A USER'S GUIDE FOR GEOTHERMAL
CHEMICAL DATA BASE

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A USER'S GUIDE FOR
GEOTHERMAL CHEMICAL DATA BASE

INTRODUCTION

This user's guide contains two data handling packages that can simplify the storing, retrieving, printing, and plotting of data. The first package, the Apple Mini-Computer Plotting Package, is designed for small data-sets (less than 100 observations), and can be used for any application. The second package is a data base consisting of chemical analyses from the Raft River Geothermal Field. This data base can be added to as long as the additional data meets the rather static requirements of the existing data-base design. Both packages describe how printed reports and computer plots can be generated.

APPLE MINI-COMPUTER PLOTTING PACKAGE

The data-base manipulation and plotting program is designed for persons with little or no previous programming experience. The user is led through the program by a series of questions requiring simple responses. This section of the user's guide gives a brief explanation of the program. An example session with this computer is given in Appendix A.

Using this program, the user can enter, modify, append, and store data on a computer disk for future use. After the data is stored, the program offers the user the opportunity to transform the data by base 10 logarithms, linear equations, and cumulative sums. The user can obtain printed copies of the data and the plotting selection, which uses the commercially available Apple Plot¹ program, allows the user to create graphs and charts. Figures 1 and 2 are examples of reports that can be generated by using this data base.

The following instructions describe the process of turning on the machine and the available selections.

Turning on the Apple

The following three devices need to be turned on:

- T.V.: Turn on normal front ON/OFF switch. Set to Channel 11.
- Apple Computer: Turn on using switch on left side in rear.
- Printer: Turn on using switch on left side in rear. There are two red levers on the upper right front of the printer; the left one should lean toward ONL and two red lights should glow.

DATA SET 1 FOR FILE MAN HOURS

I	MONTH NO.	PROJECTED HOURS
1	1	200
2	2	200
3	3	200
4	4	250
5	5	300
6	6	300
7	7	250
8	8	200
9	9	200
10	10	350
11	11	200
12	12	200

DATA SET 2 FOR FILE MAN HOURS

I	MONTH NO.	ACTUAL HOURS
1	1	170
2	2	160
3	3	120
4	4	230
5	5	325
6	6	290

Figure 1. Example of report generated using data base.

DATA SET 1 FOR FILE CUM MAN HOURS

I	MONTH NO.	PROJECTED HOURS
1	1	200
2	2	400
3	3	600
4	4	850
5	5	1150
6	6	1450
7	7	1700
8	8	1900
9	9	2100
10	10	2450
11	11	2650
12	12	2850

DATA SET 2 FOR FILE CUM MAN HOURS

I	MONTH NO.	ACTUAL HOURS
1	1	170
2	2	330
3	3	450
4	4	680
5	5	1005
6	6	1295

Figure 2. Example of report generated using data base.

The final pieces of hardware to be used are the disk drives. There are two drive units stacked one on top of the other, and labeled "1" and "2". These numbers are important. The data-base package is stored on a magnetic disk, and is read into the computer using disk drive 1. User's data can be stored, after its entry into the computer, on this magnetic disk or on a second disk located in drive 2. Appendix B discusses the use of the disk drive and its care. Read this carefully before you get started.

The steps for turning on the computer are:

1. The program is written using the DOS 3.3 system, and requires a data disk initialized in DOS 3.3. Place your program disk in drive 1.
2. Turn on the T.V. and printer; then turn on the computer. If the computer is on, either type "PR #6" and press "RETURN" or turn the computer off and then back on. The disk drive will spin and whirl for a few seconds. When the machine is ready to continue, the red light on the disk drive will go off.
3. The computer will ask if you are using a one-disk or two-disk system. If you have a two-disk capability and wish to save your data files on a second disk, separate from the program disk, type "2" and place the second disk in drive 2. The screen will now display the data-base menu and you are ready to begin.

File Manipulation Commands

There are two modes in which you may operate the Apple. If nothing goes wrong, you will be in the program mode until the session ends. In this mode, the user responds to the prompt questions. In command mode, it is up to the user to tell the computer what to do. There are a few commands that you may find useful to recover from mistakes and to protect your data files. All the following commands can only be issued from command mode. For further discussion of these commands, refer to the DOS manual.²

To protect data from accidental destruction, files can be LOCKed at the end of a session, after using Selection 7 on the data-base menu. The form of the command is:

LOCK filename

where "filename" is the name of the file to be LOCKed. A LOCKed file can be read, but no data can be written over it. Before new data can be added to an existing file, the file must be UNLOCKed:

UNLOCK filename

It should be noted here, that all commands and responses to the Apple must be followed by pressing the RETURN key. This tells the computer that you are finished, and that it is its turn.

To determine just what files are on a particular disk, use the CATALOG command. With two disk drives available, it is usually necessary to tell the Apple which to use. This is done by appending the designation, "D1" or "D2" to the command. For example:

CATALOG, D1

LOCK filename, D2

The catalog contains four types of information, an asterisk in column 1 indicates the file is locked; column 2 tells you the type of file ("A" for programs, "T" for data, "B" for binary or picture files); column 3 tells you the size of the file; and column 4 lists the file names.

When data disks begin to fill up with old, unwanted files, they can be removed using the DELETE command. LOCKed files must be UNLOCKed before they can be DELETED.

The last command that may be needed is the RUN command. This switches the computer from the command mode into the program mode. The need for this command may arise if an error is made that causes the program to be interrupted. To restart the program, type:

RUN

The RUN command would also be required if you had to UNLOCK LOCKed files to add data. Steps required are:

1. Exit the program using Selection 7.
2. UNLOCK the necessary files.
3. Type RUN.

If an error interrupts the program during its execution, an error message will appear:

BREAK IN XXXX

You are automatically placed into command mode and must issue the RUN command to return to the program mode; any data in unsaved data sets will, unfortunately, be lost. A number of error recovery routines are included in the program to minimize this possibility.

Data-Base Selections

If all things have gone well, you should now have the data-base menu on the screen. This section discusses the options available from the menu and how they are used. Appendix B gives an example session with the data base, and illustrates the use of various options. Selection 5, RUN APPLE PLOT, is covered in Apple Plot¹ and is only briefly discussed here.^a Most of the Apple Plot routines are self-explanatory, and their use can be picked up easily.

a. A copy of this reference resides with the Geosciences Branch of the Earth and Life Sciences Office, EG&G Idaho Inc., Idaho Falls, Idaho 83415.

