



VFPROC

VERTICAL CONTROL FIELD DATA PROCESSING SYSTEM

National Oceanic and Atmospheric Administration
Charting and Geodetic Services
National Geodetic Survey Division

Version 3.00
December, 1992

Vertical Field Data Processing Manual

Table of Contents

Chapter 1 - System Overview	
1.1 Introduction	1-1
1.2 Requesting Assistance	1-1
1.3 Distribution Disk Contents	1-1
1.4 Installation	1-6
1.5 Configuring Your System for VFPROC	1-7
1.5.1 The VERTPGM Environment Variable	1-7
1.5.2 The PATH Environment Variable	1-7
Chapter 2 - VFPROC Program Screen Operation	
2.1 Introduction	2-1
2.2 Using Forms	2-1
2.3 The Status Line	2-2
2.4 Getting Help	2-2
2.5 Choice Lists	2-3
2.6 Entering DOS Filenames (Directory Assistance)	2-4
Chapter 3 - The Vertical Field Observation Recording	
3.1 Introduction	3-1
3.2 Program Screen Displays	3-1
3.3 Getting Started	3-1
3.4 Leveling Activities	3-2
3.5 Entering Equipment Information	3-3
3.5.1 Equipment Information Fields	3-3
3.6 Collimation Check (C-Shot)	3-6
3.6.1 Collimation Check Observation Prompts	3-7
3.6.2 Collimation Check Displays for Non-Compensator Type Instruments	3-10
3.6.3 Error Messages in the Collimation Check	3-10
3.6.4 Collimation Test Rod Readings	3-12
3.7 Section Leveling	3-12
3.7.1 Section Beginning Prompts	3-12
3.7.2 Setup Observation Prompts	3-14
3.7.3 Error Messages for the Setup Observations	3-17
3.7.4 Section Ending Prompts	3-18
3.8 Reviewing Previous Sections	3-19
3.9 Ending Leveling	3-20
3.10 Data Transfer Procedures	3-20
Chapter 4 - Editing Field Observation Files	
4.1 Introduction	4-1
4.2 Preparing for an Editing Session	4-1
4.3 Executing EDITOR	4-1
4.3.1 Editing or creating an ".HGF" File	4-2
4.3.1.1 Editing File Header and Line Title Information	4-2
4.3.1.2 Editing a Data Record	4-3
4.3.1.2.1 Modifying an Equipment Information Record	4-4
4.3.1.2.2 Modifying a Section Running Record	4-5
4.3.1.3 Deleting a block of data From an ".HGF" File	4-5
4.3.2 Editing an ".HGZ" File	4-6
4.3.2.1 Adding a 40 record	4-6

Vertical Field Data Processing Manual

Table of Contents

4.3.2.2 Adding a Section record	4-6
4.3.2.3 Adding a River Crossing	4-8
4.3.2.4 Editing a Section Record	4-9
4.3.2.5 Editing a River Crossing	4-9
4.3.2.6 Rejecting a Section	4-9
4.3.2.7 Deleting a block of Data	4-9
Chapter 5 - Field Observation Recomputation	
5.1 Introduction	5-1
5.2 Preparing to Run NEWREC	5-1
5.2.1 Running NEWREC	5-1
5.2.1.1 Creating a New ".HGZ" file	5-3
5.2.1.2 Adding to an Existing ".HGZ" file	5-4
5.2.1.3 Data Set Information	5-4
5.2.2 The Error Message File, NEWREC.ERR	5-4
5.2.3 Field Book ".RPT" File	5-5
5.2.4 Backing-up the ".HGZ" and ".RPT" Files	5-5
5.3 Newrec Error messages	5-5
5.3.1 Collimation Check Records, C1 C2 and C3	5-6
5.3.2 Ending Bench Mark Record, B2	5-6
5.3.3 Setup Record, S1	5-6
Chapter 6 - Control Point Description Entry	
6.1 Introduction	6-1
6.2 Preparing to Enter Descriptions	6-1
6.3 Running DESC	6-1
6.4 Creating/Modifying Data Set Information	6-2
6.5 Entering a Description	6-2
6.5.1 Part 1 - Determining the Type of Description	6-4
6.5.2 Part 2 - Entering the Descriptive Header	6-6
6.5.3 Part 3 - Entering the Descriptive Text	6-6
6.6 Recalling an Existing Description	6-6
6.6.1 Modifying a Description	6-7
6.6.2 Deleting a Description	6-7
6.6.3 Copying from an Existing Description into a New Description	6-7
6.6.4 Printing a description	6-7
6.7 Statistics of Control Point Descriptions	6-7
Chapter 7 - Field Abstract Generation	
7.1 Introduction	7-1
7.2 Preparing to Generate a Field Abstract	7-1
7.3 Executing ABSTRA	7-1
7.4 Checking the Field Abstract	7-4
7.5 Field Abstract File Format	7-5
Chapter 8 - Utility Programs	
8.1 COMPRESS	8-1
8.2 MAKEFILE	8-2
8.3 HAPRINT	8-3
8.4 READROD	8-3

Vertical Field Data Processing Manual

Table of Contents

8.5 RODCAL	8-4
8.5.1 Creating a ".CAL" File For Rods Without Detailed Calibrations	8-5
8.6 MERGFILE	8-5
8.6.1 Merging .HGF files	8-6
8.7 EXTRACT	8-7
8.7.1 Using File Submenu	8-7
8.7.2 Selecting Marks	8-7
8.7.3 Using the Utilities Submenu	8-8
Chapter 9 - Data Release Procedures	
9.1 Introduction	9-1
9.2 Data Reformatting Using READFILE	9-1
9.3 Shipment of Floppy Disks	9-2
Chapter 10 - River Crossing Observation Recording	
10.1 Introduction	10-1
10.2 Program Screen Displays	10-1
10.3 Getting Started	10-1
10.4 Entering Beginning Series Information	10-2
10.5 Entering River Crossing Observation Data	10-4
10.5.1 Reciprocal Collimation	10-4
10.5.2 Bench Mark to Instrument Station Observations	10-5
10.5.3 Target to Instrument Station Observations	10-5
10.6 Ending Information	10-9
10.7 Final Computations	10-9
10.8 Generating A Text File	10-10
10.8.1 Output File Format	10-10
Appendix A - File Labeling Conventions	
Appendix B - The Corvallis Microtechnologies MCV Data Logger	
Appendix C - Building the Instrument Information File	
C.1 INST.DAT File Format	C-1
Appendix D - Data File Formats	
D.1 Introduction	D-1
D.2 E3 Record Format	D-1
D.3 C4 Record Format	D-2
D.4 B4 Record Format	D-3
D.5 S2 Record Format	D-3

1.1 Introduction

The Vertical Control Field Data Processing System (VFPROC) is a set of programs and procedures to record geodetic leveling observations and control point descriptions, and to perform the first level of quality control checks the data. These programs run on microcomputers based on the Intel¹ 80x86 family of microprocessor, running the MS-DOS² operating system.

The objective of this user's manual is to provide step-by-step instruction on the use of the data processing software. This manual assumes that the user is familiar with microcomputer operation, and the MS-DOS operating system. Where appropriate, reference is made to the corresponding operating system manual to avoid being redundant. This manual also assumes that the user is familiar with the National Geodetic Survey's leveling and data formatting procedures as described in NOAA Manual NOS NGS 3, "Geodetic Leveling" and NOAA Manual NOS NGS 2, "Input Formats and Specifications of the National Geodetic Survey Data Base, Volume II", commonly referred to as the "Bluebook".

This manual is divided into chapters according to the tasks performed to collect and validate the geodetic leveling data. This first chapter provides an introduction to the overall system and diagrams what software is used in each step of the data processing. Chapters 2 through 7 detail the individual tasks necessary to collect and process vertical observation and control point descriptive data. Chapter 8 covers the utility programs that are essential to working with the descriptions but do not represent major tasks in the processing. Chapter 9 describes the procedures to be followed when releasing data to NGS. Chapter 10 describes the operation of the program (RIVER) for collecting river crossing observations.

1.2 Requesting Assistance

If you feel you have discovered a problem with any software component of this system, please report the problem using the Software Problem Report in the back of this manual. This form may also be used to communicate suggested enhancements to the system.

1.3 Distribution Disk Contents

There are six main data processing programs for the microcomputer:

VERREC - is used to collect and validate geodetic differential leveling observation data, the output is a raw observation (".HGF") file in binary format. There are two versions of this program: the file VERREC.X is the version that runs on the hand-held field recording unit; and the file VERREC.EXE is the version that runs on any DOS-compatible PC.

RIVER - is used to collect and validate data collected during valley and river crossing observations. There are two versions of this program: the file RIVER.X is the version that runs on the hand-held field recording unit; and the file RIVER.EXE is the version that runs on any DOS-compatible PC.

EDITOR - allows creation of and modifications to binary raw observation (".HGF") files and to the binary reduced observation (".HGZ") files.

NEWREC - performs secondary checks to the observation data, reformats it into the Bluebook specified format and computes the rod correction and partial refraction correction for each section. The reformatted data is added to a new or existing binary ".HGZ" file.

DESC - prompts for control point descriptive data, performs preliminary checks on the data and provides the capability to modify or delete existing descriptions and stores this information

¹Intel is a registered trademark of Intel Corporation

²MS-DOS is a registered trademark of Microsoft Corporation

Chapter 1 - System Overview

in a binary description (".HA") file.

ABSTRA - uses the descriptive and observational data to generate a field abstract, completes the refraction correction, and adds abstracted data records to the ".HGZ" file.

The disks also contain nine utility programs for the microcomputer system:

COMPRESS - compresses binary format data files to free space on the system disk.

EXTRACT - allows the user to select marks in a description file and copy the descriptions for those marks to a new or existing description file.

MAKEFILE - creates a binary format file from a sequential Bluebook format file.

READFILE - creates a sequential Bluebook format file, from a binary format file.

MERGFIL - allows up to ten binary-format description files or raw observation files to be merged into a new or existing description or observation file, respectively.

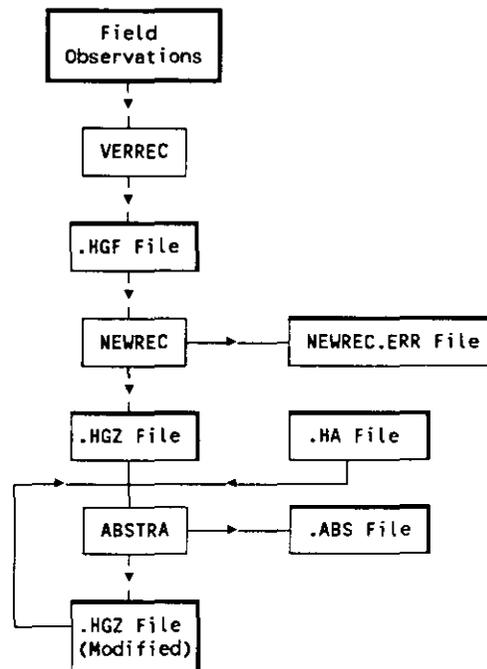
RODCAL - creates a binary format file of the detailed rod calibration data for a level rod. This binary file is used by the programs NEWREC, EDITOR and ABSTRA.

READROD - creates a sequential listing of the binary rod calibration file.

HAPRINT - creates a formatted listing of the contents of a binary-format description file.

PRTRVR - creates a text listing file from the binary ".RVR" file created by the program RIVER.

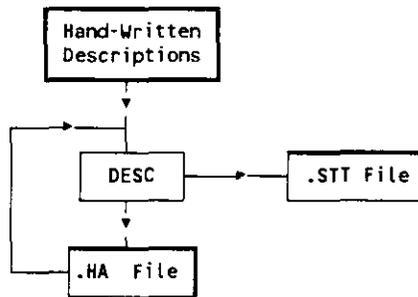
Figure 1.1 shows the programs, the files, and the sequence of steps required to collect and process the vertical control field observations.



Observation Data-Processing Procedures

Figure 1.1

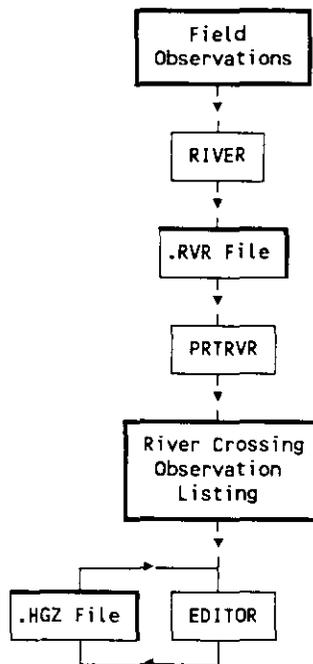
Figure 1.2 shows the programs, the files, and the sequence of steps required to process the control point descriptive data.



Description Data-Processing Procedures

Figure 1.2

Figure 1.3 shows the programs, the files, and the sequence of steps required to collect and process the river crossing field observations and add them to the other field observations.

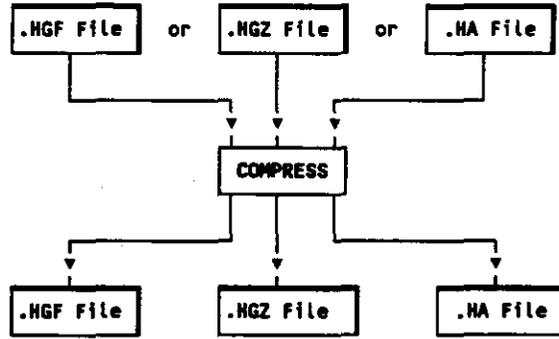


River Crossing Data-Processing Procedures

Figure 1.3

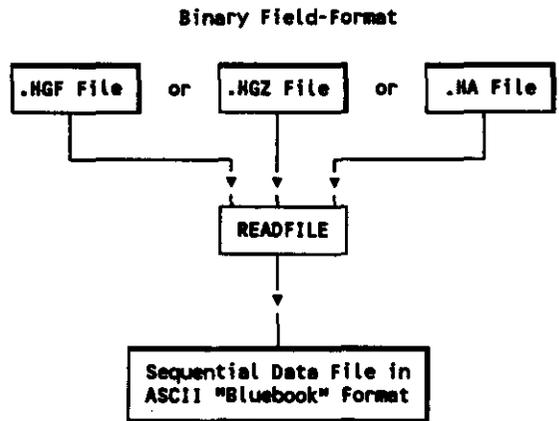
Chapter 1 - System Overview

Figure 1.4 shows interaction of the utility programs and the observation and descriptive data files.



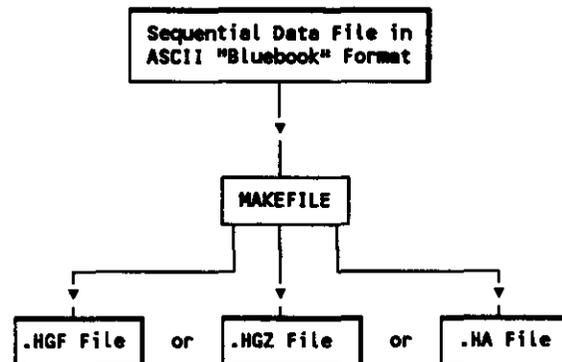
File Compression Utility

Figure 1.4a



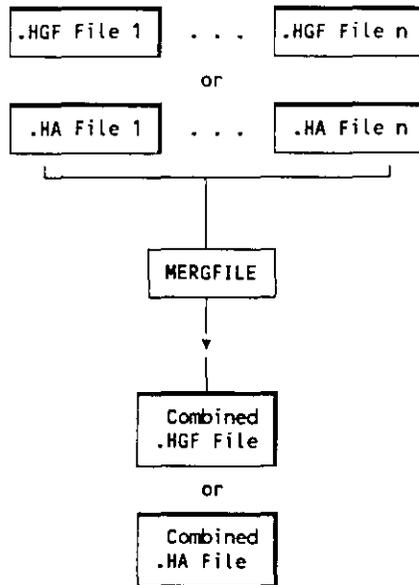
File Format Conversion Utility

Figure 1.4b



File Format Conversion Utility

Figure 1.4c



File Merging Utility

Figure 1.4d

1.4 Installation

Before installing VFPROC, review the following checklist to make sure you have everything you'll need. Note: VFPROC is not designed to run on a floppy based system. Therefore, no floppy-based installation procedures are given.

1. Two high-density 5-1/4 inch floppy disks labeled *VFPROC Disk 1/2* and *VFPROC Disk 2/2*, respectively.

- Or, two high-density 3-1/2 inch floppy disks labeled *VFPROC Disk 1/2* and *VFPROC Disk 2/2*, respectively.

2. A microcomputer with:
 - MS-DOS Version 3.3 or later;
 - 640 kilobytes of Random Access Memory (RAM);
 - At least 4 Megabytes (Mb) of storage on the hard disk;
 - An RS-232 serial interface port; and
 - A color or monochrome monitor.

Follow the steps below to install VFPROC on your hard disk.

1. Start your computer.
2. Insert the disk labeled *VFPROC Disk 1/2* into one of the floppy disk drives, e.g. A:.
3. At the DOS prompt, type A: and press **Enter**.
4. Type INSTALL and press **Enter**.
5. The installation procedure will begin running. Follow the instructions on the screen.

6. Once the installation procedure is complete, store the distribution disks as backups.

1.5 Configuring Your System for VFPROC

If you allowed the installation program to update your AUTOEXEC.BAT file, you can skip the next two sections.

1.5.1 The VERTPGM Environment Variable

In order for the software components of VFPROC to run successfully, an environment variable called VERTPGM must be set. This variable identifies the location on your disk where the programs comprising VFPROC look to find the support files they need to run. To set this variable enter the command:

```
C:>SET VERTPGM= <subdirectory name>
```

where <subdirectory name> is the name of the directory containing the VFPROC program files. For example, if you installed VFPROC on the C: drive in a directory named \PROGRAMS\VERTPGM, the command would read:

```
C:>SET VERTPGM=C:\PROGRAMS\VERTPGM
```

Once the environment variable is set it will remain active until the system is rebooted or turned off. To avoid having to set the variable every time the system comes up, place the command in the AUTOEXEC.BAT file. For a complete discussion of the AUTOEXEC.BAT file and the SET command, refer to your DOS manual.

1.5.2 The PATH Environment Variable

Although not mandatory for the operation of VFPROC, the name of the subdirectory containing the VFPROC program files should be added to your systems PATH environment variable. To set this variable enter the command:

```
C:>SET PATH= <subdirectory name>
```

Using the example in section 1.5.1 the statement would read:

```
C:>SET PATH=C:\PROGRAMS\VERTPGM
```

Again, this statement should be added to the AUTOEXEC.BAT file to avoid having to set the variable every time the system comes up. It is more than likely the AUTOEXEC.BAT file already contains a statement setting the path variable on your system. If a SET PATH statement exists, just add the subdirectory name to the end. For example, if the PATH statement in the AUTOEXEC.BAT file reads:

```
PATH = C:\;C:\DOS
```

add ";C:\PROGRAMS\VERTPGM" to the end so it reads:

```
PATH = C:\;C:\DOS;C:\PROGRAMS\VERTPGM
```

/

2.1 Introduction

This chapter describes the general operation of the data entry and help screens which appear in the programs comprising VFPROC. You will need to know this material to follow the rest of the manual. Later chapters do not repeat this information—they assume you know how to get help, how to use choice lists and how to enter data into screen forms.

The screen displays in the data collection programs VERREC and RIVER are different in appearance and operation because they were designed for use on a hand-held data logger. The screen layouts, cursor key control and the function key control used in VERREC and RIVER are explained in the chapters dealing with the operation of these programs: chapters 3 and 10 respectively.

2.2 Using Forms

The programs comprising VFPROC use a special screen called a *form* for user input. Screen forms are like paper forms that you fill in, typing data into the blanks. Forms may consist of just one field or several fields, permitting movement between them. If there is a default value for any field, it is displayed in the response portion of the field and will be used as the response if not changed. No individual response to a field is saved until the form is exited. Whenever a field on a form is entered, the entire response portion of the field will be highlighted showing the maximum number of characters allowed. If a response to a field is invalid, an error message is displayed and the cursor will remain at the invalid response.

A response to an individual field in a form may be either mandatory, optional or prohibited. An attempt to exit a field to which a response is mandatory will cause the following highlighted error message to be displayed on the bottom line of the screen and the cursor to remain in the current field.

Field entry required

If a response to a field is optional, the field can be exited without entering anything. If a response to a field is prohibited, the cursor will not enter the field to allow data entry.

A form may be exited by pressing the **F10** key while on any field on the form. When the form is exited a prompt may be displayed, asking for confirmation of this action.

Do you want to exit this form [y/n] _

Entering "N" will return the cursor to the form allowing further editing of the fields. If "Y" is entered, the data from the form is saved and the form is exited.

When working with forms it is possible to position the cursor according to the key functions described in Table 2.1.

Forms Key Definitions

Cursor Positioning:

↑	go to the previous field
↓	go to the next field
←	move the cursor left one space
→	move the cursor right one space
Tab	moves to the next field
Shift Tab	moves to the previous field
Enter	moves to the next field
F8	moves to the next field
Home	moves the cursor to the beginning of the field
Ctrl Home	moves to the first field on the form
End	moves the cursor to the end of the field

Ctrl End moves the cursor to the last field on the form

Editing Keys:

F1 display Help, when enabled
F2 display Choices, when enabled
Shift F3 undo change made to current field
F6 clears the field
Shift F6 clears the field from the cursor to the end
Ins toggles between insert and overwrite modes
Del deletes the character at the cursor position
BackSpace deletes the character to the left of the cursor

To exit a form:

Esc exit the form without saving the responses
F10 save responses and leave the form

Table 2.1

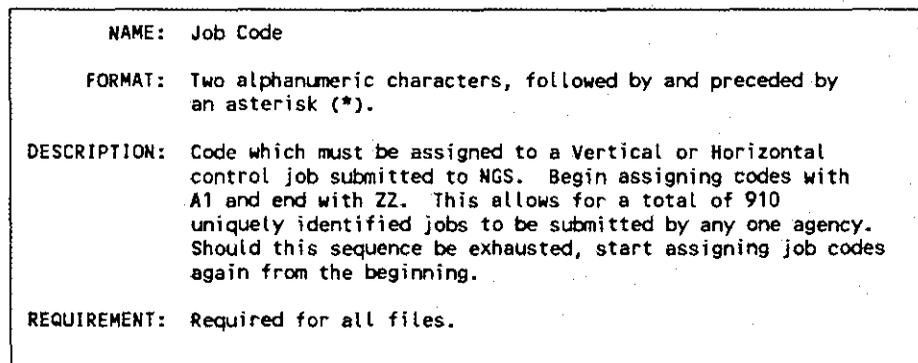
2.3 The Status Line

The status line is a one-line window located at the bottom of the screen. This window is used to display errors, messages, warnings and questions. An error, message, or warning will remain on the status line until a key is pressed. A question will remain on the status line until it is answered with a yes ("y") or no ("n").

2.4 Getting Help

VFPROC has a built-in help system which provides help for the field where the cursor is currently located. Press the **F1** key at any time to see a help message about the current field.

When **F1** is pressed a window, shown in Figure 2.1, will appear at the bottom of the screen. This window contains information about the field such as the field name, input format, a brief description, and any special notes or requirements about the field. If you hear a low pitched buzz upon pressing the **F1** key, no help is available for the current field.



Press the <ENTER> key or <ESC> key to exit help and continue

Figure 2.1

The help window is initially displayed in the bottom eight lines of the screen. The cursor keys **↑** and **↓** can be used to scroll through the text in the window. The window can be toggled to a full screen display by entering **AltF1** (pressing the **F1** while holding down **Alt**) to enable more text to be displayed at one time.

A second level of help, called system help, can be obtained by pressing the **F1** again from within the field help window. This window contains a complete list of keys and their definitions as listed in Table 2.1. The same information will be displayed in the system help window regardless of which field the cursor was on when the help was invoked.

A help window may be exited by pressing **Enter** or **Esc**. When the system help window is exited, the cursor is returned to the field help window, which may be exited by again pressing the **Enter** or **Esc** key.

2.5 Choice Lists

The data value for a field with a finite set of entries can be selected from a list of choices by pressing the **F2** key. If no choice list exists for the current field, the message "No Choice List Exists" will appear at the bottom of the screen and the cursor will remain where it is. If a choice list exists, a window will appear on the screen in a position which will not interfere with the field being entered.

When a choice window is first entered a highlight bar will be positioned on the first entry in the list. To choose an entry, move the highlight bar to that entry and press **Enter**. Once **Enter** is pressed the choice window will disappear and the chosen value displayed in the field.

An entry in the choice list usually contains a valid field value followed by a description of the value. The entire list of choices for a given field may extend beyond the bottom of the window. In this case it is possible to scroll through the choices by using the **↑** and **↓** keys. Table 2.2 contains a complete list of keys active in the choice window, and their definitions.

To abort a choice list without accepting the highlighted value press the **Esc** key. This will cause the choice window to disappear and the cursor to return to the current field.

Choice Lists Key Definitions

Cursor Positioning:

↑	move cursor up one row
↓	move cursor down one row
PgUp	scroll up the number of lines displayed in the window
PgDn	scroll down the number of lines displayed in the window
Home	move cursor to the first choice in the list
End	move cursor to the last choice in the list

To exit a choice list:

Esc	exit the choice list without accepting the highlighted responses
Enter	accept the highlighted response and exit the choice list

Table 2.1

2.6 Entering DOS Filenames (Directory Assistance)

Whenever a form contains a field that requires entry of a DOS file name (the standard form is shown in Figure 2.2), the file's name can be entered manually or selected by using "Directory Assistance". Directory Assistance allows you to display and select a file name from any disk or directory. If you cannot remember a file name you can use this option to find the file.

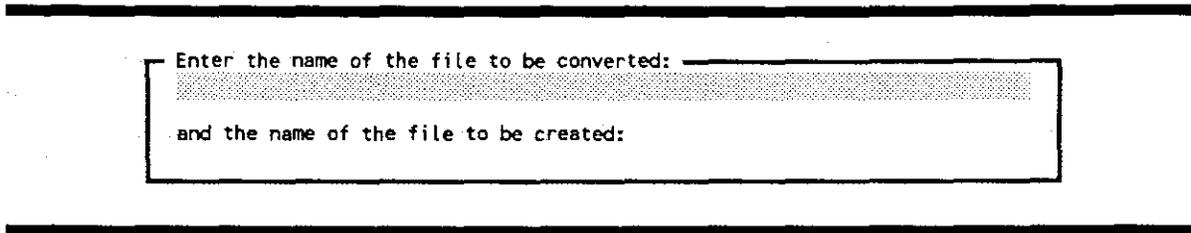


Figure 2.2

To use the Directory Assistance option:

1. Press the choice list key, **F2**.
2. Enter the name of a directory or simply press **Enter** for the current directory. Pressing **Esc** at this point will exit this feature and return you to the form.
3. Move the cursor to the name of the file or directory.
4. Press **Enter** to accept the filename, or to move to the directory. Or press **Esc** to type in a new directory name.

While entering a directory name you can include a pattern to display selected files. For example, C:\DATA*.HA would display all of the files in the DATA directory of the C: drive with .HA as the extension.

