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GEOF

A COMPUTER PROGRAM TO TRANSLATE ORGANIZED ASCII COMPUTER GEOLOGICAL FIELDNOTES TO DATABASE READABLE STRUCTURE

GEOF (Geological Editor Of Fieldnotes)

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ABSTRACT

GEOF 's (Geological Editor Of Fieldnotes) IBM compatible computer programs provide the framework for an electronic notebook for field scientists, particularly geologists. The programs recognize ASCII text organized in a particular way, and can convert the scientific data in the text into a database format. The text is organized in a simple way by position and with tags. The structure of the text mimics the input in a handwritten field notebook, and can accommodate most types of field geological data. Field notes can be typed into any computer with an ASCII text editor or note pad, and that can transfer its files to an IBM compatible computer. Several inexpensive handheld computers on the present day market have the processing capability, long battery life, and light weight for the job. Data from the notes can be used on a computer on the same day that it is collected, and can be imported into nearly any database manager. For example the data could be imported into a GIS (Geographic Information System), searched and viewed on maps the evening it was collected.

PRESENTATION FORMAT

This paper is divided into two parts; 1) a description of the GEOF system of taking geological field notes and 2) a manual of how to use the GEOF system. To accommodate different uses of this paper, some of the ideas and information are repeated in different ways throughout the sections. The manual is divided into three chapters; 1) how to input the field notes, 2) how to translate them to comma-delimited data files using the GEOF Input Facility, and 3) a description of each of the executables and batch programs of GEOF.

PART 1
THE GEOF SYSTEM

INTRODUCTION

Getting data into computer digital form has become an ever increasing priority in the earth sciences; particularly now that many powerful programs can run on fast and portable computers. These programs include database managers, geographic spatial analysis, cartography, drafting, and graphics. In the early years of computers, scientists recognized the advantage of having machine measurements

collected directly by computers. Today we recognize the further advantage of human observations and measurements collected directly by the computer.

Creating computer data files has in most situations been an onerous, resource intensive task. It generally consisted of keying in the data from handwritten notes. Science would progress faster with elimination of the duplicated effort of first handwriting the data and then re-entering it in a computer. The GEOF system of data entry and organization provides one way to directly enter geological field data into a computer at the observation site.

GEOF was designed to assist in the digital input of geological data, it can also be used for the input of other observational data. For example, it could be used to describe plots of trees in the forest industry.

WHAT THE GEOF SYSTEM CAN AND CANNOT DO.

The GEOF system provides a method of taking geological (and other scientific) notes, and preparing them for importation to a database manager. The GEOF system can translate data in a text editor to data that is tagged in a simple database structure. GEOF will further manipulate that tagged data into comma-delimited ASCII files. Although GEOF can organize the data into various formats, it cannot do other common database management functions, such as query or report writing. GEOF is meant to prepare the data for importation into a database manager.

THE GEOF NOTE STRUCTURE

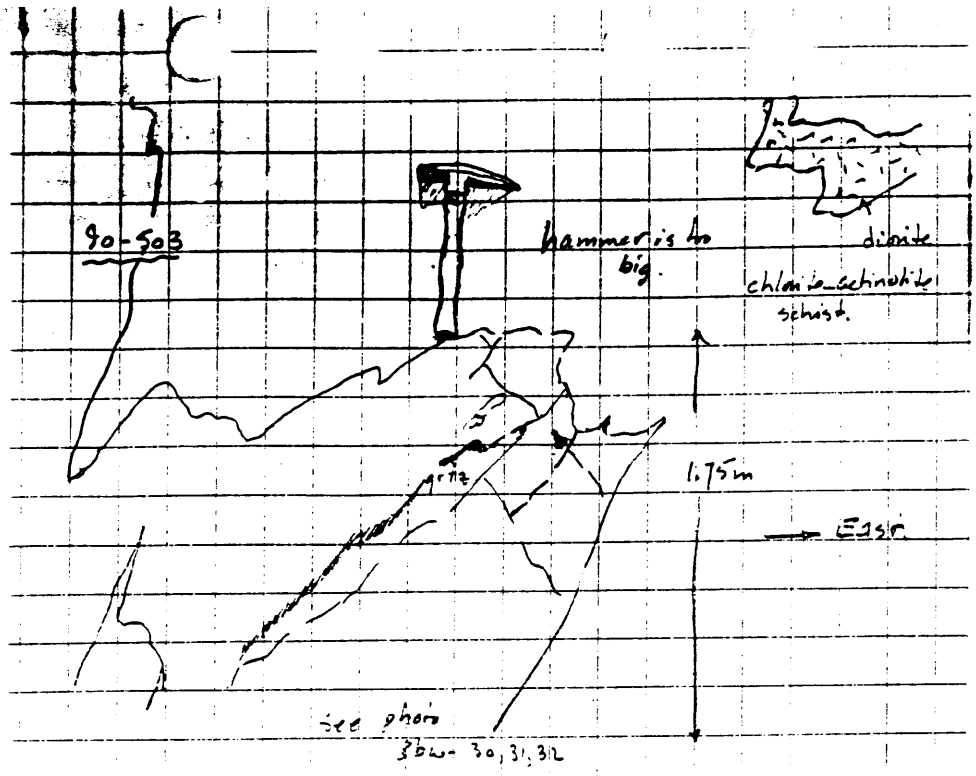
Rationale

GEOF notes were designed to mimic the organization of notes in a handwritten field notebook (Fig. 1). This design was meant to maximize the similarity between taking notes on paper and taking them in a digital notebook. The design reduced the training needed to use the system and reduced the impact of the transition to the electronic notebook. It made the notes immediately readable and useable, and paper copy could be made with a minimum of effort. The note structure is simple, intuitive and natural, and leads to a fluid input of information: important in any scientific observation.

Advantages

GEOF notes can be input on a computer with minimal memory, power, weight, and space requirements. These types of computers are inexpensive, light to carry, have relatively long battery life and take up little space in a pack sack.

GEOF translates data in the notes efficiently into almost any order. It checks your format for you and restricts data manipulation to those files that have data in the proper format. This ensures that all the data enters the database. GEOF gives some freedom to choose tags within the notes and to choose the note structure.




```
90-503
:   E473580
    N6110675
    1470
    !to here have flattemed diorite and
    actinolite_schist;
    o/c
    !sos;
    #
    quartzite
    white, llte_grey;
    -qtz mm0.3-0.5;
    ..
    BEDG cm40-80;
    !thickness of the quartzite bed.  The
    schist (metatuff?) is thicker on either
    side, and is intruded by diorite!;
    ..
    @90-503 quartzite;
    F1 340/09;
    S1 162/50w;
    diag;
    PIC 8bw-30,31,32 !of anticline of
    quartzite and schist.  Looking to the
    northwest with hammer at the top; pick
    point to the east.;
```

Figure 1. These notes are from L. Struik's field records of the Pine Pass mapping project. They show an ink-jet printout of the ASCII notes from the traverse computer, and the diagram made at the same station as the written notes.

It is completely flexible as to the amount of data it accepts at any station. Observations can be made on unlimited (except for computer memory) rocks, minerals, fossils, sedimentological characteristics, pictures, samples and structural measurements. Much of the data is interlinked in more ways than just to the station number. For instance minerals in the rock descriptions are linked to the rock name, structural measurements and their comments can be related to the rock types that were measured, and inclusions or clasts can be related to their host rock. Structural measurements can be keyed to graphical CAD symbol names in various ways, including addition of the symbol name to the notes.

GEOF, in combination with graphical database software, can give the scientist electronic access to their data in the field. The electronic notebook database can be queried and the information displayed in map form on the computer screen and on printouts while the data collection progresses.
This ability to query data collected presently by yourself and your assistants, and collected previously on the project can direct the research in progress, and assist in the present and continued interpretation of the data.

THE GEOF PROGRAMS

GEOF consists of a series of programs that take the data in the ASCII files of field notes and translates them into a format that can be read by a database manager. It does the translation in 3 steps; 1) checks the data format and translates the data into a column of field-tagged data, 2) generates a list of the unique field tags needed to catalogue the data, and 3) generates comma-delimited files from subsets of the tagged data, according to subsets of the field-tag lists (Fig. 2).

Checking and Translation

GEOF checks the structure of the field notes interactively with the scientist. The data is translated into a field-tag format only when the data fits the prescribed note format, which insures the incorporation of all the data into the database. The interactive check of the note structure works with an ASCII text editor (GED) built into the program. The notes appear in the editor marked at spots where the format deviates from that expected by GEOF. Changes can be made at the same time and the file searched for further format deviations. When the note structure is correct, the notes are automatically translated into the field-tag database format.

Field-Tag Listing

From the field tag database format GEOF generates a listing of all the unique field tags. GEOF uses the field-tag list to generate dBASE IV .DBF file structure for input of the data into dBASE, and to control the generation of comma-delimited files of the data.

Making Comma-Delimited Files

Subfiles of the field tags are used to make comma-delimited files that contain only the data of the same fields, and in the order in which the field tags appear in the subfile. In this way the comma-delimited data files can be made to match an existing database structure. It does not matter in which order the data was entered or collated, it can be ordered in any way, and therefore can be imported into any standardized database structure. It is the generation of these comma-delimited data files of field notes and their importation into a database manager, preferably into a GIS, that is the goal of the GEOF system.