There are seven selections available on the data-base menu:

1. CREATE NEW DATA SET: Write data into the computer in X,Y pairs.
2. MODIFY EXISTING DATA SET: Fix errors or append new data to existing data files.
3. LIST DATA ON PRINTER: Type a copy of data files on the printer.
4. DATA TRANSFORMATION: Modify existing data by logarithms, linear equations, or cumulative sum.
5. RUN APPLE PLOT: Create charts and graphs from data files.
6. PRINT GRAPHS AND CHARTS: Make permanent copies of the graphs and charts created by Apple Plot.
7. EXIT PROGRAM: Terminate the use of the data-base program and place the user in command mode.

Make a selection by entering the appropriate number; remember to always press "RETURN" after each entry. If you make an error in data entry, the left arrow can be used to back up and type the correct response. For questions requiring a Yes or No answer, only Y or N need be entered.

Selection 1: CREATE NEW DATA SET

This choice allows entry of up to 100 X,Y data pairs, for each of two data sets. Having two data sets (1 and 2) in each file allows construction of overlay plots. Thus, projected and actual budgets, for example, can easily be plotted on the same set of axes.

After selecting data set 1 or 2, the computer will prompt you for your data input. This should be typed as follows: X value first, then a comma, then the Y value. To terminate data entry, type a comma and press RETURN. When you have completed the entry of data to sets 1 and 2, choose the zero (0) to save your data on the disk. The computer will ask for a file name, which may be any combination of alphabetic and numeric characters, including blanks. File names may not start with a number, nor may they contain a comma. Although any length of file name may be used, the computer remembers only 30 characters; your memory is probably not that good, so use a convenient, easily remembered name to minimize spelling errors, etc.

If you indicated a two disk-drive system, the data file will be saved on the disk in drive 2; if only one drive is being used, it will be saved on the disk in drive 1. After the data entry is terminated, you will be given an opportunity to review the data you just entered. The options available here are identical to those in the modification item of the menu, so read those instructions for a description.

Selection 2: MODIFY EXISTING DATA SET

This selection permits you to change existing data sets or to append new data to an existing file. Make sure any files to be altered are UNLOCKed before you attempt to rewrite the data. UNLOCKing must be done before you begin modifications.

Once the data set to be modified is indicated, the user is given a choice to change ("C"), append ("A"), insert ("I"), delete ("D") data or do none of the above ("N"). After modifications are complete, the new data set can be written over the old data set, or saved as a new data set.

Additional data editing capabilities are available in the Apple Plot package. Under some circumstances it might be more advantageous to use the Apple Plot editing options.

Selection 3: LIST DATA ON PRINTER

This selection produces a listing of the data file on the printer. Either or both of the data sets may be listed. The only option available is whether or not to give special labels to the X and Y variables. Be sure the printer is turned on before using this selection.

Selection 4: DATA TRANSFORMATION

This selection allows transformation of your data. The transformations available are:

1. $\log_{10} (X)$

2. $\log_{10} (Y)$

3. $A + B(X)$

4. $A + B(Y)$

5. $Y_n = \sum_{i=1}^n Y_i$

The first two transformations permit linearization of exponential data, for example, you may wish to take the logarithm of time for a time-drawdown plot. The second two options permit changing units on graphs, say from English to metric units. Option 5 can be used to cumulate data, such as cumulating man-hours from monthly data. A star is placed beside each transformation once it has been completed. If you attempt to take logs of negative numbers, you will get an "Illegal Entry" error message. Also, Apple Plot cannot handle negative values on the X-axis, so logs of numbers less than 1 cannot be plotted.

Transformed data can be stored either in place of the original data file or in a new file. After being written on the disk, the data is displayed so you can check for proper results from the transformation process.

Selection 5: RUN APPLE PLOT

This selection runs the plotting routine. A detailed description of this program is provided in the Apple Plot¹ user's guide; the discussion here is limited to some eccentricities of the plotting routine.

When you choose this selection, the disk drive will whirl for quite some time and the message "LOADING APPLE PLOT" will be displayed on the screen. When Apple Plot is loaded, a title screen will appear which can be cleared by pressing the space bar. The screen then will contain the list of Apple Plot options. This list is referred to as the "menu," because it provides selections analogous to those in a restaurant menu.

After the menu is displayed on the screen, choose Option 7 to read in the data from your disk. Remember to use drive 1 "D1" or drive 2 "D2", depending on which disk drive contains the data. The term "Picture" refers to completed graphs.

Use Options 1, 2, and 3 of the Apple Plot menu to tailor the graph or chart to your liking. There are two labels that may be placed anywhere on the graph. They start in the upper-left corner and must be moved into position by the user. To do this, press the ESC key then use the I, J, K, and M keys to move the label as desired.

It is possible to fine tune the label position by pressing the CTRL and A keys simultaneously, then continue to use the I, J, K, and M keys as before; in fine tuning, the label is moved only one-fourth of the distance that is moved under the coarse control. To lock the label in position, press RETURN. After fixing the label(s), you will find that they erased parts of the plot that they passed over. You must now recreate the picture (Option 5 on the Apple Plot menu), or these glitches will become permanent parts of the picture. To return to the menu with a picture on the screen, hit the space bar. Save the picture using Option 6 by typing P,D1 (or P,D2), depending on where you want to save the graph. The plot must be saved before leaving Apple Plot, or it will be lost. The plot can be printed after leaving Apple Plot. Option 9 of the Apple Plot menu cannot be used with the Paper Tiger printer because of printer incompatibilities.

The procedure for leaving Apple Plot and returning to the data-base menu is simple, just press Q and then press ESC. Because printing of pictures so often follows plot generation, you will be given the choice of going directly to the printing routine, or returning to the data base.

Selection 6: PRINT GRAPHS AND CHARTS

This selection is used to make paper copies of the plot pictures you generated and saved using Apple Plot. If you have come directly from Apple Plot, the last picture you generated will be displayed on the screen. If you have come from the data-base routine, the plot will have lines across it, and it must be recreated by recalling the plot from the disk. The computer asks a few questions about which graph you want to print. Two of these relate to the final graph appearance. The first, the Inverse option, will print a white graph on a black background. Because this option overworks the printer head, it should be used only rarely. The next question asks if you wish to expand the graph to double the default size. When you have finished copying your plots, type a "Y" in response to the appropriate question. You will be given a choice of returning to the data-base menu, or terminating the session.

Selection 7: EXIT PROGRAM

This selection provides the way out! When you are finished with the data-base plotting routine, type 7 to exit.

After the closing message is printed, you can LOCK any data files you have created. If you type 7 by accident and wish to return to the program, type RUN to get back the data-base menu.

QUERY UPDATE GEOCHEMICAL DATA BASE

Query Update (QU) is a fully supported data-base management program implemented on the CDC computer system at the Idaho National Engineering Laboratory (INEL). A complete discussion of the commands is available in Query Update Version 3 User's Guide.³ The purpose of this section is to give only a brief description of the more pertinent QU commands, and the details of the geochemical data base needed to use it. Also, some support programs are described that allow the user to generate plots. This section assumes the user has a basic familiarity with interactive processing on the CYBER computer system.

