WorkBook71

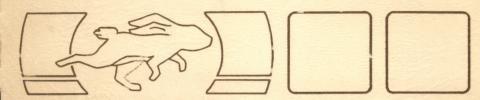
SPREADSHEET
TEXT EDITOR
FILE MANAGER

REPORT GENERATOR
RPN CALCULATOR
UTILITIES

for the HP-71

ROM

by Richard E. Harvey



WorkBook 71



ROM SOFTWARE FOR THE HP-71

BY RICHARD E. HARVEY BOX 5695 GLENDALE ARIZONA 85312 U.S.A.

INSTALLING THE ROM MODULE

Remove the port cover and gently slide in the module until it snaps into place. If the module does not fit, do not force it, it may be upside down.

* Be sure the 71 is turned off.

* Do not touch any keys on the bottom row of keys on the keyboard while installing the module.

* If you have removed another module to make room for this ROM, turn the 71 on then off, with the port empty, before installing the ROM.

* Do not handle the electrical contacts in either the

module or the HP-71.

* Place the module in a higher numbered front port than any RAM modules to be sure that the module can access your custom configuration files.

SERIAL NUMBER 2609-R1-164

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INTRODUCTION

The WorkBook71 ROM is a data gathering, analysis and report generating tool for the Hewlett-Packard HP-71 Portable Computer. Modules include Spreadsheet Editor, Text Editor, data format converter, searching, sorting and Report Formatter as well as an RPN calculator and several utilities including two LEX files which add new BASIC keywords. The goal is to provide a versatile package in which data can flow between applications with minimal hassle.

Spreadsheet data is organized in a grid of columns and rows. The intersection of a column and row is called a cell. Data stored in these cells forms the building blocks of a data analysis system known as an Electronic Spreadsheet.

Cells can contain information such as names and addresses, numbers and formulas. This flexibility makes it easy for us to maintain a mailing list, travel expense report, price list, budget or business statement and write reports in essentially the same format. Once you are comfortable with the spreadsheet concept you will probably find it easier to write a spreadsheet file to solve a problem than writing a BASIC program.

Some conventions are accepted for files written on a portable computer. We want to keep memory usage to a minimum while at the same time keep data organized in ways that make it is easy to find and extract information. Even though data doesn't always represent a conventional Spreadsheet, for want of a better word, we will often throughout this manual refer to these files as "Worksheets".

WorkBook Worksheets are written compactly, extraneous cells used to dress up the file for listing aren't necessary because of the reporting utilities provided. This can conserve a considerable amount of memory in addition to making it faster to move about the file.

When used as a Data Base Editor, each cell represents a field such as Zip code or company name. Since data entry is 30-50% of our costs and time, we want to keep the fields as general as possible that we may not later be restricted by lack of forethought. As you can see, the design of data and report formats is very important and should be a major emphasis when learning this system.

Each Module is covered in its own section of this manual. The inevitable Addendum is in the last section, listing some cautions and hints. A glossary is at the back of this manual.

USING WORKBOOK71

The WorkBook71 package consists of several separate programs, or "modules". Each module performs a specific kind of task such as data entry (the WB program) and printing reports (the REPORT and PRINTWB programs). This library makes it possible to choose only the applications you really need. This manual discusses each module in a separate section.

In addition to these applications, several utilities are available for the programmer to extend this system.

WHAT'S IN THE ROM

WB Spreadsheet Editor

This is the Spreadsheet and Data Base data entry and review program. It is the largest module and is the workhorse of the system.

• TED Text Editor

Much of computing deals with Text files. TED is a Text Editor; working with a Full Screen if a monitor is available, or as a simple line editor when used handheld. TED is very easy to use.

• RPN Calculator

A calculator similar to a Hewlett-Packard RPN calculator. Not programmable, but has continuous memory and a few unusual features.

• REPORT Text Formatter

The report printer module. Can be used as a Text Formatter with any Text file for printing reports of any size. Extensive command language allows interraction with WorkBook71 files as well as operations like formula calculation, date, star graph plotting, data base utilities and extended printer control. Prints at over 300 words per minute. This manual was printed by REPORT.

PRINTWB Spreadsheet Printer

Prints a WorkBook71 Data file as a grid of columns and rows, much as it is displayed on a monitor, or lists it like a Data Base. $\,$

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PORTER File Converter

Performs file type conversions between Text and WorkBook Data files. Useful for exchanging data with other programs or other computers.