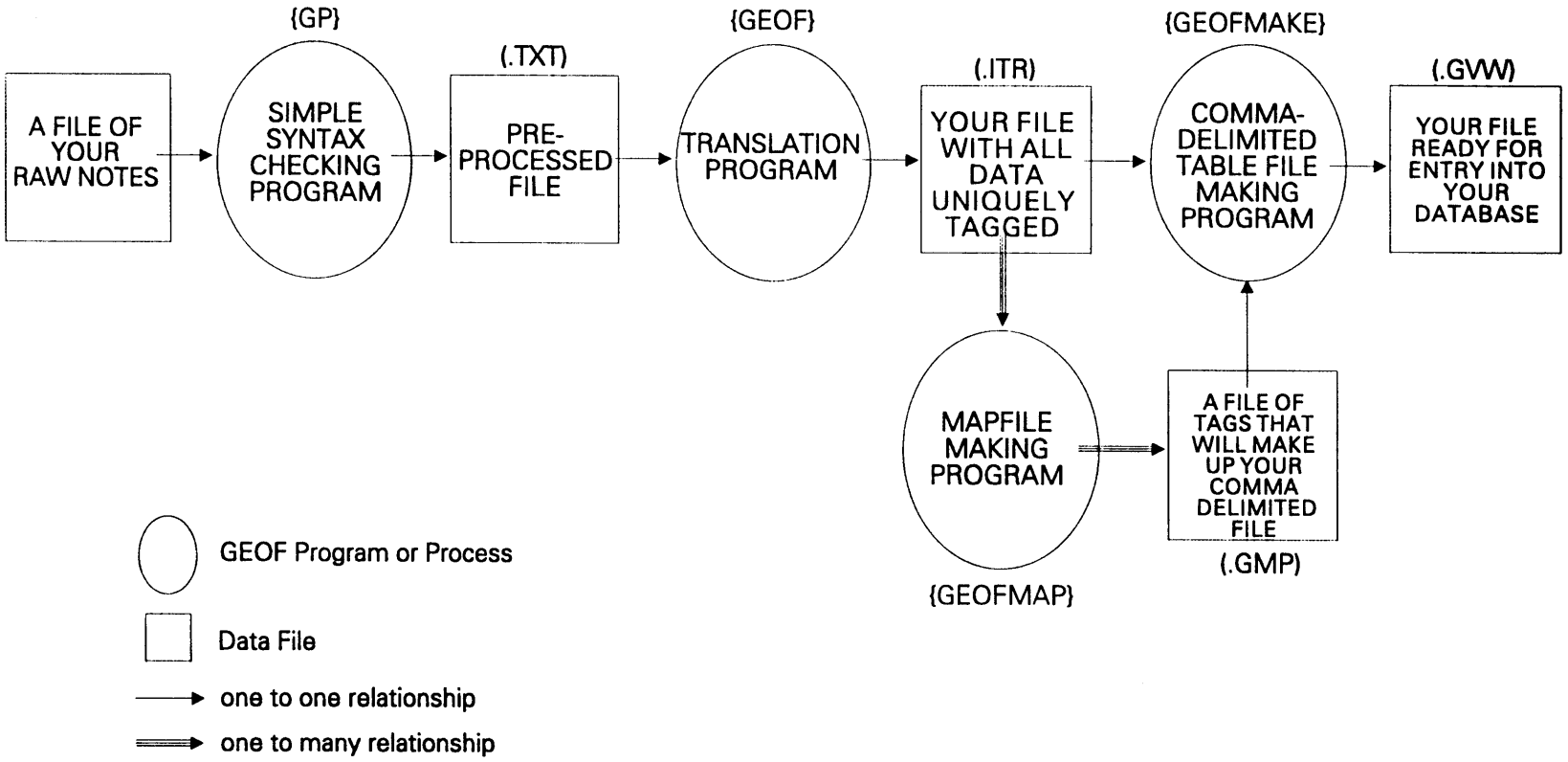


Figure 2. This flow-diagram shows the steps in the GEOF system of translating the field notes to comma-delimited files of data.

PART 2
THE GEOF MANUAL

WHAT THE PROGRAM DOES

It takes scientific notes, written on a computer in an organized and tagged preset ASCII format and compiles them into formatted comma-delimited ASCII files. The data in those files can then be imported into a database manager that could be part of a Geographic Information System (GIS).

HOW IT WORKS

Field notes are recorded on a computer text editor in ASCII format at the examination site. The note files are transferred, if necessary, to a computer with enough memory to run GEOF, a computer program to read and compile the notes.

GEOF understands the data in the field notes because the data entries appear in prescribed locations in the files or are tagged. The use of tags permits unlimited entry of observations on different materials.

GEOF preforms 3 functions; 1) it checks that the files conform to the prescribed format and generates a list of all the data, tagged according to its position or tag in the note file, 2) generates a list of all the tags required to catalogue the data, and 3) uses the contents and order of a tag-list file to generate a comma-delimited file with any of the data, in any order wanted.

Because GEOF can control the data and its order in the comma-delimited file, it has the power to generate comma-delimited data files that fit the file and field structure of any database. The data in the comma-delimited files can be imported into any database. Therefore your field data can be in a GIS system the same day you collect it, without rekeying after data collection.

THE TOOLS

Hardware:

1) A palmtop or laptop computer with an ASCII editor and memory backup system, to carry in the field and write notes at the outcrop.
2) An interface system to transfer the files from the palmtop or equivalent to an IBM compatible computer.
3) IBM XT, or greater, compatible computer (laptop or otherwise).
4) Portable parallel printer.
5) Power supplies for all the equipment.

Software:

1) ASCII editor for the field computer.
2) Transfer program to move notes from the field to camp computers.
3) GEOF programs.

WHAT TO KNOW

To Take the Notes

To take the field notes you need to know how to use:
1) the ASCII editor and file transfer routines on your field computer, and
2) the file manipulation routines on your camp computer, and you need to know:
3) the order of the mandatory 5 items at file beginning ,
4) the order of some of the data, and
5) the 11 tags to organize the descriptive data.

To Make Comma Delimited Data Files

To make comma-delimited data files from the field notes you need to know:
6) how to run the GEOF programs.

WHAT THIS MANUAL COVERS

This manual covers steps 3, 4, 5 and 6 listed in the section on "what to know". To use these programs you will first have to know 3, 4 and 5 . If you dislike manuals, but have made it this far, look over the annotated example notes in Table 2, load GEOF, following the instructions of the install program run on the A: drive, and try it with the tutorial in Chapter 2 using the supplied demonstration files. Then use the example notes to take your own geological notes. After you have accumulated a few stations run them through GEOF to get an idea of what you are doing right and wrong. After 2 or 3 days of geological work you will be correctly using most of the note format. Use the GEOF translate program often in the beginning to let it help you become familiar with the format. Before you generate comma-delimited files you should carefully read the appropriate notes in Chapter 2.

CHAPTER 1
HOW TO TAKE THE FIELD NOTES

Field notes are typed directly into an ASCII editor on a computer at the point of observation. For our development work we used a handheld DOS compatible computer with a detachable communications port because it was light (.5kg), and had a long battery life (approximately 2 weeks) (Atari Portfolio) (Fig. 3). The field notes were downloaded at base camp from the handheld computer to a laptop computer that could run the GEOF program and a GIS system.

The field notes must be organized in a way GEOF can understand them, and this is done by placing some of the data in a standard order and by tagging the rest. For instance the order of the first 5 lines of data must consist of 1) the station number, 2) the easting, 3) the northing, 4) the elevation and 5) the material code.

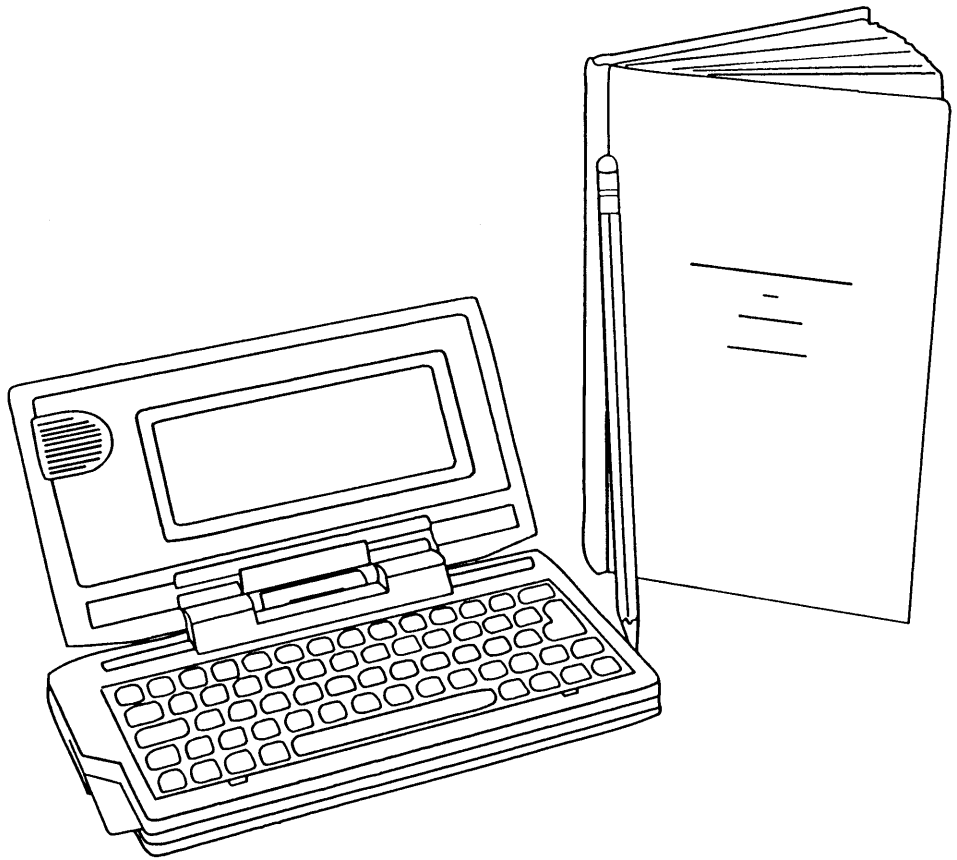


Figure 3. The traverse computer of the development work, an Atari Portfolio. The Atari Portfolio had 124KB of internal RAM and a 124KB RAM memory card, and ran a simple IBM-XT compatible DOS. It uses 3 AA alkaline batteries, which lasted from 1.5 to 2.5 weeks.

FILE ORGANIZATION

Collecting and Organizing Field Notes

During development of the GEOF system the field notes of one station stop were put into their own file, named with the station number, and with the extension .TXT. One file for one station avoided scrolling through many stations to find where you were, speeded up the computer's manipulation of the text files because the files were short, and made saving the files to a backup memory quicker. Single station files allowed later organization of the stations into any combination .

Careful consideration should be given to files names, especially in multiparty operations, where each observer must have unique file names. File names that can be easily manipulated in clumps with wild card characters will save time on the computer. GEOF assumes the note files will have the extension .TXT.

Your field computer should have the capacity to store the data files onto a backup memory system.

Combining the Notes

GEOF will work more efficiently for you on files with several stations in them, although it will work on single station files as well. The SOS function which copies data from one station to another only works when the two stations in question are in the same file.

Each station ends with an & to separate it from the next station. These &'s can be added by the computer, which can be used to automatically join several stations together into one file. Batch commands can be written to accomplish the file joining.

We made files of 10 stations each, from files with single stations, using a batch routine that added the required & at the end of each station, and then concatenated the stations. The batch file looked like this:

```
@echo off
for %%z in (90-%1.txt) do copy %%z+joiner.txt %%z
for %%z in (90-%1.txt) do type %%z >>90-%2.txt
del 90-%1.txt
```

where joiner.txt was a file of:

```
&
```

These files are in the GEOF\DOC directory as JOIN.BAT and JOINER.TXT. Note that this routine deletes the single station files. If you want to keep the single station files, remove the

```
del 90-%1.txt
```

line at the end of the batch file.

Storing the Notes

After writing the notes at a station stop, the notes should be saved to a memory backup. Files of a

single station can quickly use up storage space on pocket computers. To maximize memory storage, single station files can be combined into multistation files on the handheld computer.

At camp the files should be backed up onto several memory devices transfer the data from your field pocket computer to a laptop and from there to several floppy disks.

WRITING THE NOTES

The Language

The following two lists present the vocabulary of the GEOF system language. "Words" of the language can be thought of as tags that tag single items and that combine into one block several items of the data for GEOF. The first list is of fixed tags that GEOF recognizes, and which trigger other recognition subroutines. The second list is of tags used by L. Struik for geological structural attitude measurements during GEOF program development. Any mnemonic can be used for the structural measurements by using the correct placement of structural measurements and related comments. GEOF will create a series of sub-tags for the individual entries of the structural data with the users' preferred mnemonic.

Tags Used in the Field Notes

o/c, uncon, float, no/c, talus, erratic ...types of material observed
BEDG ..bedding descriptions
diag ..drawing exists
FOSSIL fossil descriptions
PIC ...picture record
SOS ...duplicates rock descriptions of last station to this one.
.....rock description
.. ..end of bedding, fossil, and rocks descriptions
- .....marker for minerals, fossils and bedding characteristics.
! .....comments
; .....end of string
_ .....joiner for multiple words in a single word category.
@ .....sample
& .....denotes end of station

These following tags were used by L. Struik for structural attitudes, but any number of other unique mnemonics could be used.