Accessing the Data

Before LOGIN, select line 73 on the Gandalf. System MFB (Line 76) does not support the QU software.

LOGIN using the format:

LOGIN, UID, PW, ORG, ACCOUNT, LOC.

UID: the user's 3 character identification

PW: the user's password code

ORG: the user's 4 character organization number

ACCOUNT: the user's 9 character account number

LOC.: the user's 3 character code for location.

The pertinent files to be used are permanent files residing under the ID of LCH, as follows:

<u>File Name</u>	<u>Description</u>
GEOFIL5	The geothermal chemical data base
GEOSS5	The compiled sub-schema that is a directory to GEOFIL5 (Appendix C)
REPORT5	Specifications used by QU to produce the report
BATREP5	A batch job to execute REPORT5.

If you are going to be using QU, GEOFIL5 and GEOSS5 must not be attached to the terminal. These files will be brought in by QU; an error will result if they are already attached.

Using Query Update

To enter QUERY/UPDATE type:

QU

To gain access to the geothermal chemical data base use either format (1) or (2). If you wish to update or insert items into the data base, you must use format (2). (The data base is password protected and the correct password can be obtained on a need-to-know basis from the Geosciences Branch of the Earth and Life Sciences Office, EG&G Idaho, Inc.)

1. USE GEOFIL5 OF GEOSS5 (ID=LCH)
2. USE GEOFIL5 (ID=LCH, PW=XXX) OF GEOSS5 (ID=LCH)

The QU mode will respond to any correct command with -- . This indicates the system has accepted the command and is waiting for another.

To terminate QU enter:

END

The system will respond with the number of diagnostic messages issued during that QU session. It will then return to the intercom command mode.

Command Guidelines

Whenever you enter an incorrect command, QU will issue a diagnostic error message. This will be in the format:

(XXX) ERROR MESSAGE

XXX will be the number of the diagnostic message. You have two alternate means of discovering more about the diagnostic message:

1. Look up the error number in the QU Reference Manual⁴ (Table B)
or
2. Enter: HELP XXX

The QU system will respond with a brief description of the diagnostic message.

The HELP command can also be useful for displaying the proper format and parameters of a QU directive. To display this information, type:

HELP, Directive

for example: HELP, EXHIBIT

The QU system also provides the capability to communicate with the intercom COMMAND mode. This is done by preceding any intercom command with OS. Examples:

OS, FILES

OS, KEEP, OUTPUT, FILES

The number of characters that can be accepted on one line of input is dependent upon the terminal in use. To enter one command string that requires more than one line of text, enter:

- At least one space after last line character

or

- A plus sign (+)

then

- Strike the RETURN key

and

- Continue entering characters.

Query Update Commands

The following is only a partial list of the most commonly used QU commands. A more detailed listing can be found in the Query Update User's Guide³ or the Query Update Reference Manual.⁴

Commands	Meaning
[] Brackets	Optional portion of the format
{ } Braces	Only one of the enclosed items must be used
DELETE data-name [VETO]	Delete a record with an option to VETO
DELETE USING data-name	Delete several records on basis of data-name
DISPLAY data-name 1[, data-name 2,]	Display all information stored in one or more fields
DISPLAY GEOFIL5	Display all records stored in data base
END	Terminate Query Update
*END	Terminate an UPDATE/USING, INSERT/USING or DELETE/USING series of directives
EXHIBIT { field-name file-name group-name record-name }	Exhibit data base or sub-schema information by different sections

Commands	Meaning
IF data-name $\left\{ \begin{array}{c} \text{EQ} \\ \text{NE} \\ \text{GT} \\ \text{LT} \\ \text{GE} \\ \text{LE} \end{array} \right\}$ value	Perform conditional testing; can be used in conjunction with a DISPLAY, UPDATE/MOVE, or DELETE operation
$\left[\begin{array}{c} \left\{ \text{AND} \right\} \\ \left\{ \text{OR} \right\} \end{array} \right.$ data-name	$\left. \begin{array}{c} \left\{ \begin{array}{c} \text{EQ} \\ \text{NE} \\ \text{GT} \\ \text{LT} \\ \text{GE} \\ \text{LE} \end{array} \right\} \text{ value} \end{array} \right]$
INSERT key-field value	Assign a new RECNO to the key field
INSERT key-field value MOVE data TO field name [data TO field name...]	Insert a new record
INSERT USING key-field name field name [field name ...]	Insert several new records
UPDATE key-field value [VETO] MOVE field value TO field name [field value TO field name ...]	Update a record with an option to VETO the operation
UPDATE USING key-field name field name [field name ...]	Update several records

Using Functions

Two types of functions are available to the QU users: independent or cumulative. Independent functions produce a result for each record read during the execution of the command or a single result for temporary data items. The functions can be used in conjunction with other QU directives.

Independent Functions

The functions and formats are:

MIN	$\left\{ \begin{array}{l} \text{data-name} \\ \text{literal} \dots \end{array} \right\}$	Selects the smallest value in the list of parameters. At least two parameters must be specified.
MAX	$\left\{ \begin{array}{l} \text{data-name} \\ \text{literal} \dots \end{array} \right\}$	Selects the largest value in the list of parameters. At least two must be specified.
JULIAN	(data-name)	Produces the number of days elapsed from January 1, 4713 B.C. to the specified date.
GREG	(data-name)	Produces a date as MMDDYY when given a Julian date.

Examples of their use are:

DISPLAY MIN (ALK, PH)

IF RECNO GE 1 DISPLAY JULIAN (SA-DATE)

IF ALK GT \$40.00\$ DISPLAY LAB, ALK, GREG (JDATE)

Cumulative Functions

These functions produce accumulated results for records read during the execution of a QU directive. These functions must be specified in the evaluate directive with a data-name.

The functions and formats are:

SUM	(data-name)	Produces a sum of values associated with the data-name
COUNT	(data-name)	Accumulates a count of all data-name occurrences that have been processed
MEAN	(data-name)	Produces an average of the values in data-name
MINS	(data-name)	Produces the smallest value of data-name
MAXS	(data-name)	Produces the largest value of data-name.

Examples of their use are:

```
IF RECNO GE 1 EVALUATE SUM (TDS)
```

```
IF RECNO GE 1 EVALUATE COUNT (RECNO)
```

```
IF W-TYPE EQ $DOMESTIC-1$ EVALUATE MEAN (PH)
```

```
IF WELLID EQ $RRPG-1$ EVALUATE MINS (W-TEMP)
```

IF RECNO GE 1 EVALUATE MEAN (FLUORIDE)

IF LAB EQ \$INEL\$ EVALUATE MAXS (HCO3) EVALUATE MINS (PH) DISPLAY +
WELLID JULIAN (SA-DATE)

This is not a complete list of QU functions. For a more comprehensive explanation and a list of other functions, please consult the QU Reference Manual.⁴

Generating Reports

The following are sample QU directives for making a quick report.