The Directory Assistance screen, Figure 2.3, shows each file or directory by name, the size of the file in bytes, and the date and time of the file's creation or last modification. This screen acts like any other choice list, refer to Table 2.2 for a list of keys and their definitions.

At the top of each Directory Assistance screen are the Current (.) and the Parent (..) directories. The current directory refers to the one listed in the top left corner of the window. The parent directory is the directory which contains the current directory. Root directories, e.g. "C:\", do not have a parent directory.

C:*.HGF

Use cursor keys to highlight a filename or directory, ESC to exit

<CURRENT>			
<PARENT>			
..			
BLI	<DIR>	12/04/1990	07:16
DOS	<DIR>	12/10/1987	14:53
GAMES	<DIR>	03/14/1990	18:10
LOOP	<DIR>	08/24/1990	11:38
ME	<DIR>	09/23/1989	13:11
MENU	<DIR>	02/13/1990	08:35
NORTON	<DIR>	08/07/1989	12:01
RECORDS	<DIR>	12/04/1990	18:04
TD	<DIR>	09/09/1990	07:06
UTILS	<DIR>	12/04/1989	09:52
VERTPGM	<DIR>	09/19/1990	11:01
WP51	<DIR>	09/16/1990	17:33
BOB0705.HGF		5084 07/05/1990	19:03
L25.HGF		22606 09/24/1990	02:08
L251.HGF		242102 09/24/1990	07:04

Figure 2.3

3.1 Introduction

The Vertical Observation Recording Program (VERREC) is used by the NGS to record and validate geodetic leveling data. This program is designed to run on personal computers based on the Intel 80x86 series of processing units. The program requires approximately 75k of memory and a floppy disk or hard disk for file storage. The program checks for 16k of free disk space for the output file.

NGS has chosen to use a hand-held PC for its field data collection and the program was designed for that computer. Because of this, the program's screen prompts are restricted to an area of 8 rows by 21 columns. On a standard PC the program uses the upper left corner of the screen. Two versions of the program are distributed. The VERREC.EXE program runs on the standard PC. The VERREC.X program runs on the hand-held PC.

3.2 Program Screen Displays

VERREC uses four types of screen displays for program control and data entry: **menus**, **forms**, **single-entry prompts**, and **continuation prompts**. Menu items are chosen by pressing the corresponding function key. The only menu in the program appears when the program begins and controls selection of the various leveling activities. Forms are used for data entry and display and allow the user to move from field to field in order to enter and edit data. Forms are used for entering the equipment, beginning bench mark and ending bench mark information. Each form is described in detail in later sections of this chapter. Single-entry prompts are used to enter observations in the collimation check and section running activities. Again, the various prompts are described in the appropriate sections. Continuation prompts display data and warning messages. The program pauses after each message to allow the user to read it before continuing. To continue the user need only press a key.

Since forms display many data fields at once, it is necessary to be able to move to a particular field within a form. The arrow keys will move the cursor between fields, as will the **Tab** and **Shift Tab** keys. The **PgUp** and **PgDn** keys will move the cursor up or down one screen (7 lines) at a time. To go to the first field in the form use the **Home** key. To go to the last field in the form use the **End** key.

In addition to the data entry displays there are three types of message displays. First, on the bottom line of some data entry displays there is a row of labels which identify commands associated with the blue function keys below them. Pressing a function key will initiate the corresponding command. Second, there are error messages which appear on the last line of the display. These messages indicate errors or possible errors in a particular response. These messages are accompanied by a warning beep. Third, there are screen messages which indicate errors or possible errors in computed data values. These messages halt program execution until a key is pressed. This allows the user to take note of the error before continuing.

3.3 Getting Started

To run the program type the name, VERREC, at the operating system prompt:

C:\VERREC

If you are using one of the hand-held terminals, it is also possible to execute the program by using the arrow keys to move the highlight bar to the VERREC.X file and then by pressing the **F5** key to run the program.

When the program begins the screen will clear and the program name, version number and line number prompt will appear:

VERREC Version 1.1

May 1990

File Name: _____

Chapter 3 - Vertical Field Observation Recording

Enter the name of the file where the observations will be stored. This name may be up to eight characters long. The file will have the name entered and ".HGF" as its extension. For example, by responding:

File Name: RLC0624_

the observation data will be stored in the file RLC0624.HGF. If this file does not exist it will be created. If it does exist the program will prompt:

**File Already Exists
Continue? N**

After the file name has been entered the program begins by displaying the equipment information. See section 2.4 for the details of the form and the requirements for the data. Entering equipment information is mandatory at the beginning of each leveling session. Once the equipment information has been entered the main activities menu will be displayed.

All alphabetic responses in the program must be in upper case. The program will set the CAPS-LOCK mode on when it starts. Also, in the forms display it is possible to toggle between insert and overstrike mode by pressing the INSERT key. When the program begins the overstrike mode is set. It is possible to identify which mode is active by the shape of the cursor. In the overstrike mode the cursor is a box, in the insert mode the cursor is an underscore.

3.4 Leveling Activities

There are three data collection activities covered by the recording program: entering or modifying equipment and observer information; running a leveling section; and performing a collimation check on the leveling instrument. These activities are represented by the top three choices on the SELECT ACTIVITY menu. Each of these activities is covered in greater detail in the later sections of this chapter.

SELECT ACTIVITY				
Change Equipment	F1			
Begin Section	F2			
C-Shot	F3			
Review Sections	F4			
End leveling	F5			
CHNG	BEGIN	C-SHOT	REVI	END

The fourth choice on the menu allows review and modification of the beginning and ending bench mark data for previous sections. The last choice on the menu exits the program.

To select an item from the menu, press the appropriate function key or press the first letter in the activity name. The exception to the latter method is the collimation check (C-Shot) which can be chosen by pressing the letter "S".

3.5 Entering Equipment Information

The equipment and observer information is entered at the beginning of each leveling session or whenever there is a change in the information, eg. using a new instrument or working in a different time zone. This information seldom changes, so to speed the entry process the most recent set of entries is kept in a file labeled EQUIP.DAT. This file is read by the program every time it is run and will remain unless erased. The first time the program is run this file does not exist so a set of default equipment and observer information is used by the program.

Chapter 3 - Vertical Field Observation Recording

When the VERREC program begins or when the "Change Equipment" (F1) selection is chosen from the main menu, the screen will clear the equipment information form will appear:

```
Inst.
  Code: 233
  S/N: 456516__
Stadia
  Code: H
  Factor: 100
Rod 1
SAVE                                ABORT
```

This form has more fields than can be displayed on the screen at one time. To move from field to field use the blue arrow keys at the lower right of the keyboard. As the cursor is moved down from the last prompt on the screen the form will scroll up to display the next field. Each field should be reviewed at the start of a leveling session to guarantee correctness. If equipment changes are made later in the session it may be sufficient to skip directly to the appropriate field, enter the new information and save the form.

When the "SAVE" key (F1) is pressed the message "SAVE CHANGES?" will appear at the bottom of the screen. Responding with a "Y", or just pressing the (Enter) key, will save the equipment information and exit to the main menu. Responding with an "N" will cause the message "ABANDON FORM?" to appear. This is to give the user a second chance to avoid exiting the form without saving the data.

If the "ABORT" key (F5) is pressed the message "ABANDON FORM?" will appear at the bottom of the screen. Responding "N" or just pressing the (Enter) key will return to the form. Responding "Y" will exit the form without saving the data.

When the last field is reached the cursor cannot be moved down. To save the form press the (F1) key or the (Enter) key.

3.5.1 Equipment Information Fields

There are a total of 31 fields in the equipment information form. All deal with equipment identification and related information. Each field is displayed along with the last response entered. If this value is correct and has not changed then the user can skip the field by pressing the (Enter) key or the down arrow. When a field is reached where the response must be changed, simply enter the correct value and press (Enter). This new value is now stored with the last set of responses and will appear the next time the field is reached.

This section lists each field individually, or in logical groups, and explains the valid response requirements. All fields require a response unless they are specifically indicated as optional.

```
Inst.
  Code: 233
  S/N: 429964__
```

These fields are for the NGS three-digit identification code and the serial number of the observing instrument. Refer to the Bluebook, Annex F for a complete list of the codes used for the various observing instruments. For example, the code for the Zeiss/Jena Ni002 is 233. The location of the serial number varies between instruments. Up to eight alphanumeric characters may be entered.

```
Stadia
  Code: H
  Factor: 100
```

Chapter 3 - Vertical Field Observation Recording

Enter the stadia code and stadia factor for the instrument. The stadia code is either "H" for half stadia or "F" for full stadia. The stadia factor is a three-digit number. Typical values are 100 and 333.

Rod 1

Code: 316

S/N: 270711__

Constant: 592.50__

Enter the code, serial number and scale offset constant of the "number 1" level rod. Traditionally this is the rod with the offset constant of 592.50. Refer to the "Bluebook", Annex F for the various rod codes. In this example the Kern invar rod has a code of 316. The location of the serial number varies between level rods. On the Kern rod it is at the top front on the name-plate. Up to 8 alphanumeric characters may be entered. Enter the rod constant in the units of measure on the rod and include the decimal point. The three common values for the Kern rods are 592.50, 602.50 and 613.50. As mentioned above this value is usually 592.50 for the number 1 rod. An easy way to determine the offset constant is to set up the instrument and read the rod. The difference between the high scale and low scale readings will be closest to one of the three constants. Eg. if the high-scale reading is 939.59 and the low-scale reading is 347.08, the difference is 592.51 so the constant is 592.50.

Rod 2

Code: 316

S/N: 277921__

Constant: 613.50__

The data for the number 2 rod is similar to those for the number 1 rod described above.

Rod Units: HC

Enter the units of measure used on the level rods. This field is restricted to the following values.

CF - Centifoot

CM - Centimeter

CY - Centiyard

HC - Half-centimeter

Probe Hts.

Tripod Top: 1.30

Tripod Bot.: 0.30

Enter the height of the temperature probes on the instrument tripod. The units of measure should be meters and the measurements should be made to the nearest centimeter. Key in the decimal point with each value. Normally the probes should be mounted on the tripod such that, when the instrument is at a comfortable observing height, the top probe is 1.30 meters and the bottom probe is 0.30 meter above the ground.

Truck Top: 2.60

Truck Mid.: 1.60

Truck Bot.: 0.60

Enter the height of the temperature probes on the observing vehicle probe staff. The units of measure should be meters and the measurements should be made to the nearest centimeter. Key the decimal point with each value. The probe height should be measured when the staff is mounted on the truck and the truck is parked on level terrain. Normally the top, middle and bottom probes are located approximately 2.50, 1.50 and 0.50 meters above the ground respectively.

NOTE: If temperatures are not being recorded at each setup leave all the probe heights blank. The program will then skip the temperature prompts at the end of each setup.

Chapter 3 - Vertical Field Observation Recording

Temp Code: F

Enter the alphabetic code for the temperature scale used, either C for centigrade or F for Fahrenheit. For example, if the temperature probe display is set to the Fahrenheit scale, enter F.

Time Zone: R

Enter the alphabetic code for the time zone. Refer to the "Bluebook", Annex H for the code associated with each time zone. Valid values for the United States are Q through X. For example, Eastern Standard Time is code R.

Survey Ordr/Clas: 12

Enter the survey order and class associated with the observing tolerances being used for the leveling observations. Valid survey order/class pairs are 10, 11, 12, 20, 21, 22, and 30. For example, for first order class two tolerance work, enter 12.

Time: 1527

The default time is set from the internal clock when the form is first displayed. If the displayed time is correct, skip over it. If the time is incorrect it may be changed. Enter the time of day in military fashion, for example: 3:27 PM would be entered 1527.

Date: 900424

The default date is set from the internal clock when the form is first displayed. If the displayed date is correct, skip over it. If the date is incorrect it may be changed. Enter the date in the format of year, month, and day. For example, April 24, 1990 would be entered 900424. NOTE: Changing the date or time on this form does not set the internal system date or time!

Observer 1: JLD Foot HI: 1.55 Truck HI: 2.64

Enter the alphabetic initials of the primary observer followed by the height of the instrument for the standard tripod and the height of the instrument for the motorized-leveling tripod. The observer initials can be two or three characters. For example, for John L. Doe enter JLD. The heights of the instrument should be measured with the instrument and tripod set at a comfortable observing height. The units of measure should be meters and the measurements should be made to the nearest centimeter. The height of the instrument on the motorized-leveling tripod is optional. The range of values for the standard height of the instrument is 0.0 to 2.0 meters. For the motorized-leveling tripod it is 0.0 to 3.5 meters.

Fields are provided for data on up to four different observers. This means the recorder can enter this information once at the start of the day and does not have to enter a new equipment record when observers change, as long as the new observer is one of the four originally entered.

3.6 Collimation Check (C-Shot)

The collimation error for the Jena Ni002 level instrument must be determined at least once a week, while the collimation error for all other instruments must be determined daily. The observing and recording procedures for all instruments are similar, with an additional outside setup required for the Ni002.

For the first (inside) setup, position the instrument midway between the two level rods with the backsight and foresight distances set at 10.0 meters each. The tolerance for these distances is ± 0.2 meter. Because of a stadia offset of 0.4 meter in the Ni002 the optimal backsight and foresight stadia distances are 9.6

Chapter 3 - Vertical Field Observation Recording

meters as viewed through the instrument. The tolerance for these distances is the same. Using rod 1 as the backsight, observe a set of rod readings in the normal fashion. Change the compensator's position between the low-scale and high-scale readings if the instrument is an Ni002. The recording unit will prompt for the appropriate reading by rod number.

For the second setup position the instrument in line with the two rods and 20.0 meters "outside" of rod 1. The tolerances for this setup require that the backsight be between 19.6 and 20.4 meters. For the Ni002 the optimum backsight stadia distance is 19.6 meters and the tolerance range is 19.2 to 20.0 meters. Rod 1 is again used as the backsight and a normal set of rod reading are observed. For the Ni002 the compensator should be left in position 1 (".") showing on the compensator knob) for the complete setup. The recording unit will prompt for the appropriated reading by rod number. After the rod readings have been entered the unit will display the computed collimation error, C (C1 for the Ni002). Record this value on the backup recording form.

For the Ni002 a second outside setup is required. This is performed at the same location as the first outside setup but the compensator is held in position 2 (".." showing on the compensator knob) for the entire setup. After the rod readings have been entered for this setup the unit will display the computed collimation error C2. Record this value on the backup recording form.

Instruments other than the Ni002 must be adjusted if $|C| > 0.05$ (mm/m). If this is the case the message that appears after the C value will give the foresight (rod 2) high-scale reading to be used to adjust the instrument. While remaining at the outside setup, focus the instrument on the rod 2 high scale and adjust the instrument until the line of sight intersects the computed reading. Secure the instrument and take another set of readings for the outside setup. The recording program will loop back to allow this.

For the Ni002 there are four tolerance checks for the collimation errors:

- 1) $|C1| > 0.12$ (mm/m)
- 2) $|C2| > 0.12$ (mm/m)
- 3) $|C1 - C2| > 0.20$ (mm/m)
- 4) $|(C1 + C2) / 2| > 0.02$ (mm/m)

All four of these values are computed and displayed by the recording unit. If any one of the tolerances is exceeded repeat the complete collimation check to verify the original observations. If the tolerances are exceeded the second time the field office should be notified and the instrument may be returned to the repair shop for adjustment.

A detailed explanation of the collimation check procedures and the principles behind it is given in NOAA Manual NOS NGS 3, "Geodetic Leveling", Chapter 3, section 3.3.7.

3.6.1 Collimation Check Observation Prompts

In this section the collimation prompts are described in the order they occur. Examples of valid entries are also given. These entries correspond to the readings and tolerances for the Ni002. Error messages are discussed at the end of this chapter.

When the collimation-check prompt sequence begins the screen will clear and a message will be displayed:

C-Shot Inside Setup

At the bottom right corner of the screen the **F5** function key is labeled ABORT. Pressing the **F5** key at this point will terminate the collimation check. This provides a way out of the prompt sequence in the

Chapter 3 - Vertical Field Observation Recording

event something happens to prevent completion of the collimation check observations. If a C-Shot is aborted no record of it is recorded in the .HGF file.

This prompt signals the beginning of the Collimation Check setups. Press any key to continue.

Inside, Rod 1
Low Scale: 31003

Enter the "number 1" rod, low scale reading. The entry must be numeric with up to two digits to the right of an implied decimal point. For example, if the observer reads 310 off of the rod and then .03 off of the micrometer drum of the instrument. The recorder should key in 31003.

If a mistake is made while entering a response it is possible to correct it by using the backspace key. On the hand-held PCs this is the key to left of the white shift key.

At the bottom left of the screen the **F1** function key is labeled S-OVER, meaning Start Over. Pressing the S-OVER key at any time during the inside setup will return the program to the C-Shot Inside Setup prompt. This provides a simple way to start the recording sequence over or to return to the point in the program where the collimation check can be aborted.

Stadia: 3004

Enter the "number 1" rod, stadia reading. The entry must be numeric with up to one digit to the right of an implied decimal point. For example, if the observer reads 300 off of the rod and then interprets the position of the stadia wire to be .4 rod units, the recorder enters 3004. Next the program will display the backsight stadia distance in meters and prompts for the number 2 rod, low scale reading.

B-Sight Dist: 9.6

Inside Rod 2
Low Scale: 30968

Enter the "number 2" rod, low scale reading. The entry must be numeric with up to two digits to the right of an implied decimal point. For example, if the observer reads 309 off of the rod then reads .68 off of the micrometer drum of the instrument, the recorder should key in 30968.

Stadia: 2994

Enter the "number 2" rod, stadia reading. The entry must be numeric with up to one digit to the right of an implied decimal point. For example, if the observer reads 299 off of the rod then interprets the position of the stadia wire to be .4 rod units, the recorder enters 2994. The program will display the stadia imbalance for the setup and prompts for the rod 2 high scale reading.

Imbalance: 0.0

Inside Rod 2
High Scale: 92324_

Enter the "number 2" rod, high scale reading. The entry must be numeric with up to two digits to the right of an implied decimal point. For example, if the observer reads 923 off of the rod then .24 off of the micrometer drum of the instrument, the recorder should key in 92324.

Inside Rod 1
High Scale: 90259_

Enter the "number 1" rod, high scale reading. The entry must be numeric with up to two digits to the right of an implied decimal point. For example, if the observer reads 902 off of the rod then .59 of the

Chapter 3 - Vertical Field Observation Recording

micrometer drum of the instrument, the recorder should key in 90259.

This ends the prompts for the inside setup of the C-shot.

C-Shot Outside Setup 1

This prompt signals the beginning of the first outside collimation check setup. Press any key to continue. It is also possible to abort the collimation check at this point by pressing the ABORT (F5) key. Pressing the START OVER key at any time during the outside setup will return the program to this prompt.

Outside Rod 1 Low Scale: 25743

The "number 1" rod, low scale reading. The entry must be numeric with up to two digits to the right of an implied decimal point. For example, the observer reads 257 off of the rod then .43 off of the micrometer drum of the instrument, the recorder should key in 25743.

Stadia: 2372

Enter the "number 1" rod, stadia reading. The entry must be numeric with up to one digit to the right of an implied decimal point. For example, if the observer reads 237 off of the rod then interprets the position of the stadia wire to be .2 rod units, the recorder enters 2372. The program will display the backsight stadia distance in meters and prompts for the rod 2 low scale reading.

Backsight Dist: 19.8

Outside Rod 2 Low Scale: 25702

Enter the "number 2" rod, low scale reading. The entry must be numeric with up to two digits to the right of an implied decimal point. For example, if the observer reads 257 off of the rod and .02 off of the micrometer drum of the instrument, the recorder should key in 25702.

Stadia: 2172

Enter the "number 2" rod, stadia reading. The entry must be numeric with up to one digit to the right of an implied decimal point. For example, the observer reads 217 off of the rod then interprets the position of the stadia wire to be .2 rod units, the recorder enters 2172. The program will display the stadia imbalance for the setup and prompt for the rod 2 high scale reading.

Imbalance: -20.0

Outside Rod 2 High Scale: 87049_

Enter the "number 2" rod, high scale reading. The entry must be numeric with up to two digits to the right of an implied decimal point. For example, if the observer reads 870 off of the rod and .49 off of the micrometer drum of the instrument, the recorder should key in 87049.

Outside Rod 1 High Scale: 84992_

Enter the "number 1" rod, high scale reading. The entry must be numeric with up to one digit to the right of an implied decimal point. For example, if the observer reads 849 off of the rod and .92 off of the micrometer drum of the instrument, the recorder should key in 84992.

Chapter 3 - Vertical Field Observation Recording

If the instrument is an Ni002 the program will display the collimation of the instrument with the compensator in position 1:

C1: -0.027

Press Any Key.

This value should be written down on the backup recording form. Press any key to continue.

C-Shot Outside Setup 2

This prompt signals the beginning of the second outside setup for the collimation check. The prompts for the outside setup start over again at this point. Press any key to continue. Pressing the ABORT (F5) key will end the collimation check at this point and none of the data will be saved.

The example rod readings for the second outside setup are as follows:

Outside Rod 1 Low Scale:	257.57
Outside Rod 1 Stadia:	237.2
Outside Rod 2 Low Scale:	257.38
Outside Rod 2 Stadia:	217.2
Outside Rod 2 High Scale:	870.83
Outside Rod 1 High Scale:	850.07

Once the backsight high scale reading has been entered the program will compute and display the results of the tolerance checks performed on the collimation values of the instrument.

C1: -0.028
C2: 0.024
(C1 + C2) / 2: -0.002
C1-C2: -0.051

Press Any Key.

Write these values on the backup recording form. If any of the collimation values or computed values exceed the tolerances listed in Section 3.6 the complete C-shot should be repeated. If the instrument continues to exceed any of the tolerances the field office should be notified because the instrument may require adjustment.

Pressing any key at this point will return the program to the main activity menu.

If the instrument fails to meet one of the collimation checks an error message will precede the collimation value display:

**Mean C Exceeds
Tolerance:**

or:

**C Difference Exceeds
Tolerance:**

**Take another C-shot
or have the level
adjusted.
Press Any Key.**

3.6.2 Collimation Check Displays for Non-Compensator Type Instruments

If the instrument does not have a reversible compensator (i.e. is not the Ni002), the program will display the collimation value for the instrument after the first outside setup.

Collimation Good!
C: 0.001

Press Any Key.

If this value exceeds a tolerance of 0.05 mm/m an error message will be displayed instead, along with the corrected rod 2 high-scale reading. The values displayed here are for the test data given in Section 3.6.4.

Collimation Exceeds
Tolerance: -0.053

New Far Rod
Reading: 1047.22

Press Any Key.

The correct rod reading is used to adjust the instrument and reduce the collimation error. The level instrument should be pointed at the number 2 (far) rod and the front optic adjusted until the reticle is coincident with the computed reading. The front optic is then tightened and the entire collimation check is repeated. Pressing any key at this point will cause the program to repeat the prompts for the outside setup.

3.6.3 Error Messages in the Collimation Check

The following prompts may occur during the collimation check prompt sequence and indicate observational errors.

**Backsight out of
range:**

**Foresight out of
range:**

These messages occur if the respective backsight or foresight stadia distances exceed the allowable tolerances presented in Section 3.6. Pressing any key will return the program to the beginning of the inside or outside setup prompt respectively.

**Imbalance too
large:**

This message occurs if the difference between the backsight and foresight distances on the inside setup exceed 0.2 meters.

**Reading Check
Exceeded:**

This error message occurs if the check between the low-scale and high-scale elevation differences exceeds a tolerance of 0.25 mm. The value displayed will be given in the same units of measure as on the level rods.

3.6.4 Collimation Test Rod Readings

Additional test data are given here to assist the user in becoming familiar with the operation of the program. The data are for an instrument without a reversible compensator which fails the collimation check on the first set of observations. The corrected foresight rod reading is given along with a second set of outside observations which yield an acceptable collimation error.

Inside setup readings:

Backsight Low Scale:	276.87
Backsight Stadia:	266.0
Foresight Low Scale:	318.33
Foresight Stadia:	308.0
Foresight High Scale:	931.83
Backsight High Scale:	869.37

Outside setup readings:

Backsight Low Scale:	392.00
Backsight Stadia:	372.0
Foresight Low Scale:	433.28
Foresight Stadia:	393.0
Foresight High Scale:	1046.79
Backsight High Scale:	984.50

Collimation value and corrected high scale rod reading are:

Collimation Exceeds
Tolerance: -0.053

New Far Rod
Reading: 1047.22

Press Any Key.

Corrected outside setup readings:

Backsight Low Scale:	392.26
Backsight Stadia:	372.0
Foresight Low Scale:	433.75
Foresight Stadia:	393.0
Foresight High Scale:	1047.28
Backsight High Scale:	984.76

3.7 Section Leveling

The section running prompts are broken down into three groups: section beginning information, setup observation data, and section ending information. The section-beginning and the section-ending data are entered through forms which allow review and modification. The setup-observation data are entered through single-entry prompts.

3.7.1 Section Beginning Prompts

When the Begin Section option is chosen from the main activities menu the screen will clear and the beginning bench mark form will appear. The form is larger than the screen so only the first seven lines will be

Chapter 3 - Vertical Field Observation Recording

displayed. If this is the first section of the day the response fields will be blank. For subsequent sections the fields will contain the respective values from the previous section ending form.

Beginning Information	
Obs.:	___
Rec.:	___
SSN:	___
Desig.:	_____
Temp.:	_____
Wind:	__
SAVE	ABORT

At the bottom of the screen there are labels above the **(F1)** and **(F5)** function keys. The SAVE command **(F1)** will save the current responses in the form and continue to the setup observation prompts. The ABORT command **(F5)** will exit the form without saving the data and the program will return to the main activities menu.

Beginning Information Obs.: JLD

Enter the alphabetic initials of the observer, two or three characters. The response displayed is the initials of the observer for the last section. If the observer has not changed, record these initials on the backup recording form under "SECTION BEGINNING INFORMATION" and press ENTER to go to the next field. If the observer has changed, key in the initials of the new observer. For example, if the observer for the section named John L. Doe, enter JLD. The initials entered are compared to the four sets entered with the equipment information. If a match is not found an error will occur when this form is saved.

Rec.: FW_

Enter the alphabetic initials of the recorder, two or three characters. The response displayed, if any, is the initials of the recorder for the last section. If the recorder has not changed, record these initials on the backup recording form under "SECTION BEGINNING INFORMATION" and press **(Enter)** to go to the next field. If the recorder has changed, key in the initials of the new recorder. For example if the recorder for this section is Frank Wright enter FW and press **(Enter)** to continue.

SSN: 0307

Enter the station serial number (SSN) of the starting bench mark. This value is gotten from the marksetting logs or maps. A valid entry is any number between 1 and 9999. The response displayed, if any, is the SSN for the ending bench mark of the previous section. If this is also the beginning bench mark press ENTER, otherwise enter the correct starting SSN. For example if the marksetting map has the bench mark labeled with an SSN of 0307 enter 0307.