(structural attitudes, where n=1-9)
An .... axial surfaces
Bn ....boudin axes
DYKE ..dykes
Fn ....fold axes
FRn ...fractures
FTn ...faults
Jn ....joints
Ln ....lineations
SLKS ..slickensides

STRIA .glacial striations
Sn ....bedding (S0), cleavage, foliation, schistosity.
Vn ....veins

Semicolons

Semicolons are used to end optional strings. Semicolons are not needed after required strings.

Blank Spaces

Blank spaces are required to differentiate tags and words in expected strings. Tags must be separated from other characters by blanks, or the tags will not be recognized. In one case, after the letter tag of the UTM (Universal Transverse Mercator) coordinates, it is necessary to exclude a blank between the letter and the number. Line returns are interchangeable with blanks.

User-Defined Tags

Structural tags can be custom to the users needs. The programme will recognize the custom tag that appears before a standard structural attitude measurement, and will link the attitude to the tag. It is critical to consistently use the same tag for the same structure type, or else your measurements will become lost in the database. Similarly if you make a mistake in writing the tag, the program creates a new attitude category for that wrong tag. Unless you scan for all possible structural attitude tags, such a "wrong" tag will hide the measurement from that database.

Syntax of Numbers

Decimal numbers less than 1 need to be prefixed by a 0, so it looks like 0.5.

Multi-Word Entries

GEOF expects word data to consist of one word, except in comments. Where more than one word is needed such as in a modified colour or rock name, the words are made to appear as one word by linking them with an underline. For example:

green_grey

Remarks

Non-data remarks can be added to the data files. GEOF ignores remarks delimited with leading and following asterisks (* *). The remarks can be put in any of the files, and GEOF will ignore them. As such they do not become part of your database. Remarks in the data files are useful for data collection notes, and for narrowing down errors in syntax or semantics.

Station Elements

What is a Station

A station consists of all the data collected at an observation site in the field. It corresponds to stopping along your traverse to take notes and assigning those notes a position in space, generally a dot on a map with a number beside it. The data file therefore consists of, at the minimum, station

number, UTM coordinates (easting and northing), elevation in metres, and type of material observed. Optionally it contains descriptions of things, broken down into various subcategories and qualities, and contains records of tasks accomplished; such as photographs and samples taken.

Using Station Elements

Station elements are the entries in the station that are understood by GEOF. They include the GEOF language vocabulary - tags -, and the appearance of data in certain positions in the text of the station notes. The language vocabulary has already been listed. Here we describe the data that must occur in specific positions, and then the grammar of the GEOF language.

Position Dependent Entries

The first 5 non-comment data entries of the station must consist of 1) station number, 2) easting, 3) northing, 4) elevation, and 5) material code, and each of these is written in a specific way.

Station Number -The station number must look like this;

92-100 or N92-100

where N can be any letter of the alphabet. The letter is used to denote the stations of various other mappers. The 92 represents the year, and the 100 the 100th station stop of the season. The dash must be there between the year and the station number. The station number in this format is a text entry and would be treated as such in your database. To sort the station numbers in numerical order the number of digits for each number should be the same; for example 92-001, 92-002 ---> 92-999.

Easting and Northing - The easting and northing of the UTM coordinates must be proceeded with an E for easting and an N for northing, and look like this;

E550500
N6091800

The letters must be capital and be directly followed by the number.

Elevation -The elevation follows the Northing after a space or line return, and consists of a number. The number can represent the elevation in any units, and for 3-dimensional computer display should be in metres to match the UTM coordinates' units.

Material Code -The material code classifies the material described at the station stop. The material could be an outcrop (o/c), nearly outcrop (no/c), float (float), unconsolidated material (uncon), talus (talus), or erratic (erratic).

These five entries make up the basic station and need to be in each one, before GEOF will process it. All the other data entries are optional. Within the optional data entries the data is understood because it appears in certain places. For example GEOF understands that the word following the rock tag will always have the same database tag and in our case was the rock name.

Other Position Dependent Entries - Other position dependent entries include 1) rock name following blank or line return directly after rock tag, 2) rock colours, fresh and weathered, separated by a

comma, after a blank or line return after the rock name, 3) mineral name following tag, 4) mineral size then percent following mineral name, 5) sample number directly after the sample tag, and 6) sample name following the sample number, 7) strike or trend/dip or plunge after the structure tag followed directly with an optional dip direction letter (n,e,s,w), 8) optional word after the structural measurement, 9) range of bedding thickness after the bedding tag, 10) sedimentological characteristics and fossils have the same positioning format as minerals (3, 4 above), and 11) picture codes follow the tag with roll number, film type, dash, and frame numbers separated by commas. For the position of all the entries relative to tags and other entries, see Table 2.

Block Tagged Entries

GEOF looks for descriptions of things in blocks of entries and as singly tagged entries. Block entries are marked with a tag at the start and at the end, and contain other block and singly tagged entries. GEOF recognizes entries in blocks for 1) rock descriptions, 2) bedding characteristics, and 3) fossil lists and descriptions. The lead tag in each of these blocks is unique, and the end tag of a double period (..) is the same for all three blocks.

Bedding Block - Descriptions of sedimentary characteristics are made under the block with the lead tag -- BEDG -- and the end tag of a double period (..) (Table 2). The thickness range of the beds can be given on the same line as the BEDG tag and can be followed by a descriptive comment. Other entries include sedimentary features such as grading, crossbedding, flames, loads, flutes, scours, etc... Each of these features is preceded with a hyphen (-) and can be followed with an optional size range, percentage range and comment (Table 2). For descriptions of the size and percentage range entries see below and Table 2.

Fossil Block - Listing and description of fossils are done in a block with the lead tag -- FOSSIL -- and end tag of a double period (..) (Table 2). Each fossil name is preceded with a hyphen (-) and can be followed with optional size range, percentage range and comment. For descriptions of the size and percentage range entries see below and Table 2. As many fossils as computer memory will allow can be listed within the block.

Rock Block - Descriptions of rocks are made under the block with the lead tag -- # -- and the end tag of a double period (..) (Table 2). The first two lines of the block must contain the rock name and colour, in that order. The rock name must be a single word or several words joined with an underline. Two colours are permitted, one for fresh and the other for weathered. The two colours are separated by a comma and a space and are ended with a semicolon. One colour could be given and GEOF will add the same colour to the fresh and weathered column of the database. Following the mandatory rock name and colour are optional comments and mineral descriptions. Each mineral name is preceded with a hyphen (-) and can be followed with optional size range, percentage range and comment. As many minerals as computer memory will allow can be listed.

GEOF accepts rock blocks within rock blocks. This permits the description of rocks within rocks, such as in the cases of a conglomerate or xenolithic igneous rock (Table 2). Your database, that will eventually contain your field data, should be designed to accept the imbedded rock descriptions.

Structural attitudes of a rock type can be added to the block, and they will be tagged by GEOF such that the structural attitude can be related to the rock type. For a description of structural attitude entries see below and Table 2.

Singly Tagged Entries

Singly tagged entries appear on their own or in a sequence of optional entries that are related to each other by position. In some situations the entry has a lead tag and an end tag, and in other situations it has only a lead tag. The tag can be directly adjacent to the entry or be separated by a space.

Comments - Comments have a lead tag of **!** and an end tag of **;** . Any set of characters of any length can go between the two tags. When GEOF reads the exclamation mark it records everything until it reads a semicolon. Some databases have restrictions on field width and your comments should be written to that database field width. GEOF will take several comments for the same entry. The position of the comment in the station will determine to which entry the comment will be linked. For example, a comment that follows a mineral name will be tagged with a mineral characteristic to link it to the mineral and distinguish it from a comment that followed the material code (Table 2).

Drawings - Drawings and sketches are tagged with **diag** , which stands alone (Table 2). GEOF attaches the word TRUE to the data field if it finds the tag **diag** in the station description.

Minerals, Fossils, and Sedimentary Features - Each of these entries are preceded with the tag **-** (Table 2). The size range, percentage range and comment can follow these terms to modify them. They follow the general form:

-entry mm1-2 %10-20 !comment string;

The size can be given in cm and GEOF will convert it to mm. For both the size and percent, a single value could be given and GEOF will enter the same value in the minimum and maximum columns. The size, percent and comment are optional, although the phrase must end in a semicolon, either the one of the comment or another (Table 2).

Percentages - For a description of how and where to enter a percentage, see the section above on Minerals, Fossils and Sedimentary Features or see Table 2.

Photographs - Photographic frames are catalogued with a phrase that starts with the tag **PIC**. After reading the tag, GEOF anticipates a series of characters that denote the roll number, film type, and frame numbers, and looks for a comment describing the contents of the photographs (Table 2). For example:

PIC 1bw-3,4,5 !of pencil on sheared granite. Looking down with pencil pointing east;

Same Old Stuff - To repeat all the rock descriptions of the last station GEOF looks for the tag **SOS** standing alone (Table 2). It calls upon GEOF to duplicate the rock description of the last station into the database for the present station. For SOS to work the two stations must be in the same file. Another way to accomplish the same goal as using SOS is to copy the relevant data from the last station using the text editor on the computer.

Samples - Phrases that describe a sample are lead with a tag of @ and end in a comment about why the sample was taken (Table 2). The phrase takes the following form:

@N92-105 granite !for strontium isotopic analysis and point counting;

GEOF reads the sample number in two parts; the N92 is placed in one field and the 105 in another field.

Sizes - For a description of how and where to enter a size, see the section above on Minerals, Fossils

and Sedimentary Features or see Table 2.

Station Format

In Table 2, we present the format of the data and tags as an annotated sample of an ASCII file of an incredible station with all its tags and variables in the necessary format. The order of the first five lines is fixed.

TABLE 2 STATION FORMAT EXAMPLE

90-001	Station number. Can be preceded by a letter. Number of digits is unconstrained, however the dash must be there.
E499800	Easting (UTM). Must be preceded by the upper case E.
N6101900	Northing (UTM). Must be preceded by the capital N.
1200	Elevation. Can be in any units.
o/c !small area exposed in 10m cliff;	Type of material. o/c = outcrop. Others accepted; no/c = nearly outcrop, float, erratic, uncon = unconsolidated, talus. Material code is here followed by a optional comment about the material. Comments begin with an exclamation mark as a tag and end with a semicolon (see the section on "Characteristics of the Note Structure" for the implications of where a comment is placed).
SOS	Tag that duplicates all the rock descriptions of the previous station in this file when the .itr file is created (.itr files explained under operation of GEOF). This tag works only if the previous station is in the same file as this one with the SOS.
#	Tag for optional rock description.
limestone	Rock name. Must follow tag.
grey, light_grey;	Fresh colour, weathered colour (your choice as to order). If the second colour name is left out the two colours are assumed to be the same and it is duplicated into the second variable position. The underline joins words into single words for computer recognition.
-calcite mm0.05-1 %95-100 !milky to clear crystals, some with impurities;	Optional mineral description in the rock tagged with a preceding dash and followed by its size and % range, if known. Units and % symbol precede the value. Any other characteristics of the mineral can follow immediately on that line with an optional comment. The line must end in a semicolon to end the mineral field, the semicolon of the optional comment will do.
!some breccia;	Optional comment about the rock or anything else that doesn't fit in one of the defined categories is tagged with a preceding ! and ends with a .
..	Two periods end the rock description, and

other descriptions that have groups of items.

```
#
vein
white, white;
!mm3-10 wide;
-calcite mm5-20;
..
#
lamprophyre
dark, dark;
!dyke cm50 wide;
..
#
conglomerate
```

Veins are described as rocks.