Commands ^a	Meaning
QU	Initiates the QU system
USE GEOFIL5 OF GEOSS5 (ID=LCH)	Specifies sub-schema GEOSS5 with data base GEOFIL5 (READ permission only)
REWIND FILE1	Activates a temporary file called File 1
IF WELLID EQ \$RRGE-2\$ EXTRACT UPON FILE1 PH, SA-DATE, SA-TIME, JDATE	Upon completion of conditional test, the computer will load all selected values for data names PH, SA-DATE, SA-TIME, JDATE, to FILE1
FORMAT REPORT1	Notifies QU that the following directives are to be associated with a report called Report1

Commands ^a	Meaning
DETAIL IS PH IN COLUMN 1, SA-DATE IN COLUMN 15, SA-TIME IN COLUMN 30, JDATE IN COLUMN 45	Arranges the data items by columns in Report1
TITLE AT LINE 1 IS \$QUICK REPORT\$ IN COLUMN 44 AT LINE 2 IS \$RRGE-2 PH BY DATE AND TIME \$ IN COLUMN 38 AT LINE 3 IS \$ \$	Specifies title specifications for Report1
REWIND FILE1 SRTFILE	Rewind File1 and create temporary file SRTFILE
SORT FILE1 UPON SRTFILE ON JDATE SA-TIME	Sort File1 by JDATE and SA-TIME store the results on SRTFILE
PREPARE REPORT1 FROM SRTFILE	Initiates production of Report1
END	Terminates QU
BATCH, REPORT1, PRINT, UIDXX	Sends Local File Report1 to print.

a. Commands shown here would normally be typed across the page, rather than in stacked segments as shown here for long strings of text.

The following list gives some of the more commonly used report commands. Since this list is not complete, see QU reference materials.^{3,4}

Commands	Meaning
DETAIL IS field name IN column n field name IN column n ...	Specify report column positioning
EXTRACT UPON file name, field name	Write data contained in specified field onto a named file
FORMAT report name	Associate DETAIL and TITLE directive with a report name
PREPARE report name FROM file name	Initiate the preparation of a report
REWIND file name	1) Create a specified blank file 2) Rewind an existing file to the beginning of information
SORT file name UPON sort- file name ON field name ON field name	Sort information within (file name) by (field name) and store in (sort-file name)
TITLE AT LINE m IS title IN Column n	Supply a title with an option to specify the line number and column position

Using Report5

REPORT5 is a cataloged set of QU directives that will ATTACH the data base, prepare a copy of all information contained in that data base, sort the copy by WELL ID and the Julian of SA-DATE, then output the data according to the REPORT5 format. (See Figure 3 for sample output.)

WELLID	LOCATION	LAT(N)	LONG(W)	W-TYPE
RRGE-1	B15526E23CAA	0420609	1132301	6THRML PROD

REC	WELL DEPTH (M)	DATA LAB	DATE	PROPERTIES		GAS (ML/L)		CATIONS (MG/L)			ANIONS (MG/L)		
				ALK	HARD	AR	HE	CA	K	PB	HCO3	FL	P
				SPC	TDS	CO2	N2	MG	SR	SIO2	CO3	SO4	
			S-CODE TIME	TEMP (C)	PH	H2	O2	NA	LI	NH4	CL	NO3	
00238	1521	RR	10 09 78	47.20 2800.00 87.50	119.00							5.98	
00754	1521	USGS	10 13 78	42.00 3000.00 91.00	140.00 1740.00			54.00 10 530.00	39.00 1.80	140.00	743.00 51.00	8.00 67.00	.03
00246	1521	RR	10 16 78	38.80 3100.00 91.00	142.00						870.00	7.75	
00253	1521	RR	10 23 78	39.80 3900.00 93.00	150.00						872.00	6.48	
00023	1521	INEL	11 12 78	33.20 2980.00	1656.00			56.00 1.00 466.00	34.00 1.40 1.60	136.96	853.00 830.00	5.98 45.00	
00024	1521	INEL	11 12 78	34.60 3000.00	1658.00			50.00 18 472.00	32.00 1.40 1.60	136.96	834.00	5.78 35.80	
00260	1521	RR	11 27 78	41.84 2900.00 90.00	140.00						924.00	8.05	
00270	1521	RR	12 04 78	45.20 2900.00	144.00							7.42	
00280	1521	RR	12 11 78	48.80 2800.00	153.00			582.00			843.00	8.32	
00296	1521	RR	12 18 78	44.20 2900.00	158.00			537.00			957.00	8.41	
00306	1521	RR	12 25 78	42.40 2700.00	136.00			510.00			1000.00	6.55	
					8.30			615.00			1010.00		

PAGE 4

Figure 3. Sample output according to REPORT5 format.

REPORT5 can be issued in two different modes, interactively or by batch job.

1. To generate REPORT5 in the interactive mode, you must first be in the intercom COMMAND mode. Enter the commands:

ATTACH, REPORT5, ID=LCH

QU,I=REPORT5, TL=9000, T=LOOK.

where:

I: Input File

TL: Transmission Length

T: Transaction file (copy of all QU system messages)

The system will respond with:

QUERY UPDATE 3.2 518-80322 (Date) (Time)

REPORT5 will generate the following files:

- TABLE2
- LOOK
- FILE1 - raw data from data base
- SRTFILE - sorted data from data base.

TABLE2 is the formatted output from REPORT5. Batch TABLE2 to print. If there were no errors during the execution of REPORT5, the remaining files can be returned. If an error did occur, the file 'LOOK' will contain the record of the QU session, and can be examined for errors.

2. To process REPORT5 in the BATCH mode, enter:

ATTACH, BATREP5, ID=LCH

BATCH, BATREP5, INPUT.

BATREP5 will generate job LCH00. The output from LCH00 will be cataloged as (TABLE2, ID=LCH), in addition a copy will be sent to the printer.

Plotting Data

The CYBER system and current application software provide many ways to plot data. The simplest and fastest way to plot involves:

- Magnum (An ISDMS Interactive Graphic Processor)⁶
- Tektronix terminal (or other graphics terminal)
- Hard copy printer.

The report generating capabilities of QU enable you to select, extract, and arrange the data as you wish. The report you produce will be used as input to the MAGNUM plot package⁶.

Bringing the output from QU under control of SENATOR or EDITOR allows you to preview and/or rearrange the values. While in this mode, any blank fields must be deleted or set to either 0 or other default values. Catalog the finished version as "TAPE2." This will be your input to YRFX. Figures 4 and 5 give examples of plots created using MAGNUM.