Desig.: 125+57 C _____

Enter the designation stamped on the starting bench mark, up to 25 characters in length. Due to the limited width of the screen, only part of the field is displayed. When keying in a designation that is longer than the field the entry will scroll to the left. Valid characters are: A through Z, 0 through 9, space, "-", "+", "=", and ".". This entry should correspond exactly to what is stamped on the bench mark. The response displayed, if any, is the stamping for the ending bench mark of previous section. If this is the beginning bench mark press ENTER, otherwise enter the correct starting bench mark designation. If there is no stamping on the mark or the stamping is hard to determine, enter the designation as indicated on the marksetting log or map. For example a highway mark stamped 125+57 C would be entered as is.

Chapter 3 - Vertical Field Observation Recording

Temp: 659_

Enter the temperature of the invar strip on the rod or the air temperature from the bottom temperature probe if the invar strip temperature is not available. The entry is numeric with up to one digit to the right of an implied decimal point. The response displayed is the ending temperature for the previous section. If this is also the beginning temperature press **(Enter)**, otherwise enter the correct temperature. For example, if the T-meter reads 65.9 for the bottom probe, enter 659. Because no decimal point is entered, any trailing zeros must be entered.

Wind: 2

Enter the wind velocity code. Valid entries are: 0 - no wind; 1 - light breeze; or 2 - strong wind. The response displayed is the ending wind code for the previous section. If this is also the beginning wind code press **(Enter)**, otherwise enter the correct wind code. For example, if there is a strong wind enter a 2.

Sun: 1

Enter the sun brightness code. Valid entries are: 0 - no sun, overcast; 1 - partly cloudy; or 2- full sun. The response displayed is the ending sun code for the previous section. If this is also the beginning sun code press **(Enter)**, otherwise enter the correct sun code. For example, if the sky is partly cloudy enter a 1.

Time: 1527

The internal clock is read when the beginning bench mark form is first displayed and the time is automatically displayed in the response field. If the displayed time is correct just press **(Enter)**, otherwise key in the correct time. Enter the time of day in military fashion. For example 3:27 pm would be entered 1527.

Rod on
Mark: 1

Enter the identifier of the rod on the starting bench mark, either "number 1" or "number 2" rod, as identified on the equipment record. This is necessary since the rod constants for the two rods may be different. For example, in the equipment record the "number 1" rod was identified by its serial number and rod constant, if that rod is on the starting bench mark enter a 1.

To save the form, and any changes made, either press **(Enter)** from the last field or press the SAVE (F1) key. The following message will appear at the bottom of the screen.

Save Changes? Y

To save the form simply press **(Enter)**. The program will go to the setup observation prompts.

If you wish to exit the form without saving the data, enter "N" and press **(Enter)**. The program will prompt:

Abandon Form? N

Press "Y" and **(Enter)**. The program will return to the main activities menu.

3.7.2 Setup Observation Prompts

The next group of prompts deal with the rod readings and temperature readings at each setup. At the beginning of each setup the setup number, running stadia imbalance, and running section distance are displayed.

Chapter 3 - Vertical Field Observation Recording

Setup #: 1
Imbalance: 0.0
Distance: 0.00
END FOOT ABORT

At the bottom of the screen there are labels above the **F1**, **F3** and **F5** function keys. The END command above the **F1** key will end the observation prompting sequence and display the ending bench mark form. The ABORT command will end the section without displaying the ending elevation, etc. and the program will return to the main activities menu.

The **F3** key toggles between two modes of observing: the standard method (FOOT) where the observer and rodmen travel on foot and carry the equipment; and the motorized method (TRUCK) where the instrument and rods are mounted on vehicles. This option can be changed at the beginning of any setup and is recorded along with the other data for the setup. Once selected, the option remains in effect until the key is pressed again.

Press any key to continue.

Backsight

Low Scale: 56270

Enter the low scale reading from the backsight rod. The entry must be numeric with up to two digits to the right of an implied decimal point. For example, if the observer reads 562 off of the rod and .70 off of the micrometer drum of the instrument, enter 56270. Because no decimal point is entered any trailing zeros must be entered.

At the bottom of the screen there is a label above the **F1** function keys. The S-OVER command allows the user to start the recording sequence from the beginning. This option is available throughout the observing sequence. However, when the temperature prompts begin, pressing the **F1** key will return the program to the first temperature prompt.

Stadia: 5218

Enter the stadia reading from the backsight rod. The entry must be numeric with up to one digit to the right of an implied decimal point. For example, if the observer reads 521 off of the rod and interpolates the .8 off of the rod, enter 5218. The program will next display the backsight stadia distance and prompt for the foresight low scale rod reading.

B-Sight Dist: 40.2

Foresight

Low Scale: 29381

Enter the low scale reading from the foresight rod. The entry must be numeric with up to two digits to the right of an implied decimal point. For example, if the observer reads 293 off of the rod and .81 off of the micrometer drum of the instrument, enter 29381.

Stadia: 2536

Chapter 3 - Vertical Field Observation Recording

Enter the stadia reading from the foresight rod. The entry must be numeric with up to one digit to the right of an implied decimal point. For example, if the observer reads 253 off of the rod and interpolates the .6 off of the rod, enter 252.6. The program will compute the foresight stadia distance and the imbalance between the foresight and the backsight and display the computed value along with the prompt for the foresight high scale rod reading.

Imbalance: 0.8

**Foresight
High Scale: 90733_**

Enter the high scale reading from the foresight rod. The entry must be numeric with up to two digits to the right of an implied decimal point. For example, if the observer reads 907 off of the rod and .33 off of the micrometer drum of the instrument, enter 90733.

**Backsight
High Scale: 115521**

Enter the high-scale reading from the backsight rod. The entry must be numeric with up to two digits to the right of an implied decimal point. For example, if the observer reads 1155 off of the rod and .21 off of the micrometer drum of the instrument, enter 115521.

If there are no probe heights on the equipment record then no temperatures will be prompted for.

Temp Top: 667_

Enter the reading from the top temperature probe on the instrument tripod or truck probe staff. The entry must be numeric with up to one digit to the right of an implied decimal point. For example, if the T-meter reads 66.7 degrees for the top probe on the truck probe staff, enter 667.

If for any reason temperature readings are not being recorded for the setup it is possible to skip the temperature prompts. Simply press **Enter** at the top temperature prompt to enter a "null" temperature. The other temperature prompts will not occur. The program will prompt:

Skip Temps? Y

If the user responds "y"es the program will go to the starting setup prompts. If "n"o is entered the program will prompt again for the temperatures.

Temp Mid.: 671_

This prompt only occurs for motorized leveling (TRUCK mode) when three temperature probes are present. Enter the reading from the middle temperature probe on the truck probe staff. The entry must be numeric with up to one digit to the right of an implied decimal point. For example, if the T-meter reads 67.1 degrees for the middle probe on the truck probe staff, enter 671.

Temp. Bot.: 680_

Enter the reading from the bottom temperature probe on the instrument tripod or truck probe staff. The entry must be numeric with up to one digit to the right of an implied decimal point. For example, if the T-meter reads 68.0 degrees for the top probe on the truck probe staff, enter 680.

At this point the program performs checks on the temperature gradients and, if these checks are met, the program will return to the setup-number display in preparation for another setup. If any of the temperature gradient checks are exceeded, an error message will appear. Refer to Section 2.6.3 for an explanation of these messages.

3.7.3 Error Messages for the Setup Observations

During the observation recording sequence the program computes certain values and checks them against appropriate tolerances for the order and class of survey. If any of these values exceed the tolerance the program displays an error message and returns to the beginning of the setup.

After the backsight and foresight stadia readings are recorded the program computes the distance from the instrument to the rod. If the distance tolerance is exceeded the following error message will appear on the display.

**Backsight too
long: 60.4**

Press Any Key.

After the foresight stadia reading is recorded an additional check is made on the imbalance between the backsight and foresight distances. If this imbalance exceeds the tolerance the following error message will be displayed.

**Imbalance too
large: 5.4**

Press Any Key.

After the backsight high scale rod reading is recorded the high-scale and low-scale elevations are compared and the difference is checked against a tolerance. If this difference exceeds the tolerance the following error message will be displayed. The difference is displayed with the appropriate rod units.

**Reading Check
Exceeded: -0.33 HC**

Press Any Key.

After the temperatures are entered the program performs several temperature checks to catch possible keystroke errors. The difference between the top and bottom temperatures must be between -3.0 to 1.0 degrees centigrade (-5.4 to 1.8 degrees Fahrenheit). The temperature gradients of successive setups must be between -3.0 to 3.0 degrees centigrade (-5.4 to 5.4 degrees Fahrenheit). For setups where three temperatures are recorded, the middle temperature must fall between the top and bottom temperatures.

If the first range check fails the following error message will be displayed:

**Temperature Gradient
Exceeded: -19.8
66.7 67.5 86.5**

Temps Okay?

If the second range check fails the error message will read:

**Gradient Difference
Exceeded: -9.8
66.7 67.5 68.5**

Temps Okay?

If the third range check fails the error message will read:

Middle Temperature
Out of Range:
66.7 68.9 68.5

Temps Okay?

The top two lines indicate the nature of the error. Below that are the temperatures just entered. At the bottom is the a prompt to query if the temperatures are correct. If the temperatures are correct enter "Y" and the program will return to the setup number display in preparation for another setup. If, however, the temperatures are incorrect, enter "N" and the program will prompt for all of the temperatures again.

3.7.4 Section Ending Prompts

When the END command (F1 key) is chosen at the beginning setup display, the program will prompt:

End Program? N

If the user responds "n" or simply presses the ENTER key the program will return to the setup prompts and the setup number display will appear. If a "y" response is entered the screen will clear and the ending bench mark form will appear. The form is larger than the screen so only the first seven lines will be displayed. The first part of the form must be completed by the recorder. At the end of the form are the computed elevation, distance, imbalance and setup count for the section.

Ending Information	
SSN:	___
Desig.:	_____
Temp.:	680_
Wind:	_
Sun:	_
Time:	1625
SAVE	

At the bottom of the screen there are labels above the (F1) and (F5) keys. The SAVE command (F1) will save the current responses in the form and will cause the program to return to the main activities menu. The ABORT command (F5) will return the program to the setup prompts and the setup number display will appear. A section cannot be aborted from the ending bench mark form. If you have reached this form in error press the ABORT key to return to the setup prompts.

The first line of the form indicates that this information is for the ending bench mark.

Ending Information
SSN: 308_

Enter the station serial number (SSN) of the ending bench mark. This value is gotten from the marksetting logs or maps. A valid entry is any number between 1 and 9999.

Desig: D 134 1947__

Enter the designation stamped on the ending bench mark, up to 25 characters in length. The format and restrictions on this field are the same as for the beginning bench mark designation discussed in Section 2.6.1.

Temp: 708_

Chapter 3 - Vertical Field Observation Recording

Enter the temperature of the invar strip on the rod or the air temperature from the bottom temperature probe if the invar strip temperature is not available. The entry is numeric with up to one digit to the right of an implied decimal point. To speed data entry the bottom probe temperature from the last setup is carried forward and displayed in this field.

Wind: 2

Enter the wind velocity code at the end of the section. Valid entries are: 0 - no wind; 1 - light breeze; or 2 - strong wind.

Sun: 1

Enter the sun brightness code at the end of the section. Valid entries are: 0 - no sun, overcast; 1 - partly cloudy; or 2- full sun.

The input values for the ending SSN, designation, temperature, wind code and sun code are stored and displayed in the corresponding beginning prompts for the next section. This is to speed the entry of redundant data.

Time: 1640

The internal clock is read when the ending bench mark form is first displayed and the time is automatically displayed in the response field. If the displayed time is correct just press **Enter**, otherwise key in the correct time. Enter the time of day in military fashion. For example 4:40 pm would be entered 1640. NOTE: Changing the time in this field does not set the internal clock!

The second part of the ending bench mark form displays the computed values for the section. All information must be recorded on the backup recording form. Under the section for "SECTION ENDING INFORMATION".

Elev: 5.39566

This field displays the ending elevation difference for the section, in meters. Record this value in the ELEVATION DIFFERENCE block on the backup recording form.

Dist: 1316.3

This field displays the total distance of the section, in meters. Record this value in the TOTAL DISTANCE block on the backup recording form.

Setups: 13

This field displays the total number of setups for the section. Record this value in the TOTAL SETUPS block on the backup recording form.

Imbal.: -2.1

This field displays the ending backsight-foresight stadia imbalance for the section, in meters. Record this value in the STADIA IMBALANCE block on the backup recording form.

Press the **F1** key, SAVE, to save the ending bench mark information and return to the main activities menu.

3.8 Reviewing Previous Sections

The Review Sections selection on the Select Activities menu allows the user to display and modify the

Chapter 3 - Vertical Field Observation Recording

beginning and ending data entered for the previous sections. When the **(F4)** key is pressed the screen will clear and the section review form will appear. The form is larger than the screen so only the first seven lines will be displayed. The first section to be displayed is the last section leveled. The form is divided into two groups of fields: those for the beginning section information and those for the ending section information. The format of the fields in this form are the same as those of the corresponding fields in the section beginning and section ending forms.

At the bottom of the screen are labels above the **(F1)**, **(F2)**, **(F4)** and **(F5)** keys. The PREVIOUS and NEXT commands (**(F1)** and **(F5)** respectively) allow review of the previous and next sections. Pressing the PREV option will cycle back through the sections until the first section for the last set of equipment is reached. At that point the program will beep and continue to display the first section. The NEXT option works differently in that when the last section in the group is reached the program will beep and display the first section in the group.

It is possible to change any entry on the form with the exception of: the rod on the mark, the elevation, the total setup imbalance, the total distance, and the number of setups. Changing any of these values would invalidate the observations and computations.

To change a value in a field, move the cursor to that field and key in the new value. Next press the SAVE key and the program will prompt:

Save Form? Y

Respond "yes" and the modifications will be saved.

To exit the form without saving the changes, press the ABORT key and respond "yes" to the prompt:

Abandon Form? N

3.9 Ending Leveling

To end the leveling program select the End Leveling option (**(F5)**) from the Select Activities menu. The screen will clear and the program will prompt:

End Program? N

The default response is "no" and will cause the program to return to the Select Activities menu. A "yes" response will cause the program to terminate.

3.10 Data Transfer Procedures

Once the leveling observations are completed the observation data file must be transferred to the field office for further processing. If the field crew is using a laptop PC simply copy the data file(s) to a floppy disk and transfer the files to the office PC. If, however, the field crew is using a data logger the process requires a direct serial communications link to the office PC or a PC with a floppy disk drive. The procedures for setting up this communications link and transferring the data are covered in Appendix B.

3.11 Setting up the NA3000 for use with VERREC

Do not use the Continuous Leveling mode of the NA3000 when using the VERREC program. Put the NA3000 in Measure Only Mode. This will display a rod reading and a distance to be entered into the VERREC program. Under the SET command of the NA3000 set the MEASURE to continuous. When the measurement button is depressed the instrument will keep reading until the CLEAR button at the bottom right corner of the NA3000 keypad is depressed. Remember that based on NGS specifications, a reading is acceptable only when the standard deviation is less than or equal to 0.10cm. This number is represented on the top left corner of the LCD.

3.11.1 Setting Up the Equipment Record

The NA3000 computes and displays elevations as opposed to a rod reading. Instead of a stadia measurement it computes a sight distance. Because of this the VERREC program is set up to prompt for different data. The instrument code for the NA3000 is 243. Entering 243 for the instrument code on the equipment form will run the VERREC program in NA3000 mode. Enter a rod constant of 000.00 for both rods in the equipment form. Make sure that the rod units are in CM. Set the stadia factor to 200. Set the stadia intercept to H. The NA3000 computes and stores a refraction correction, applying it to each observation automatically.

3.11.1 Collimation Check - NA3000

When performing a Collimation Check on the NA3000 first allow the instrument to 10 to 15 minutes to get acclimated to the climate. VERREC performs a C-Shot using Kukkamaki's method. The built in software of the NA3000 performs a C-Shot using the 1/3, 2/3 method. Therefore the VERREC software should be used to perform a C-Shot instead of using the NA3000 built in software titled "Check and Collimation".

3.11.2 Section Leveling - NA3000

Elevations and distances are prompted for when using the NA3000 as opposed to rod readings and stadia for the Ni002. Because there is no high scale on the NA3000 rods, only one reading is taken for both the foresight and backsight for SECOND ORDER WORK. In order to meet tolerances for FIRST ORDER WORK, two readings must be taken for both foresight and backsight. The differences in section leveling prompts used with the Ni002 and the NA3000 can be seen in the following example. Note that this is first order.

Ni002	NA3000
Backsight Low Scale: 276.87	Backsight Elevation: 1.38430
Stadia: 266.0	Distance: 09.80
Foresight Low Scale: 318.33	Foresight Elevation: 1.59160
Stadia: 308.0	Distance: 09.90
Foresight High Scale: 931.83	Foresight 2nd Elev: 4.65920
Backsight High Scale: 869.37	Backsight 2nd Elev: 4.36680

4.1 Introduction

The EDITOR program allows changes to be made to the records of a binary ".HGF" or binary ".HGZ" file. This allows any data errors, found by NEWREC, or found when reviewing the field book listing file (".RPT"), to be corrected in the ".HGF" file directly.

The EDITOR program also allows sections to be rejected in a binary ".HGZ" file, and for sections running and river crossing data to be added directly to the binary ".HGZ" file. If new section running or river crossing data is to be added, all required data should be collected prior to the editing session. Once the editing session begins, a section running or river crossing can not be added unless all requested information is given.

4.2 Preparing for an Editing Session

Before an editing session begins you should have clear knowledge of the modifications to be made.

Required modifications can be identified from the error messages in the NEWREC.ERR file or from errors found when reviewing section running information files.

4.3 Executing EDITOR

Run the editor by typing "EDITOR" in response to the operating system prompt, e.g.,

```
C:\>EDITOR
```

The screen will clear and the program will prompt for data file identification. The first prompt is for the type of file to be edited (Figure 4.1).

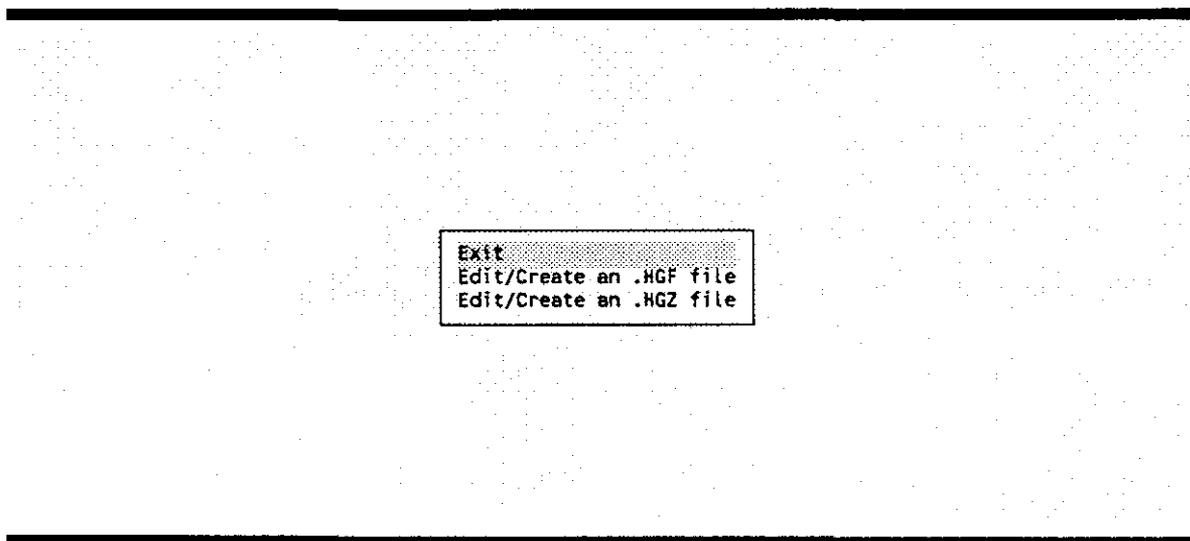


Figure 4.1

If "Exit" is selected, the program will terminate, the screen will clear and the DOS prompt will appear.

If "Edit/Create an .HGF file" or "Edit an .HGZ file" is selected, the program will begin prompting for information to identify the ".HGF" or ".HGZ" file to be edited. The screen will clear and the program will prompt for the disk drive on which the file resides. This will be a standard file selection form, as discussed in Section 2.6.

If the **Esc** key is pressed, the program will return to DOS.

When selecting a file, the **Esc** key will cause the program to return to the main menu. Entering an incorrect filename will cause the program to print an error message and prompt again.

4.3.1 Editing or creating an ".HGF" File

Once an ".HGF" file name is entered, a prompt will appear at the bottom of the screen. If the ".HGF" file selected exists, then a prompt will ask to edit the ".HGF" file. If the ".HGF" file does not exist the program will prompt the user to create the file.

In either case, if the user responds yes then the program will display a menu of operations that can be performed on the data file (Figure 4.2). For the case where an ".HGF" file is being created, the only practical option is to edit the file header. For this situation the data fields in the form are either blank or filled with default values. From an operational stand point, the Header and Line Title forms used for creating a new ".HGF" file are the same as those used for editing an existing ".HGF" file. The only difference is that the default values do not come from an existing file. Because of this, the explanations given in the following sections regarding the editing operations for the Header and Line Title forms, applies equally to entering new Header and Line Title information.

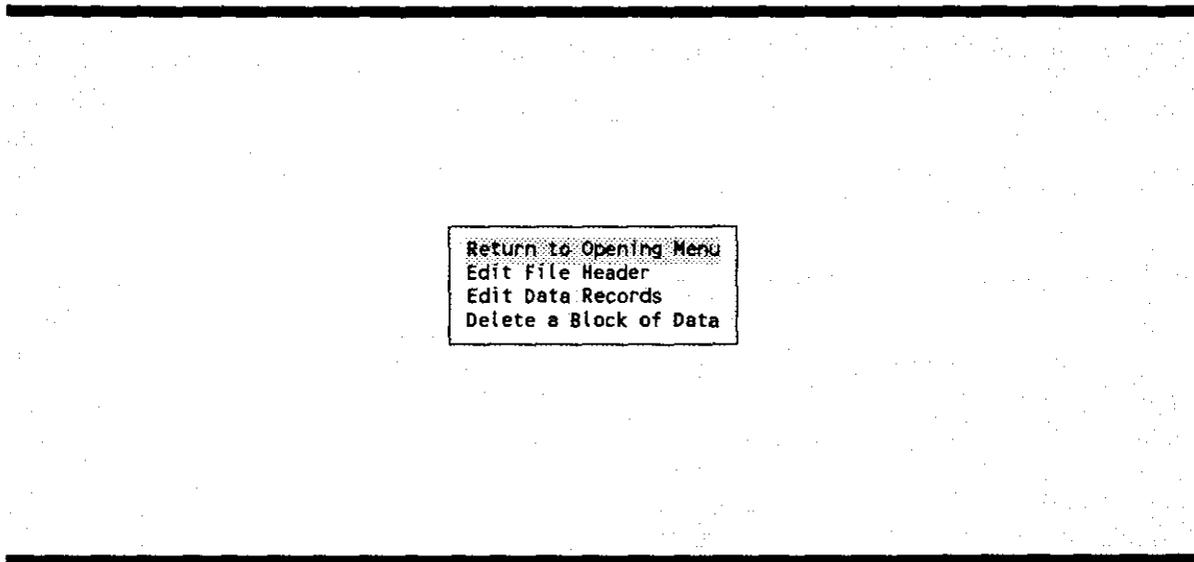


Figure 4.2

If the "Return to Opening Menu" option is selected the screen will clear and the opening menu will appear.

Each of the other choices, "Edit File Header", "Edit Data Records", and "Delete a Block of Data" are described in sections that follow.

4.3.1.1 Editing File Header and Line Title Information

The data set and line title information are the same for both the ".HGF" and ".HGZ" file. Because of this the same Header and Line Title forms are used regardless of file type. When this form appears, the various fields will contain the current values (if any) from the file being edited.

The Header and Line Title forms will appear on the screen, with the screen being divided into two parts (Figure 4.3). The upper part is the Header form, the lower part is the Line Title form. The cursor will first appear in the Header form.

The form may be exited with the **Esc** key, and any changes made to the form will not be saved to the

file. If the form is exited with the **(F10)** Key, then the changes are written out to the file. If any fields of the form contain invalid values, an error message will be displayed on the bottom of the screen, and you will be placed in the field containing the invalid value. You must correct all such errors before the program will allow you to exit the form and save the data. Refer to Chapter 2.

You may switch back and forth between the two forms with the **(F9)** key. Refer to Chapter 2 for more info on function key and cursor key operation.

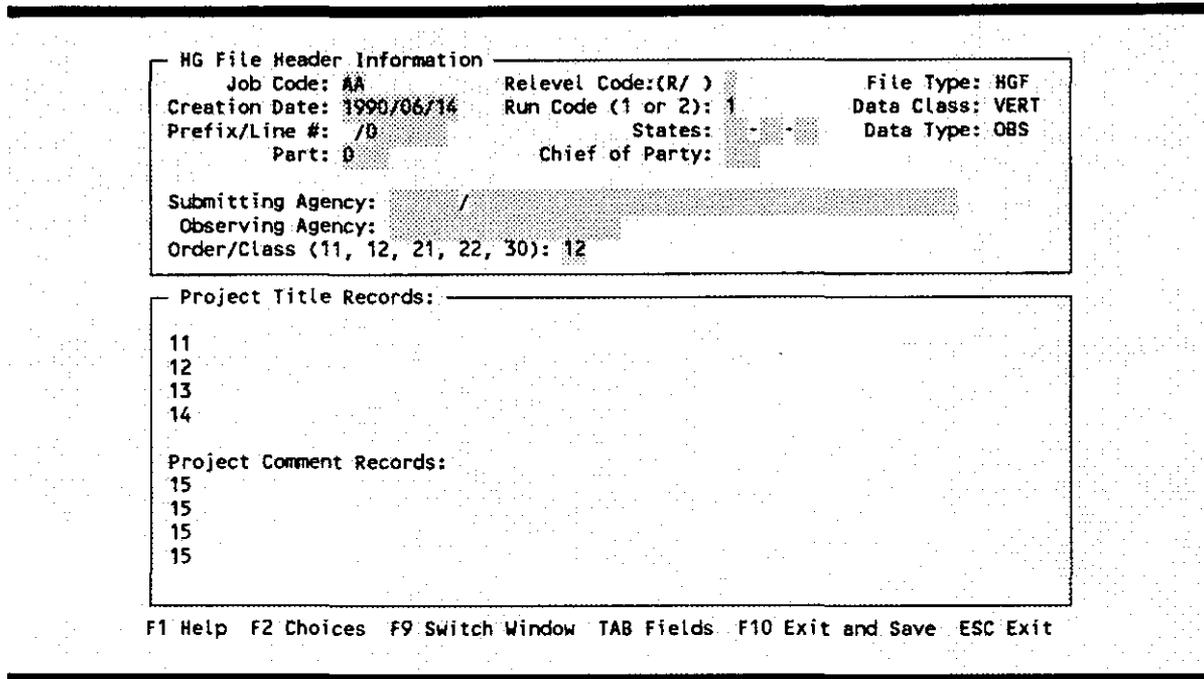


Figure 4.3

The second(lower) part of the screen is for editing the Line Title information. Any existing line title records are displayed in the given fields. There are actually 2 fields on the Line Title form. The upper field is for the Line Title and continuation records (*11*, *12*, *13*, and *14*), and the lower field is for up to eight(8) comment (*15*) records. When the Line Title form is first entered(via the **(F9)** key) you are automatically placed in the field for Line Title records. Typing text into this field will cause words that extend past the end of a line to be wrapped onto the next line. You can change to the *15* record field by hitting the **(Tab)** key. Only 4 of the comment records are shown at a time. You can scroll the others into view with the arrow keys. Again, typing will cause the last word to wrap onto the next line if necessary.