Here is a conglomerate description which consists of nested rock descriptions for the clasts. Each clast's description starts with a # .

```
grey, grey;
-clasts cm0.4-2 %30 !matrix supported.
subrounded, oblate.;
#chert
lite_grey, lite_grey; !laminated;
..

#qtz
smoky, smoky;
..
!clasts form lenses in finer
matrix.;
..
S0 100/40s upright;
```

This is the first clast of the conglomerate.

This double period ends the first clast description.

This is the second clast of the conglomerate.

A comment on the conglomerate.

End of the conglomerate description.

Bedding. The S0 could be replaced with a tag of your choice as can any of the structural measurement tags. This style of notation uses dip direction. Right hand rule is also taken, because the program ignores the missing letter. A one word descriptor can follow the attitude (for FIELDLOG this could be the structure symbol name). Comments can follow the structural measurement, before the ;. ALL THE STRUCTURES CAN BE PLACED INSIDE THE ROCK DESCRIPTION TO RELATE THE STRUCTURE TO THE ROCK TYPE. Placed HERE THE STRUCTURES ARE RELATED ONLY TO THE LOCATION.

```
S0 100/45s upright;
S1 110/50s;
S2 100/20n crenulation !spaced
mm1-2;
```

First cleavage, foliation, schistosity.

Subsequent cleavages follow in numeric order. Optional word descriptor used as a search variable or CAD shape symbol comes before

	the comment.
L1 290/05 stretch;	Lineation measurement follows same scheme as S surfaces.
F1 290/05 open !asymmetric to the west, see diagram;	Fold axes numbered in chronological order with comments like those of other structural measurements.
B1 010/20;	Boudin axis.
FT 190/40w extension;	Fault.
SLKS 190/00 sinistral;	Slickenside.
J1 040/40e	Joints.
DYKE 100/89s lamprophyre;	Dyke orientation.
BEDG cm0.5-30 !irregular;	Descriptions under the general tag BEDG are for all bedding characteristics. Tag is followed by bedding thickness range and general comment. Description ends in double period.
-graded;	Bedding features are treated like minerals under the rock description.
-xbed_trough cm5 !height;	
-flames;	
-loads !even and regular;	
..	
@90-001 limestone !for conodonts;	Sample numbers are prefixed with @ and are followed by the rock type, and a comment on why the sample was taken. The sample number can be preceded by a letter.
@90-001a lamprophyre !for chem;	Sample numbers may have a suffix letter for multiple samples at one station.
FOSSIL	Tag for fossils.
-Archaeocyathid mm10-20 %2 !poorly preserved and mostly dolomitized;	Fossil names and characteristics written like the mineral description under the rock tag.
-trilobite cm5 %3 !broken hash;	
..	Fossil description ends in double period.
PIC 1bw-4,5,6 !of the archaeocyathids;	A photograph is tagged with PIC, then the roll number, the type (either black and white -bw-, or colour -c-) then a dash followed by the frame numbers separated by commas. A standard comment for the description of the items photographed.
diag;	Tag noting that a drawing was made at this station.
&	Tag that ends the station and must be at the end of each station.

You can string the entries instead of making them separate lines as done here. The line return can be replaced with a blank. To make the printed notes more legible, we have used this separate line structure.

Characteristics of the Note Structure

GEOF catalogues data from the field notes without recognizing the words, and establishes relations between some of the variables.

Recognition - Geof extracts the words from the notes and uniquely tags them, but does not recognize the words. Because the variables themselves are not understood by the GEOF compiler, the note structure can be adapted to other types of scientific notes. For example: the size range of the minerals could be substituted with the metreage along a drill core. The meaning of the variables is assigned by the database fields into which the variables are imported.

Relationality - Data in the GEOF field notes can be made relational in two ways: 1) the position of the data in the field notes, and 2) the organization of the database files. GEOF tags strings of data in specific places so that the tags have common elements. For instance a comment following a material code will be tagged with the material code's tag prefix to distinguish that comment from other comments about a rock, mineral, fossil or structure. Each of those comments will be tagged with the appropriate tag prefix. In this way the comments are linked to their descriptor, and become searchable variables that can be used for a database query.

Presently all of the data is or can be linked to the station number, location, elevation and material code. Unlinked items generally include all those that can have more than one entry, for example: rocks are not linked to pictures. However, rocks can be linked to structural attitudes. By placing the structural measurement within the rock description then the rock name and measurement are linked.

Tags that have prefix links are shown in the list of tags generated from GEOF from many of the unique variables used in the mapping project of the development work (Table 3). This list does not contain a tag for a structural measurement within a rock description. Each GEOF users tag list will be unique to the layout and structural mnemonics used.

TABLE 3
Listing of the tags and database characteristics generated by GEOF for data collected by L.C. Struik during the 1990 mapping project in Pine Pass map area.

Stid	Station number
StNorth	Station UTM northing
StEast	Station UTM easting
StElev	Station elevation
StMt	Station material code
StMtME	Station material code memo
Rk	Rock memo
Rkc1	Rock colour 1
Rkc2	Rock colour 2
RkME	Rock memo
RkMinm	Rock mineral name
RkMiDtR1	Rock mineral size minimum
RkMiDtR2	Rock mineral size maximum
RkMiDtTlR1	Rock mineral percentage minimum
RkMiDtTlR2	Rock mineral percentage maximum
RkMiDtME	Rock mineral memo
Spnm	Sample name
SpPrf	Sample taker's letter code
SpR1	Sample year
SpR2	Sample number
SpPtf	Sample number suffix letter
SpME	Sample memo
S1idCrd1	Surface 1 strike
S1idCrd2	Surface 1 dip
S1idCrddr	Surface 1 dip direction
S1idCrdnm	Surface 1 key word
S1idCrdME	Surface 1 memo
L1idCrd1	Lineation 1 trend
L1idCrd2	Lineation 1 plunge
L1idCrddr	Lineation 1 plunge direction
L1idCrdnm	Lineation 1 key word
L1idCrdME	Lineation 1 memo
A2idCrd1	Axial surface 2 strike
A2idCrd2	Axial surface 2 dip
A2idCrddr	Axial surface 2 dip direction
A2idCrdnm	Axial surface 2 key word
A2idCrdME	Axial surface 2 memo
ME	Memo (general station memo)
S2idCrd1	Surface 2 strike
S2idCrd2	Surface 2 dip
S2idCrddr	Surface 2 dip direction
S2idCrdnm	Surface 2 key word
S2idCrdME	Surface 2 memo
L2idCrd1	Lineation 2 trend

L2idCrd2	Lineation 2 plunge
L2idCrddr	Lineation 2 plunge direction
L2idCrdnm	Lineation 2 key word
L2idCrdME	Lineation 2 memo
Pcno	Picture roll number
Pccl	Picture film type code
Pcrf	Picture frame number
PcME	Picture memo
diag	present
S0idCrd1	Surface 0 strike
S0idCrd2	Surface 0 dip
S0idCrddr	Surface 0 dip direction
S0idCrdnm	Surface 0 key word
S0idCrdME	Surface 0 memo
BdDtR1	Bedding thickness minimum
BdDtR2	Bedding thickness maximum
BdDtTlR1	Bedding percentage minimum
BdDtTlR2	Bedding percentage maximum
BdDtME	Bedding memo
BdFsMinm	Bedding feature name
BdFsMiDtR1	Bedding feature size minimum
BdFsMiDtR2	Bedding feature size maximum
BdFsMiDtTlR1	Bedding feature percentage minimum
BdFsMiDtTlR2	Bedding feature percentage maximum
BdFsMiDtME	Bedding feature memo
RkSr	Rock name, clast
RkSrc1	Rock colour 1, clast
RkSrc2	Rock colour 2, clast
RkSrME	Rock memo, clast
RkSrMinm	Rock mineral, clast
RkSrMiDtR1	Rock mineral size minimum, clast
RkSrMiDtR2	Rock mineral size maximum, clast
RkSrMiDtTlR1	Rock mineral percentage minimum, clast
RkSrMiDtTlR2	Rock mineral percentage maximum, clast
RkSrMiDtME	Rock mineral memo, clast
V1idCrd1	Vein 1 strike
V1idCrd2	Vein 1 dip
V1idCrddr	Vein 1 dip direction
V1idCrdnm	Vein 1 key word
V1idCrdME	Vein 1 memo
DYKEidCrd1	Dyke strike
DYKEidCrd2	Dyke dip
DYKEidCrddr	Dyke dip direction
DYKEidCrdnm	Dyke key word
DYKEidCrdME	Dyke memo
FTidCrd1	Fault strike
FTidCrd2	Fault dip
FTidCrddr	Fault dip direction
FTidCrdnm	Fault key word

FTidCrdME	Fault memo
FRidCrd1	Fracture strike
FRidCrd2	Fracture dip
FRidCrddr	Fracture dip direction
FRidCrdnm	Fracture key word
FRidCrdME	Fracture memo
J1idCrd1	Joint 1 strike
J1idCrd2	Joint 1 dip
J1idCrddr	Joint 1 dip direction
J1idCrdnm	Joint 1 key word
J1idCrdME	Joint 1 memo
J2idCrd1	Joint 2 strike
J2idCrd2	Joint 2 dip
J2idCrddr	Joint 2 dip direction
J2idCrdnm	Joint 2 key word
J2idCrdME	Joint 2 memo
F1idCrd1	Fold axis 1 trend
F1idCrd2	Fold axis 1 plunge
F1idCrddr	Fold axis 1 plunge direction
F1idCrdnm	Fold axis 1 key word
F1idCrdME	Fold axis 1 memo
F2idCrd1	Fold axis 2 trend
F2idCrd2	Fold axis 2 plunge
F2idCrddr	Fold axis 2 plunge direction
F2idCrdnm	Fold axis 2 key word
F2idCrdME	Fold axis 2 memo
SLKSidCrd1	Slickenline trend
SLKSidCrd2	Slickenline plunge
SLKSidCrddr	Slickenline plunge direction
SLKSidCrdnm	Slickenline key word
SLKSidCrdME	Slickenline memo
STRIAidCrd1	Stria trend
STRIAidCrd2	Stria plunge
STRIAidCrddr	Stria plunge direction
STRIAidCrdnm	Stria key word
STRIAidCrdME	Stria memo

Each database has its optimum way to store data, and some databases are more relational than others. Study the structure and features of your database and set it up to optimize the relationships between your data files before you import the data from GEOF's output.

CHAPTER 2

HOW TO USE THE GEOF PROGRAMS

To use GEOF you should have some geological notes of your own in GEOF readable format or will use the demonstration file DEMO.TXT.

This part of the manual follows a chronological format; the first section is devoted to installing and configuring the GEOF system, the second section is a "getting to know GEOF" section for beginning users, which introduces a menu system to use GEOF, and the third section is meant as a reference for more advanced users, which shows how to use the individual batch routines and executable programs to accomplish the same goals as through the menu system.

INSTALLATION

Hardware Requirements

absolute minimum = IBM PC compatible with 20MB hard disk and 512K RAM.

recommended minimum = IBM PC-AT compatible with 40MB hard disk and 1MB RAM.

Software Requirements

DOS 3.0 or higher
recommended = DOS 5.0 (to maximize usable part of 640K).
FASTOPEN (file handle cache)
"DEVICE=FASTOPEN.EXE C:=(50,50)"
SMARTDRIVE or other disk cache
"DEVICE=SMARTDRV.SYS 256 256"

If needed, get help from a "PC Guru" to ensure that you have the optimal installation configuration. GEOF works swiftly on small files without the optimization, and you get time for a quick cup of tea when processing very large files on a 16MHz 386SX.