The graph displays the Spectral Power (SPC) in microns on the y-axis (ranging from 10000 to 13000) against Time in years on the x-axis (ranging from 1978 to 1981). The data shows a sharp drop in SPC around 1978.5, followed by a gradual increase.

Time (Years)	SPC (microns)
1978.0	12200
1978.1	10900
1978.2	11100
1978.3	10900
1978.4	11400
1978.5	10500
1978.6	11200
1978.7	10800
1978.8	11200
1978.9	10800
1979.0	11400
1979.1	10600
1979.2	10700
1979.3	10200
1979.4	10300
1979.5	10400
1979.6	10300
1979.7	10400
1979.8	10300
1979.9	10400
1980.0	10300
1980.1	10350
1980.2	10400
1980.3	10450
1980.4	10500
1980.5	10550
1980.6	10600
1980.7	10650
1980.8	10700
1980.9	10800

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Figure 5. Example of plot created using MAGNUM.

MAGNUM is designed to create time series plots with time along the x-axis. A FORTRAN program YRFIX under ID=LCH can be used to take data created by a report procedure and reformat it for entry into MAGNUM. Time will be output in fractional years, which will be more intelligible than Julian dates.

MAGNUM files contain only two variables, time and a data variable. However they may contain subfiles, each of which can contain time series data for a different variable. Plots of one variable against another can be made, if the time coordinates are equivalent for two subfiles. This equivalence, however, is the responsibility of the user.

To extract data from the data base in a format suitable for YRFIX, use the following EXTRACT and DETAIL statements:

```
EXTRACT UPON file WELLID, SA-DATE, (data item), JDATE
```

```
DETAIL IS WELLID IN COLUMN 1, SA-DATE IN COLUMN 21, (data-item) IN  
COLUMN 31.
```

The file should be sorted by WELLID and JDATE. Before running YRFIX, report output should be edited to delete the last line of the report. This file should then be saved as file TAPE2 as input for the program YRFIX. Output from YRFIX will be in file TAPE3.

The following minimum commands can be used to create a plot of data saved in permanent file TAPE3. TAPE3 should not be attached.

```
BEGIN, MASTER  
MAGNUM
```

The computer will clear the screen and prompt with the command "Ready ..." by issuing the commands

ATTACH TYP1 TAPE3 UID

FIND 1 1

PLOT 1

A very simple plot will be generated. Axis labels, titles, and other changes can be made to make the graph more appealing. Details of the commands can be found in the MAGNUM Reference Manual.⁶

Backing Up and Restoring Data Base

If the data base has been subjected to a large number of changes (i.e., INSERT, DELETE, UPDATE) it should be backed up to tape. This will preserve a copy of the data base in the event that the original is lost, destroyed or invalidated by erroneous entries.

Two methods exist for copying this data base to tape. Copying can be done either interactively or by a batch job. More details for backing up files to tape are given in the INEL Cyber User's Guide.⁵ The following batch job should be run to backup the data base:

UIDXX, STANY, T8, P2.

ACCOUNT,

BACKUP, ID=UID, PF=GEOFIL5, PW=XXX.

6/7/8/9

This method will create job LCHBU which will attach the data base (GEOFIL5) and copy it to a scratch tape. The dayfile listing of the output from LCHBU will provide the VSN of the backup tape. This listing should be saved for possible reference later. In addition, the tape library will issue a blue card which will contain information pertinent to the batch job.

The alternate interactive method utilizes the system routine called BACKUP. To use this method, enter:

BACKUP, ID=LCH, PW=XXX

The system will respond:

ARE YOU IN SENATOR (YES) (NO)

Enter the appropriate response. The system will respond with

?

At this point you enter the perm file name of any files you wish copied to tape.

PF=Permfilename

The system will continue to prompt you with the entry

?

When you wish to terminate the routine, enter:

END

Job LCHBUXX (XX=Terminal ID) will be created and batched in. This job will copy the selected perm files to tape. The VSN of the tape will be found in the dayfile of the output. This listing should be saved for later reference.

It is recommended that any backup procedure be executed twice. This provides the extra protection of a redundant backup tape.

To restore a file using the batch method, use the following commands:

```
UIDXX, STANY, T8, P2.  
ACCOUNT, ....  
RESTORE, VSN=XXX XXX, ID=LCH, PW=XXX.  
7/8/9  
PF=GEOFIL5  
END  
6/7/8/9
```

This will send job LCHREXX into the input QUE to recover the needed perm files.

The interactive restore is similar to the interactive backup routine-enter:

```
RESTORE, VSN=ANNNNN, ID=LCH  
PF=perm file name 1  
PF=perm file name 2  
PF=END
```

This will create batch job LCHREXX to restore the specified perm files.

CAUTION: Both methods will restore the required perm files at the same cycle number they had when copied to tape. Care should be taken to ensure that no perm files exist already with those cycle numbers.

REFERENCES

1. Apple Plot, Cupertino, California: Apple Computer Inc., 1980.
2. The Disk Operating System Manual, Cupertino, California: Apple Computer Inc., 1980.
3. Query Update Version 3 User's Guide, 60387700A, Sunnyvale, California: Control Data Corporation, 1976.
4. Query Update Version 3 Reference Manual, 60498300E, Sunnyvale, California: Control Data Corporation, 1979.
5. INEL CYBER User's Guide, EG&G-IS-5138, June 1980.
6. H. R. Bruestle, Magnum 1.0, An ISDMS Interactive Graphics Processor, EG&G-IS-5101, February 1980.

APPENDIX A
AN EXAMPLE SESSION

JRUN

ARE YOU USING A ONE OR TWO
DISK-DRIVE SYSTEM ?

ENTER 1 OR 2
DATA BASE ROUTINES
TO CREATE A NEW DATA BASE
MODIFY AN EXISTING ONE
OR PLOT GRAPHS AND CHARTS
SELECT YOUR OPTION BY NUMBER

1...CREATE A NEW DATA SET
2...MODIFY AN EXISTING DATA SET
3...LIST DATA ON PRINTER
4...DATA TRANSFORMATION
5...RUN APPLE PLOT
6...PRINT GRAPHS AND CHARTS
7...EXIT PROGRAM

MY CHOICE IS...1
TWO DATA LISTS ARE AVAILABLE
DO YOU WANT ONE OR TWO ?
(ENTER 1 OR 2)