• FINDER Search Program

Input a series of qualifiers such as Zip codes within a certain range or city and FINDER will search WorkBook71 Data files for matching data. Outputs Text which is compatible with Distribution Lists used by the REPORT program.

• SORTWB Sorting Program

Used for alphabetizing fields in a WorkBook71 Data file. Especially useful when the file is used as a Data Base.

• WBLEX Machine Language File

This file extends BASIC with new keywords. These keywords add new forms of INPUT, data formatting, data extraction, and to speed formula recalculation.

TEXTUTIL Machine Language File

Adds new BASIC keywords for use with Text files.

USING THE HP-71

The HP-71 is a remarkable machine. It can address more memory than many desk top computers, yet it has a 4-bit processor and a smaller footprint than many pocket calculators. It speaks a very advanced dialect of BASIC, yet its programming methods are as different from its closest HP relatives as from the "standard" Microsoft BASIC. It is the multiple file structure and unlimited recursion which make packages like this one practical, and that is what this section is about. No attempt is made here to teach HP-71 BASIC, you may not even want to learn it.

The BASIC HP-71

Using the HP-71 as well as programming in both BASIC and Assembly Language are discussed in a book written specifically for the 71 user. "The BASIC HP-71" contains numerous charts, tables and examples. Much of the information of Vols I and II of the HP-71 IDS is included, but in more usable form. The

book answers often asked questions as well as offering new ways of using the HP-71. If you are new to the 71 or just wish to make better use of the computer, this book is to be recommended.

Calling Programs and Calculator Variables

When you run a program it can access variables which you have used in CALC mode. This is an advantage because you can do some calculations (like using the statistical functions) then run a program which will perform further processing of those variables.

This is all well and good but, what happens when you run a large program with a considerable number of variables? It can alter your calculator variables without your knowing it until you go back to use them later. Also, when the program ends, it leaves behind a considerable number of variables in which you probably have no interest and wish weren't there wasting valuable memory. One solution is to use DESTROY ALL in the program, many do. Unfortunately you also loose your calculator variables.

There is an elegantly simple method to preserve your calculator variables for use in personal solutions and still be able to run variable hungry programs. When a subprogram is CALLed the computer creates a separate environment, with its own variables. When the subprogram ends its environment is discarded and your calculator variables are left intact. Begin the program with:

10 CALL APROG @ SUB APROG

Of course, you can use any program name. The first statement tells the computer to call a subprogram which happens to begin in the next statement. When the program ends what actually happens is the computer reclaims the memory used in the subprogram then goes back to read the next command following the CALL statement. The next statement is SUB which designates the beginning of a different program, hence the end of the current one, so the program terminates with an implied END. This is how the programs in this package operate.

Looking at RECURSION, at RECURSION, at RECURSION

It's all done with mirrors, actually pointers and return stacks. Calls to subroutines can be nested within themselves. In the same manner programs can call other programs and return to where they started. It is the second concept which is the most helpful in conjunction with this package. A program can call another program, even itself, then return upon completion! (this is the only sentence in this manual which ends with an exclamation point, note why). As an example, the WorkBook Editor program can call itself to edit another file (or another portion of the same file). Then, when you exit the second program, the original file will still be active with the cursor in the same place. The only catch is that the

called program can't end with PAUSE because the computer will do just that. Of course, you can use f-CONT to continue, but the effect is less transparent.

HP-71 File Structure

There can be as many files in the computer as available memory will allow. File types can be BASIC programs, Text, LEX and others. CAT ALL can be used to list the available files. This listing can become quite long and cumbersome when looking for a particular file. The HP-71 has the ability to partition memory into :PORTS. There are many reasons for recommending the use of partitioned memory (such as not loosing files from a "Memory lost").

GETTING STARTED

User Keyboard

WorkBook 71 does not alter key assignments. Neither does it activate nor deactivate USER mode. There are no special key assignment files in the ROM. When programs are waiting for a single keystroke such as 'Y or N', key redefinitions are ignored. When the flashing cursor is present and USER mode is set redefinied keys are active. Several keys have special uses in the WorkBook Spreadsheet and Text Editors. It is best to either not redefine those keys or not have the USER keyboard active when running the program. These programs "take over" those keys. Immediate execute key assignments are ignored in both programs, nothing will happen when you press them.