4.3.1.2 Editing a Data Record

If the "Edit Data Records" option is selected from the HGF menu, the program will display a list of all the E3 records which are available in the file (Figure 4.4). If a collimation record(C4) is available for an E3 record, a "Yes" will be displayed in the right-most column. This screen is a choice list, as discussed in Section 2.5. The E3 records are ordered by date.

There are several concepts which are common to the ".HGF" data editing forms. Pressing the **(F6)** Key will return you to the list of E3 records from which you may choose to edit another record or exit. Also, if you exit a form by any means except the **(Esc)** key, changes to that form are SAVED.

4.3.1.2.1 Modifying an Equipment Information Record

Use the cursor keys to move up and down the list of E3 records (Figure 4.4). When the record to be

Use cursor keys to highlight an E3 record, ESC to exit

Date	Time	Instrument Code/Serial #	Rod 1 Code/Serial #	Rod 2 Code/Serial #	Cshot Present
E3 900710	0826	233/456506	316/345989	316/351925	Yes
E3 900711	0603	233/456506	316/345989	316/351925	
E3 900712	0842	233/456506	316/345989	316/351925	
E3 900713	0802	233/456506	316/331477	316/331468	
E3 900716	0756	233/456506	316/331477	316/331468	Yes
E3 900716	0800	233/456567	316/270712	316/277919	Yes
E3 900716	1043	233/456567	316/331474	316/331466	
E3 900716	1524	233/456567	316/270712	316/277919	
E3 900717	0746	233/456506	316/331477	316/331468	
E3 900718	0726	233/456567	316/331474	316/331466	
E3 900718	0738	233/456506	316/331477	316/331468	
E3 900718	0857	233/456567	316/270712	316/277919	
E3 900718	1004	233/456567	316/331474	316/331466	
E3 900719	0722	233/456506	316/331477	316/331468	
E3 900719	1123	233/456567	316/331474	316/331466	
E3 900720	0711	233/456506	316/331477	316/331468	
E3 900720	0720	233/456567	316/331474	316/331466	

Figure 4.4

edited is highlighted, press enter to bring up the equipment and collimation information forms (Figure 4.5).

Equipment Information

Date: 91/07/22 Time: 12:43 Zone: 0 Inst. Code: 233 Serial Number: 456615

Rod 1 Code: 316	Probe Heights	Observer: 1	2	3	4
Rod 1 S/N: 345992	Tripod Top: 1.3	Initials: JH	JRW		
Rod 2 Code: 316	Tripod Bot: 0.3	Norm. HI: 1.6	1.56		
Rod 2 S/N: 351923	Truck Top: 0.0	Truck HI: 1.6	1.56		
	Truck Mid: 0.0				
	Truck Bot: 0.0				

Collimation Information

Date: 91/07/22 Time: 09:34 Inst. Code: 233 Serial Number: 456615

	Inside Setup	Outside Setup 1	Outside Setup 2
Backsight Low:	267.9	311.3	311.6
Backsight Stadia:	251.40	291.40	291.40
Backsight High:	860.65	903.76	904.16
Foresight Low:	270.8	313.9	314.7
Foresight Stadia:	260.40	273.40	274.40
Foresight High:	884.49	927.43	928.20
Stadia Imbalance:	0.0	-20.0	-20.0
Elevation Diff.:		-13.30	-15.25
Collimation Error:		-0.057	0.040

F6 Next E3 F7 First B4 F10 Save and Exit Esc Exit

Figure 4.5

The equipment information form appears on the upper half of the screen and the collimation information form is right below it. If there is no collimation information for this equipment record then the collimation form will not appear.

All the fields in the equipment information form may be modified. The cursor keys and **Tab** key allow movement between fields. The **F6** key will display the list of E3 records, the **F7** key will advance to the next E3 record in the file, and the **F8** key will display the next Section Running (B4) record for this E3 record.

4.3.1.2.2 Modifying a Section Running Record

When modifying a B4 record, the upper part of the screen will be the form for the B4 record, while the lower half of the screen will be the form for the setup (S2) records (Figure 4.6). To edit the S2 record, you must first switch to it with the **F9** key. Only the temperature readings may be edited on the S2. On the B4 record, the beginning and ending spsn, designation, temperature, wind, sun, and the beginning rod on mark may be edited.

```

Beginning and Ending Section Information
Date: 90/07/05 Starting Time: 12:43 Observer: VXP Recorder: RTH # Setups: 4

Starting SSN: 1312      Ending SSN: 1318
Designation: 1 29 175.93 Designation: N 342 RESEI
Temperature: 74.5      Temperature: 78.6
Wind: 1                Wind: 1
Sun: 2                 Sun: 2
Rod on Mark: 1

Stadia Imbalance: -0.9 Running Distance: 267.9 Elevation Diff: -5.69353

Setup Information
Setup: 1

Backsight Stadia: 183.9  Foresight Stadia: 581.4
Low Scale: 132.07       Low Scale: 633.64
High Scale: 724.21      High Scale: 1246.79

Temperature Readings Top: 75.2 Middle:      Bottom: 76.8

F6 Next E3  F7 Next B4  F8 Next S2  F9 Edit S2  F10 Save  Esc Exit

```

Figure 4.6

There are several keys which have special meanings when editing a B4 record. These are: **F6**, which will display the next E3 record (saving the current B4's changes); **F7**, which will display the next B4 record for this E3; **F8**, which will display the next S2 for this B4, and **F9** which will switch editing from the B4 form to the S2 form, and back again.

4.3.1.3 Deleting a block of data From an ".HGF" File

When "Delete a block of data" is selected from the HGF options menu, a list of the E3 records available in the file is displayed (Figure 4.4). Using the cursor keys, highlight the E3 record for the date and instrument identifying the block of data to be deleted. If no data is present in the file, then the message

No Data in File

will be displayed at the bottom of the screen. Press **Enter** to select the block of data to be deleted. The program will then prompt:

Once this work is deleted it is lost for good, continue (Y/N)?

A "Y" response will cause the data to be deleted. Remember that this deletion is PERMANENT. There is no way to recover deleted data, so be careful. Also note that all B4 & S2 records for that block of data will also be deleted.

4.3.2 Editing an ".HGZ" File

Once an existing ".HGZ" file name is entered, the program will display a menu of operations that can be performed on the data file (Figure 4.7)

```

Return to Opening Menu
Edit Header Information
Add an Equipment Record (*40*)
Add a Section Record (*41*)
Add a River Crossing (*42*)
Edit a Section Record (*41*)
Edit a River Crossing (*42*)
Reject a Section Running
Delete a Block of Data
  
```

Figure 4.7

If the "Return to Opening Menu" option is selected the screen will clear and the opening menu will appear.

If the "Edit File Header" option is selected, editing will take place as per Section 4.3.1.1, above.

Each of the other choices, "Add a 40 Record", "Add a Section Record", "Add a River Crossing", "Edit Section Record", "Edit River Crossing", "Reject a Section", "Delete a Block of Data" are described in sections that follow.

4.3.2.1 Adding a 40 record

If the "Add a 40 Record" option is selected, the program will present a data form (Figure 4.8, upper half) for the entry of all the fields in a 40 record. The date and time fields will already be filled with the current date and time, but these may be changed if necessary.

In some of the fields of the 40 record form, a choice of options is available. These are the "Instrument Code/SN" field (which will list all of the instruments in the inst.dat file) and the two "Rod x Code/SN" fields, which will list the information about each .ROD file in the VERTPGM directory. These lists are accessed by pressing the F2 key while in the appropriate field. Items are selected from these lists as per Section 2.5. When an item is selected from the instrument or rod lists, the code and serial number of the selected rod will be entered in the current field.

4.3.2.2 Adding a Section record

If the "Add a 41 Record" option is selected, the program will first present the user with a choice list of 40 records that the 41 should be added to (Figure 4.11). Use the cursor keys to move up and down the list of 40 records. When the record to be added to is highlighted, press **Enter** to select the 40 record. Pressing **Esc**

40 record			
Date: 90/06/12	Time: 08:07	Zone: N	Instrument Code/SN: 233/456502
Rod 1 Code/SN: 316/345991		Rod 2 Code/SN: 316/351927	
Height of instrument: 1.49		Instrument/probe set code (1/2): 1	
Upper Temperature Probe: 1.30		Micrometer Used? (/M): N	
Middle Temperature Probe: .		Collimation Error: -0.005	
Bottom Temperature Probe: 0.30			

41 record			
Start Time: 08:19	Start SSN: 3192	Temp Scale(F/C): C	Wind Code: 1
End Time: 09:00	End SSN: 3204	Start temp: 69.9	Sun Code: 0
		End temp: 69.9	
Number of Setups: 12			
Observer's Initials: RLC			
Stadia Intercept Code(F/M): N	Run Units:	Elevation Units: M	
Foresight Stadia: 976	Run Length:	Elevation: 6.58588	
Backsight Stadia:			
Refraction Correction: 00	Partial Refraction Correction: 459.14000		

F10 Exit and Save Alt-F1 Expand Window ESC Exit without saving

Figure 4.8

from this list will take you back to the "HGZ" menu.

Once a 40 record has been selected, the 40 and 41 record forms will appear on the screen (Figure 4.10). The 40 record is in the upper part of the screen and can NOT be edited. It is provided for informational purposes only. The lower part of the screen is the 41 record, which is where you will enter data. Pressing **Esc** from the 41 form will take you back to the "HGZ" menu. The 41 record form is larger than the screen area available for it, therefore, while entering data in the 41 record form, it will scroll as necessary to bring the current part of the form into view. Alternately, pressing **Alt F1** from within the 41 record form will cause the form to expand to fill the screen (Figure 4.9), hiding the 40 record form. Pressing **Alt F1** again will cause the form to shrink back to its original size, revealing the 40 record.

4.3.2.3 Adding a River Crossing

If the "Add a River Crossing" option is selected, the program will place the River Crossing form (see Figure 4.10) on the screen for the user to fill out. After the form is filled out and exited with **F10**, the program will use the information in the form to add both a 40 and a 42 record to the HGZ file being edited.

4.3.2.4 Editing a Section Record

If the "Edit a Section Record" option is selected, the program will first present the user with a choice list of 40 records (as in "Adding a Section Record"), and once a 40 record is selected, the program will prompt the user with a list of available Section records for that 40 record. Editing a Section record is the same as adding one, except that the fields are already filled out with the information from the selected record.

4.3.2.5 Editing a River Crossing

If the "Edit a River Crossing" option is selected, the program will present the user with a choice list of available River Crossings. The user may then select a River Crossing from the list. The River Crossing form will then be brought up, just as in "Add a River Crossing", but with the data from the selected river crossing filled in.

```

*41* record
Start Time:      start span:  Temp Scale(F/C): 0  wind:
End Time:      end span:    Start temp:      sun:
                                   End temp:
Number of Setups:
Observer's Initials:

Stadia Intercept Code(F/H): #    Run Units:      Elevation Units:
Foresight Stadia:                Run Length:     Elevation:
Backsight Stadia:

Refraction Correction:           Partial Refraction Correction:
Rod Correction:

Mean temperature, Upper probe:
Mean temperature, Lower probe:

F10 Exit and Save  Alt-F1 Contract Window  ESC Exit without saving

```

Figure 4.9

```

River Crossing Record
Date: 91/06/14      Zone: A      Instrument Code/SN: 233/530137
Start Time: 12:40  Start SSN: 123  Run Units: KM      Elevation Units: NT
End Time: 01:30   End SSN: 654   Run Length: 3.0000 Elevation: 50.0000

```

Figure 4.10

4.3.2.6 Rejecting a Section

If the "Reject a Section" option is selected from the HGZ menu, the program will display a list of all the 40 records which are available in the file (Figure 4.11). This screen is a choice list, as discussed in Section 2.5. The 40 records are ordered by date and time.

Use the cursor keys to move up and down the list of 40 records. When the record containing the section to be rejected is highlighted, press **Enter** to select the 40 record. The program will display a list of all the Section (41 or 42) records which are available for the selected 40 record (Figure 4.12).

Use the cursor keys to move up and down the list of 41 and 42 records. When the record you wish to reject is highlighted, press **Enter**. The program will then present a choice list of rejection options. When an option is selected from this list, or if you press **Esc**, you will be returned to the HGZ menu.

While in the 41/42 records choice list, pressing **Esc** will cause the program to go back to the 40 records choice list.

Use cursor keys to highlight a 40 record, ESC to exit

Date	Time	Instrument Code/Serial #	Rod 1 Code/Serial #	Rod 2 Code/Serial #
40	900710	0826 233/456502	316/345991	316/351927
40	900711	0603 233/456502	316/345991	316/351927
40	900712	0842 233/456502	316/345991	316/351927
40	900713	0802 233/456502	316/345991	316/351927
40	900716	0756 233/456502	316/345991	316/351927
40	900716	0800 233/456502	316/345991	316/351927
40	900716	1043 233/456502	316/345991	316/351927
40	900716	1524 233/456502	316/345991	316/351927
40	900717	0748 233/456502	316/345991	316/351927
40	900718	0726 233/456502	316/345991	316/351927
40	900718	0738 233/456502	316/345991	316/351927
40	900718	0857 233/456502	316/345991	316/351927
40	900720	0720 233/456502	316/345991	316/351927

Figure 4.11

Use cursor keys to highlight a 41/42 record, ESC to exit

Date	Instrument	Rod 1	Rod 2	Time
40	910625	233 530137	316 66748	316 66747 0715

Date	Start Time	End Time	Start SPSH	End SPSH	Reject Code
41	910625	0802	0809	0213	5984
41	910625	0830	0840	0021	0045
41	910625	1230	1240	0456	0789

Figure 4.12

4.3.2.7 Deleting a block of Data

If the "Delete a Block of Data" option is selected from the HGZ menu, the program will display a list of all the 40 records which are available in the file (Figure 4.11, Section 4.3.2.1). Use the cursor keys to move up and down the list of 40 records. When the record to be deleted is highlighted, press **Enter** to select the 40 record. The program will prompt you to delete the 40 record.

Once this work is deleted it is lost for good, continue (Y/N)?

Chapter 4 - Editing Field Observation Files

If "Y" is pressed, the 40 record and all it's sections will be irrecoverably deleted.
If "N" is pressed, the program will go back to the "HGZ" menu.

5.1 Introduction

At this point, the observations have been loaded into an ".HGF" file by VERREC.

They are now ready for the second level of processing which includes:

1. checking for additional transmission and data entry problems.
2. computation of rod and refraction corrections.
3. reformatting into a standard "Bluebook" format file.
4. preparing the data for the final field processing step, abstracting; and
5. creation of a "field book" listing (".RPT" file) which neatly displays the raw data, computed values and error flags.

5.2 Preparing to Run NEWREC

Before running NEWREC the following files must exist:

1. A file identifying the code and serial number of each instrument used in the survey. This file must be labeled *INST.DAT* and reside in the directory into which VFPROC was installed, i.e., *\VERTPGM*. Refer to appendix E for information on creating this file.
2. A file containing detailed calibration for each rod used in the survey. These files are identified by the rod serial number with the file type ".ROD". Refer to chapter 9 for more information about rod files.
3. A data file with the file type ".HGF". This file is the main output file of the program VERREC. If this file does not exist refer to Chapter 3 for the steps on creating an ".HGF" file from raw observation data.

There also may be an ".HGZ" file, which must be located in the same directory as the ".HGF" file, which is the output from a previous NEWREC run. If there is no ".HGZ" file a new one may be created from within NEWREC.

5.2.1 Running NEWREC

Run NEWREC by entering "NEWREC" in response to the DOS prompt. A form will appear on the screen, asking you for the name of the ".HGF" file you wish to process.

It is possible to skip the drive and file name prompts by entering the file name following the program name when the program is first run. For example entering:

C:\NEWREC C:JLD0983.HGF

will cause the program to check the existence of this file, only prompting for a file name if the file does not exist.

After verifying that the file exists (and prompting you for a filename if it doesn't), NEWREC will prompt for the beginning and ending dates that you wish processed (Figure 5.1). The program will provide the first and last date in the file.

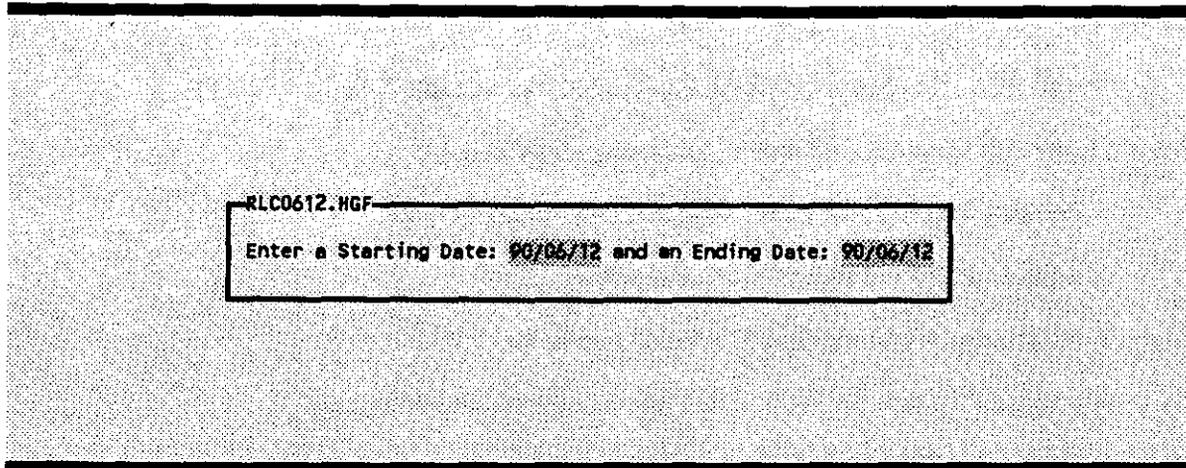


Figure 5.1

When entering starting and ending dates the following rules apply:

1. If the requested starting date is prior to the starting date of the file or if the requested ending date falls after the ending date of the file, the date is ignored and an must be reentered.
2. If the requested starting date falls after the starting date of the file and does not specifically exist in the file then the first date after the requested date is used as the starting date.
3. If the requested ending date falls before the ending date of the file and does not specifically exist in the file then the first date after the requested date is used as the ending date.
4. If the requested starting date falls after the ending date of the file the starting date is ignored an must be reentered.
5. If the requested ending date falls before the starting date of the file the ending date is ignored an must be reentered.
6. If the requested ending date falls before the requested starting date the ending date is ignored must be reentered.

Once a valid range of dates are entered processing begins. The screen will clear and the display will read:

SSN	Designation	Date	Time
3192	C 448	900612	0930

As each record is processed, the Station Serial Number, designation (of the beginning bench mark), date and time of the section being processed is displayed.

Once all of the records have been processed, one of two messages will appear. At the completion of the record processing, one of two messages will be displayed. If there were any "fatal" errors encountered during processing the program will terminate without saving the processed data.

***** NEWREC Failed! See NEWREC.ERR for specific error.**

Several errors, each with a unique message appearing in "NEWREC.ERR", are considered by the program as being fatal:

1. Invalid Record - occurs if the program encounters an unrecognizable record in the file.

Chapter 5 - Field Observation Recomputation

2. Unable to Open Temporary File - this is a program error which occurs if no disk space remains. Free up some space and try running NEWREC again.
3. Invalid Tolerance Units - occurs if the units of tolerance in the line title information of the input ".HGF" file is not either "MM" or "FT". In this case, correct the tolerance using the EDITOR program.

Several other errors, which leave no message in "NEWREC.ERR", are also considered fatal. These errors are:

1. Missing Rod Calibration File - occurs when no detail rod calibration file exists for a rod listed in the equipment information record. In this case, refer to chapter 9 for a discussion of creating the necessary detail calibration file.
2. Invalid Rod Units - occurs when the rod units specified in the detailed calibration file are invalid, ie. not "CM" or "HC". In this case, contact an employee of the National Geodetic Survey Division, Systems Development Branch.
3. Invalid Rod Serial Number - occurs when the rod serial number specified in the detailed calibration is not the same as that listed on the equipment record. In this case, contact an employee of the National Geodetic Survey Division, Systems Development Branch.

If no errors were detected, then the "Next Step" menu (Figure 5.2) is displayed asking where the data should be added. The various options in the menu can be selected by moving the highlighted bar to the choice you want and hitting the ENTER key.

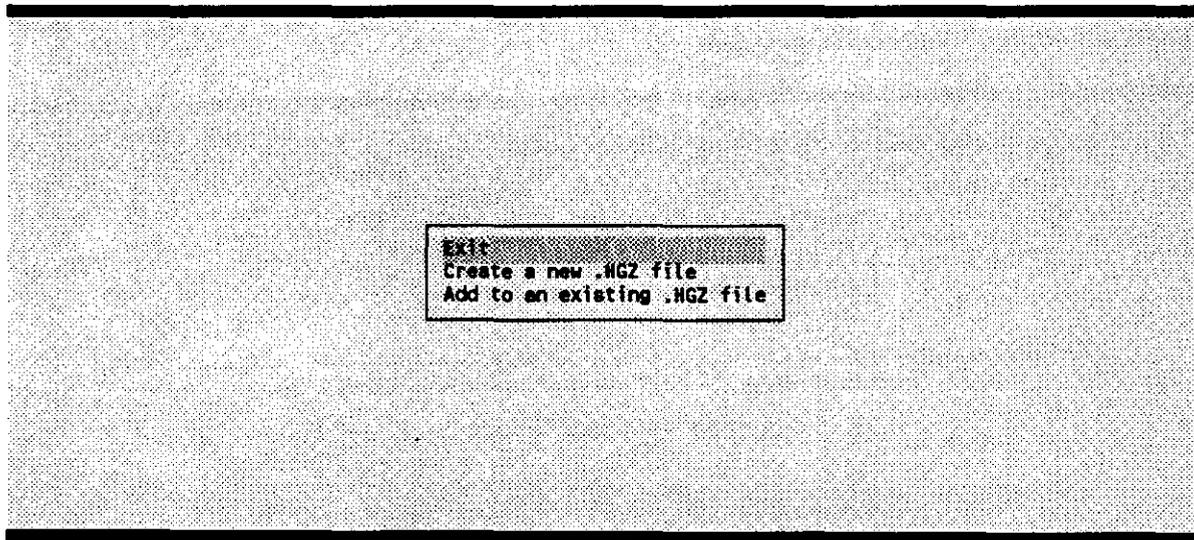


Figure 5.2

If "Exit" is selected, the data is not saved and the program terminates.

If "Create..." is selected, the program prompts for the disk drive and file name of the ".HGZ" to create. This will be a standard file selection form, and will NOT allow you to choose an already existing .HGZ file.

If "Add to..." is selected in response to the "Next Step" menu, the program prompts (with a standard file selection form) for the file to which the data is to be added.

Chapter 5 - Field Observation Recomputation

5.2.1.1 Creating a New ".HGZ" file

When you have chosen a file, the program will prompt:

Get line information from another .HGF file?

If "N" is entered the program creates the ".HGZ" file and prompts for data set identification and line information (refer to section 5.2.1.3 for a detailed explanation of Data Set Information prompts). If "Y" is entered, the program will give a standard file selection form, and you may select an .HGF file to copy Data set information and line titles from.

Once the program successfully opens the ".HGF" file, the data set and line title information may be modified before being added to the new file (section 5.2.1.3). When this is complete the program will begin adding the data to the new file.

5.2.1.2 Adding to an Existing ".HGZ" file

When adding data to an existing ".HGZ" file, if the data being added to the file already exists in the ".HGZ" file the old copy is deleted and the new copy added. This process, however, does not free the disk space occupied by the old copy. So, to prevent the file from growing unintentionally large it should be run through the program COMPRESS (chapter 9).

5.2.1.3 Data Set Information

Data Set Information contains information about a particular file. The Data Set Information screen, Figure 5.3 is composed of two individual forms which prompt for the data set information. If the file is being created, the fields in each form will contain their particular default values. If the file already exists, the previous responses are displayed, and may be modified.

The screenshot displays a terminal window with two forms. The first form, titled "HG File Header Information", contains the following fields: Job Code: *AA*, Prefix/Line #: L/2111, Part: 0, Relevel Code:, Run Code (1 or 2): 1, States: MD-DE-VA, Chief of Party: QED, Creation Date: 1990/07/05, File Type: HGF, Data Class: VERT, and Data Type: OBS. The second form, titled "Project Title Records", shows a list of line titles with line numbers 11 through 14. Below this, there are "Project Comment Records" with line numbers 15 through 15. At the bottom of the screen, a navigation bar lists: F1 Help, F2 Choices, F9 Switch Window, TAB Fields, F10 Exit and Save, and ESC Exit.

```

HG File Header Information
  Job Code: *AA*                Creation Date: 1990/07/05
  Prefix/Line #: L/2111        File Type: HGF
  Part: 0                      Data Class: VERT
  Relevel Code:              Data Type: OBS
  Run Code (1 or 2): 1
  States: MD-DE-VA
  Chief of Party: QED

Project Title Records
11 LINE TITLES, WHICH COMMENT AND EXPAND UPON THE FILE...
12
13
14

Project Comment Records:
15
15
15
15

F1 Help  F2 Choices  F9 Switch Window  TAB Fields  F10 Exit and Save  ESC Exit

```

Figure 5.3
Data Set Information

Originally, the cursor will be positioned in the Data Set Information form (The top half of the screen). This form is actually bigger than it looks, so when you fill out the fields that show in the upper half of the screen, that part of the screen will scroll to reveal the other fields in the form. The bottom half of the screen is taken

up by the Line Title form. You may switch between the two forms at any time by pressing the **(F9)** key. Within a specific form, you can go from one field to the next by pressing the tab key. You can exit both forms and save them to the HGZ file by pressing **(F10)**. You can exit both forms and get back to the "Next Step" menu by pressing ESC.

5.2.2 The Error Message File, NEWREC.ERR

If errors are found during processing, messages are listed in the file "NEWREC.ERR".

Errors can be corrected by making changes directly to the ".HGF" file using the EDITOR program.

If the error file is to be printed ready the printer and type "PRINT NEWREC.ERR" in response to the DOS prompt.

5.2.3 Field Book ".RPT" File

The main output file of the NEWREC program is a field book listing containing all observed data values along with compute corrections and accumulated section values. This report is written into the file "filename".RPT and is sent along with the ".HGF" file to the Rockville office.

5.2.4 Backing-up the ".HGZ" and ".RPT" Files

Once the ".HGF" file has been run through NEWREC successfully both the newly updated ".HGZ" file and the newly created ".RPT" file should be copied to a floppy disk to protect it against loss or damage. To do this:

1. Load a formatted floppy disk into the disk drive. Refer to the DOS manual for an explanation of the Format command.
2. At the DOS prompt type "COPY C:filename.HGZ B:" to transfer the ".HGZ" file.
3. Again at the DOS prompt type "COPY C:filename.RPT B:" to transfer the ".RPT" file.