CURRENT CONTENTS ARE...
DATA SET 1.. 0 DATA PAIRS
DATA SET 2.. 0 DATA PAIRS

ENTER 0 TO WRITE DATA TO DISC

MY CHOICE IS... 1
DATA ENTRY FOR DATA SET 1

TYPE ',' (RTN) TO END DATA ENTRY

X,Y 1,200
X,Y 2,200
X,Y 3,200
X,Y 4,250
X,Y 5,300
X,Y 6,300
X,Y 8,200
X,Y 9,200
X,Y 10,3500
X,Y 11,200
X,Y 12,200
X,Y ,

TWO DATA LISTS ARE AVAILABLE
DO YOU WANT ONE OR TWO ?
(ENTER 1 OR 2)

CURRENT CONTENTS ARE...
DATA SET 1.. 11 DATA PAIRS
DATA SET 2.. 0 DATA PAIRS

ENTER 0 TO WRITE DATA TO DISC

MY CHOICE IS... 2
DATA ENTRY FOR DATA SET 2

TYPE ',' (RTN) TO END DATA ENTRY

X,Y 1,170
X,Y 2,160
X,Y 3,120
X,Y 4,230
X,Y ,

TWO DATA LISTS ARE AVAILABLE
DO YOU WANT ONE OR TWO ?
(ENTER 1 OR 2)

CURRENT CONTENTS ARE...
DATA SET 1.. 11 DATA PAIRS
DATA SET 2.. 4 DATA PAIRS

ENTER 0 TO WRITE DATA TO DISC

MY CHOICE IS... 0
CURRENT FILE..NONE
'RTN' FOR CURRENT FILE
FILE NAME...MAN HOURS
CHECK INPUT VALUES
WHICH DATA SET DO
YOU WISH TO EXAMINE ?
(ENTER 1 OR 2 / 0 FOR MENU)

MY CHOICE IS...1
DATA SET 1

I	X VALUE	Y VALUE
1	1	200
2	2	200
3	3	200
4	4	250
5	5	300
6	6	300
7	8	200
8	9	200
9	10	3500
10	11	200
11	12	200

'C'HANGE/'A'PPEND/'D'ELETE/'I'NSERT/
'RTN' OR 'N' IF NONE I
INSERT

BEFORE

WHICH PAIR?

??
WHAT ARE THE VALUES TO INSERT ?
X,Y 7,250

WHICH DATA SET DO
YOU WISH TO EXAMINE ?

(ENTER 1 OR 2 / 0 FOR MENU)

MY CHOICE IS...1
DATA SET 1

I	X VALUE	Y VALUE
1	1	200
2	2	200
3	3	200
4	4	250
5	5	300
6	6	300
7	7	250
8	8	200
9	9	200
10	10	3500
11	11	200
12	12	200

'C'HANGE/'A'PPEND/'D'ELETE/'I'NSERT/
'RTN' OR 'N' IF NONE N
WHICH PAIR ?

?10

WHAT ARE THE NEW VALUES ?

X,Y 10,350

CHANGE MORE DATA ? (Y/N)

?N

WHICH DATA SET DO
YOU WISH TO EXAMINE ?

(ENTER 1 OR 2 / 0 FOR MENU)

MY CHOICE IS...2
DATA SET 2

I	X VALUE	Y VALUE
1	1	170
2	2	160
3	3	120
4	4	230

'C'HANGE/'A'PPEND/'D'ELETE/'I'NSERT/
'RTN' OR 'N' IF NONE N
WHICH DATA SET DO
YOU WISH TO EXAMINE ?

(ENTER 1 OR 2 / 0 FOR MENU)

MY CHOICE IS...0
CURRENT FILE..MAN HOURS
SAVE IN A NEW DATA SET ? N
DATA BASE ROUTINES
TO CREATE A NEW DATA BASE
MODIFY AN EXISTING ONE

OR PLOT GRAPHS AND CHARTS
SELECT YOUR OPTION BY NUMBER

1...CREATE A NEW DATA SET
2...MODIFY AN EXISTING DATA SET
3...LIST DATA ON PRINTER
4...DATA TRANSFORMATION
5...RUN APPLE PLOT
6...PRINT GRAPHS AND CHARTS
7...EXIT PROGRAM

MY CHOICE IS...2
CURRENT FILE..MAN HOURS
DO YOU WANT A CATALOG ?

(Y/N)..N
CURRENT FILE..MAN HOURS
ENTER FILE NAME FROM
WHICH TO READ DATA
TO USE CURRENT FILE
PRESS 'RTN'

FILE..
WHICH DATA SET DO
YOU WISH TO EXAMINE ?

(ENTER 1 OR 2 / 0 FOR MENU)

MY CHOICE IS...2
DATA SET 2

I	X VALUE	Y VALUE
1	1	170
2	2	160
3	3	120
4	4	230

'C'HANGE/'A'PPEND/'D'ELETE/'I'NSERT/
'RTN' OR 'N' IF NONE A
DATA ENTRY FOR DATA SET 2

TYPE ',' (RTN) TO END DATA ENTRY

X,Y 5,325
X,Y 6,290
X,Y ,

WHICH DATA SET DO
YOU WISH TO EXAMINE ?

(ENTER 1 OR 2 / 0 FOR MENU)

MY CHOICE IS...2
DATA SET 2

I	X VALUE	Y VALUE
---	---------	---------

1	1	170
2	2	160
3	3	120
4	4	230
5	5	325
6	6	290

'C'HANGE/'A'PPEND/'D'ELETE/'I'NSERT/
'RTN' OR 'N' IF NONE N
WHICH DATA SET DO
YOU WISH TO EXAMINE ?
(ENTER 1 OR 2 / 0 FOR MENU)

MY CHOICE IS...0
CURRENT FILE..MAN HOURS
SAVE IN A NEW DATA SET ? N
DATA BASE ROUTINES
TO CREATE A NEW DATA BASE
MODIFY AN EXISTING ONE
OR PLOT GRAPHS AND CHARTS
SELECT YOUR OPTION BY NUMBER
1...CREATE A NEW DATA SET
2...MODIFY AN EXISTING DATA SET
3...LIST DATA ON PRINTER
4...DATA TRANSFORMATION
5...RUN APPLE PLOT
6...PRINT GRAPHS AND CHARTS
7...EXIT PROGRAM

MY CHOICE IS...3
CURRENT FILE..MAN HOURS
DO YOU WANT A CATALOG ?

(Y/N)..N
CURRENT FILE..MAN HOURS
ENTER FILE NAME FROM
WHICH TO READ DATA
TO USE CURRENT FILE
PRESS 'RTN'

FILE..
WHICH DATA SET DO
YOU WISH TO PRINT ?