Display Delay Rate

The WorkBook Editors ignore current delay settings. For other programs set DELAY to what you feel is a comfortable rate. Note that program execution pauses for the DELAY time when displaying data before moving on to the next instruction; there is a definite effect on program opperation speed.

The RUN key

You can use programs in this series by using either of the following:

CALL filename

RUN filename

Using RUN has an advantage in that the HP-71 will run the most recently run program again by pressing the RUN key. If, for example, you often use just the WorkBook Editor enter RUN WB. The next time you want to use the program you can do so by pressing the RUN key again.

10 Minute Timeout

Mormally the HP-71 will timeout after waiting aproximately 10 minutes for a keystroke. After 10 minutes of inactivity, the WorkBook Editors will enter Command level then exit. The RPN calculator will turn off the computer. Other programs in the package will timeout normally.

Alternate Character Set

Prompts for single key input and display of Column and Row labels are displayed in the alternate character set. When no character set has been created then they are displayed as regular HP-71 characters.

If you would like inverse (clear characters on dark background) or underlined characters, a utility called CHARSET, discussed in the addendum, may be used to create these characters.

Power Consumption

While running BASIC programs causes an increase in battery consumption, the programs in this package were designed to minimize power waste. In Browse level or when the flashing cursor is present relatively little power is consumed. The RPN calculator consumes little power except when keys are pressed.

When the HP-IL loop is active, power consumption is somewhat increased. Maintaining a monitor increases power usage again. It is recommended that an AC adapter be used when using an external keyboard.

The WorkBook File

This system uses a DATA file with fixed number of records and record length. The first two records are used by the system to store data about the file such as last cell edited or number of columns in the file. This data is read whenever a file is assigned, then updated when through editing the file. The data is in a compacted format and its use is generally transparent. Each subsequent record in the file corresponds to a cell. Data is stored in sequence beginning with the cell in the upper left corner. The last row in one column immediately preceeds the first row in the next column to the right. The section "Using WorkBook Files with your programs" has a more in depth discussion of file structure.

Using HP-IL

The WorkBook system will support a printer, mass storage device and a display device. Printer and display devices must be assigned before running the programs, the programs will not assign them. For this reason you may designate any device that can process the data as the device. This is helpful if you are using a non-HP printer with parallel interface or perhaps an RS-232c display device or keyboard. Assigning devices is discussed in the HP-IL Interface Owner's Manual.

Standard HP printers and display devices are automatically assigned when they are present and the HP-IL is active. Instead of leaving the loop active when devices are not present (causing a delay when you turn on the 71), the HP-IL keywords OFFIO and RESTOREIO disable and enable the loop as needed. The HP-IL ROM Owners Manual discusses usage of these keywords.

The first device found on the HP-IL with an accessory ID from 16 through 31 will be used as the mass storage device. This corresponds to the Hewlett-Packard 82161A Cassette Drive and Hewlett-Packard 9114A and 9114B Disc Drives. Other devices with the appropriate accessory ID and which have a similar response to high level HP-IL commands should also be usable.

The usual method for a program to determine the existance of mass storage from a running program is to poll devices until one is found. This is effective unless the loop is inactive in which case the computer will wait for several seconds for a nonexistant device to respond. Instead of requiring this wait occasionally a program will ask if you would like to use mass storage, even if it is not present.

External Displays

The WorkBook Editors check to see if there is an active display device assigned when they start. If there is one then the programs will maintain a display of cols and rows. Prompts for input which are normally shown only on the LCD are also shown on the bottom rows of the display device. Other programs will support a display device but do not necessarily provide a formatted display. The RPN calculator does not support a monitor.

Display devices which support HP display escape sequences should be acceptable, though not all Terminals are HP compatible.

As furnished, the package is configured for use with a 40 column by 20 row display device or none at all. Instructions for use with other display configurations are listed in the addendum.

Memory Requirements

Each program requires from 500 to 1100 bytes of RAM free for variables as they operate. Most programs write or read your Text or Data files. The RPN calculator requires a 120 byte SDATA file. Be sure that you have enough free RAM available to accommodate needed files. The WorkBook ROM itself uses no RAM when not in use.

A WORKBOOK71 PRIMER

This is an introduction to the WorkBook71 package. Very few technical details are included though some new terms and operations will be introduced without fully explaining them in this section. The section on each module in WorkBook71 discusses the actual use of each operation.