Installing GEOF

First make a backup of the GEOF disk.

We provide an install program that makes appropriate directories on a drive that you specify, and copies the files from the supplied floppy disk to the appropriate directories on your specified drive. To use the install program put the floppy disk with the program in your floppy drive (a:), enter the drive, and issue the command:

install

INSTALL.BAT is designed for use from a drive labelled A:. If your drive is labelled B: or some other letter, the INSTALL.BAT program can be edited to change the A:'s to the desired letter. Follow the directions of the install program. Ensure that your path statement in your autoexec.bat file includes a directory for the GEOF executables under the directory \EXEC. GEOF can then be run from the directory with your field notes. Reboot the computer to enact the new autoexec.bat path. Once the installation and path are complete enter the directory where you have your field notes.

Type GIF to test GEOF and its setup. Hit the ESC key to get out of GEOF.

GEOF looks for files in several sets of subdirectories, each of which has been set up during the installation. If you prefer to have GEOF look for files in different subdirectories those changes should be made before using GEOF on your field data. The next section describes some of the configuration techniques for GEOF.

Configuring GEOF

Introduction (what this section covers)

GEOF looks for data files and executables in specific directories. The location and names of those directories can be changed. GEOF has help screens for each of its components, and the contents of those screens can be changed to reflect your concerns. GEOF calls its executables through a series of batch files. Those batch files can be customized to reflect your working style and needs. This section describes how to change 1) where GEOF looks for files, 2) the content of the help screens, and 3) how to set up custom batch files for the executables (Table 3).

Customizing GEOF (Table 3)

Changing File Locations - File locations are controlled by the redirection files - TEMPLATE and GEOF.SYS. TEMPLATE lists directories where GEOF puts its files and GEOF.SYS lists directories where GEOF looks for files.

Changing where GEOF puts its files. - The file TEMPLATE can be changed to list the directories where GEOF will put it's files. TEMPLATE can be edited with an ASCII editor. Substitute the directories you want to use with those that are there.

Changing where GEOF looks for files. - The file GEOF.SYS can be changed to list the directories where GEOF will look for files. GEOF.SYS can be edited with an ASCII editor. Substitute the directories you want to use with those that are there.

Changing Help Screen Contents - The help screen contents reside in a single file (GIHELP.WDS) from which the help screens are generated by the WINCOM.EXE program acting on the screen contents file.

To change the contents of the screens, edit the GIHELP.WDS file and recompile it with the WINCOM.EXE program.

WINCOM GIHELP.WDS

TABLE 3 QUICK REFERENCE CHART FOR CUSTOMIZATION

Changing file locations	At time of installation	Best done at time of installation, or beginning of a new field season of data. Mistakes can cause GEOF to behave unpredictably.
Changing help text	Anytime	Error-prone, unfriendly process. Make backups of original help texts.
Setting up batch files	At time of installation	May override GEOF file management routines, so best done at installation time to minimize unintentional scattering of data.

This generates the individual help screens, that the GIF menu system will look for.

GEOF TOOLS THROUGH THE MENU FACILITY, GIF

Introduction

GEOF consists of a set of tools (executable programs). Three of the most commonly used tools can be run from an automated menu. The other two tools are run outside of the menu. This section describes the menu system and what each tool does. The menu system is accessed with the command GIF, and the other tools by GEOFMAP, and GED.

All of GEOF's executable programs and batch files are described in the next chapter. A manual for using the GEOF tools without the GIF menu is described below.

GIF - The Menu System

The command GIF (**G**eof **I**nput **F**acility) activates a menu of action choices (Fig. 4). Exit the menu with the ESC key. Each choice is accompanied with a visible help screen, a hidden help screen, and a command line (Fig.4). The visible help screen tells what the tool choice does, and the hidden help screen elaborates on how the tool works. To access the hidden help screen press the F1 function key; press the ESC key to exit.

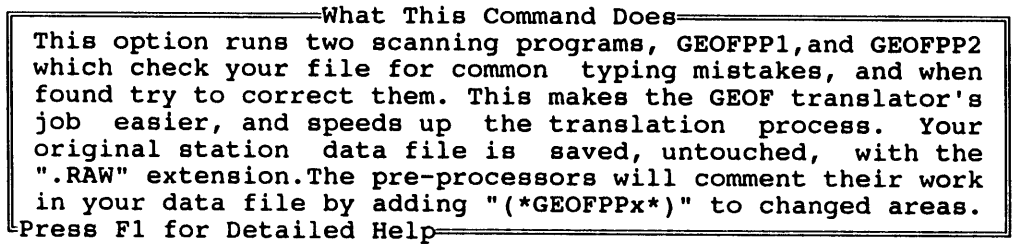
The command line at the bottom of the menu screen shows the command that the highlighted menu choice will execute. These are the commands that can be run from the DOS command line. Flipping through the menu with the up and down cursor keys will reveal all the commands and help screens associated with each menu choice. To execute a command on a data file, type in the name of the data file and press the Enter key. You may want to wait until you know what the commands do before executing one of the choices.

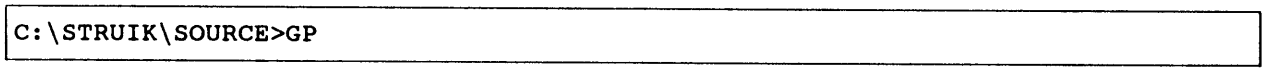
The Preprocess tool checks your note file for periods where it expects semicolons and adds the semicolons (Fig.4). This is useful during the initial stages of note taking, and can be skipped when you are proficient in the note format.

The Translate tool interactively edits your notes to the prescribed format and then compiles a columnar tagged data list from your notes into a file with the extension .ITR (Fig. 5). The Translate tool uses the GED editor through which you correct the format of your notes interactively. In most cases this tool is the first to be used.

The GEOF Make tool of the menu invokes the GEOFMAKE program that generates the comma-delimited files, with extension .GVW (view), from the .ITR files, and the .GMP files created with the GEOFMAP tool (Fig. 6). After making the view files the GEOF Make tool organizes them for you into the proper subdirectories, controlled by the GEOF.SYS file. GEOF Make detects the file dates and only works on these files where the .ITR file is newer than the view file (.GVW file). GEOFMAKE can also be invoked with the command:

A





B

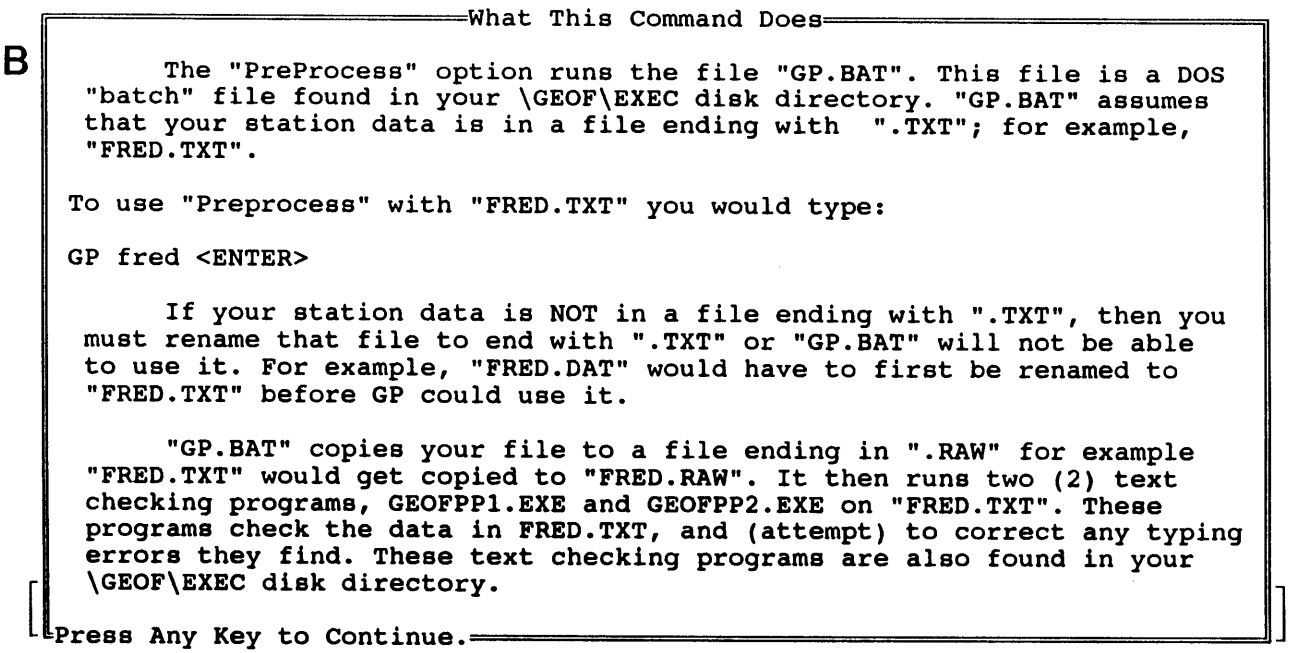


Figure 4. A. The GIF screen for the menu choice, Preprocess. B. The GIF help screen for the menu choice, Preprocess, accessed with the F1 function key.

A

What This Command Does

This option runs the GEOF translator. This program takes as input a station data file, ending in ".TXT", and then outputs a translated ".ITR" file. For example, the data file "FRED.TXT" would get translated to "FRED.ITR". DOS file patterns; for example, "Fred*" or, "*" may be used as input to GEOF to allow the translator to work on more than one file. As well, the translator is smart enough to not re-translate a data file if an up-to-date ITR translation file for that data file already exists. For example, if a new "FRED.ITR" currently exists, then GEOF will not attempt (as there is no need) to re-translate "FRED.TXT" .

Press F1 for Detailed Help

```
C:\STRUIK\SOURCE>GEOF
```

B

What This Command Does

The "Translate" option runs the "GEOF.EXE" translator/editor. This file is found in your \GEOF\EXEC disk directory. "GEOF.EXE" assumes that your station data is in file(s) ending with the ".TXT" extension; for example, "FRED.TXT". For convenience, it allows you to give a LIST of files to translate. These may include "wildcard" characters like "*", for example:

```
GEOF  fred fred2 john*
```

would translate "FRED.TXT", "FRED2.TXT", and all ".TXT" files beginning with the word "JOHN"; for example, "JOHN.TXT", "JOHN1.TXT", "JOHN2.TXT", and so on.

If the translator discovers a mistake in the format or content of your data, it will "pop" you into the full-screen editor. (Pressing F1 will display a list of this editor's features). The editor automatically takes you right to the location of the error in your data file. And, in the bottom-left corner of the editing window, you will see an error message, describing what the translator thinks is wrong in your file. Once you have "REPAIRED" the error, you may:

PRESS F7 TO TRY TRANSLATING THIS FILE AGAIN,
OR, PRESS ESC TO GIVE UP ON THIS FILE, FOR NOW.

Press Any Key to Continue.

Figure 5. A. The GIF screen for the menu choice, Translate. B. The GIF help screen for the menu choice, Translate, accessed with the F1 function key.

