SPC27	NAD27	LC27	4701	West Virginia (North)	2000000	-286200	25305029.12	25715126.55	0.9999407460	0.6377729697	2368	57.52979	3.81099	3.77244	0
WV_S	SPC27	NAD27	LC27	4702	West Virginia (South)	2000000	-291600	26639323.45	27070620.78	0.9999256928	0.6181953936	2282	33.82207	3.81227	3.58491	0
WI_N	SPC27	NAD27	LC27	4801	Wisconsin (North)	2000000	-324000	20124133.05	20489179.67	0.9999453461	0.7213707913	2761	19.04034	3.80511	4.73451	0
WI_C	SPC27	NAD27	LC27	4802	Wisconsin (Central)	2000000	-32400	21050746.99	21430913.91	0.9999407059	0.7055766312	2683	48,81363	3,80628	4.52782	0
WI_S	SPC27	NAD27	LC27	4803	Wisconsin (South)	2000000	-324000	22161432.25	22672134.66	0.9999325474	0.6871032423	2595	20.01691	3.80761	4.30274	0
WY_E	SPC27	NAD27	TM27	4901	Wyoming (East)	500000	-378600	2431	20.83533	0.9999411765	0.3808422					
WY_E	SPC27	NAD27	TM27	4901	Wyoming (East)	500000	-378600	2431	20.83533	0.9999411765	0.3808422					

Supplementary

Table C.15: SPC27 (continued)

Zn ID	Zone Family	Datum ID	Proj Type	Zone #	Name #	*Field 1	*Field 2	*Filed 3	*Field 4	*Field 5	*Field 6	*Field 7	*Field 8	*Field 9	*Field 10	*Field 11
WYEC	SPC27	NAD27	TM27	4902	Wyoming (East Central)	500000	-378600	2431	20.83533	0.9999411765	0.3808422					
WYWC	SPC27	NAD27	TM27	4903	Wyoming (West Central)	500000	-378600	2431	20.83533	0.9999411765	0.3808422					
WY_W	SPC27	NAD27	TM27	4904	Wyoming (West)	500000	-378600	2431	20.83533	0.9999411765	0.3808422					
PRVI_	SPC27	NAD27	LC27	5201	Puerto Rico and Virgin Islands	500000	-239160	63542221.66	63687479.449	0.9999939449	0.3128882281	1088	48,44933	3,82699	1.5103	0
SX_	SPC27	NAD27	LC27	5202	ST. Croix	500000	-239160	63542221.66	63687479.449	0.9999939449	0.3128882281	1088	48,44933	3,82699	1.5103	0
SA_	SPC27	NAD27	LC27	5300	Samoa	500000	-612000	-82312234.65	-82000000	1	-0.2464352205	-851	-49.53291	3.82892	-1.16664	0

Global Product Support

If you have any problems or require further assistance, the Customer Support team can be reached through the following:

- telephone
- email
- Ashtech BBS system
- Internet

Please refer to the documentation before contacting Customer Support. Many common problems are identified within the documentation and suggestions are offered for solving them.

Ashtech customer support:

Sunnyvale, California, USA

800 Number: 1-800-229-2400

Local Voice Line: (408) 524-1680

fax Line: (408) 524-1500

Email: support@ashtech.com

Ashtech Europe Ltd. Oxfordshire UK

TEL: 44 1 993 883 533

fax : 44 1 993 883 977

Solutions for Common Problems

- Check cables and power supplies. Many hardware problems are related to these simple problems.
- If the problem seems to be with your computer, re-boot it to clear the system's RAM memory.
- If you are experiencing receiver problems, reset the receiver as documented in the set commands section of this manual. Note that the reset command clears receiver memory and resets operating parameters to factory default values.
- Verify the batteries are charged.
- Verify that the antenna views skyward are unobstructed by trees, buildings, or other canopy.

If none of these suggestions solves the problem, contact the Customer Support team. To assist the Customer Support team, please ensure the following information is available:

Table D.1: GPS/GIS Product Information

Information Category	Your actual numbers
Receiver model	
Receiver serial #	
Software version #	
Software key serial #	
Firmware version #	
Options*	
A clear, concise description of the problem.	
* The firmware version # and options can be obtained using the $PASHQ,RID (receiver identification) command.	

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