A spreadsheet can be compared to Calc mode; each cell in the spreadsheet is analogous to an entry on the command stack. However, unlike Calc mode, you may place entries in any cell in a grid, and formulas in cells may refrence other cells. So, the spreadsheet can be thought of as a flexible calculator, but add to this the ability to have those formulas automatically recalculated and it becomes an analytical tool. Change one value, say number of units sold, and see how that reflectes in projected "Year,Net". What if you change or add to your product line? You can project the effects without having made a single sales call. For good reason, this is often called "playing 'what if...'", and is, for many, the main reason for using a spreadsheet.

Since we're using a handheld computer, a spreadsheet often is used for quite varied purposes. While usually thought of as a mathematical tool, this arrangment of columns and rows is a natural way to organize many types of information. WB (the abreviated name for the spreadsheet program) helps you organize data such as name lists or inventory. These various types of information are as at home in the spreadsheet format as purely mathematical formulas. And, with the ease of editing and viewing data in a spreadsheet format, this is probably the easiest way to use this data in a handheld computer.

First, let's look at a WB spreadsheet file and see how it is set up.

	+	Mon	Tue	Wed	Thu	Fri	Wktot
City	I PALO	ALTO SAN	JOSE	MONTEREY	PALO ALTO	HOME	
Hotel	1	50.88	40.28	78.8	1 40.28		210.25
Trans	1	2.05		43.6	0 4.10	137.30	187.05
Auto	1	12.00		14.50	0 10.40		36.90
Phone	1	5.10	14.55	3.6	0	12.40	35.65
Food	1	16.30	3.27	42.6	0 16.20	7.00	85.37
Misc	1	27.50	4.60	43.0	0		75.10
Total	1	113.83	62.70	226.1	1 70.98	156.70	630.32

Travel expense accounting is an obvious use for a handheld computer. The first five columns in this file each represents a day, the last column is the week total. Rows represent types of expenses and the last row is the total for

each day. A cell is the coordinate of a column and row, such as [Tue,Total].

This example uses "User" labels for Columns and Rows for easy refrence. Each Col (we'll usually abreviate "Col" for "Column") and Row are numbered from one through the end of the file. [Tue,Total] can also be expressed as [2,8] or [Tue,8] or [2,Total]. In the WorkBook format, a cell refrence is a set of brackets enclosing Col and Row refrences which are, themselves, separated by a comma.

This is all well and good if you are using a monitor. However, WorkBook71 can be used with or without a monitor. As with viewing a BASIC program file, only a single line (or portion of a line) is in the display at one time; the cursor keys move you through the file. A single cell at a time is displayed in the computers display. The Col and Row labels are on the left of the display, followed by "~" then the actual cell contents (or as much as will fit in the display). The first cell in the upper left corner is displayed as:

Mon, City PALO ALTO

Press **ENDLINE** or the Down Arrow key to move down to the second cell in the same Col:

Mon, Hotel = 50.88

The "=" designates that what follows is a number. If the cell had contained a formula then the first character would have been "+". However, the "=" or "+" is not shown in the formatted listing above, they only show when you edit the cell. Press g-DN Arrow to move to the last Row is this Col:

Mon, Total +113.83 @FNS([1,2],[1,7])

When a monitor is active the display is much the same, the current cell is displayed on the bottom of the monitor. However, as much of the file as will fit will also be displayed formatted in the grid of Cols and Rows on the monitor. Col labels are centered, numbers are right justified, and Text cells are left justified on the monitor. When you move through the file or change a cell, the monitor display will be changed accordingly.

Cells may contain many types of information. [Mon,City] is text ("PALO ALTO"), while [Mon,Hotel] is a number. The third type of data is a formula, such as the one in [Mon,Total], which is the sum of the values in that Col. To sum Col 1 we could enter:

+[1,2]+[1,3]+[1,4]+[1,5] ... -or-+[Mon,Hotel]+[Mon,Trans]+[Mon,Auto] ...

-or-+FNS([Mon,Hotel],[Mon,Misc])

A report can consist of a spreadsheet printed in the format of the file above. Often this is pasted to a typed page with, perhaps, a chart. WorkBook71 offers another way to print reports. The REPORT program is a Text Formatter which reads Text files you have written and prints a report using commands embeded in the text. You can read data from the WB spreadsheet, calculate formulas and use the results or even merge a WB file in your report, no sissors or paste needed. REPORT can be used for general printing as well as for printing spreadsheet oriented information. This manual was printed by REPORT.