A

```
GEOF
 Preprocess
 Translate
>Geof Make
```

```
What This Command Does
This option runs the Geof Make facility. A make facility is a program
that checks that all the files that make up a computer program are up to
date, and then combines them together to actually "make" that program.
The Geof Make facility does just this, except that instead of updating a
computer program, Geof Make updates your database ".GVW" view files. For
example, if you change a ".GMP" map file, Geof Make will automatically
rebuild all of the ".GVW" files connected to that map, as they may now
be obsolete.
Press F1 for Detailed Help
```

```
C:\STRUIK\SOURCE>GEOF /m
```

B

```
What This Command Does

The GeofMake facility is a program, "GEOFMAKE.EXE", found in your
\GEOF\EXEC subdirectory. It's job is to ensure that your ".GVW file
database is up to date, complete, accurate, and organized.

A  ".GVW" file is a file containing a subset of all the "field tags" in
your translated station data ".ITR" file. For example, "FRED.GVW" would
contain a subset of all the "fields" found in "FRED.ITR". In order to
determine what subset of the data GEOFMAKE should include in "FRED.GVW"
GEOFMAKE consults what we call a ".GMP" map file. This file lists the
"field tags" that GEOFMAKE should extract from your data.

GEOFMAKE finds all existing ".ITR" files and combines them with all
existing ".GMP" map files, creating and updating your ".GVW" view file
data base.


To do this, it has to know two things:

c
Press Any Key to Continue.
```

C

```
                              What This Command Does
Firstly, where to find/put all your data base files:

                        Default Directory Structure

                    ¦--ITR          EXEC - contains all executable files.
--GEOF--¦--EXEC     ¦               ITR  - contains all translated stations.
        ¦           ¦--MAP          MAP  - contains all ".GMP" map files.
        ¦--DATA--¦                  VIEW - contains many subdirectories,
                    ¦--VIEW--¦--           one for each ".GMP" map file.
                             ¦--           Each directory contains the ".GVW"
                                           view files associated with the map.

And secondly, GEOFMAKE has to know how old your data files are, so that it
can determine whether or not they are obsolete. For instance, if you
translate a station data file into a ".ITR" file, run GEOFMAKE to create
".GVW" files from that ".ITR" file, and then go back, include some data
that you'd forgotten and re-translate your data into a ".ITR" file again,
GEOFMAKE will notice that the ".GVW" files are OLDER than the new ".ITR"
file that you just made, and automatically re-make new ".GVW" files with
your updated data.

        *******  To use  GEOFMAKE,  type  "GEOFMAKE /m"  *******
Press Any Key to Continue.
```

Figure 6. A. The GIF screen for the menu choice, Geof Make. B. The GIF help screen for the menu choice, Geof Make, accessed with the F1 function key. C. The continuation of the help screen for Geof Make.

GEOF /m

GEOFMAP

GEOFMAP operates on your files with the .ITR extension - the files with the tagged data. It generates a file, with extension .GMP, that is a table of all the different tags used in the .ITR files listed in the ITR directory, and some database characteristics (Fig. 7). GEOFMAP calls the GED editor to display the table and to let you edit it. The tags and their order in the .GMP (map) file control the data and it's order in the comma-delimited file. If you retain only the sample number and UTM coordinates in the map file then you will get a comma-delimited file with just that data in it, and in the order they are listed in the map file.

GEOFMAP lets you construct a map file of tags that mirrors the order of fields in your database file. Therefore each database file has an associated map file. GEOFMAP creates a directory, under the VIEW directory, for each map file you make. The view files created using Geof /m are placed in the appropriate VIEW\MAP directory.

To use GEOFMAP, type GEOFMAP and a mapfile name of your creation on the DOS command line and press ENTER. For example, if you want a map file called ROCK.GMP, issue the command:

GEOFMAP ROCK

GEOFMAP creates a master map file from all the .ITR files in the ITR directory, and calls that master map file ROCK.GMP. By editing that file, ROCK.GMP, to contain only the tags for the entries you want in the ROCK file of your database, and saving that ROCK.GMP file, GEOFMAP will create the appropriate subdirectories and generate the view files for the ROCK.GMP map file.

GED

GED is the ASCII text editor of the GEOF system. GED can be used on its own to edit ASCII text files of any sort. GED functions include character delete, line delete, cut-and-paste of blocks of lines, search, goto, holding 9 files in use at a time and the ability to copy between them, and saving files under different names. GED has a help screen that shows all the key functions (Fig. 8) The editor can be called outside of GEOF .

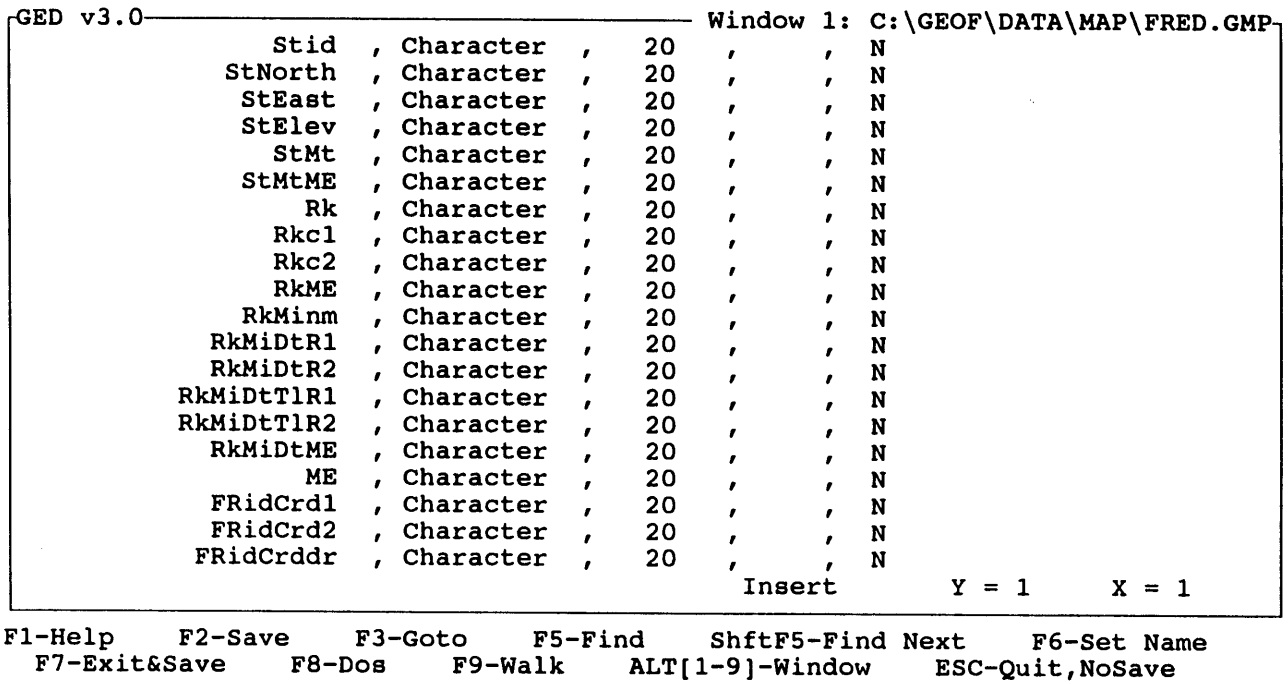


Figure 7. The screen image shows the first part of a map file (.GMP) in the GED editor from the command: GEOFMAP FRED. The map file could be edited to contain the data tags specific to and in the same order as the fields in your database file. This file is used by the program GEOFMAKE to generate a comma-delimited data file from the .ITR data list.

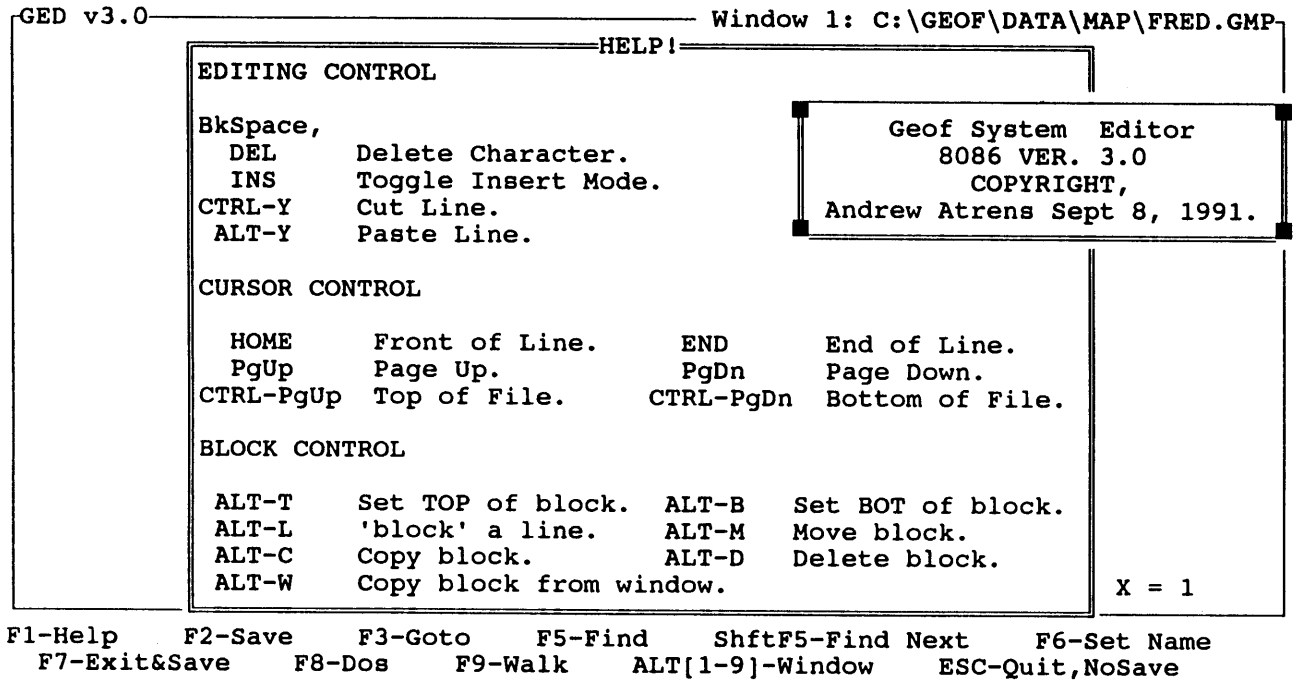


Figure 8. Screen image of the help screen of the GED editor.

USING GEOF WITH GIF - A TUTORIAL

Move into the directory where you have a file of field notes.

To **START** the program use the command:

GIF

To **GET OUT** of the program use the Esc key

When you start the program you will get a menu of 3 choices, each with associated help screens (Fig. 4). The commands that each of these choices issue is shown on the command line at the bottom of the screen. Further help on each of the choices can be accessed by pressing the F1 function key. The choices are:

Preprocess — Scans the data file after copying the original to one with a .RAW extension, and makes corrections to common errors and omissions in the .TXT file (Fig. 4).

Translate — This is the data recognition and compilation program. It works with you interactively using it's editor to correct the format. It then compiles the data into a tagged data list file with a .ITR extension (Fig. 5).