(ENTER 1 OR 2 / 0 FOR MENU)

MY CHOICE IS...1
DO YOU WISH TO ADD X-Y LABELS ? NY

INPUT X LABEL
?FY-81 MONTH

INPUT Y LABEL
?HOURS

DATA SET 1 FOR FILE MAN HOURS

I	FY-81 MONTH	HOURS
1	1	200
2	2	200
3	3	200
4	4	250
5	5	300
6	6	300
7	7	250
8	8	200
9	9	200
10	10	350
11	11	200
12	12	200

2
DO YOU WISH TO ADD X-Y LABELS ? N

DATA SET 2 FOR FILE MAN HOURS

I	X VALUE	Y VALUE
1	1	170
2	2	160
3	3	120
4	4	230
5	5	325
6	6	290

0
DATA BASE ROUTINES
TO CREATE A NEW DATA BASE
MODIFY AN EXISTING ONE
OR PLOT GRAPHS AND CHARTS
SELECT YOUR OPTION BY NUMBER

1...CREATE A NEW DATA SET
2...MODIFY AN EXISTING DATA SET
3...LIST DATA ON PRINTER
4...DATA TRANSFORMATION
5...RUN APPLE PLOT
6...PRINT GRAPHS AND CHARTS
7...EXIT PROGRAM

MY CHOICE IS...
ILLEGAL ENTRY
DATA BASE ROUTINES
TO CREATE A NEW DATA BASE
MODIFY AN EXISTING ONE
OR PLOT GRAPHS AND CHARTS
SELECT YOUR OPTION BY NUMBER

1...CREATE A NEW DATA SET
2...MODIFY AN EXISTING DATA SET
3...LIST DATA ON PRINTER
4...DATA TRANSFORMATION
5...RUN APPLE PLOT
6...PRINT GRAPHS AND CHARTS
7...EXIT PROGRAM

FILE..
 3RUN
 ARE YOU USING A ONE OR TWO
 DISK-DRIVE SYSTEM ?
 ENTER 1 OR 2 2
 DATA BASE ROUTINES
 TO CREATE A NEW DATA BASE
 MODIFY AN EXISTING ONE
 OR PLOT GRAPHS AND CHARTS
 SELECT YOUR OPTION BY NUMBER

- 1...CREATE A NEW DATA SET
- 2...MODIFY AN EXISTING DATA SET
- 3...LIST DATA ON PRINTER
- 4...DATA TRANSFORMATION
- 5...RUN APPLE PLOT
- 6...PRINT GRAPHS AND CHARTS
- 7...EXIT PROGRAM

MY CHOICE IS...4
 CURRENT FILE..NONE
 DO YOU WANT A CATALOG ?

(Y/N)..NY
 PRESS SPACE

DISK VOLUME 254

*A 002 HELLO
 *A 003 APPLEPLOT DRIVER
 *A 131 APPLEPLOT
 *B 002 IDS440P4.OBJ
 *A 030 DATA BASE
 *B 034 DINASAURS PLOT
 *T 003 DINASAURS DATA
 *A 007 PLOTTER
 *A 002 FANCY
 T 002 MAN HOURS
 TYPE FILE NAME...MAN HOURS
 THE FOLLOWING DATA
 TRANSFORMATIONS ARE AVAILABLE

SET1 SET2

- 1...LOG 10 OF X
- 2...LOG 10 OF Y
- 3...LINEAR OF X
- 4...LINEAR OF Y
- 5...CUM SUM Y
- 6...WRITE DATA TO DISC
- * INDICATES TRANSFORM COMPLETED
- MY CHOICE IS...5
- WHICH DATA SET DO
- YOU WISH TO TRANSFORM ?
- (ENTER 1 OR 2 / 0 FOR MENU)

MY CHOICE IS...1

THE FOLLOWING DATA
 TRANSFORMATIONS ARE AVAILABLE

SET1 SET2

- 1...LOG 10 OF X
- 2...LOG 10 OF Y
- 3...LINEAR OF X
- 4...LINEAR OF Y
- 5...CUM SUM Y *
- 6...WRITE DATA TO DISC
- * INDICATES TRANSFORM COMPLETED
- MY CHOICE IS...5
- WHICH DATA SET DO
- YOU WISH TO TRANSFORM ?

(ENTER 1 OR 2 / 0 FOR MENU)

MY CHOICE IS...2
 THE FOLLOWING DATA
 TRANSFORMATIONS ARE AVAILABLE

SET1 SET2

- 1...LOG 10 OF X
- 2...LOG 10 OF Y
- 3...LINEAR OF X
- 4...LINEAR OF Y
- 5...CUM SUM Y * *
- 6...WRITE DATA TO DISC
- * INDICATES TRANSFORM COMPLETED
- MY CHOICE IS...6
- CURRENT FILE..MAN HOURS
- ENTER FILE NAME ON WHICH TO
- WRITE TRANSFORMED DATA
- 'RTN' TO USE CURRENT FILE

NOTE - USING THE SAME FILE
 NAME WILL OVERWRITE
 YOUR ORIGINAL DATA

ENTER FILE NAME...CUM NAMAN HOURS
 CHECK INPUT VALUES
 WHICH DATA SET DO
 YOU WISH TO EXAMINE ?

(ENTER 1 OR 2 / 0 FOR MENU)

MY CHOICE IS...1
 DATA SET 1

I	X VALUE	Y VALUE
1	1	200
2	2	400
3	3	600
4	4	850
5	5	1150
6	6	1450
7	7	1700

8	8	1900
9	9	2100
10	10	2450
11	11	2650
12	12	2850

'C'HANGE/'A'PPEND/'D'ELETE/'I'NSERT/
 'RTN' OR 'N' IF NONE N
 WHICH DATA SET DO
 YOU WISH TO EXAMINE ?
 (ENTER 1 OR 2 / 0 FOR MENU)
 MY CHOICE IS...2
 DATA SET 2

I	X VALUE	Y VALUE
1	1	170
2	2	330
3	3	450
4	4	680
5	5	1005
6	6	1295

'C'HANGE/'A'PPEND/'D'ELETE/'I'NSERT/
 'RTN' OR 'N' IF NONE
 WHICH DATA SET DO
 YOU WISH TO EXAMINE ?
 (ENTER 1 OR 2 / 0 FOR MENU)
 MY CHOICE IS...0
 DATA BASE ROUTINES
 TO CREATE A NEW DATA BASE
 MODIFY AN EXISTING ONE
 OR PLOT GRAPHS AND CHARTS
 SELECT YOUR OPTION BY NUMBER
 1...CREATE A NEW DATA SET
 2...MODIFY AN EXISTING DATA SET
 3...LIST DATA ON PRINTER
 4...DATA TRANSFORMATION
 5...RUN APPLE PLOT
 6...PRINT GRAPHS AND CHARTS
 7...EXIT PROGRAM
 MY CHOICE IS...5

JRUN

DO YOU WANT TO..

1...PRINT PICTURES

2...RETURN TO DATA BASE

MY CHOICE IS..1

PLOT PICTURES FROM DRIVE 1 OR 2 ?