Tabular data such as phone number lists and inventory are often maintained by a Data Base system. WorkBook71 is biased towards Data Base use; the WB editor is designed for continuous data entry and has a search command to help you quickly find a name or phone number. REPORT has several Data Base commands and other utilities for data searches and sorts.

Most often we write a Data Base in WB with a Col representing a single item (record) and each Row as a field (such as name or Zip code).

	1	2	3	4
	+			
Cmpny	l Bissenette Mkt	BYTE	Calumet	Cartoon Colour
Adrs	l 789 Side St	70 Main St	890 Supreme Dr	9024 Lindblade
City	l Philadelphia	Peterborough	Bensenville	Culver City
State	I PA	NH	IL	CA
Zip	1 34567	03458	60106	90230
Dept	l Produce	Publisher	Purchasing	Purchasing
Attn	ı Claude Bissene	tGene W. Simpso	nSir	Linus Van Pelt

Each Col is a separate record. As you move down the Col, each row is a field. Searches and sorts (the FINDER and SORTWB programs) are by fields such as Zip codes (field 5).

Since the results of searches are in the form of Text files, they may be used with REPORT for Distribution Lists. copy of the report can be customized for each name in the list, recalling fields and inserting data into the text.

TED, the Text Editor, is useful for writing reports and is often used as a notebook; a line or two jotted down as a reminder can be quickly found with TED's search command. Text files written using TED can be formatted using REPORT or LISTed or PLISTed directly.

Pick the modules you need, it is not necessary to be familiar with the entire system to use just the module you need. Once you are comfortable with one program, you should find that the others will be easier to use because they all share common command structures.





WB WorkBook71 spreadsheet editor

The WorkBook Editor is a general purpose program which uses a specially formatted DATA file as a Worksheet. If you have not done so, it is suggested that you read the chapter "Using WorkBook71" for an overview before editing files with this program.

Run the Program

The program file is called "WB". WB may either be RUN or CALLed. Be sure you have enough memory for the aproximately 1100 bytes of memory the program uses while it runs in addition to your other files. WB uses the **ON** key so that key cannot be used to suspend the program once the WorkBook file is being edited. Use Command level E (discussed later) to exit this program.

At the first prompt WB will ask you for a file name. Enter the name of a valid WB DATA file or a new file name. Do not include a mass storage device name with the file name. At this point the computer command stack is active, though, while WB is editing a file, the command stack is not used.

WB71 file:

If you press **ENDLINE** without specifying any file name the program will do a CAT ALL. Terminate the CAT ALL by beginning to type the file name. At this point you may suspend WB by pressing the **ATTN** key.

If the file is of the wrong type or there is insufficient memory to continue the prompt will return. If the specified is a valid HP-71 file name and the file is not currently in RAM you will be presented with the following options:

New, Load, Virt

Press N, L or V. at this prompt. It is not necessary to press ENDLINE. New means create a new file. Load means look for the file on the first mass storage device and load it to main RAM. Virt means use a mass storage based (or "virtual memory") file of the name previously specified.

When a new file is created you have the option of specifying three parameters for the file:

col, row, len: 6,8,40

This specifies the physical size and format for the file. The three requirements are number of columns, rows and individual cell capacity (length). All three parameters are required and must be separated by commas. You may edit the line as needed; mathematical expressions may be used. While the number of cols and rows may be altered later, the individual cell length may not be sure to designate a cell length sufficient for the job at hand. The default is a file of 6 cols by 8 rows with a

cell size of 40 characters. The maximum usable cell size is about 84 characters. Once the file is assigned you are editing the file.

Setting up the File

The WorkBook DATA file is the backbone of the system. When you first create one you are designing the format to be followed throughout its use. Several thoughts should immediately come to mind:

- * How much data do I think will be needed?
- * Am I sure my needs later on will be accommodated by the selected size?
- * How much memory is available?
- * What kind of work am I going to do with the file?
- * If I am going to do numerical analysis how complex (long) will formulas be?
- * If I am going to use the file for tabular or Data Base data what is the maximum field length I will need?
- * What physical shape will the file need? For instance, if you are writing a weekly bookkeeping spreadsheet which will cover one month, you will probably need columns for each week and a total column, and quite a number of rows for such things as unpaid invoices or closing inventory. This file would probably be 6 or 7 cols by perhaps 30 rows, and since formulas are straightforward, cell length of perhaps 40 characters. Another file might contain names and addresses in a mailing list. At most there will be 7 fields, so we need about 7 rows. The number of cols is the total number of entries you will be making, say 100 people. There will be no formulas and names are fairly short so a cell length of 25 characters is probably enough.