Once the copying process is complete the floppy disk should be removed from the disk drive, labeled, and stored in a safe place.

5.3 Newrec Error messages

NEWREC lists data errors in two locations: in the NEWREC.ERR file, and in the field book listing (".RPT" file). For example, the following entry in the "NEWREC.ERR" file

```
Record: "S1" Obs/Inst: RLM Date: 870112 Time: 1057 Record Offset: 11347
***** ERROR K; Backsight/Foresight Low Scale Reading below 0.5m
```

can be easily traced to a corresponding entry in the ".RPT" file.

The sections that follow detail the possible errors presented by records type.

5.3.1 Collimation Check Records, C1 C2 and C3

- A. The value of the computed Stadia Imbalance exceeds the allowable tolerance. For the inside setup, C1 record, $-0.2 \leq ds \leq 0.2$ meter. For the outside setups, C2 & C3 records, $19.6 \leq ds \leq 20.4$ meters.
- B. The computed Stadia Imbalance differs from the recorded Stadia Imbalance by more than 0.05.
- C. The Total Setup Distance for the inside setup (C1 record) is out of range.

Chapter 5 - Field Observation Recomputation

- for the Ni002, 18.8 m to 19.6 m
- for all other instruments, 19.6 m to 20.4 m
- D. The Stadia Imbalance on one of the outside setups (C2 or C3 records) is out of range:
 - for the Ni002, 19.2 m to 20.0 m
 - for all other instruments, 19.55 m to 20.4 m
- E. The absolute value of the Setup Reading Check exceeds 0.00025 m.
- F. The computed Mean Elevation Difference differs from the recorded Mean Elevation Difference.
- G. The computed Collimation Error differs from the recorded Collimation Error.
- H. The computed Collimation Error exceeds 0.05 for an instrument other than an NI002. (C2 record)
- I. The average of the computed Collimation Errors for setups 2 and 3 exceeds the tolerance, ie $|(CE1 + CE2)/2| > 0.02$.
- J. The sum of the computed Collimation Errors for setups 2 and 3 exceeds the tolerance, ie $|CE1| + |CE2| > 0.2$.

5.3.2 Ending Bench Mark Record, B2

- A. The computed mean elevation difference differs from the recorded mean elevation difference for the section.
- B. The computed section distance differs from the recorded section distance.
- C. The computed mean elevation difference differs from the corrected elevation difference for the section.

5.3.3 Setup Record, S1

- A. The backsight distance exceeds the tolerance. 50 or 60 meters depending on the survey order and class.
- B. The foresight distance exceeds the tolerance. 50 or 60 meters depending on the survey order and class.
- C. The computed setup stadia imbalance exceeds the tolerance.
- D. The computed accumulated stadia imbalance exceeds the tolerance.
- E. The computed setup reading check exceeds the tolerance.
- G. The computed Setup Mean Elevation difference exceeds 3.5.
- H. The setup temperature gradient is out of range, ie. -3.0 to 1.0 degrees centigrade (-5.4 to 1.8 degrees Fahrenheit).
- I. The change in the temperature gradient between setups exceeds the tolerance, ie. -3.0 to 3.0 degrees centigrade (-5.4 to 5.4 degrees Fahrenheit).
- J. The middle temperature does not fall between the top and bottom temperatures for the setup.
- K. The backsight or foresight low-scale rod reading is below 0.5 m, 100 on the level rod. This error

Chapter 5 - Field Observation Recomputation

check is not performed on the first or last setup.

A warning may also appear for an "S1" record if any bottom temperature for a given setup exceeds the mean of the previous bottom temperatures in the section by plus or minus 10 degrees.

6.1 Introduction

Control Point descriptions are keyed directly into a file on the microcomputer through the use of the prompting program DESC. The program checks all data to guarantee conformity to the specifications given in "Input Formats and Specifications of the National Geodetic Survey Data Base" or "Bluebook". It also guides the user according to predefined rules for control point description entry, prompting for only those data items required for a particular type of description.

6.2 Preparing to Enter Descriptions

Before any descriptions can be keyed in the descriptive data to be entered must be available, your computers date must be set to provide for date checking, and the environment variable VERTPGM must be set.

All this information should be assembled before entering control point descriptions.

6.3 Running DESC

To run the control point description entry program, type "DESC" at the DOS prompt.

When the program begins, the screen will clear and the program identifier and version number will appear in a box in the center of the screen. It will remain there for several seconds or until a key is pressed. The program sets the caps lock to upper case at this time because all descriptive data must be entered in upper case.

Next, a form is displayed which prompts for the name of the description file to read. Filenames are entered in the format: [drive:][path\]filename.HA. Description filenames must have the extension .HA; if any other extension is given it will be replaced by .HA. For example, "TEST.XXX" would be changed to "TEST.HA" upon exit of this form.

It is possible to skip the file name prompt by including a file name when the program is run, e.g.,

```
C:>DESC L123456
```

If the filename you have entered does not exist the program will prompt to create the file,

```
L123456.HA does not exist, create it? (Y/N)
```

If you respond "N" to this prompt, the file will not be created and you will be prompted for another filename. Otherwise, DESC will prompt for the Data Set Information.

If the filename already exists DESC will prompt,

```
L123456.HA exists, do you want to modify the data set information? (Y/N) _
```

If you respond "N" the Data Set Information prompts are skipped and the Geodetic Control Station Description is displayed. Otherwise, the Data Set Information is displayed and may be modified.

6.4 Creating/Modifying Data Set Information

Data Set Information contains information about a particular description file. The Data Set Information screen, Figure 6.1, is actually three individual forms which prompt for the data set information. If the file is being created, the fields in each form will contain their particular default value. If the file already exists, the previous responses are displayed, and may be modified.

Originally, the cursor will be positioned in the Data Set Information. The cursor can be cycled through the other forms by pressing the **F9** key. The order is Data Set Information form, Project Title form and the

Chapter 6 - Control Point Description Entry

Positional Range form.

Changes to the Data Set Information screen are saved by pressing the **F10** key from within any of the three forms.

Data Set Information	Positional Ranges
Job Code: Data Class: GEOD Data Type: DESC Submitting Agency or Firm: NATIONAL GEOD Abbreviation: NGS File Creation Date: 12/15/1989 Chief of Party: QED	Minimum Degrees Latitude: 34 Maximum Degrees Latitude: 34 Minimum Degrees Longitude: 118 Maximum Degrees Longitude: 118 Units of Measure (E/M): M

Project Title and Comments
01 *02* *03* *04* *05

Figure 6.1
Data Set Information Screen

Changes are abandoned by pressing the Escape key. If the file is being created, and you abandon the changes to the Data Set Information screen, you will be prompted for another filename.

6.5 Entering a Description

Descriptions are entered using two forms, one for the description header, Figure 6.2, and one for text, Figure 6.3.

```

                                GEODETTIC CONTROL STATION DESCRIPTION
*10*SSN   DR CODE  REC CODE  LAT      LON      APPROX ELEV
      QUAD    STATE/COUNTY  /          APP      PID
*13*DESIGNATION
      UNDERGROUND MARK TYPE   MAG CODE  SET CODE  TR CODE  PACK TIME
*15*ALIAS
*20*CODE/SET BY  /          YEAR      CHIEF
      CODE/RECOVERY  /          DATE      CHIEF      CONDITION
*26*TYPE   MAG CODE  CODE/SETTING  /
      STABILITY CODE  AGENCY INSCRIPTION
*28*STAMPING
*29*(UNITS  ROD (PIPE) SET TO THE DEPTH OF      FT,
      IN A SLEEVE EXTENDING TO THE DEPTH OF      FT,
      ENCASED IN A PIPE,  (F)LUSH WITH THE GROUND/(P)ROJECTING/(R)ECESED  IN
```

Figure 6.2
Geodetic Control Station Description Screen

Originally, the cursor will be positioned in the header form. The two forms can be toggled by pressing the **F9** key. When the header form is displayed only the first field, the Station Serial Number (SSN), is prompted. The SSN uniquely identifies a description in a .HA file. If the SSN has not been entered previously, DESC assumes that a new description is being entered. Once created, a description can be recalled by entering the existing SSN. To exit DESC at this point press the Escape key.

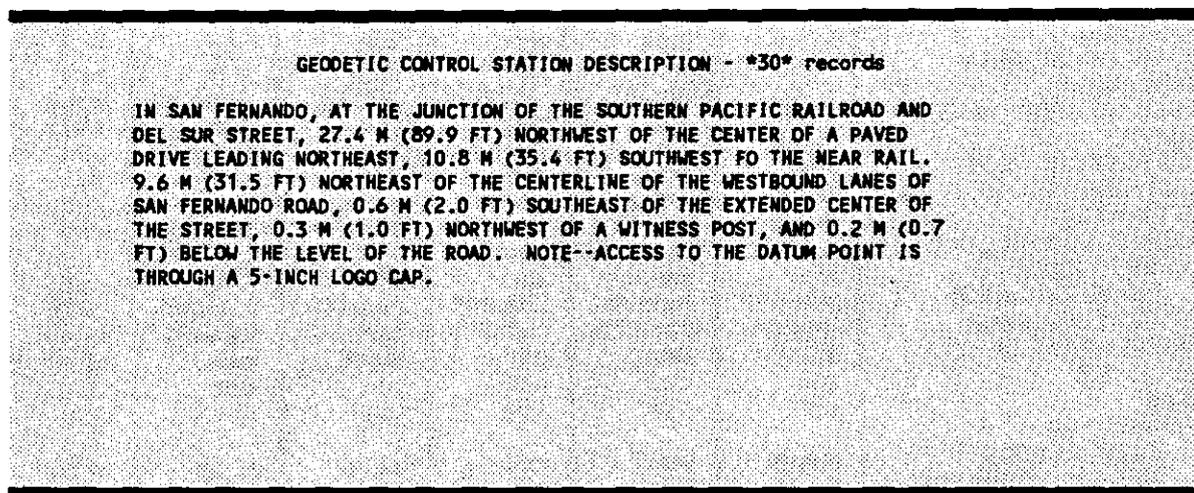


Figure 6.3
Descriptive Text Screen

A description is entered in three parts; identifying information, the description header, and the description text.

The **Esc** key can be used within any part of the description form to abort entry or modification of a description. When the **Esc** key is pressed, you will first confirm that you intend to abort the changes.

Exit this description without saving changes? (Y/N)

Responding "Y" will cause changes made to any part of the description to be ignored. If the description is being created it will not exist. If the description is being modified, no changes will be saved, the description will, however, still exist in its original form. Responding "N" will return you to the form.

6.5.1 Part 1 - Determining the Type of Description

The fields identifying the type of description being entered includes the station serial number (SSN), Described/Recovery code (D/R code), Recovery code, latitude, and longitude. Once these fields are exited they cannot be re-entered unless the description is abandon and re-keyed. The values of these fields are used to identify the description as one of six types:

1. An original description of a newly set mark.
2. A preliminary site description.
3. Recovery description describing a point not in the NGS database.
4. Recovery description updating a point in the NGS database.
5. Recovery description completely redescribing a point in the NGS database.
6. A description of a point which was not recovered.

Chapter 6 - Control Point Description Entry

Description Type

Field Name	1	2	3	4	5	6
SSN	mand	mand	mand	mand	mand	mand
DR CODE	mand	mand	mand	mand	mand	mand
REC CODE	skip	skip	"F"	"M"	"T"	" "
LATITUDE	mand	opt	opt*1	opt*1	opt*1	blank
LONGITUDE	mand	opt	opt	opt	opt	blank
APPROXIMATE ELEV	opt	opt	opt	opt	opt	opt
QUADRANGLE	opt	skip	skip	skip	skip	mand
STATE/COUNTRY CODE	mand	opt	mand	mand	mand	skip
COUNTY	mand	opt	mand	mand	mand	skip
APPLICATION CODE	opt	opt	opt	opt	opt	skip
PERMANENT IDENTIFIER	skip	skip	skip	opt	opt	skip
DESIGNATION	mand	mand	mand	mand	mand	mand
UNDERGROUND MARKER						
... TYPE CODE	opt	opt	opt	opt	opt	skip
... MAGNETIC CODE	mand*2	mand*2	mand*2	mand*2	mand*2	skip
... SETTING CODE	mand*2	mand*2	mand*2	mand*2	mand*2	skip
TRANSPORTATION CODE	mand	mand	mand	mand	mand	skip
PACK TIME	opt	opt	opt	opt	opt	skip
ALIAS	opt	opt	opt	opt	opt	opt
MONUMENTING						
... AGENCY CODE	mand	mand	opt	skip	skip	skip
... AGENCY DESCRIPTION	mand	mand	opt	skip	skip	skip
... YEAR	mand	mand	skip	skip	skip	skip
... PARTY CHIEF	opt	opt	skip	skip	skip	skip
RECOVERING						
... AGENCY CODE	skip	skip	mand	mand	mand	mand
... AGENCY DESCRIPTION	skip	skip	mand	mand	mand	mand
... DATE	skip	skip	mand	mand	mand	mand
... PARTY CHIEF	skip	skip	opt	opt	mand	opt
CONDITION CODE	skip	skip	mand	mand	mand	"N"
SURFACE MARKER						
... TYPE CODE	mand	opt	mand	mand	mand	skip
... MAGNETIC CODE	mand	mand*2	mand	mand	mand	skip
... SETTING CODE	mand	mand*2	mand	mand	mand	skip
... SETTING CLASS.	mand*3	mand*3	mand*3	mand*3	mand*3	skip
STABILITY CODE	opt	opt	opt	opt	opt	skip
AGENCY INSCRIPTION	opt	opt	opt	opt	opt	skip
STAMPING	opt	opt	opt	opt	opt	skip
RP DEPTH	mand*4	opt*4	opt*4	opt*4	opt*4	skip
SLEEVE DEPTH	mand*4	opt*4	opt*4	opt*4	opt*4	skip
FPR CODE	mand*4	opt*4	opt*4	opt*4	opt*4	skip
PR DIST	mand*4	opt*4	mand*4	mand*4	mand*4	skip
30 RECORD	mand	mand	mand	mand	mand	opt

*1 Although optional, if no latitude is entered the description will default to a type 6.

*2 Applies only if a valid type code is entered, otherwise the field is skipped.

*3 Applies only if a setting code between 30 and 41 is entered. Otherwise a response is optional. If no setting code is entered the field is skipped.

*4 Applies only if a setting code between 15 and 24, 45 and 50, or 55 and 60 is entered. Otherwise the fields are skipped.

The PR_DIST option applies if the above conditions are met and the FPR_CODE is 'P' or 'R'.

Table 6.1

Chapter 6 - Control Point Description Entry

Entering a description of the first five types is obvious based on the definition of the D/R and Recovery codes. For example, to enter a description of type five, set the D/R code to "R", meaning a recovery, and the Recovery code to "T", meaning that the description completely describes a point existing in the NGS data base. To enter a description for a point that was not recovered, type six, set the D/R code to "R" and leave the Recovery code, Latitude and Longitude blank.

6.5.2 Part 2 - Entering the Descriptive Header

The second part of description entry consists of those fields currently on the screen not prompted for in the first part. Including the height, quadrangle, state and county, application code, and permanent identifier from the *10* record down to and including the *29* record. The requirements of these fields are set based on the types of the description. Table 6.1 summarizes the requirements for each type of description.

6.5.3 Part 3 - Entering the Descriptive Text

Once all of the requirements of the second part have been satisfied, the third part of description entry, descriptive text, is entered by pressing the **(F9)** key.

If you are entering a recovery description identified as updating an existing point in the NGS database, DESC prompts:

RECOVERED AS DESCRIBED? (Y/N): _

before displaying the text screen. Responding "Y" will cause the phrase "RECOVERED AS DESCRIBED." to be appended to the text before it is displayed.

As you type text the cursor is automatically returned at the end of the line, this is known as word wrap. For a list of keys and their definitions for text entry, press the **(F1)** (help) key.

When a description is saved, all distances are automatically converted to their respective counterparts, e.g. kilometers are converted to miles and miles are converted to kilometers. A distance is identified as: a sequence of digits, followed by a blank, followed by the units abbreviation KM, MI, M, or FT. For example, entering:

10.1_KM

(where ' _ ' denotes a blank), will cause the program to automatically insert:

(6.30 MI)

to the right of the distance. The statement would then read:

10.1 KM (6.30 MI)

When modifying an existing distance, the converted equivalent will be updated to reflect any change.

6.6 Recalling an Existing Description

A description is recalled by entering the Station Serial Number (SSN) of an existing description. When an existing SSN is entered, the header of the description is displayed. Pressing the **(F9)** key will toggle between the header and the text. The bottom line of either screen will read:

(C)arry, (D)elete, (P)rint, (M)odify, (I)gnore

Entering an "I" will cause the description to be ignored. The screen will return to a blank description form.

Chapter 6 - Control Point Description Entry

6.6.1 Modifying a Description

A description is modified by recalling the description to be changed and entering an "M" to choose the "Modify" option from the menu at the bottom. From this point, modification of a description is just like entering a new one.

6.6.2 Deleting a Description

A description is deleted by recalling the description and enter a "D" to choose the "Delete" option from the menu at the bottom. Before deleting the description DESC will confirm that you want to delete the description.

6.6.3 Copying from an Existing Description into a New Description

Information from an existing description can be copied into a new description. This makes it possible, when entering marks with very similar information (especially text), to just type the description once and copy the information from that description into corresponding similar descriptions.

To copy one description into another recall the existing (source) description, from which the information should be copied, and enter a "C" to choose the "Carry" option from the menu at the bottom. This will create a copy of the description, blank the SSN, and set the cursor at the top. Assign a new SSN and proceed to enter the description, changing what is different.

6.6.4 Printing a description

To print an individual description recall the description and enter a "P" to choose the "Print" option from the menu at the bottom. If the printer is not ready when "P" is entered, the program will pause until it has been turned on. Figure 6.4 is an example of a description printed in this manner.

6.7 Statistics of Control Point Descriptions

After exiting the description entry portion of DESC, the following prompt will appear:

Generate a statistical breakdown of "<filename>?" (Y/N) _

where <filename> is the name of the description file you entered when first running DESC. Responding "Y" causes the creation of a file named "<filename>.STT". This file contains a statistical breakdown of the descriptions in the file based on the (DR) code, condition code and setting classification code.

The first table in the file gives a breakdown of the marks according to the condition code. It is followed by a summation of original and recovery descriptions.

The second and third tables break down the original and recovery marks according to setting classification. The setting classifications are listed followed by a count of the number of marks in the description file with the corresponding setting code. The setting classifications are printed as they appear on the back of the "CONTROL STATION DESCRIPTION" form. Therefore, if the setting classification was re-worded for a particular point, the point will be included within the default classification total.

The fourth and fifth tables break down the original and recovery points according to monumentation quality class. Each setting code has a default quality class code assigned to it. These default class codes can be overridden if an entry is made into the stability override code (*26* record). This override is taken into account when the totals are computed. This fact should be taken into consideration when comparing the totals in tables two and three to those in tables four and five, because the totals for setting classifications that fall under a particular quality class may not equal the total for that class if quality overrides were used for any of the marks. A sample statistical listing is shown in Figure 6.5.

***** R E C O V E R Y D E S C R I P T I O N *****

SSN: 0001
Designation: 1050.63
Latitude: 341637N
Longitude: 1182558W
Elevation: 320M
Stamping: USGS 1050.63
PID: EW2489
State: CA
County: LOS ANGELES
Disk From: UNK

Underground Mark-
Type: Aluminum marker
Magnetic code: N
Setting: SET INTO THE TOP OF A CONCRETE MONUMENT

Surface Mark-
Type: Rivet
Magnetic code: N
Setting: ABUTMENT

***Mark is not suitable for GPS

Recovered in Good condition by - NGS on 12211989, chief of party MSA.

IN LOS ANGELES, 0.5 MILE SOUTHEAST ALONG THE SOUTHERN PACIFIC COMPANY RAILROAD FROM THE STATION AT SAN FERNANDO, AT STEEL BRIDGE 462.32 OVER A LOS ANGELES COUNTY FLOOD CONTROL DITCH, IN THE TOP OF THE NORTHEAST END OF THE SOUTHEAST CONCRETE ABUTMENT, 7.3 FEET NORTHEAST OF THE NORTHEAST RAIL, 1.3 FEET SOUTHEAST OF THE SOUTHEAST END OF NORTHEAST STEEL GUARDRAIL, AND ABOUT 1 FOOT LOWER THAN THE TRACK.

IN 1971 THIS POINT WAS REPORTED BY CA1980 AS BEING IN GOOD CONDITION.

IN 1975 THIS POINT WAS REPORTED BY CA1980 AS BEING IN GOOD CONDITION.

IN 1987 THIS POINT WAS REPORTED BY NGS AS BEING IN GOOD CONDITION.

IN 1989 THIS POINT WAS REPORTED BY NGS AS BEING IN GOOD CONDITION. RECOVERED IN GOOD CONDITION. A NEW TO REACH FOLLOWS. 0.7 KM (1.13 MI) NORTHWESTERLY ALONG THE SOUTHERN PACIFIC RAILROAD FROM ITS JUNCTION WITH STATE HIGHWAY 118 IN SAN FERNANDO.

Figure 6.4
Sample Output Using the Print Option

Chapter 6 - Control Point Description Entry

JOB CODE	SUBMITTING AGENCY	DATE DATA SET CREATED
BL	NATIONAL GEODETIC SURVEY	06291988
RECOVERED IN GOOD CONDITION.....		70
RECOVERED IN POOR CONDITION.....		0
MARKS DESTROYED.....		1
NOT RECOVERED.....		0
IN SOME OTHER CONDITION.....		0
	TOTAL -	71
ORIGINAL DESCRIPTIONS.....		35
RECOVERY DESCRIPTIONS.....		71
	TOTAL -	110

THE NEW MARKS SET FOR THIS PROJECT ARE BROKEN DOWN AS FOLLOWS

UNSPECIFIED (see descriptive text).....	1
SET INTO THE TOP OF A CONCRETE MONUMENT.....	34

TOTAL -	35

ALL RECOVERY MARKS FOR THIS PROJECT ARE BROKEN DOWN AS FOLLOWS

UNSPECIFIED (see descriptive text).....	2
UNSPECIFIED SHALLOW.....	1
IMBEDDED IN THE GROUND.....	1
SET INTO THE TOP OF AN IRREGULAR MASS OF CONCRETE.....	1
SET INTO THE TOP OF A CONCRETE MONUMENT.....	24
.....	35
SET IN CONCRETE AT THE CENTER OF A CLAY TILE PIPE IMBEDDED IN THE	4
LIGHT STRUCTURES (other than those listed below).....	1
RETAINING WALLS.....	2

TOTAL -	71

BELOW IS A SUMMARY OF THE MONUMENTATION QUALITY CODES FOR ALL DESCRIPTIONS WHICH HAD *26* CODES, QUALITY OVERRIDE CODES HAVE BEEN TAKEN INTO CONSIDERATION.

ORIGINAL MARKS
 CLASS A - 0
 CLASS B - 0
 CLASS C - 36
 CLASS D - 3

RECOVERY MARKS
 CLASS A - 0
 CLASS B - 0
 CLASS C - 62
 CLASS D - 9

Figure 6.5
 Sample Statistical Listing

7.1 Introduction

One of the main tasks of the field data processing is the creation of an abstracted data file and a field abstract listing. These two products are produced by the program ABSTRA from the control point description file (.HA) and level observation file (.HGZ).

The field abstract listing is used by the field party personnel to aid in their analysis of the ongoing project and quality control review. The abstracted data file is one of the data file formats required by the NGS Vertical Network Branch. Both the abstract listing and the abstracted data file will be transmitted to the National Geodetic Survey main office when the leveling project is complete.

7.2 Preparing to Generate a Field Abstract

Before running ABSTRA make sure that you have the following:

1. An ".HGZ" file, containing the observation data to be abstracted.
2. One or more ".HA" files, containing the control point descriptions. These files are optional but must be located in the same directory as the ".HGZ" file. Up to five ".HA" files may be used.
3. The survey point serial number (SSN) of a starting control point.
4. The survey point serial number (SSN) of an ending control point. This value is optional and if it is not entered, the control point furthest from the starting control point will be used.
5. The elevation of the starting control point must be known. If it is not entered the program will use a value of zero.

Is it also necessary to set the environment variable VERTPGM to the subdirectory containing the INST.DAT and detailed rod calibration files. Refer to Chapter 1, section 1.4 for how to set the environment variable.

If any section runnings are to be rejected from the abstract it is necessary to change the rejection codes on the section running records of these sections to "F". This can be done via the EDITOR program. The procedure for setting the rejection flags is covered in Chapter 4, section 4.3.2.5.

7.3 Executing ABSTRA

To execute the program ABSTRA simply type "abstra" in response to the DOS prompt.

The program will then prompt for the .HGZ and .HA filenames to abstract. Filename prompting is slightly different in abstra than other programs. In abstra, a large box (Figure 6-1) will come up on the screen, with the line under the heading "HGZ file:" highlighted. This line is where you enter the name of the .HGZ file for the abstract. After you press **Enter**, the line immediately under the "HA files:" heading becomes highlighted, and you may type the name of a .HA file. After each time you hit **Enter**, the next line becomes highlighted and you may type the name of another .HA file. You can enter up to 5 .HA filenames. If you simply press **Enter** without entering a .HA filename, file selection will end and the abstracting process will begin. The normal file selection keys (**F2**), (**F10**), and (**Esc**) - see chapter 2 for details) are usable in this form.

It is possible to skip the file name prompts by entering the file name following the program name when the program is first run. For example entering:

```
C:\ABSTRA C:L24999.HGZ
```

will cause the program to check for this file, and will only prompt for a file name if the file does not exist. You may enter .HA files in the same manner, with up to 5 .HA files following the .HGZ file.

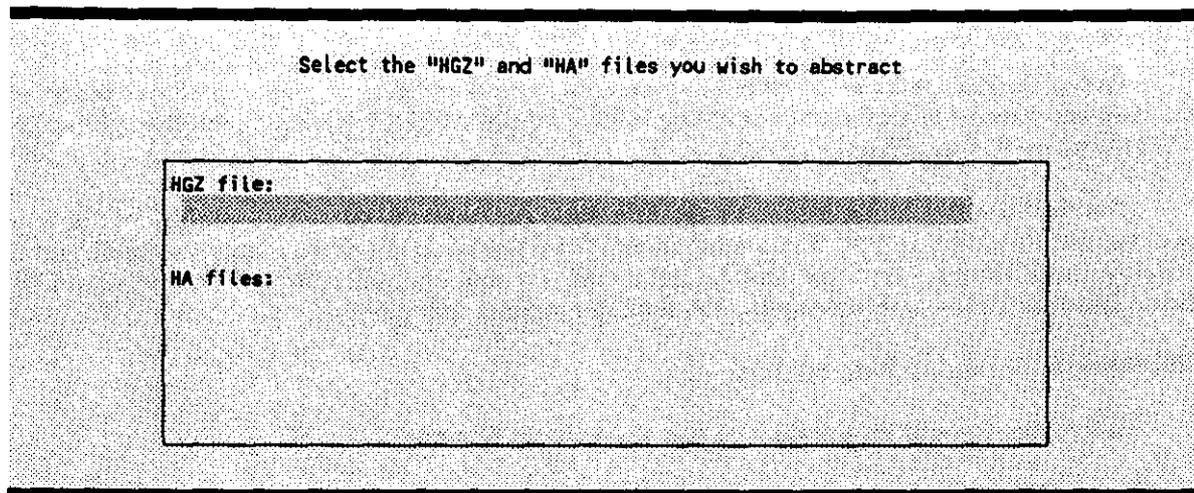


Figure 7.1
Abstra File selection

Once all filenames have been entered, the screen will go blank, and a message will appear indicating that the neighbor list is being built. This is the first step in determining the order of the leveling line.