DRIVE..2
 NEED A CATALOG (Y/N) ?N
 DIFFERENT PICTURE (Y/N) ?N
 INVERT SCREEN (Y/N) ?N
 EXPAND SCREEN (Y/N) ?N

ICATALOG,D2

DISK VOLUME 254

*A 002 HELLO
 *A 003 APPLEPLOT DRIVER
 *A 131 APPLEPLOT
 *B 002 IDS440P4.OBJ
 *A 030 DATA BASE
 *B 034 DINASAURS PLOT
 *T 003 DINASAURS DATA
 *A 007 PLOTTER
 *A 002 FANCY
 T 002 MAN HOURS
 T 002 CUM MAN HOURS
 B 034 PLOT HOURS
 B 034 PLOT CUM HOURS

LOCK MAN HOURS
 LOCK CUM MAN HOURS

APPENDIX B
CARE AND USE OF DISKETTES

APPENDIX B

CARE AND USE OF DISKETTES

The diskette is a small plastic disk, 5 inches in diameter with a magnetic coating allowing the storage, retrieval, and erasure of data. This diskette is permanently sealed in a square, plastic cover. The following practices will help extend the life of your diskette:

1. Do not bend the diskette.
2. Never touch the gray or brown surface of the diskette that is visible through the oval opening in the plastic cover.
3. Magnetic fields can scramble data on the disk, so keep the diskettes away from magnets and TV sets.
4. Store the diskette in the pockets that are provided with them.
5. Store the diskettes vertically.
6. Use only a felt-tipped pen to label your diskette.
7. Keep diskettes away from heat.

To use a diskette, remove it from its cardboard pocket, and slide it carefully into the disk drive with the label facing up. The proper way to load a disk is to place your thumb over the diskette label when inserting the diskette. Make sure the disk-drive door is open before insertion. Closing the door lowers the reading device onto the disk. Open the door if a diskette is to be left in the drive unit for several hours without use. NEVER open the disk-drive door while the red "IN USE" light is on, as this may destroy any information that is on the disk.

APPENDIX C
SUB-SCHEMA LAYOUT

APPENDIX C

SUM-SCHEMA LAYOUT

IDENTIFICATION DIVISION
 SUB-SCHEMA NAME IS GEOS5
 DATA DIVISION
 AREA-NAME IS GEOFIL5 ID IS LCH
 ORGANIZATION IS INDEXED NEW
 KEY IS RECNO
 RECORD-NAME IS WELLINFO

02	RECNO	PIC 9(5)
02	WELLID	PIC X(15)
02	WELL-DATA	
03	DEPTH	PIC Z(5)
03	LOC	PIC X(12)
03	W-TYPE	PIC X(12)
03	GEOG	
04	LAT	
05	N-DEG	PIC Z(3)
05	N-MIN	PIC Z(2)
05	N-SEC	PIC Z(2)
04	LONG	
05	W-DEG	PIC Z(3)
05	W-MIN	PIC Z(2)
05	W-SEC	PIC Z(2)
03	W-STATUS	
04	S-CODE	PIC X(4)
04	S-DATE	PIC X(8)
02	SAMPLE	
03	SA-DATE	PIC X(8)
03	SA-TIME	PIC X(8)
03	LAB	PIC X(6)
02	COMPOS	
03	PROPERTIES	
04	ALK	PIC ZZZZZ.ZZ
04	SPC	PIC ZZZZZ.ZZ
04	W-TEMP	PIC ZZZZZ.ZZ
04	HARD	PIC ZZZZZ.ZZ
04	TDS	PIC ZZZZZ.ZZ
04	PH	PIC ZZZZZ.ZZ
03	GAS	
04	AR	PIC ZZZZZ.ZZ
04	CO2	PIC ZZZZZ.ZZ
04	H2	PIC ZZZZZ.ZZ
04	HE	PIC ZZZZZ.ZZ
04	N2	PIC ZZZZZ.ZZ
04	O2	PIC ZZZZZ.ZZ
03	CATIONS	
04	CA	PIC ZZZZZ.ZZ

	04	MG	PIC	ZZZZZ.ZZ
	04	NA	PIC	ZZZZZ.ZZ
	04	K	PIC	ZZZZZ.ZZ
	04	SR	PIC	ZZZZZ.ZZ
	04	LI	PIC	ZZZZZ.ZZ
	04	PB	PIC	ZZZZZ.ZZ
	04	SI02	PIC	ZZZZZ.ZZ
	04	NH4	PIC	ZZZZZ.ZZ
03		ANIONS		
	04	HC03	PIC	ZZZZZ.ZZ
	04	C03	PIC	ZZZZZ.ZZ
	04	CL	PIC	ZZZZZ.ZZ
	04	FLUGRIDE	PIC	ZZZZZ.ZZ
	04	S04	PIC	ZZZZZ.ZZ
	04	N03	PIC	ZZZZZ.ZZ
	04	P	PIC	ZZZZZ.ZZ
03		SOMEDAY	PIC	X(82)
03		JDATE	PIC	X(9)
03		KDATE	PIC	X(9)

APPENDIX D
DEFINITIONS OF DATA-NAMES

APPENDIX D

DEFINITIONS OF DATA-NAMES

RECNO	Record number of item
WELLID	Fifteen character identification of well
WELL-DATA	Group name for the following three items
DEPTH	Depth of the well in meters
LOC	Location of well
W-TYPE	Type of well
GEOG	Group name of lat (latitude) and long (longitude)
W-STATUS	Group name for the following two items
S-CODE	Status code
S-DATE	Date of status
SAMPLE	Group name for the following three items
SA-DATE	Date of chemical sample
SA-TIME	Time of sample
LAB	Lab-produced analysis of sample

PROPERTIES	Group name for the following six items
ALK	Alkalinity, in mg/L as CaCO_3
SPC	Conductivity
W-TEMP	Temperature of water, in degrees centigrade
HARD	Hardness, in mg/L as CaCO_3
TDS	Total dissolved solids
PH	pH of water
GAS	Group name for the following seven items, all in ml/L
AR	Argon
CO2	Carbon Dioxide
H2	Hydrogen
HE	Helium
N2	Nitrogen
O2	Oxygen
CATIONS	Group name for the following nine items, all in mg/L
CA	Calcium
MG	Magnesium

NA	Sodium
K	Potassium
SR	Strontium
LI	Lithium
PB	Lead
SI02	Silica
NH4	Ammonium
ANIONS	Group name for following seven items, all in mg/L
HC03	Bicarbonate
C03	Carbonate
CL	Chloride
FLUORIDE	Fluoride
S04	Sulfate
N03	Nitrate
P	Phosphorous, as P
SOMEDAY	Reserved for expansion
JDATE	Julian date of chemical sample
KDATE	Reserved for Julian of S-Date