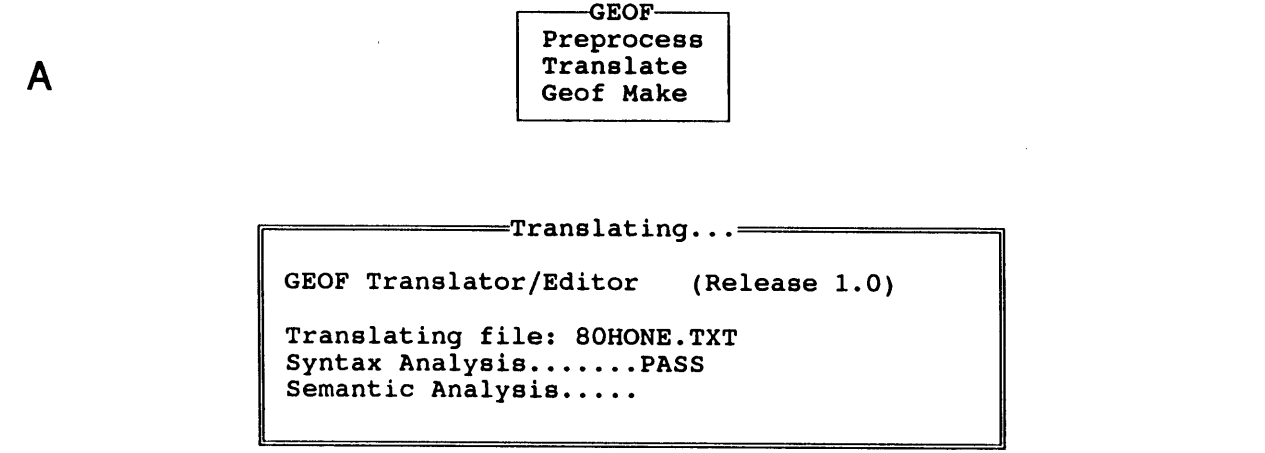
Geof Make — This routine uses the map file with the .GMP extension to make a comma-delimited data file from the .ITR file. Geof Make checks file creation dates and will create new comma-delimited files (with .GVW extension) for those files with comma-delimited data files older than the .ITR files, or for which no .GVW files exist (Fig. 6).

For the tutorial, we will run the Translate, and Geof Make functions on the DEMO.TXT file in directory \GEOF\DEMO. First look at the DEMO.TXT file and its structure, and make a backup copy of it. Delete some of the tags in DEMO.TXT, and then run it through the Translate program. To run Translate move the arrow in the menu to Translate using your down and up cursor keys and once there type the name of the file (DEMO in this case). The .TXT extension is not required. The file name will appear on the command line and Translate is then executed by pressing the return key.

GEOF's Translate program guides you through the correction of the errors you induced in the DEMO.TXT file. It finds the first error, opens its editor, sets the editor's cursor pointer at the problem site in the text, and writes what it thinks the problem is at the bottom of the screen. You correct the error using the editor's routines and then compile the file using the function key F7 (exit and save). GEOF will repeat the routine for the subsequent errors until you have corrected them all. Any number of errors can be corrected in the file before recompiling. When the file is in the proper format, the translator will PASS it and generate a tagged data file (DEMO.ITR) (Fig.9). The .ITR file contains all the data reorganized as single entries (bracketed by quotes) following a unique tag. Now run Geof Make by moving the curser to it in the menu. The command line will show the command:

Geof /m

A



B

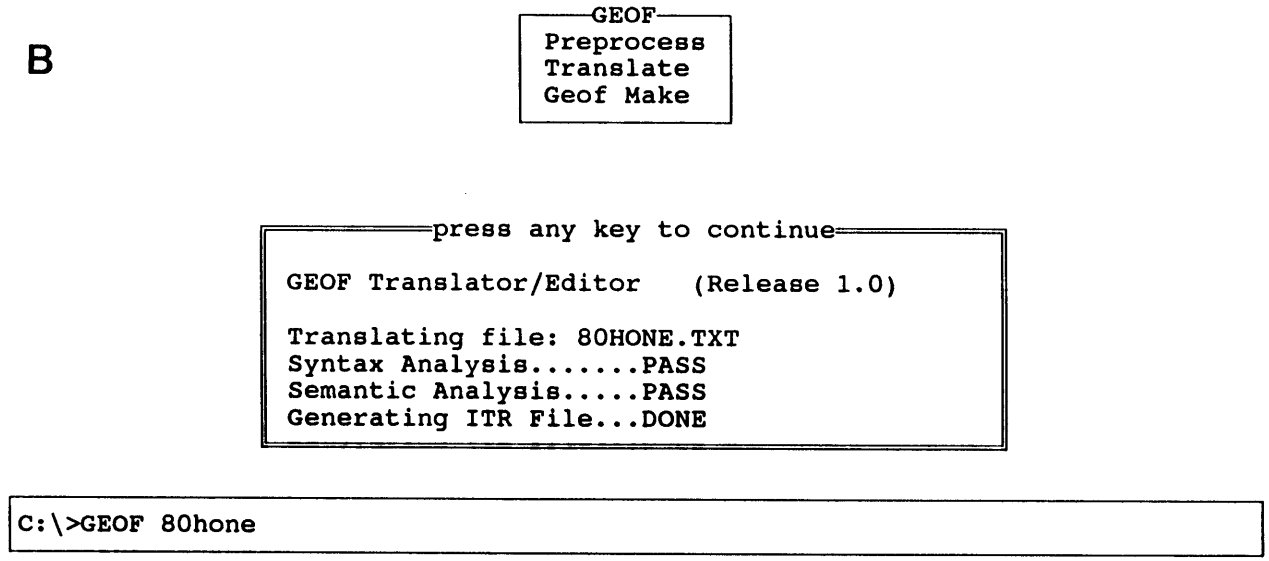


Figure 9. A. Screen image of GIF at the stage when the GEOF Translate routine has completed the note format check, the Syntax Analysis, and has begun the Semantic Analysis. B. The Translate routine has completed the Semantic Analysis and generated the data listing ITR file.

The option /m for GEOF does two things, first it creates three subdirectories for output, if they do not already exist, and second when a note file-name is entered it generates comma-delimited files of the data requested by the map files in \DATA\MAP\ subdirectories. Execute GEOF Make and create the subdirectories by returning (entering) the command GEOF /m as shown on the command line. The GEOF Make facility will create 3 directories under \GEOF\DATA, one for each of the .ITR, .GMP and .GVW files that GEOF generates (Fig. 6). GEOF puts .ITR files in directory ITR; GEOFMAP puts your .GMP files in directory MAP; and GEOF /m puts the .GVW files in directory VIEW. If you want your files put in different directories, see the instructions under configuring GEOF.

To continue you need to have a .GMP file in the MAP directory. Exit GIF. The .GMP (map) files are made with the program GEOFMAP acting on the .ITR files present in the \GEOF\DATA\ITR directory. To make a map file with all the tags in the DEMO.ITR file you would issue the command:

GEOFMAP filename

GEOFMAP will generate a master map file of all the tags in the .ITR files in the ITR directory and name that file with the name you supplied. For example, you may want to generate a comma-delimited file with station information such as station number, easting, northing, elevation, material code, station memo, material code memo, and the code. To make that file, issue the command:

GEOFMAP STATION

GEOFMAP puts you into the GED editor and lets you edit the listing of field tags (Fig. 10). Delete all the tags you don't want in your station file, and put the tags you want in the order they appear in the columns of your database. GEOFMAP will save this edited file, called STATION.GMP as \GEOF\DATA\MAP\STATION.GMP, and it will create a subdirectory called \GEOF\DATA\VIEW\STATION, under which all the views (comma-delimited files) created by the station map will go.

GEOF expects that you will make map files for each of the files in your database. GEOF's default paths put the secondary map files in the \GEOF\DATA\MAP directory.

GEOFMAP will automatically generate the view files from your .GMP file, and for the STATION.GMP file, the view file will be \GEOF\DATA\VIEW\STATION\DEMO.GVW. You will see a directory for each .GMP file you make, in the \GEOF\DATA\MAP directory. In each of these directories is a comma-delimited file that was made from the .GMP file of the directory name.

You now have a comma-delimited file that you can import into a database. Make your own .GMP files to match your data and your database.

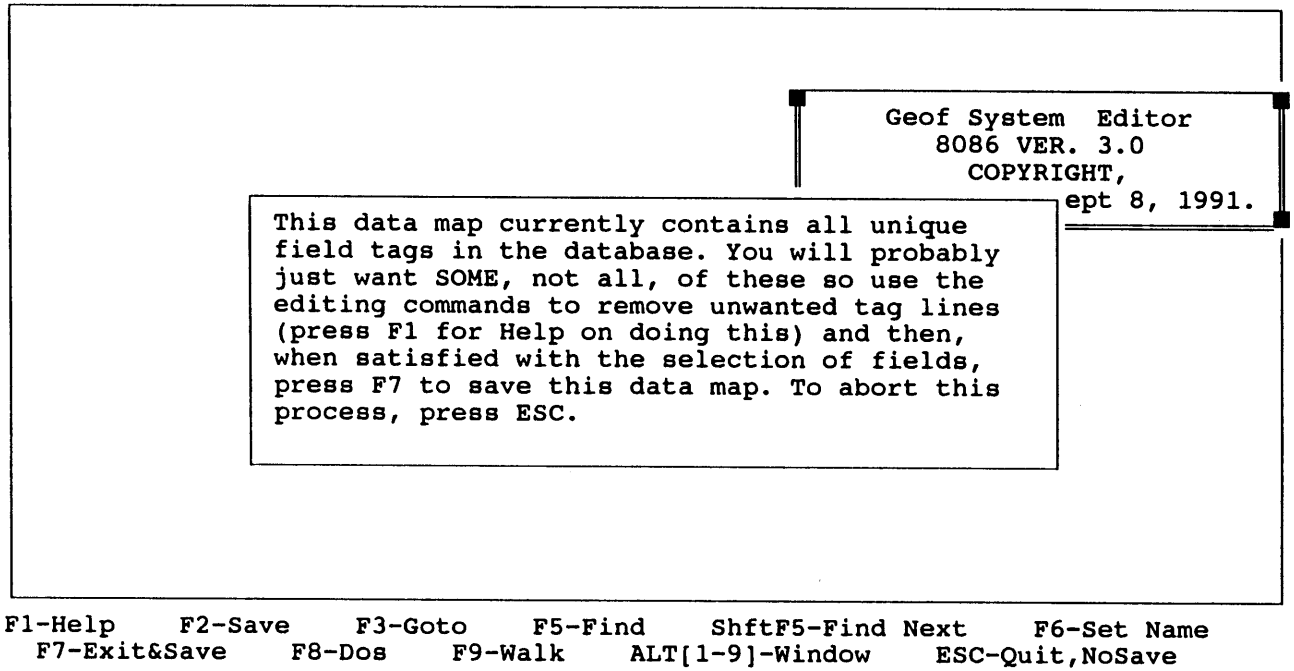


Figure 10. Screen image of the GED editor created by the routine GEOFMAP when it generates the map file of the field tags from the data lists in the ITR files.

Once you are confident that your map files contain all the possible tags from your field notes, the comma-delimited files can be made from the GIF menu with GEOF Make and the command:

GEOF /m *

The command uses each of the map files in the directory \GEOF\DATA\MAP and generates a comma-delimited file from every .ITR file in the \GEOF\DATA\ITR directory for which there is no up-to-date comma-delimited file (one with extension .GVW). The program can also be run using individual ITR files. GEOF keeps track of the file dates and the file locations through the GEOF.DOC file, which it creates during the first successful translation.

DATA IMPORTATION

Once in comma-delimited format the data can be imported into virtually any database. See the instructions of your database for importation of ASCII data files.

Complications

Structural Measurements

Many stations have more than one structural measurement of the same type; for instance several bedding measurements. Because of the way GEOF grabs data from the tagged data files (.ITR), you cannot make a comma-delimited file with all the structural data in it. What happens is that you get duplicate measurements. To get around that, data from each structural type was extracted with the sample number into a file of its own. For example: for each of the planar data sets you would have a comma-delimited file with sample number, strike, dip, keyword, and comment.