Wait, building neighbor list.

Once the neighbor list has been constructed ABSTRA will prompt for the starting and ending control points, the starting elevation and the units of measure for the elevation and distance measurements. These will be prompted in the form shown below(Figure 7.2).

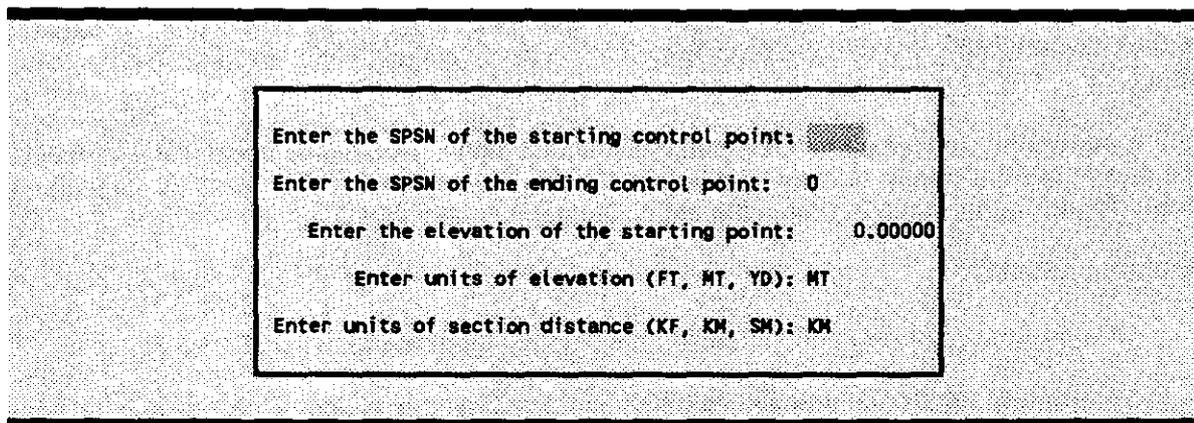


Figure 7.2
SPSN, Elevation, and Units entry

ABSTRA always runs on an entire observation file and all the section runnings will be included in the abstract. Because of this, care should be exercised in choosing the appropriate starting and ending control points. If the abstract is run with starting and ending control points defining only a small section of the line then outer portions of the line will be treated as spurs off of the two ends.

The first two prompts in the form are the starting and ending control points. When entering the SSN of the control point where the abstract is to begin, there is no default. The SSN of the ending control point defaults to zero(farthest from start). The response(other than 0 for the ending SSN field) must be a number between 1 and 9999, i.e. any valid SSN. If the SSN entered is not found in the observation file the following message will appear and the SSN field will be prompted again.

STARTING(or ENDING) MARK, SSN: 9999 * NOT FOUND !**

The next prompt in the form is the starting elevation. When entering the starting elevation, you are prompted with a default value of zero(0). The elevation is a numeric field, taking any number, the .(decimal point) and a sign(-) if needed.

The next two fields are for the units of measure for the elevation and distance measurements that will appear in the abstract listing and on the field abstract (*30*) record in the observation data file. These fields default to the units used in the first *41* record in the .HGZ file. If you type an invalid units designation, no error message will be issued, however, the program will not allow you to proceed until you have typed a valid units designation. Valid entries for these prompts are restricted to those given in the "Bluebook":

Elevation

FT - feet
MT - meters
YD - yards

Distance

KF - kilofeet
KM - kilometers
SM - statue miles

The response for these two fields is not mandatory and may be skipped by pressing the ENTER for each. If these fields are skipped, the default units are gotten from the first section running (*41*) record in the observation file.

Once the units of measure have been entered the program will check to determine if the abstract can be completed between the starting and ending SSNs given. If it can, the screen will go blank and the display will come up:

Constructing line order.

If the abstract cannot be completed between the starting and ending control points, it means that there is a missing section running in the leveling. A warning message will appear at the bottom of the screen indicating the SSN of the last control point that could be reached, and the program will ask to continue with the abstract.

***** WARNING, PATH INCOMPLETE, LAST SSN IS: 1234**

Do you wish to continue? (y/n):

If "Y" is entered, the program will continue with the abstract using the last control point reached as the ending mark for the abstract. If "N" is entered, then the program will terminate.

Once the line order has been constructed, the program will begin building the updated copy of the observation file. The screen will go blank and then display:

Copying the observation data to the temporary .HGZ File.

Once complete, the program will build the field abstract (*30*) records from the computed line order. While this happens the screen will display:

Copying line order to the temporary .HGZ file.

The next task of ABSTRA is to generate the field abstract listing and the screen will display:

Generating field abstract listing.

When the program ends a message describing exactly which files have been modified will be displayed.

Chapter 7 - Field Abstract Generation

******* ABSTRA has completed successfully *******

**The abstracted data has been added to C:L24999.HGZ.
The field abstract listing is in C:L24999.ABS**

Check L24999.ABS file for errors found during this process.

7.4 Checking the Field Abstract

The ABSTRA program generates two files:

1. The ".HGZ" file contains the abstracted data.
2. The ".ABS" file contains the field abstract listing and a list of all the errors found by ABSTRA.

The abstract listing can be printed to determine the number and type of errors in the data. The error messages will include:

***** All acceptable runnings for this section are backward !**

***** All acceptable runnings for this section are forward !**

These two errors indicate either that all the runnings for this section are in the same direction or that all the runnings in one direction have been rejected. In either case, another running must be done on the section in the opposite direction.

***** All runnings for this section were rejected, all elevations
beyond this point are erroneous!**

This error indicates that all the runnings for this section have failed the tolerances for the survey and a mean elevation can not be computed for the section. As a result, the running elevation can not be carried forward accurately. This section should be checked in the ".ABS" file and, another running must be done of the section.

***** Computed distance exceeds field distance by more than 0.35 km !**

***** Field distance exceeds computed distance by more than 0.5 km !**

These two errors usually mean that the latitude and/or longitude on the description for the control point have been scaled or entered incorrectly. Check the plotting of the control point's location and re-scale its latitude and longitude. If the computed distance exceeds the field distance, a correction must be made-- usually to the scaled latitude or longitude in the ".HA" file. The second error may be ignored if the latitude and longitude are found to be correct. This error is often due to the leveling route not following a very winding path.

The first error also shows up in the computed-versus-field distance listing at the end of the ".ABS" file. A pair of asterisks (**) indicates the section(s) where this error occurred.

***** This mark was not included in the abstract because it is
not connected to the line !**

This error means either that a section running is missing from the observation file to connect this mark to the line, or an SSN has been entered incorrectly in the observation file. The quadrangle maps should be reviewed to see if there is a section yet to be run or that the abstract includes an invalid SSN.

***** Bench mark description exists but mark not leveled to.**

Chapter 7 - Field Abstract Generation

This message indicates that a description for a certain mark exists in the ".HA" file but the corresponding SSN was not found in the line order generated from the observation file. Control points that were not recovered or were discovered destroyed are not included in this group.

***** The designation/description for this mark SSN is missing !**

This message indicates that a description for the mark with the given SSN was not found on the description file. This may be due to fact that either the description was not typed, or the a description was typed but given an incorrect SSN.

***** The latitude or longitude for this mark is missing !**

This error indicates that a latitude and/or longitude was missing from the description of the mark. This error will result in refraction corrections not being computed and computed section distances being incorrect. These last two messages will only occur when a description file is included in the ABSTRA run.

7.5 Field Abstract File Format

The following figures show the five major portions of the field abstract listing (.ABS) file. The heading in the file, shown at the top of Figure 7.3, identifies the version of the program used and the date and time the .ABS file was created. At the top of each page is the line title information for the project and column headers for the abstracted data. Each section running is separated by dashed lines.

Following the listing of the abstracted sections is an explanation of the codes used to identify the possible errors associated with the elevations. After the error notes comes a listing of each instrument and rod set used on the project, see Figure 7.4.

The section running tree, Figure 7.5, is a listing of the level line order, with the main line running vertically down the left hand side of the page and the spurs and loops listed across the page extending from the base mark. Spurs are enclosed by parenthesis and nesting of spurs is indicated by the nesting of parenthesis. The mark with SSN 2234 has two spurs coming from it. Mark 2240 has a spur nested within a spur. A loop can be identified when a spur's ending mark also occurs on the main line or another lower level spur. In Figure 7.5 the spur from mark 2213 ends on mark 2240 on the main line so it is a loop.

The fourth section in the file (Figure 7.6) shows a listing of field versus computed distances for each section. Double asterisks appear to the right of the ending mark of a section with a difference in the computed and field distances that exceeds the tolerances discussed in Section 7.4.

The last section in the file is a list of the errors found in processing the observational and descriptive data, see Figure 7.7. These errors are also discussed in Section 7.4.

LEVEL LINE SECTION RUNNING TREE

2208
 2209
 2210 (2268, 2269)
 2211
 2212
 2213 (2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224,
 2225, 2240)
 2226
 2227 (2228)
 2229
 2230
 2231 (2232)
 2233
 2234 (2237), (2235, 2236)
 2238
 2239
 2240 (2241, (2242), 2338)
 2243 (2244, 2245)
 2246
 2247
 2248
 2249
 2250
 2251
 2252
 2253

Figure 7.5

FROM	TO	N. LATITUDE	W. LONGITUDE	FIELD DISTANCE	VS. COMPUTED
2211	2212	372443	1182056	0.80	0.78
2212	2213	372510	1182057	0.80	0.84
2213	2214	372517	1182235	2.44	2.42
2214	2215	372511	1182348	1.94	1.80
2215	2216	372542	1182427	2.03	1.35 **
2216	2217	372645	1182418	1.95	1.96
2217	2218	372723	1182420	1.41	1.18
2218	2219	372828	1182437	2.17	2.05
2219	2220	372937	1182507	2.38	2.26
2220	2221	373036	1182451	2.03	1.87
2221	2222	373113	1182354	1.79	1.81
2222	2223	373117	1182338	0.69	0.41
2223	2224	373112	1182318	0.69	0.51
2224	2225	373109	1182236	1.09	1.03
2225	2240	373142	1182203	1.84	1.30 **

Figure 7.6

Chapter 7 - Field Abstract Generation

ABSTRA Version 2.23, June 1987 Wed Jun 17 09:44:56 1987

-*- FIELD ABSTRACT -*-

19861008-19861103 HGZ L24999 4.0 MM ORDER 1 CLASS 2 PAGE 1
 BISHOP CA TO TONOPAH JUNCTION NV

FROM TO	START	F/B	DIST TOTAL (KM)	ELEV DIFF (M)	-(F+B) TOTAL (MM)	MEAN DIFF FLD ELEV (M)	I C
2201 P 1100						1.00000	
2201 P 1100	10090752	F	0.06	-0.09233	-0.10	-0.09238	1
2202 A 1442	10090848	B	0.06	0.09243	-0.10	0.90762	1
			0.06				
2202 A 1442	10090821	F	0.12	-1.59869	-0.08	-1.59873	1
2203 B 1442	10090837	B	0.12	1.59877	-0.18	-0.69111	1
			0.18				
2203 B 1442	10090931	F	0.45	0.55670	0.00	0.55670	1
2204 R 1100							
			0.63		-0.18	-0.13441	
2204 R 1100	10090959	F	0.84	0.57217	0.00	0.57217	1
2205 C 1142							
			1.47		-0.18	0.43776	
2205 C 1142	10091105	F	0.33	-0.07688	0.00	-0.07688	1
9930 N 1293							
			1.81		-0.18	0.36088	

Figure 7.3

- C - section elevation difference was rejected for cause ie. *43* record rejection code set to "F"
- R - section elevation difference was rejected by Halperin rejection algorithm
- @ - section elevation difference does not include refraction correction
- * - section elevation difference does not include rod correction

INSTRUMENT CODE	INSTRUMENT	RODS
1	233 - 423233	316 - 270715 316 - 277922
2	233 - 456582	316 - 270718 316 - 277925
3	233 - 456511	316 - 331473 316 - 331470

Figure 7.4

Chapter 7 - Field Abstract Generation

SECTION
FROM TO

E R R O R M E S S A G E S

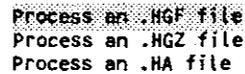
2215 2216 *** Field distance exceeds computed distance by more than 0.5 km!
2225 2240 *** Field distance exceeds computed distance by more than 0.5 km!

Figure 7.7

8.1 COMPRESS

The COMPRESS program compresses the ".HGF", ".HGZ" and ".HA" data files created and modified by programs VERREC, NEWREC and DESC, respectively. When new copies of existing data are added to an ".HGF" or ".HGZ" file, the old copy is not deleted, but rather, all references to the old copy are deleted. Therefore, as these data files are updated they may contain old, unused copies of the data and take up more disk space than necessary. With regards to an ".HA" file, certain modifications to a description, such as the modification of *30* text, will cause the creation of an unused copy of the data in the file. COMPRESS is run on a data file to eliminate old, unused copies of the data and therefore free up disk space.

To run the program, type "COMPRESS" at the DOS prompt. The screen will clear and the program will prompt to determine the type of file to be compressed, Figure 8.1.



```

Process an .HGF file
Process an .HGZ file
Process an .HA file
  
```

Figure 8.1
Opening Menu

Highlight the file type, or Exit, and press the **Enter** key. Next, COMPRESS prompts for the name of the file to compress. If the filename does not exist or it is not a binary format file, you will be asked to enter another filename.

It is possible to skip file name prompt by entering the file name following the program name when the program is first run. For example entering

```
COMPRESS A:L24776.HA
```

will cause the program to check the existence of this file, only prompting for a file name if the file does not exist.

Once an existing file name has been entered the program will begin compressing the file and display the message:

```
COMPRESSING <filename>
```

This message will remain on the screen until the entire file has been compressed, at which time the screen will clear and the opening menu reappears.

Chapter 8 - Utility Programs

In addition to compressing the data file the program also will generate (for .HA files) an index listing of the files' contents and position in the file (offset). Other file types do not need to have an index generated. The index file will have the same name as the input data file but with the file type of ".INX". For example, if the input data filename is "C:L24776.HA", the output index file would be "C:L24776.INX".

8.2 MAKEFILE

The files used by VFPROC are stored in what is called "binary" format. The program READFILE, Chapter 8, converts a binary format file into ASCII "bluebook" format. MAKEFILE, converts an ASCII "bluebook" format file back into it's original binary format.

To run MAKEFILE, type "MAKEFILE" at the DOS prompt. The screen will clear and the program will prompt for the type of file to be converted, Figure 8.2. Highlight the correct file type, or Exit, and press the **Enter** key.

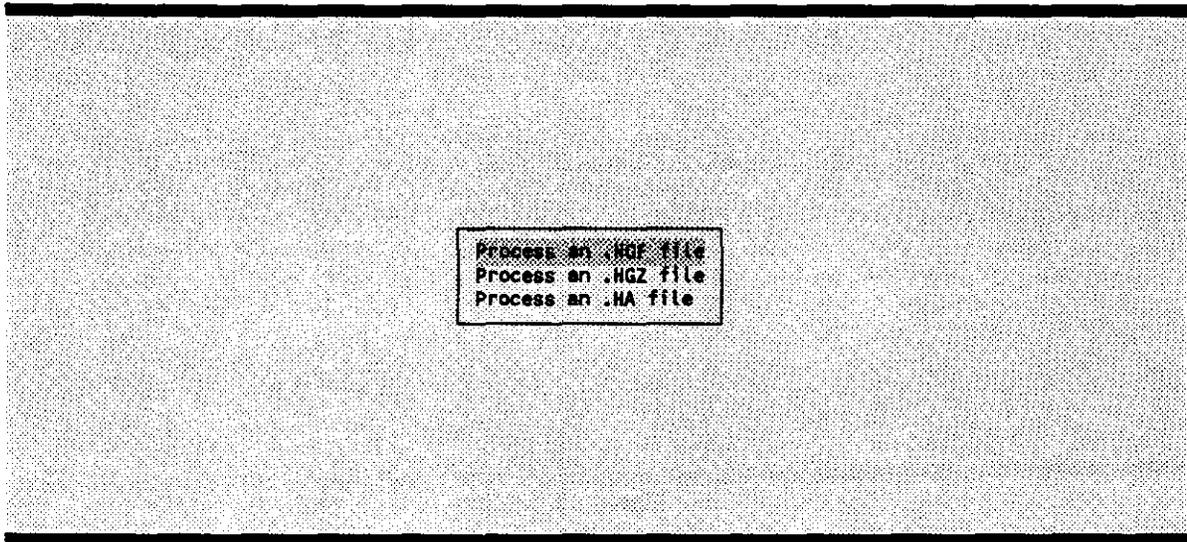


Figure 8.2
Opening Menu

Next, MAKEFILE prompts for the name of the file to be converted and the name of the file to be created. If the input filename does not exist or it is not a valid ASCII bluebook format file (of the type you selected), you will be asked to enter another filename.

The output file can be named anything you want, but must have an extension that matches the filetype you selected. If you enter a filename with any other extension, it will be replaced with the type you selected in the opening menu. If the output filename already exists you will be asked to overwrite the file.

Now, conversion of the input file begins. As the file is being converted, MAKEFILE displays some information about the data being converted. This is just to let you know that MAKEFILE is working and to give you something to look at.

During the conversion process if the program encounters an error a message will appear at the bottom of the screen,

INVALID RECORD: 002200*12

and MAKEFILE will not attempt to finish converting the file.

A second type of error message may also be displayed if a record was found to be out of sequence.

RECORD OUT OF ORDER: 000040*10

In either case the input file should be corrected with a text editor. The record causing the error may be easily located by matching the sequence number provided in the error message.

When MAKEFILE is finished, the opening menu will appear and you can convert another file, or exit to DOS.

8.3 HAPRINT

HAPRINT takes an ASCII bluebook format description file (output of READFILE) and prints it's contents, leaving a blank space between descriptions. This makes it easier to distinguish individual descriptions when reading the listing.

To run HAPRINT type "HAPRINT <filename>" at the DOS prompt; where <filename> is the name of the file to be printed.

While the file is printing HAPRINT does not allow other processes to be executed, as does the DOS "print" command. When the file is finished printing, the DOS prompt will appear.

8.4 READROD

The detail rod calibration files (".ROD") used by VFPROC are stored in binary format. This format is more efficient for use by the programs but cannot be viewed through a text editor or typed to the printer. In order to view the contents of a ".ROD" file READROD must be run. READROD creates an ASCII file containing a listing of the low and high scale calibrations. This file will be given the same name as the ".ROD" file, but with a file type of ".LST". For example, if the input file is named "255114XX.ROD" the listing file will be named "255114XX.LST". The ".LST" file is of the same format as the .CAL file used by RODCAL. Therefore, READROD and RODCAL together can be used to edit a ".ROD" file.

To run READROD type "READROD". The screen will clear and the program will prompt for the name of the rod file to be converted(This will use the standard file prompt discussed in Chapter 2). Type the name of the rodfile, or select it with the **(F2)** key, and press **(Enter)**. To exist the program press **(Esc)**.

The program next checks to see that the file exists. If the file does not exist an error message is displayed at the bottom of the screen and the file name is prompted again.

It is possible to skip the file name prompt by entering the file name following the program name when the program is first run. For example entering:

C:\READROD 270711XX.ROD

will cause the program to check the existence of this file, only prompting for a file name if the file does not exist.

After the program verifies that the ".ROD" file exists the screen will clear and read:

Generating C:270711XX.LST

This message will remain on the screen until the entire ".ROD" file has been processed at which time the screen will clear and the DOS prompt will appear.

8.5 RODCAL

The RODCAL program takes a text file containing one set of rod calibrations and creates a binary file to be used by NEWREC and EDITOR. The input calibration file must have the file type ".CAL". The output file will be named using the serial number of the instrument identified in the input file, with "X"s appended to make the name eight characters long (e.g., 270711XX.ROD).

If no detailed calibrations exist for a particular rod a ".ROD" file must still be created. The ".CAL" file for such a rod would only contain a header record, refer to section 8.5.1 for instructions on creating a calibration file of this type.

To run RODCAL type "RODCAL". The screen will clear and the program will prompt for the name of a ".CAL" file (This will use the standard file prompt discussed in Chapter 2). Note this file must have a file type of ".CAL".

The program next checks to see if this file exists. If the file does not exist an error message is displayed at the bottom of the screen and the disk drive and file name are prompted again.

"C:270711.CAL" -- NOT FOUND

Pressing the **(Esc)** key while entering a file name will cause the program to terminate.

It is possible to skip the file name prompt by entering the file name following the program name when the program is first run. For example entering:

C:\RODCAL 270711.CAL

will cause the program to check the existence of this file, only prompting for a file name if the file does not exist.

After the program verifies that the ".CAL" file exists, it will search the *\VERTPGM* directory and verifies that no other file for that rod already exists. If another file is found the following prompt is displayed:

A Rod File, 270711XX Already Exists for Rod '270711 '
Do you wish to replace it ? _

If "N" is entered the program will terminate and the DOS prompt will appear. If "Y" is entered, the existing file will be written over.

Now, RODCAL begins converting the ".CAL" file. While RODCAL is working the screen will read:

Processing Calibrations for ROD 270711

This message will remain on the screen until the entire ".CAL" file has been processed at which time the screen will clear and the operating system prompt will appear.

8.5.1 Creating a ".CAL" File For Rods Without Detailed Calibrations

Even if a particular rod does not have detailed calibrations, a ".ROD" file must still exist for the various programs comprising VFPROC to run successfully. The ".CAL" file for such a rod can be created using any text editor and should contain a record of the following form:

Columns	Field Contents	Example
1 - 2	Record ID	RD
3 - 5	Rod Code	316
6 - 13	Inst. Serial Number	270711
14 - 19	Date	801016
20 - 24	Rod Constant	59250
25 - 26	Rod Units	HC

All of the fields must be entered on this record. The id must be "RD" and blanks should be entered to the right of the instrument serial number, as needed, to make the length of this field eight characters.

Once this file is created and saved, run RODCAL to convert the file to binary format.

8.6 MERGFILE

The MERGFILE program merges up to ten binary format description files (".HA" file), created using the description entry program DESC, into an existing or new file. Before merging the files, MERGFILE checks all input files to guarantee that they are valid description files and that no two files contain duplicate station serial numbers (SSN's).

To run MERGFILE, type "MERGFILE" at the DOS prompt. The screen will clear and the program will prompt for the type of data file you are merging. You may select either ".HGF" or ".HA" files to merge. Next, a form is displayed prompting for up to ten input filenames and an output filename, Figure 8.3 (lower portion). Each filename must have an extension matching the one you picked from the opening menu; if any other extension is given it will be replaced by the extension selected from the opening menu. For example, if .HA files were being merged, "TEST.XXX" would be changed to "TEST.HA". For further information about entering filenames, refer to Chapter 2 section 6. File selection is the same for both .HGF and .HA filetypes.

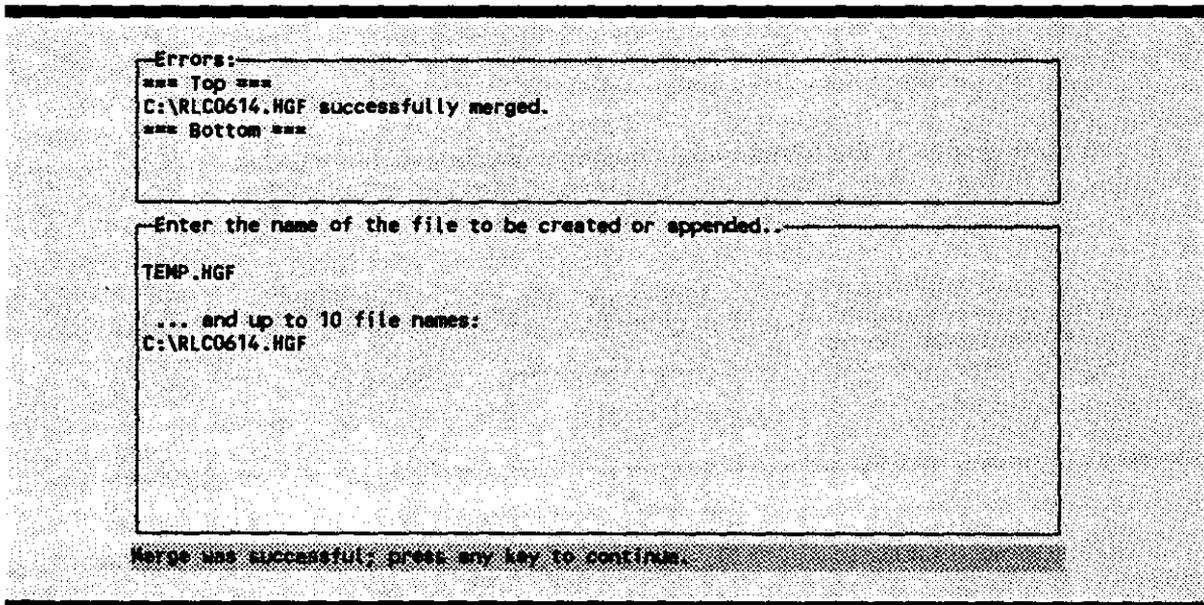


Figure 8.3

If the selected output file does not exist, it will be created, and the line title information of the first input file will be copied to the output file.

The specified input files are appended to the output file in the order they appear on the screen, top to bottom. The output file may or may not exist. If it does exist, the descriptions in the input file(s) will be added to the output file. If the output file doesn't exist, it will be created, with the data set information copied from the top-most input file.

Once all of the file have been specified, merger of the files is initiated by pressing the **F10** key. As each input file is added to the output file, MERGFILE checks for duplicate SSN's between the files. For each duplicate SSN found a message is added to the window labeled "Errors:", Figure 8.3(upper portion).

Once all of the input files have been processed, MERGFILE will report whether or not the files were successfully merged.

If the files could not be merged, read the messages in the error window to find out why. You can move the cursor to the error window by pressing the **F9** key. Once positioned in the window you can scroll the messages using the up and down arrow keys. The errors reported in this window will also be written to a file named "MERGFILE.ERR", in the current directory. At this point you could delete the filename(s) containing the duplicate SSN from the list and restart the merge process, or exit MERGFILE and modify the files containing the duplicate SSN's via the description entry program, DESC.

If you run the program on multiple sets of files, the error window will NOT be cleared after each set.

8.6.1 Merging .HGF files

When merging .HGF files, a cshot will not always be available for each instrument. If this occurs, MERGFILE will put up the form show in Figure 8.4.

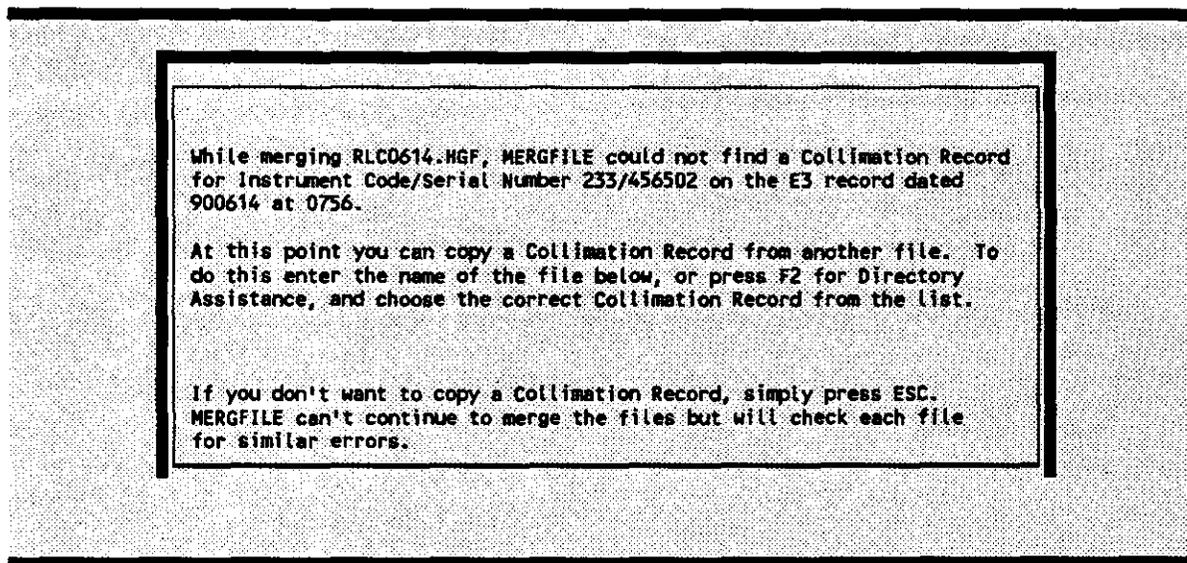


Figure 8.4

This form prompts for the name of a file that contains a cshot for this instrument. You may use standard file selection to find the file. Once you have found a file, MERGFILE will put up a choice list of all the CShots in that file that match the instrument in question. If there are no Cshots in the selected file for the instrument in question, a message to that effect will be displayed, and you will be returned to the file selection line. If you do not select a file (by hitting ESC), MERGFILE can not proceed with the merge, but will proceed to check the rest of the input files for errors.

To exit MERGFILE and return to DOS, press the **Esc** key.

8.7 EXTRACT

The EXTRACT program allows you to take one binary format description file (".HA" file), and creates another valid ".HA" file with your selected descriptions. Before this new file is created, you can renumber the SSN fields of the selected descriptions and sort the selections according to the PID, designation, or SSN fields.

To run EXTRACT, type "EXTRACT" at the DOS prompt. The screen will clear and a pull down menu will appear at the top of the screen. You may choose the "File" or "Utilities" submenus by using the arrow keys, Figure 8.5. Next, highlight menu item with the arrow keys and select that field with either the left mouse button or the **Enter** key.

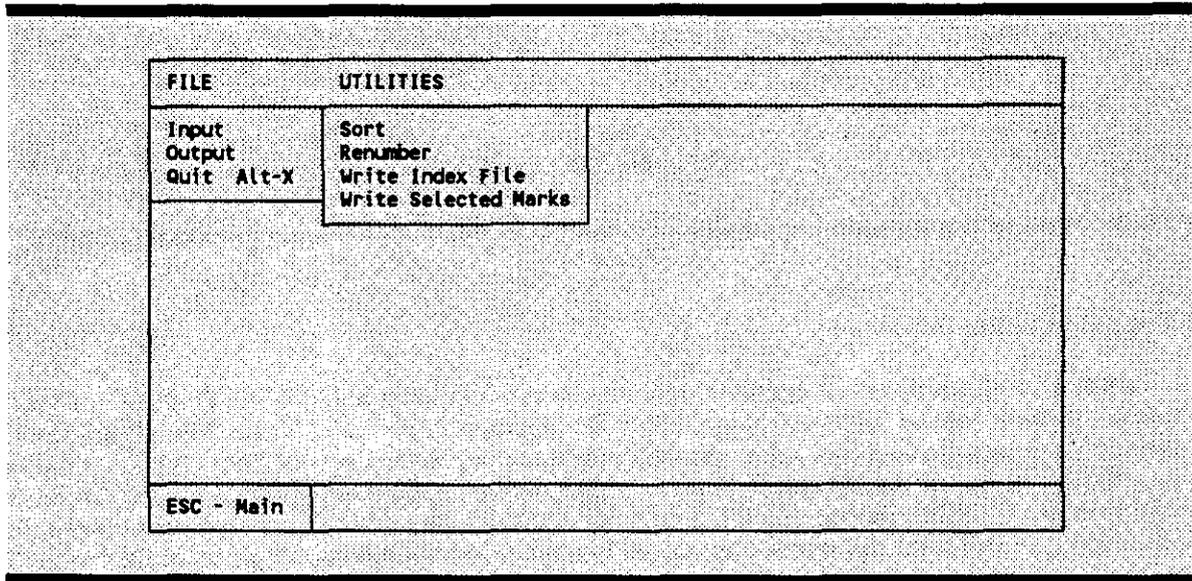


Figure 8.5

8.7.1 Using File Submenu

When the "Input" field is selected, a form will appear prompting for the name of the file that contains the descriptions that you will be extracting from. If the input file does not exist or it is not a valid ".HA" file, you will be asked to enter another filename. Once a valid file has been selected, it will be displayed on the screen, but control will remain in this menu.

The output file can be named anything you want. This can be done by choosing the "Output" field. This file you enter will automatically have the ".HA" extension added. If you enter a filename with any other extension, it will be replaced with ".HA" extension. If the output filename already exists, you will be asked to overwrite the file. For more information on entering filenames, refer to Chapter 2, section 6.

To exit the program, select the "Quit" field or to exit from anywhere, press the key sequence **Alt X**.

8.7.2 Selecting Marks

Once you have selected an input file, it will be immediately displayed. As long as an input file is open, you can jump between the choice list and the menus, figure 8.6. If you are in a submenu do two consecutive **Esc** key presses. If you are in the top level menu simply press the **Esc** key once. Now control is within the choice list. A key command bar will be displayed at the bottom of the display. This line tells you that in order to get back to the main menu, press the **F10** key; to make a selection, press either the key or the left button of the mouse.

FILE		UTILITIES			
Input File: D:\COHPN.HA					
Output File: D:\SELECT.HA					
Number of stations in list: 174			Number of stations selected: 0		
SSN - PID	DESIGNATION	LOGO	YEAR	LAT	LONG
8734 JJ0284	6 AV	NGS	1991	370225	1064822
8736	A 26			380543	1031024
5868 LK0589	AMARILLO RGNL PT	USSC	1991	350640	1073023
8737 HJ0111	ANDERS			400500	1041024
8853	ANNA	NGS	1990	360245	1063509
8783 GM0519	ATKINS	BLM	1925	360560	1025402
8784	B 89	BLM	1925	340320	1051032
5867	BANLEW			400225	1062034
8854	BENTON	USSC	1991	380002	1031024
8765 JK1164	CADSHAW			401923	1057809
SPACE - Choose F10 - Menu Alt-X - Exit Extract					

Figure 8.6

8.7.3 Using the Utilities Submenu

When a list of descriptions is displayed, you can choose what field it is sorted by. To do this, select the "Sort" field. A form will be displayed listing "SSN", "Designation", and "PID," figure 8.7. The default is designation. To change the field for sorting, simply highlight the field with either the arrow keys or the mouse and press the **Enter** key or the left mouse button. If you wish to accept your choice, press the OK button, otherwise press the CANCEL button. If a file is currently displayed, then it will be resorted immediately. Any choices made up to this point that weren't saved, are lost due to the reordering. If an input file has not been chosen yet, then when one is, it will be displayed according to the sort field you selected.

FILE		UTILITIES	
		Sort Renumber Write Index File Write Selected Marks	
		Sort Order SSN () Designation () PID () OK CANCEL	
ESC - Main	Select field for sorting list of selections		

Figure 8.7

Once you have made some selections, you may choose to change the ordering the SSN's. To do this, select to "Renumber" field. When this field is selected, a form will be displayed, figure 8.8, containing spaces for you to write in the starting number and the increment of the SSN's in your new file. The numbers you write in this form will be validated when you want to write out your selected descriptions to the output file. After you have chosen new numbers, you may accept them by pressing the OK button. The default starting number is 1 and the default increment is 1.

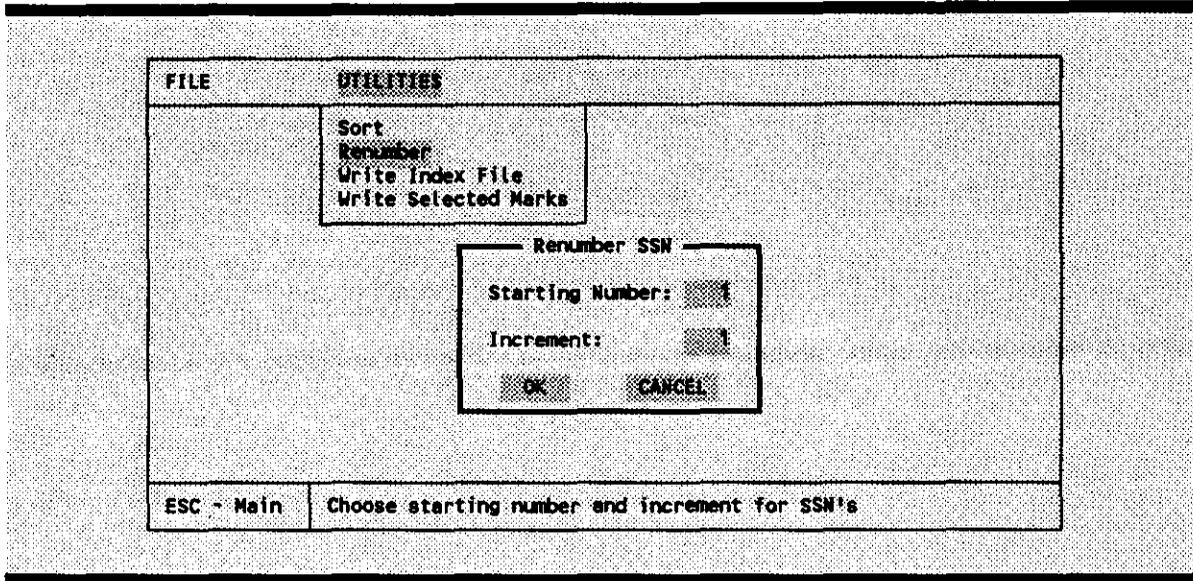


Figure 8.8

In addition to Extracting descriptions from the data file, you can generate an index listing of the selected marks by choosing the "Write Index File" field. This listing will contain the same description of the mark as is shown in the choice list on screen. The index file will have the same name as the input data file but with the file type of ".INX". For example, if the input data filename is "C:L24776.HA", the output index file would be "C:L24776.INX". When this file is being created, a message will appear at the bottom of the display. This file will only be created if an output file has been chosen and selections have been made.

When you are ready to save your selected descriptions, simply select the "Write Selected Marks" field, Figure 8.9. The new file will only be written if input and output files have been chosen and selections have been made. Immediately you will be shown a window asking whether or not to use the renumbering scheme for the SSN's. Simply press the appropriate choice that represents your decision.

FILE		UTILITIES	
Input File: D:	Sort		
Output File: D:	Renumber		
Number of stat:	Write Index File	umber of stations selected: 3	
SSN - PID	Write Selected Marks		
8734 JJ02		LOGO YEAR - LAT - LON	
8736	A 26	NGS 1991 370225	1064822
5868 LK0589	AMARILLO R		380543 1031024
8737 NJ0111	ANDERS	C 1991 350640	1073023
8853	ANNA		400500 1041024
8783 GN0519	ATKINS	Starting Number: 1	S 1990 360245 1063509
8784	B 89	Increment Value: 1	M 1925 360560 1025402
5867	BANLEW	Number of Choices: 3	H 1925 340320 1051032
8854	BENTON		400225 1062034
8765 JK1164	CADSHAW	ACCEPT	C 1991 380002 1031024
		DON'T USE	401923 1057809
ESC - Main		Write chosen descriptions to new HA file	

Figure 8.9

9.1 Introduction

Upon completion of a project all of the data related to that project must be sent to the National Geodetic Survey (NGS). This data takes two forms:

- USGS quadrangle maps with level lines drawn on them
- floppy disks containing data files

The last item can be broken down further into the various data files.

- the raw observational data (".HGF") file(s)
- the field book report (".RPT") file(s)
- the control point descriptive data (".HA") file(s)
- the abstracted and condensed observational data (".HGZ") file(s)
- the field abstract listing (".ABS") file(s)

In order to transfer these files to NGS, they must be copied onto floppy disks using the DOS "copy" command. Whenever possible high density floppy disks should be used to minimize the number of disks used.

The individual files should be copied onto floppy disks according to line number. More than likely all the files for a given level line will not fit on the same floppy disk. In this case, use as many floppy disks as necessary, labeling the disks accordingly.

Once the data has been copied to the floppy disk make a directory listing of the floppy's contents using the "dir" command. Make a hard copy of this listing and enclose it with the floppy disk when shipped.

9.2 Data Reformatting Using READFILE

The files created by VFPROC (.HA, .HGZ, and .HGF) are stored in what is called "binary" format. This format is efficient for working with the data but it is not appropriate for transferring the data to another computer system. Because of this the program READFILE is run to convert the binary format files into text format.

To run READFILE, type "READFILE" at the DOS prompt. READFILE prompts to determine the type of file being converted, Figure 9.1.

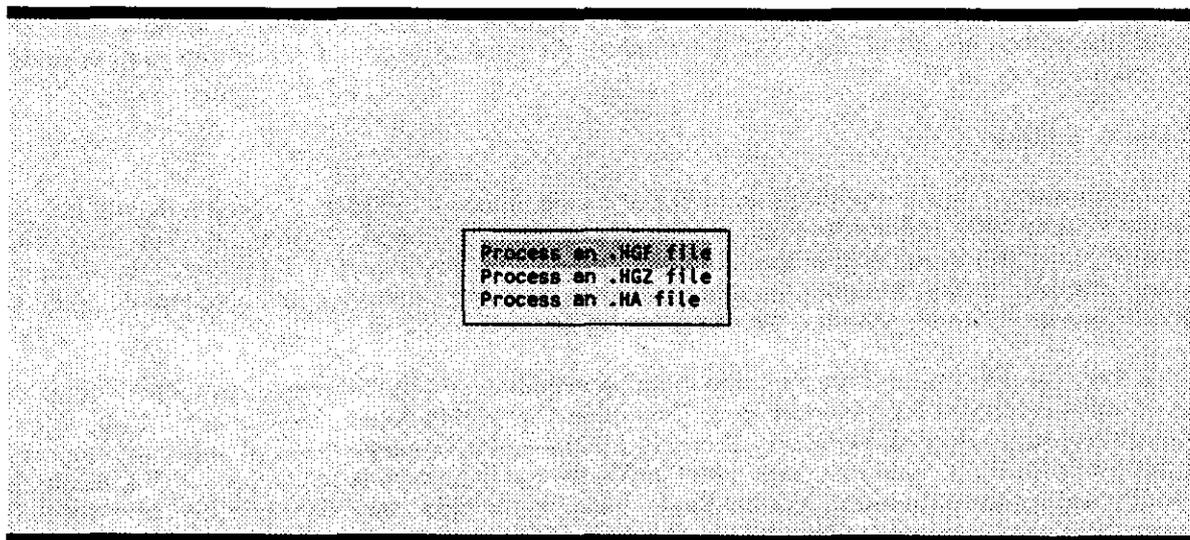


Figure 9.1
Opening Menu

Highlight the correct file type, or Exit, and press the ENTER key. Next, READFILE prompts for the

Chapter 9 - Data Release Procedures

name of the file to be converted and the name of the file to be created. If the input filename does not exist or it is not a binary format file, you will be asked to enter another filename.

The output file can be named anything you want, if the output filename already exists you will be given the option to overwrite the existing file.

If a description file is being converted, READFILE next prompts for the order in which the descriptions should appear in the output file, Figure 9.2. Highlight the desired order and press the ENTER key.

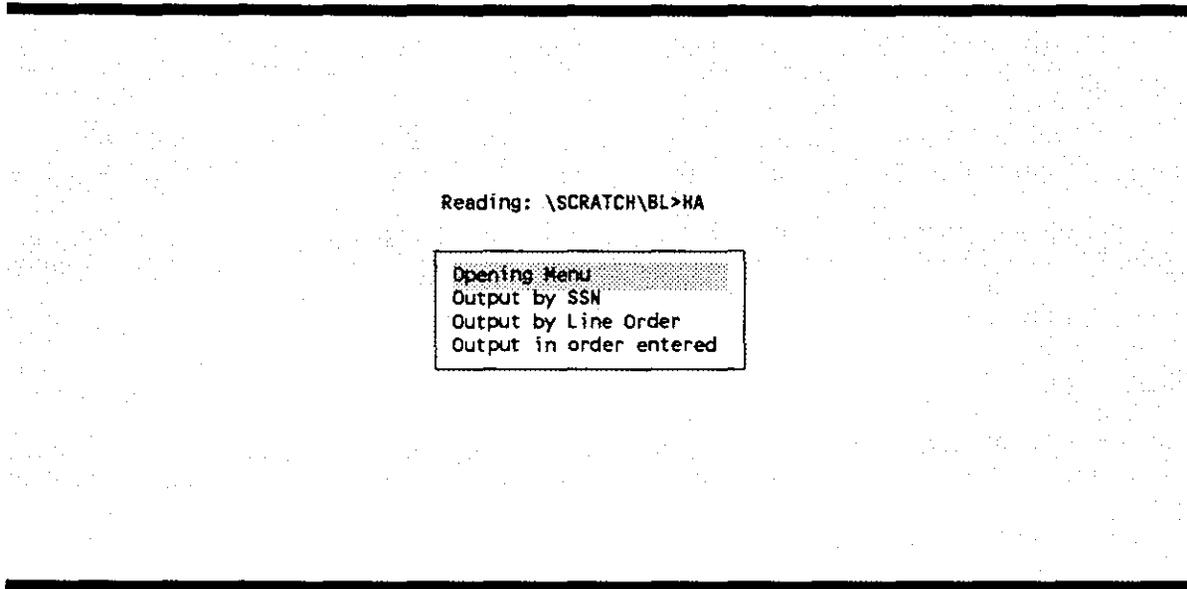


Figure 9.2

If the descriptions are to be output in line order, READFILE prompts for the name of an existing ".HGZ" file containing the necessary line order information.

Now conversion of the input file begins. As the file is being converted, READFILE displays some information about the data being converted. This is just to let you know that READFILE is working and to give you something to look at. When READFILE is finished, the opening menu will appear and you can convert another file, or exit to DOS.

9.3 Shipment of Floppy Disks

Floppy disks by nature are flexible and prone to damage if handled roughly. To protect them in shipping precautions must be taken to keep them flat, uncrimped and securely wrapped. To guarantee this, floppy disks should never be shipped in just an envelope. Instead they should be "sandwiched" between two layers of boxing cardboard. Special shipping containers are available at computer retail stores for just this purpose. They are designed to provide adequate protection for one or two disks.

If these are not available then a suitable shipping container can be easily constructed. First, cut several squares of clean cardboard from a sturdy box. They should be slightly larger than the disk. Next, make a sandwich starting with a layer of cardboard followed by a disk followed by another layer of cardboard. Continue in this fashion until all the disks have been added and a layer of cardboard is on the top. Third, secure the bundle with masking tape across the edges but do not compress the disks since this may crimp them and make them unreadable. Finally insert the bundle into a heavy mailing envelope and seal.

Taking the time to make sure these precautions are met will pay off in the assurance that the disks and the data they contain will reach NGS undamaged.

10. Introduction

The procedure for leveling across a river or valley requires combining conventional leveling observations with a set of simultaneous reciprocal observations made using a special set of equipment. For recording the conventional leveling between the bench mark and the height stud on the river crossing targets, the program VERREC is used. See Chapter 9 for a complete explanation of the VERREC program.

Two runnings between the bench mark and the height stud are done both before and after the river crossing observations are made. The mean of these four runnings is used when computing the final elevation for the entire section. After each running, record the elevation for use in computing this mean.

The river crossing observations are recorded using the program RIVER. This program is used by the NGS in conjunction with river crossing procedures described in the NGS Geodetic Leveling manual, Chapter 4. It is designed to run on personal computers based on the Intel 80x86 series of processing units. The program requires approximately 50k of memory and a floppy disk or hard disk with 16k free space for file storage. Two versions of the program are distributed. The RIVER.EXE program runs on the standard PC. The RIVER.X program runs on the hand-held PC used by the NGS.

10.1 Program Screen Displays

The RIVER program uses three types of screen displays for program control and data entry : **forms, single-entry prompts and continuation prompts**. Forms are used to input the beginning bench mark and equipment information. Single-entry prompts are used to enter reciprocal collimation readings, conventional leveling observations to the bench mark, and data from observations to the target. Continuation prompts display data, warning messages, or error messages. The program pauses after each continuation prompt to allow the user to read it before continuing. To continue the user need only press a key. Specific forms and single-entry prompts are discussed in more detail in the appropriate sections of this chapter.

For more information on screen display and cursor control within forms refer to Section 9.2.

10.2 Getting Started

To run the program type the name, RIVER, at the operating system prompt:

```
C:\RIVER
```

If you are using one of the hand-held terminals, use the arrow keys to move the highlight bar to the RIVER.X file and then press the **F5** key to run the program. When the program begins the screen will clear and the program name, version number and "File Name: " prompt will appear:

```
RIVER Version 1.1
```

```
July 1990
```

```
File Name: _____
```

Enter the name of the file where the river crossing observations will be stored. This name may be up to eight characters long. If the file already exists or no file is specified, the program will be aborted. The file will have ".RVR" as an extension.

10.3 Entering Beginning Series Information

Once the data file name has been entered the screen will clear and the Beginning Information form will appear. There are a total of 11 fields in this form. The form is larger than the screen so only the first seven lines will be displayed. At the bottom of the screen are the labels SAVE and ABORT above the **F1** and **F5**

Chapter 10 - River Crossing Observation Recording

keys respectively. For an explanation of the SAVE and ABORT functions refer to Section 9.4.

Beginning Info.	
From	
SSN	: 0002
Desig.	: TBM NORTH
To	
SSN	: 0003
Desig.	: PF 14 DI
SAVE	ABORT

From
SSN : 0002
Desig. : TBM NORTH

Enter the station serial number and designation of the bench mark located on this side of the river or valley. A valid entry is any number between 1 and 9999. The designation can be 25 characters in length and contains a description of the bench mark.

To
SSN : 0003
Desig. : PF 14 DI

Enter the survey-point serial number and designation of the bench mark located on the far side of the river or valley following the same guidelines.

Inst. Pairs
Units HC,CM : HC
Code : 232
S/N : 119599__
S/N : 125722__

Enter the units of measurement of the observation. Next enter the instrument codes and serial numbers for the pair of instruments used to make the river crossing observations between the nearby bench mark and the opposite target station. Both follow the same guidelines for the conventional leveling instrument described above.

Time : 1527

The default time is set from the internal clock when the form is first displayed. If the displayed time is correct, skip over it. If the time is incorrect it may be changed. Enter the time of day in military fashion. For example: 3:27 PM would be entered as 1527.

Date : 900620

The default date is set from the internal clock when the form is first displayed. If the displayed date is correct, skip over it. If the date is incorrect it may be changed. Enter the date in the format of year, month, and day. For example, June 20, 1990 would be entered 900620. NOTE: Changing the time or date does not set the internal system clock!

Zone : R

Chapter 10 - River Crossing Observation Recording

Enter the alphabetic code for the time zone. Refer to the Bluebook, Annex H for the code associated with each time zone. Valid values for the United States are Q through X. For example, Eastern Standard Time is code R.

Temp. : 500

Enter the temperature in degrees. Either centigrade or Fahrenheit scale may be used, as indicated by the temperature code.

Temp Code: F

Enter the alphabetic code for the temperature scale used, either C for centigrade or F for Fahrenheit.

Wind : 2

Enter the wind velocity code. Valid entries are: 0 - no wind; 1 - light breeze; or 2 - strong wind.

Sun : 1

Enter the sun brightness code. Valid entries are: 0 - no sun, overcast; 1 - partly cloudy; or 2 - full sun.

To save the form, and any changes made, either press ENTER when the cursor is in the last field or press the SAVE F1 key. the following message will appear at the bottom of the screen.

Save Changes? Y

To save the form simply press ENTER. The program will then prompt for the river crossing data. If you wish to exit the form without saving the data, enter "N" and press ENTER. The program will prompt:

Abandon Form? N

Press "Y" and ENTER. The screen will clear and the program will terminate.

10.4 Entering River Crossing Observation Data

The two target positions are prompted for first.

Target Positions

Upper (t) : 120

Lower (T): 0

Enter the positions, t and T, of the targets on the opposite side of the river. The units correspond to those previously entered for the leveling rod. Valid measurements are 0, 40, 80, 120 for half-centimeters and 0, 20, 40, and 60 for centimeters.

Target Interval 120

PRESS ANY KEY

The program will display the target interval and instruct the user to 'PRESS ANY KEY' to continue.

10.4.1 Reciprocal Collimation

The program will prompt for the reciprocal collimation observations next. The river crossing procedures require that a reciprocal collimation be performed immediately before every set of observations in the series. There are a total of six sets of reciprocal collimation observations.

Reciprocal Collim.
1st Reading: 1048

After bringing the middle reticle line of instrument 1 into coincidence with the image of the middle line of instrument 2 and turning the wedge knob clockwise, record the reading of the wedge scale. The reading must be four digits long and not include the decimal point.

2nd Reading: 1051

After moving the middle reticle line of instrument 2 out of coincidence and turning the knob wedge counterclockwise, record the second scale reading. Again the reading must be four digits long, and not include the decimal point.

r : 1050

Mean of r : 1060
PRESS ANY KEY

The average of the two readings will be displayed as "r". NOTE: When computing averages, the average is always rounded to the even number. For example, the average of 1049 and 1050 will be 1050 and the average of 1050 and 1051 will also be 1050. The average of the current and previous reciprocal collimation values will be displayed as "Mean of r" for the third through sixth reciprocal collimation values. The difference between the current and previous reciprocal collimation values will be tested. If $|r_1 - r_2| > 1$ then the following will be displayed:

r1 - r2 > 1!
1st Reading: 1200
2nd Reading: 1210
1st Reading: 1080
2nd Reading: 1070
Change Readings?

If the readings are correct answer N. If any of the readings are incorrect, enter Y and the following prompt will appear:

1 - First
Reciprocal Col.
2 - Second
Reciprocal Col.
Change Which? 1

Enter the number of the corresponding reciprocal collimation that needs to be changed. The reciprocal collimation will be prompted for again.