Adding Data to Comma-Delimited Files

The comma-delimited data files can be edited before importation. For instance columns of data could be added, or the entries checked for spelling. In our work we added mnemonics used for graphical symbol generation in our GIS system, and converted all abbreviations to the full words using routines in an editor. Full words were used to keep the files consistent through the years and make searches easier, especially for others not familiar with each geologist's notation. If you plan to replace abbreviations use consonant mnemonics for your abbreviations to avoid replacing parts of words.

Importation to dBASE

The routine GEOF2DB is a batch file that runs a set of instructions and a program to import the data into dBASE using .GMP and .GVW. The program sets up the dBASE file and column structure for you. To make it work; make a directory where you want your dBASE files to reside; copy GEOF2DB.UPD and GEOFTMP.DBF from the \GEOF\EXEC directory to that dBASE file directory (only need to do that once); then copy .GMP and .GVW, that you've generated from your field notes, to that same dBASE file directory. In that directory execute the batch routine on the file name (with your path to the dBASE directory):

GEOF2DB file

This should dump you into dBASE, where GEOF2DB sets up the database structure and imports the data into the appropriate columns.

GEOF TOOLS AS INDIVIDUAL EXECUTABLE AND BATCH PROGRAMMES

GEOF can be used without the GIF menu, and the following manual describes how to do that. Elaborations on each of the programs and what they do can be found in Chapter 3.

1. Use the GP.BAT batch file to preprocess the raw data file, with the command:

    GP filename

2. Use GEOF.EXE to compile the data file, with the command:

    GEOF filename

If problems were detected in the format of the data, the editing screen will say what they are, and allow you to fix them. Editing commands are displayed in a help screen accessed with the function key F1. Once you have "repaired" the errors, press F7 to save your changes and automatically re-compile. To abort this process, press ESC.

Repeat this interactive editing procedure until the batch file terminates and the following is displayed on the screen:

Syntax Analysis.....PASS
Semantic Analysis.....PASS
Generating ITR File.....DONE

At this point, your data file has been successfully read and understood by the computer, and GEOF has generated an output file with the extension .ITR, in ITR format. That output.ITR file contains a list of individually tagged data entries. The .ITR file is the organized data set that GEOFVIEW uses to extract the data to make comma-delimited files.

3. Use the GEOFMAP tool to generate a .GMP (map) file of your data, with the batch command GM.bat:

    GM mapfilename

4. Use the GE.bat tool to edit the .GMP file, with the command:

    GE mapfilename

The .GMP file contains "database definitions" for all of the field tags used in your database. A "database definition" is a single line of information about a field. It answers questions like: "What is the maximum length of this field?", "What type of data can go into this field?, for example; is it a

text field, or is it a number field?", and "Should this field be used as an index to the database?". "Database definitions" follow this format:

, , , ,

For example, "database definitions" for the fields "Rock", and "RockSize" might look like:

Rock , Character , 15 , , N
RockSize , Numeric , 10 , 2 , N

As you can see in the "RockSize" definition (above), two numbers are given instead of only one number, as in the "Rock" definition (also above). The "10" in the "RockSize" definition, like the "15" in the "Rock" definition, represents the maximum length (in this case, the number of digits, excluding the "." if the number has decimal places) of the field. However, the "2" in the "RockSize" definition has no counterpart in the "Rock" definition. This "2" represents "numerical precision", that is, the number of decimal places to be given to "RockSize" field values. Because it would not make sense to give character fields "decimal places", a similar number is not included in the "Rock" definition.

The position of a field's description in this file will directly correspond to its data's position in the output database. So then by rearranging the order of the lines in this .GMP file, you rearrange the order that your fields will appear in your output database. And, if you want a field to appear more than once in your database, then just simply include it more than once in the .GMP file. Similarly, if you don't want a field to appear in your database at all, remove it's line description from the .GMP file.

As previously mentioned, field description lines conform to dBASE IV field definition format. For more information on what valid field "types" you may choose, refer to your dBASE IV user's guide's section on "COPY STRUCTURE FROM".

The GE command uses the GED editor to modify the ".GMP" file. For information on using GED, refer to Chapter 3 of this manual.

5. Use the GEOFVIEW tool to generate a .GVW file. This file is in ASCII text, containing your database information, and is directly importable into most relational database programs. GEOFVIEW can be run with the batch program GV.bat, with the command:

GV

At this point your data has been translated into a relational table contained in a "comma delimited" DOS text file, ".GVW" file, and is ready to be imported into the relational data- base of your choice.

6. To import this data into dBASE IV, copy the .GMP and .GVW files to your dBASEIV directory. Rename the .GMP and .GVW files to the name of the DBF file that you wish to generate, so that you have:

dbffilename.GMP, and dbffilename.GVW

Use the GEOF2DB batch file to import the data into dBASEIV, with the command:

GEOF2DB

The file .DBF will be automatically created, and your data copied into it. The database will be set up with the data tags of the MAP and ITR files as the field headings.

7. To import the data into most databases, including dBASE, use the import function of the database on the comma-delimited files generated by GEOF. In this case the field order of the database must be matched by the data order in the comma-delimited files. GEOF has control over the data order in the comma-delimited files through the GEOFMAP and GEOFVIEW tools.

CHAPTER 3
INDIVIDUAL PROGRAMS AND THEIR COMMAND STRUCTURE

This section lists and describes each of GEOF's executables and batch programs.

GP.BAT
USAGE : GP (extension is omitted.)

This batch file runs a raw data file (assumed to be of type .TXT) through two preprocessors GEOFPP1.EXE, and GEOFPP2.EXE, described below. It then copies .TXT to .RAW, and renames the preprocessed data file to .TXT .

GM.BAT
USAGE : GM (extensions are omitted.)

This batch file invokes GEOFMAP.EXE creating a Map (.GMP) file of the data.

GIF.EXE
USAGE: GIF [ ] [/ ?] (where /? displays help)

The GEOF Input Facility, combines the GP.BAT batch file and GEOF.EXE into a convenient menu-driven system. This system is discussed in Chapter 2.

GEOFPP1.EXE
USAGE : GEOFPP1 .

This is a simple preprocessor. It zips through a raw data file adding semicolons. It will not destroy any information, and documents every change that it makes by the comment:
(* PP1 *). The raw data file is renamed file.raw and the processed file is named file.txt .

GEOFPP2.EXE
USAGE: GEOFPP2 .

This second preprocessor obeys all the rules of the first, however it uses a slightly more sophisticated algorithm to determine where it should add semicolons. It documents its additions by adding (* PP2 *)

to the data file. The raw data file is renamed file.raw and the processed file is named file.txt .

GEOF.EXE
USAGE : GEOF [/?]

where /? - displays help
/m - makes output receiving directories and makes .GMP files
/r- makes .GMP files ignoring whether .GMP files already exist
Inputs: a station data file ending with the .TXT extension.
for /m; a map file ending with .GMP.
for /r; a map file ending with .GMP.
Outputs: an ITR data file, ending with the .ITR extension.
an error file, "GEOF.ERR", containing compiler error information.
for /m; a comma-delimited (view) file with extension .GVW.

What it does

The GEOF compiler accepts a station data file as input. It translates this data file into a more computer-friendly format, called ITR format, closely checking that the input station data file is in correct "station data" format. The output file that GEOF generates will have the same name as the input station data file but instead of ending with ".TXT", it will end with ".ITR".

"ITR" loosely stands for "intermediate textual representation" of the station data. This file contains a list of identified field tags and values for each station in the data file. The end of each station is denoted by either an EOF (end of file) mark or a "&" alone by itself on a line:

The format of the ITR files is:

FieldTag " Data "

As the compiler is executing, it's progress is displayed on the screen with the following statements:

Syntax Analysis.....PASS
Semantic Analysis.....PASS
Generating ITR File.....DONE

The syntax analysis phase checks whether entries in the input station data file are in the correct place and fit the prescribed format. The semantic analysis phase then loosely checks to see if what you've typed in makes some sense. The generating ITR file phase translates your data into ITR format, and sends it to a file.

Format Errors

In typing your data file, you may have forgotten some punctuation or left out a required entry or tag, and your file won't perfectly fit the format GEOF understands. The compiler is quite meticulous at catching these mistakes and pointing them out so that you can fix them.

When such an error is detected at the syntax, or semantic analysis level, GEOF will enter the data file

into its editor, set the cursor at the problem spot, and write the suspected error in the lower left of the screen. Typically, an error message will look as follows:

Expected:;

At the same time the compiler generates an error information file, named "GEOF.ERR". This file contains the following information:

```
%1 +89 %2.txt
REM File: 91-3h1.txt
REM Line Number: 89
REM Line Position: 33
REM Current Line:
REM grey_light_taupe; grey_light_taupe;
REM                               ^
REM Message: !(comment) -(mineral) #(subrock) EXPECTED.
```

******GEOF.ERR, follows correct DOS format, and can be run as a batch ".BAT" file! The first line, which looks the most cryptic, is actually quite amenable to the NORTON EDITOR. Other editors, which follow Norton's command format will work equally well with this "batch file", should you choose to use them instead of GED, the editor supplied with the compiler.******

Abnormal Errors

The most common "abnormal" error you will encounter is the "Out of Memory" error. When this happens the GEOF compiler, in trying to translate your data file, has run out of DOS memory to work with. Typically this happens when the input station data file is larger than about 32 kilobytes (a rare occurrence), but is also dependant on how many other programs you have loaded in memory. In this case, a file called "ERRORINF.$$$" may be created. This file is not used by any of the GEOF programs.

GEOFMAP.EXE
USAGE: GEOFMAP (output goes to default output.)

This tool generates a MAP file of the input ITR file in a file with extension .GMP . A .GMP file contains one reference to each field type found in the ITR file followed by definition of the characteristics of the field type. Each reference is contained in a line of the following format:

StId , Character , 20 , , N

This format follows that of dBASE IV, where the first characteristic is the data type, the second the width of the field, the third the precision of numerical data, and lastly the presence of an index. This .GMP (map) file can then be modified; fields can be deleted, data types and field width's can be changed etc, etc, allowing the user to define a view of a subset of his/her station data file.

Specifically, field inclusion, exclusion, duplication, and ordering can be controlled. For more details on this, refer to Chapter 2.

GEOFVIEW.EXE
USAGE: GEOFVIEW (output goes to default output.)

This tool uses an ITR file and GMP file to generate a relational table DOS text file in which fields are delimited by commas, and records are on individual lines. This file is readable into most database systems; some examples: dBASE, FIELDLOG, INFOCUS, TERRASOFT, and ARC/INFO.

GEOF.UPD

This file is a template for a dBASEIV data-importation script program.

GEOF2DB.BAT
USAGE: GEOF2DB

This batch file converts GEOF.UPD into .PRG, a dBASEIV program script file. This dBASEIV "batch" file contains information specific to the importation of a specific relational table associated to the .GVW file. .PRG is executed directly under dBASEIV, and the data in the file .GVW is automatically imported into dBASEIV relational tables.

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REGISTRATION

To recieve notices of GEOF updates send the following information:

GEOF REGISTRATION

Surname:_____

First names:_____

Company/Institute:_____

Street Address:_____

City:_____

Province/State:_____

Country:_____

Postal Code:_____

To:

Dr. L.C. Struik
GEOF Registration
Geological Survey of Canada
100 West Pender Street
Vancouver, B.C. , Canada V6B 1R8