10.4.2 Bench Mark to Instrument Station Observations

A set of backsight observations must be made from the instrument set-up to a precise level rod held on the nearby bench mark, in order to determine the height of the instrument station above the bench mark.

Bench Mark
 Inst. 1 1st 2nd
 Lower 194 1776 1780
 Upper 197 0548 0548
 Lower Mean: 17.78
 Upper Mean: 05.48
 PRESS ANY KEY

For Instrument 1, enter the value of the lower graduation from the level rod followed by two readings from the optical micrometer. Next, enter the upper graduation from the level rod and two readings from the optical micrometer. The average of the two readings for both the lower and upper graduations will then be displayed, rounded to the nearest even digit.

Bench Mark
 Instr. 2
 Lower 194 1669 1671
 Upper 197 0433 0435
 Lower Mean: 16.70
 Upper Mean: 04.34
 PRESS ANY KEY

Repeat the above procedure for Instrument 2.

10.4.3 Target to Instrument Station Observations

The foresight target observations consist of four sets of data, each set containing ten lower graduation readings and ten upper graduation readings for each instrument. Information on each set of ten readings will be displayed at the top of the screen. For example, "Set 1 Inst. 1 Lower" corresponds to the ten lower graduation readings for the first instrument in set 1. At this point the program can be aborted by pressing the **F5** key. The lower readings will be prompted for first, followed by the upper readings. Pressing **F1** returns the cursor to the first field of the ten readings if corrections need to be made. After both the lower and upper readings have been entered, the corresponding means will be computed and displayed. The process will be repeated for Instrument 2. This will continue until the data for each of the four sets has been entered. Following each set of ten readings, the standard deviation is computed. If it is greater than 0.2 the program will prompt again for the complete set of readings. A reciprocal collimation will be prompted for between each set, and after the fourth set. The following is a complete example of the instrument station observations.

Reciprocal Collim.
 1st Reading :1062
 2nd Reading:1064
 r :1063

PRESS ANY KEY

Set 1 Inst. 1 Lower
 1: 1342 2: 1348
 3: 1344 4: 1349
 5: 1348 5: 1343
 7: 1344 8: 1342
 9: 1349 10: 1345
 PRESS ANY KEY

Set 1 Inst. 1 Upper
 1: 0850 2: 0848
 3: 0848 4: 0840
 5: 0839 6: 0840
 7: 0838 8: 0840
 9: 0838 10: 0840
 PRESS ANY KEY

Chapter 10 - River Crossing Observation Recording

Lower Mean: 13.45

Upper Mean: 8.42

PRESS ANY KEY

Set 1 Inst. 2 Lower

1: 1275 2: 1273

3: 1278 4: 1277

5: 1280 5: 1281

7: 1282 8: 1282

9: 1283 10: 1281

PRESS ANY KEY

Set 1 Inst. 2 Upper

1: 0769 2: 0770

3: 0770 4: 0774

5: 0771 6: 0775

7: 0770 8: 0772

9: 0773 10: 0775

PRESS ANY KEY

Lower Mean: 12.80

Upper Mean: 7.72

PRESS ANY KEY

Reciprocal Collim.

1st Reading :1060

2nd Reading:1056

r :1058

Mean of r :1060

PRESS ANY KEY

Set 2 Inst. 1 Lower

1: 1352 2: 1358

3: 1355 4: 1351

5: 1350 5: 1355

7: 1351 8: 1354

9: 1351 10: 1357

PRESS ANY KEY

Set 2 Inst. 1 Upper

1: 0818 2: 0820

3: 0825 4: 0828

5: 0827 6: 0831

7: 0831 8: 0830

9: 0833 10: 0833

PRESS ANY KEY

Lower Mean: 13.53

Upper Mean: 8.28

PRESS ANY KEY

Set 2 Inst. 2 Lower

1: 1293 2: 1294

3: 1296 4: 1296

5: 1295 5: 1292

7: 1297 8: 1294

9: 1297 10: 1295

PRESS ANY KEY

Set 2 Inst. 2 Upper

1: 0778 2: 0775

3: 0777 4: 0780

5: 0772 6: 0778

7: 0770 8: 0782

9: 0772 10: 0771

PRESS ANY KEY

Chapter 10 - River Crossing Observation Recording

Lower Mean: 12.95

Upper Mean: 7.76

PRESS ANY KEY

Reciprocal Collim.

1st Reading :1065

2nd Reading:1066

r :1066

Mean of r :1062

PRESS ANY KEY

Set 3 Inst. 1 Lower

1: 1360 2: 1361

3: 1362 4: 1362

5: 1360 5: 1358

7: 1357 8: 1358

9: 1360 10: 1356

PRESS ANY KEY

Set 3 Inst. 1 Upper

1: 0837 2: 0840

3: 0839 4: 0843

5: 0840 6: 0839

7: 0839 8: 0840

9: 0837 10: 0837

PRESS ANY KEY

Lower Mean: 13.59

Upper Mean: 8.39

PRESS ANY KEY

Set 3 Inst. 2 Lower

1: 1289 2: 1288

3: 1291 4: 1286

5: 1290 5: 1289

7: 1288 8: 1289

9: 1291 10: 1290

PRESS ANY KEY

Set 3 Inst. 2 Upper

1: 0784 2: 0790

3: 0782 4: 0783

5: 0782 6: 0784

7: 0786 8: 0788

9: 0786 10: 0788

PRESS ANY KEY

Lower Mean: 12.89

Upper Mean: 7.85

PRESS ANY KEY

Reciprocal Collim.

1st Reading :1070

2nd Reading:1072

r :1071

Mean of r :1068

PRESS ANY KEY

Chapter 10 - River Crossing Observation Recording

Set 4 Inst. 1 Lower
1: 1364 2: 1360
3: 1361 4: 1357
5: 1357 5: 1360
7: 1359 8: 1356
9: 1358 10: 1362
PRESS ANY KEY

Set 4 Inst. 1 Upper
1: 0852 2: 0848
3: 0852 4: 0852
5: 0851 6: 0855
7: 0859 8: 0860
9: 0859 10: 0854
PRESS ANY KEY

Lower Mean: 13.59

Upper Mean: 8.54

PRESS ANY KEY

Set 4 Inst. 2 Lower
1: 1290 2: 1294
3: 1291 4: 1296
5: 1298 5: 1298
7: 1299 8: 1299
9: 1296 10: 1300
PRESS ANY KEY

Set 4 Inst. 2 Upper
1: 0785 2: 0789
3: 0785 4: 0787
5: 0786 6: 0789
7: 0787 8: 0790
9: 0790 10: 0789
PRESS ANY KEY

Lower Mean: 12.96

Upper Mean: 7.88

PRESS ANY KEY

Reciprocal Collim.
1st Reading :1064
2nd Reading:1063
r :1064

Mean of r :1068
PRESS ANY KEY

10.5 Ending Information

The ending information is prompted for after the final bench mark readings.

Ending Information

Time: 1200

Enter the ending time in the same format as the beginning time.

Temperature : 550

Enter the ending temperature in the same format as the beginning temperature. Do not forget to include the decimal.

10.6 Final Computations

After the entire observing session is complete the program will display computed data from the input of the river crossing. The computations include:

- R - The intercept of mean collimated lines of sight of the instruments on a level rod held on the bench mark adjacent to the Instrument Station. Measured in meters.
- H - The intercept of mean of collimated lines of sight of the instruments above the lower target. Measured in meters.
- T - The position of the lower target on the opposite side in meters
- Sr - The distance from the instrument to the rod on the same side in meters.
- Sh - The distance from the instrument to the rod on the other side in meters.

Computations

R(m) : 0.97853
H(m) : 0.33966
T(m) : 0.00
SR : 12.18
SH : 1173.21
PRESS ANY KEY

A data file with the extension ".RVR" is generated using the name prompted for at the beginning of the program. The program terminates after generating this file.

10.7 Generating A Text File

Accompanying the RIVER.EXE and RIVER.X programs is the program PRTRVR.EXE. This program converts a data file with the extension ".RVR" into a text file that can be printed or viewed by any text editor. PRTRVR runs only on a PC after the ".RVR" file has been transferred from the hand-held PC.

To run the program type PRTRVR at the operating system prompt followed by the names of the input data file and the output listing file:

```
C:\PRTRVR JMW01.RVR JMW01.PRN
```

The program will print the program name and version information to the screen followed by a message indicating the output file name. When the program has completed successfully the operating system prompt will return.

```
prtrvr, Version 1.2, April 1991
```

```
-- Writing River Crossing Data to: gwa.out
```

10.7.1 Output File Format

The file created by the PRTRVR program roughly resembles the River Crossing form shown in Chapter 4 of NOAA Manual NOS NGS3, "Geodetic Leveling", figure 4-14. The data are separated onto two pages for convenience.

Chapter 10 - River Crossing Observation Recording

Simultaneous Reciprocal Observations

Instrument Pair, Code: 216 SN: 421 Code: 216 SN: 421

Date	Time Beginning	Ending	Temp Beginning	Ending	Time Zone	Wind Code	Sun Code
910115	0629	0647	69.0 F	69.0 F	Q	1	1

From Designation	To Designation
0123 X 305	0124 Y 305

Target Positions On Column: Upper (t) - 120 HC Lower (T) - 0 HC

INSTRUMENT 1					INSTRUMENT 2							
Reciprocal Collimation										10.48	10.51	10.50
B Lower: 194		17.76	17.80	17.78	B Lower: 194		16.69	16.71	16.70	16.69	16.71	16.70
M Upper: 197		5.48	5.48	5.48	M Upper: 197		4.43	4.35	4.39	4.43	4.35	4.39
Reciprocal Collimation										10.62	10.64	10.63
S L:	13.42	13.44	13.48	13.44	13.49		12.75	12.78	12.80	12.82	12.83	
E	13.48	13.49	13.43	13.42	13.45	13.45	12.73	12.77	12.81	12.82	12.84	12.80
T U:	8.45	8.48	8.39	8.38	8.38		7.69	7.70	7.71	7.70	7.73	
1	8.48	8.40	8.40	8.40	8.40	8.42	7.70	7.74	7.75	7.72	7.75	7.72
Reciprocal Collimation										10.60	10.56	10.58
Mean of Prev. Two Recip. Coll.:												10.60
S L:	13.52	13.55	13.50	13.51	13.51		12.93	12.96	12.95	12.97	12.97	
E	13.58	13.51	13.55	13.54	13.57	13.53	12.94	12.96	12.92	12.94	12.95	12.95
T U:	8.18	8.25	8.27	8.31	8.33		7.78	7.77	7.72	7.70	7.72	
2	8.20	8.28	8.31	8.30	8.33	8.28	7.75	7.80	7.78	7.82	7.71	7.76
Reciprocal Collimation										10.65	10.66	10.66
Mean of Prev. Two Recip. Coll.:												10.62
S L:	13.60	13.62	13.60	13.57	13.60		12.89	12.91	12.90	12.88	12.91	
E	13.61	13.62	13.58	13.58	13.56	13.59	12.88	12.86	12.89	12.89	12.90	12.89
T U:	8.37	8.39	8.40	8.39	8.37		7.84	7.82	7.82	7.86	7.86	
3	8.40	8.43	8.39	8.40	8.37	8.39	7.90	7.83	7.84	7.88	7.88	7.85
Reciprocal Collimation										10.70	10.72	10.71
Mean of Prev. Two Recip. Coll.:												10.68
S L:	13.64	13.61	13.57	13.59	13.58		12.90	12.91	12.98	12.99	12.96	
E	13.60	13.57	13.60	13.56	13.62	13.59	12.94	12.96	12.98	12.99	13.00	12.96
T U:	8.52	8.52	8.51	8.59	8.59		7.85	7.85	7.86	7.87	7.90	
4	8.48	8.52	8.55	8.60	8.54	8.54	7.89	7.87	7.89	7.90	7.89	7.88
Reciprocal Collimation										10.64	10.63	10.64
Mean of Prev. Two Recip. Coll.:												10.68
B Lower: 194		17.83	17.83	17.83	B Lower: 194		16.86	16.82	16.84	16.86	16.82	16.84
M Upper: 197		5.58	5.60	5.59	M Upper: 197		4.46	4.44	4.45	4.46	4.44	4.45

Figure 10-1

Chapter 10 - River Crossing Observation Recording

Computations

Beginning Bench Mark

11 - 10: 7.78 11 - u1: 12.30 i1: 1.8976 Istart: 1.7043
12 - r : 6.20 12 - u2: 12.31 i2: 1.5110 Sstart: 12.19

Set 1

b1 - 10: 3.45
b1 - a1: 5.03 h1: 82.3062
b2 - r : 2.20
b2 - a2: 5.08 h2: 51.9685 H: 67.1374 S: 1186.94

Set 2

b1 - 10: 3.53
b1 - a1: 5.25 h1: 80.6857
b2 - r : 2.33
b2 - a2: 5.19 h2: 53.8728 H: 67.2792 S: 1149.43

Set 3

b1 - 10: 3.59
b1 - a1: 5.20 h1: 82.8462
b2 - r : 2.21
b2 - a2: 5.04 h2: 52.6190 H: 67.7326 S: 1171.88

Set 4

b1 - 10: 3.59
b1 - a1: 5.05 h1: 85.3069
b2 - r : 2.28
b2 - a2: 5.08 h2: 53.8583 H: 69.5826 S: 1184.60

Ending Bench Mark

11 - 10: 7.83 11 - u1: 12.24 i1: 1.9191 Istart: 1.7102
12 - r : 6.20 12 - u2: 12.39 i2: 1.5012 Sstart: 12.18

Final Computations

R(m) : 0.97854
H(m) : 0.33970
T(m) : 0.00000
SR(m): 12.18
SH(m): 1173.21

Figure 10-1

10.7.2 Final River Crossing Computations

The data computed in the river crossing program and the data from the .RPT file generated by the newrec program are used for the final river crossing computations. The highlighted values are obtained from the river crossing computations and the underlined values from the .RPT file.

FINAL RIVER CROSSING COMPUTATIONS

YR/MO/DAY ZONE UNITS STADIA
 91 07 08 R MT KM

CODE EQUIPMENT SERIAL NUMBER
 233 456603

FROM DESIGNATION TO DESIGNATION
 0001 TBM EAST 0002 TBM WEST

SERIES A

R = + 0.97854 MT (mean rod intercept - held on BM A) Sr = + 12.18 MT
 H = - 0.33970 MT (mean target intercept) Sh = + 1173.21 MT
 T = - 0.0 MT (dh from height stud to lower target)
L = - 1.01652 MT (mean dh from BM B to height stud) S1 = + 13.0 MT
 dh= - 1.30467 MT Sa = + 1430.57 KM

SERIES B

L = + 0.25860 MT (mean dh from BM A to height stud) S1 = + 24.0 MT
 T = + 0.0 MT (dh from height stud to lower target)
 H = + 0.30370 MT (mean target intercept) Sh = + 1413.52 MT
 R = - 1.53636 MT (mean rod intercept - held on BM B) Sr = + 17.46 MT
 dh= - 0.97406 MT Sb = + 1454.98 KM

SET-UPS = 3

S(a to b) = 1/2[Sa + Sb] = 1.443 KM

dh(a to b) = 1/2[dha + dhb] = -1.13937 MT

The following is an example of the .RPT file from which the values L, S1 and the benchmark and designation are obtained. These values are underlined. L and S1 are the means of three .RPT files.

LEVELING OBSERVATIONS FOR *AA* HG -1 PAGE 2

***** BEGINNING BENCH MARK INFORMATION *****

BENCH MARK SPSN DESIGNATION	OBSERVER INIT H.I.	AIR TEMP.	WIND CODE	SUN CODE	DATE (YYMMDD)	TIME (HHMM)
<u>0001 TBM EAST</u>	SEB 1.57	65.0	1	0	910708	0954

***** SECTION RUNNING INFORMATION *****

SET UP NO.	STADIA	ROD UNITS LEFT BACKSIGHT FORESIGHT	RIGHT HI	MM DDH	METER SSD	SDHM	TEMPERATURES (F) TOP MIDDLE	BOTTOM DT	ERROR CODES
1	40.0 12.0	52.30 0.61	644.77 614.07	1	-0.05 <u>24.0</u>	0.0 <u>0.25848</u>	63.9	63.9	0.0

Appendix A - File Labeling Conventions

A. File Labeling Conventions

Every file on the IBM PC is named according to predefined conventions set up by the software manufacturers or NGS procedure. The name of a file is constructed of three parts, drive, file name and file type and has the following format:

"drive": "file name". "file type"

The "drive" is a one character designator indicating the disk drive on which the file resides. For all the files processed by the vertical control programs drive "C" is the hard disk drive and drives "A" and "B" are floppy disk drives.

The "file name" can be 1 to 8 characters in length and may consist of any combination of letters or digits. Other "special" characters may be used but should be avoided. A file name is strictly up to the user but certain conventions should be followed in order to make each file name unique and recognizable to everyone that will use the file.

The "file type" consists of 1 to 3 letters or digits and, with special characters allowed but, again, not recommended. The file type should identify the general category of the data in the file. The file type is also arbitrary but, for the sake of consistency it should conform to NGS and industry conventions to make it meaningful to all users.

With these conventions in mind the data files for a level line should be labeled according to the preassigned line and part number in the project instructions and the file type should clearly identify the file contents.

NGS Labeling Conventions

- .ABS - field abstract listing, output from ABSTRA.
- .CAL - ASCII format detail calibration file, input to RODCAL to create a ".ROD" file.
- .ERR - error message output file from a program, e.g., NEWREC.ERR
- .HA - binary format description file, output from VERTDESC and input to ABSTRA & CHKDES.
- .HGF - binary format "cleaned up" observation data, output of VERREC, input to NEWREC.
- .HGZ - binary format field observation output from NEWREC and input to ABSTRA.
- .LST - an ASCII listing file.
- .ROD - binary format detailed calibration file, input to NEWREC and EDITOR.
- .STT - control point description statistical listing file, output of DESC.
- .RPT - "field book" report listing file, output from NEWREC.

Industry Labeling Conventions

- .\$\$\$ - temporary file.
- .BAK - backup file.
- .BK! - backup file.
- .BAS - BASIC source code file.
- .BAT - DOS command batch file.
- .COM - executable file.
- .DAT - general data file.
- .DOC - document file.
- .EXE - executable file (relocatable), all VFPROC program files are of this type.

B.1 Introduction

The geodetic leveling program, VERREC, is designed to run on an IBM PC compatible microcomputer. The National Geodetic Survey has chosen small, hand-held PCs for its field parties but they are not required equipment. If one of these hand-held units is not being used then the remainder of this chapter can be skipped.

B.2 Terminal Layout

The front of the Corvallis Microtechnology MC-V data terminal (Figure 1.1) has two focal points, the liquid crystal display (LCD) and the lower alphanumeric key pad. The terminal display consists of eight, 21-character lines of liquid crystal display (LCD). All prompts and the data responses appear on the display.

The keys on the key pad are self explanatory and are grouped according to their function. The blue keys at the top are function keys which correspond to menu choices that will appear at the bottom of the screen. The brown keys are for the standard alphabetic and punctuation characters. The grey keys at the bottom are for numeric characters. To the left of the numeric keys is a column of arrow keys that move the cursor between rows and columns on the screen.

Of particular interest are the yellow and white shift keys located at either end of the middle row of keys. When the white (SH1) key is pressed the alphabetic keys will be in upper case mode. When the yellow (SH2) key is pressed the keys will generate the characters shown above them in yellow. Take some time to get familiar with the layout of the key pad.

Cursor motion is controlled by the four blue keys along the lower left edge of the keyboard. To move the cursor up or down one line, or left or right one column, use the blue arrow keys. To move the cursor up or down one screen (7 lines) at a time, used the "yellow shifted" arrow keys labeled **PgUp** and **PgDn** respectively. To go to the top of a display form, press the yellow shifted **Home** key. To go to the bottom of the form use the yellow shifted **End** key.

The terminal is powered by a set of nickel-cadmium batteries located inside the back panel. These batteries can be recharged by plugging in the charging unit at the top of the recording unit. For more information about the recharging procedures refer to the operator's manual.

The top of the terminal is where all external connections are made, Figure 1.2. Of particular interest are the two communications ports are labeled COM1 and COM2. For a more detailed description of the components located at the top of the unit refer to the operator's manual.

B.3 Power Control and Battery Charging

The ON/OFF key is located at the upper right of the terminal front panel. To turn the terminal off press the yellow shift button and then the ON button. The terminal also has a "time-out" feature that will turn off the display automatically after 10 minutes of inactivity. Press the ON button to return to the point in the program where you left off.

With normal use the four nickel-cadmium batteries in the unit will provide enough power for 8 hours of normal operation. An auxiliary battery pack may or may not be supplied with the unit. It should be a standard practice of the level crew to recharge the batteries nightly.

The terminal does provide a "low-battery" warning and will signal this condition with a cascading beep from a high to a low pitch. After sounding the warning the unit will shut off automatically and must be recharged before it will become operational.

Appendix C - The Instrument Information File

C.1 Introduction

Before the programs PREPROC, NEWREC and EDITOR can be run, a file containing information about the leveling instruments used in the observations must be created. This file must be named "INST.DAT" and reside in the directory identified by the VERTPGM environment variable, usually C:\VERTPGM.

C.2 INST.DAT File Format

The format of the INST.DAT file must conform to the "*20*" record format listed in "Input Formats and Specifications of the National Geodetic Survey Data Base, Volume II".

<u>Columns</u>	<u>Content</u>	<u>Example</u>
1 - 6	Sequence Number	000000
7 - 10	Data Code	*20*
11 - 13	Survey Equipment Code	233
14 - 21	Inst. Serial Number	456789
22 - 37	Manufacturer	ZEISS/JENA
38 - 49	Model or Type	NI002
50 - 69	Agency (owner)	NGS
70 - 71	blank	
72 - 77	Date Stadia Factor Was Determined	900531
78 - 80	Stadia Factor	100

This file can be created or new entries added using any text editor. The number of entries in the file is not limited but the programs will only recognize the first 30 instrument records.

Appendix D - Raw Observation File Record Formats

D.1 Introduction

The raw observation (.HGF) files are a binary format and cannot be viewed with a text editor or listed to the screen. However, the sequential listing files generated by the READFILE program can be viewed and listed. The records in these files have fixed formats as described in the following sections.

D.2 E3 (Equipment) Record Format

<u>Column</u>	<u>Contents</u>
1- 6	Sequence Number
7- 8	Record Identifier, E3
9- 11	Instrument Code
12- 19	Instrument Serial Number
20- 22	Instrument Stadia Constant
23	Instrument Stadia Factor (H or F)
24- 26	Rod 1 Code
27- 34	Rod 1 Serial Number
35- 40	Rod 1 Offset Constant
41- 43	Rod 2 Code
44- 51	Rod 2 Serial Number
52- 57	Rod 2 Offset Constant
58- 59	Rod Units
60- 63	Top Tripod Probe Height
64- 67	Bottom Tripod Probe Height
68- 71	Top Truck Probe Height
72- 75	Middle Truck Probe Height
76- 79	Bottom Truck Probe Height
80	Temperature Scale Code (F or C)
81	Time Zone Code (A - Z)
82- 85	Time (HHMM)
86- 91	Date (YYMMDD)
92- 94	Observer 1 Initials
95- 98	Observer 1 Conventional Instrument Height
99-102	Observer 1 Truck Instrument Height
103-105	Observer 2 Initials
106-109	Observer 2 Conventional Instrument Height
110-113	Observer 2 Truck Instrument Height
114-116	Observer 3 Initials
117-120	Observer 3 Conventional Instrument Height
121-124	Observer 3 Truck Instrument Height
125-127	Observer 4 Initials
128-131	Observer 4 Conventional Instrument Height
132-135	Observer 4 Truck Instrument Height

Appendix D - Raw Observation File Record Formats

D.3 C4 and C5 (Collimation) Record Format

Column	Contents
1- 6	Sequence Number
7- 8	Record Identifier, C4
9- 11	Instrument Code
12- 19	Instrument Serial Number
20- 23	Time (HHMM)
24- 29	Date (YYMMDD)
30- 34	Backsight Stadia Reading, Inside Setup
35- 40	Backsight Low-scale Rod Reading, Inside Setup
41- 47	Backsight High-scale Rod Reading, Inside Setup
48- 52	Foresight Stadia Reading, Inside Setup
53- 58	Foresight Low-scale Rod Reading, Inside Setup
59- 65	Foresight High-scale Rod Reading, Inside Setup
66- 70	Stadia Imbalance
71- 79	Elevation Difference (mm)
80- 85	Collimation Error
86- 90	Backsight Stadia Reading, Outside Setup 1
91- 96	Backsight Low-scale Rod Reading, Outside Setup 1
97-103	Backsight High-scale Rod Reading, Outside Setup 1
104-108	Foresight Stadia Reading, Outside Setup 1
109-114	Foresight Low-scale Rod Reading, Outside Setup 1
115-121	Foresight High-scale Rod Reading, Outside Setup 1
122-126	Stadia Imbalance
127-135	Elevation Difference (mm)
136-141	Collimation Error
142-146	Backsight Stadia Reading, Outside Setup 2
147-152	Backsight Low-scale Rod Reading, Outside Setup 2
153-159	Backsight High-scale Rod Reading, Outside Setup 2
160-164	Foresight Stadia Reading, Outside Setup 2
165-170	Foresight Low-scale Rod Reading, Outside Setup 2
171-177	Foresight High-scale Rod Reading, Outside Setup 2
178-182	Stadia Imbalance
183-191	Elevation Difference (mm)
192-197	Collimation Error

Appendix D - Raw Observation File Record Formats

D.4 B4 (Bench Mark) Record Format

<u>Column</u>	<u>Contents</u>
1- 6	Sequence Number
7- 8	Record Identifier, B4
9- 11	Observer's Initials
12- 14	Recorder's Initials
15- 18	Starting Bench Mark Serial Number
19- 43	Starting Bench Mark Designation
44- 48	Starting Temperature
49	Starting Wind Code
50	Starting Sun Code
51- 54	Starting Time
55- 60	Date
61	Number of Rod on Mark
62- 65	Ending Bench Mark Serial Number
66- 90	Ending Bench Mark Designation
91- 95	Ending Temperature
96	Ending Wind Code
97	Ending Sun Code
98-101	Ending Time
102-104	Number of Setups
105-109	Accumulated Stadia Imbalance
110-115	Section Stadia Distance
116-125	Section Elevation Difference
126	Height of Instrument/Probe Set Used for Section

D.5 S2 (Setup) Record Format

<u>Column</u>	<u>Contents</u>
1- 6	Sequence Number
7- 8	Record Identifier, S2
9- 11	Setup Number
12	Blank
13- 17	Backsight Stadia Reading
18	Blank
19- 24	Backsight Low-scale Rod Reading
25	Blank
26- 32	Backsight High-scale Rod Reading
33	Blank
34- 38	Foresight Stadia Reading
39	Blank
40- 45	Foresight Low-scale Rod Reading
46	Blank
47- 53	Foresight High-scale Rod Reading
54- 58	Top Temperature Reading
59- 63	Middle Temperature Reading
64- 68	Bottom Temperature Reading
69	Instrument/Probe-set Code (1 or 2)