Once the file is created, there are command level functions to add extra cols or rows. There is no substitute for organization and planning.

Conserving Memory

The REPORT program can be used to embellish the printed format of any Worksheet. Extra blank or "dressing" cells can therefore be eliminated. Another advantage of keeping the file compact is that it is faster to move between actual entries without having to move past multitudes of blank cells.

Displayed column width has no bearing on memory usage but the cell width, that is, the maximum number of characters which may be stored in a cell, is very critical. By keeping the numerical display format (FIX) to a minimum number of decimal places you will again be able to keep required cell width to a minimum. Of course, FIX9 will use seven more characters than FIX2.

Figuring Memory Usage

Since cells are of a fixed size it is easy to determine the memory files will consume. Memory required is the line length plus 4 multiplied by the total number of cells plus 2.

(LINE LENGTH+4)*(#COLS*#ROWS+2)

Editing The File

Once a new WorkBook file is open, the current col and row labels are on the left of the display. The cursor is flashing and you may enter anything in the cell or alter the current contents of the cell. Up and down arrow keys move you through the current row and the **ENDLINE** key moves you down one row and, if you are at the bottom row of the file, will move you to the top of the next col. This is Edit level and is most often used for continuous data entry.

Another way to view the file is Browse level. Enter Browse level by pressing **g-CMDS**. Like edit level, the current cell and associated labels are displayed. You'll notice that there is no cursor and that the FLAG1 annunciator is lit; this indicates that you are Browsing and cannot accidentally alter the cell. Additionally, since the left and right arrow keys are not used for editing the cell, they are available to move to adjoining cols. Pressing RUN allows you to edit the cell while in Browse and **g-CMDS** again returns you to Edit level. Press ON to enter command level.

If you are not familiar with editing spreadsheets or the command structure used in WorkBook71, please refer to "Operational Levels", later in this section.

Using a Monitor

The WorkBook Editor provides a formatted display if a Video Interface is available. The file is displayed in a grid of columns and rows on the top part of the screen. The current edit cell is displayed on both the bottom of the screen and on the computer's built in LCD display.

2,5 +3.60 @[1,2]*2

In the example above, the current edit cell is displayed on the bottom of the screen. The line begins with a Col (2) then Row (5) label refrence. As you can see, cell [2,5] on the top of the display contains the value 3.60, the same as in the

cell. There is a formula in the cell (formulas are discussed later) referring to cell [1,2] which contains the value 1.80 (and may very well also contain a formula, but formulas are only visible on the edit line). The contents of each cell is displayed on the Spreadsheet grid with as many characters as will fit within the column width, but the entire cell contents are displayed on the edit line.

Each time you move to another cell its contents are shown on the edit line. In this example only, Col 1 through 5 are shown, should you move to Col 6 the entire display will shift over to include Col 6, Col 1 will not be shown. Rebuilding the display will take a few seconds. You can view a cell which is not in the display by using \mathbf{g} -ON without having to wait for the display to change to a new screen.

The program is provided configured for a 40 Col by 20 Row display (or no display device at all). The Addendum gives instructions for changing to other display configurations.

Formulas, Recalculation

The three types of cells are Text, Numeric, and Numeric/Formula. The latter two have in common that you may enter formulas which WB will compute then return the results to that cell. Numeric cells contain only the results of that formula. Formula cells contain both the results and the formula itself. This type of cell will be updated when you recalculate the Worksheet.

The first character designates the cell type:

First Char "=" A Numeric (results only) cell. First Char "+" A Numeric/Formula cell.

Any other first character designates a Text cell. The examples in this section assume FIX 2 which is the display format a new file will have, and that you are in Edit level. If you are running the program now and you see FLAG 1 lit (next to the PRGM annunciator) press **g-ENDLINE** to enter Edit level.

One advantage to this system is the ease of changing from one cell type to another. For example, a formula may be temporarily changed into Text by replacing the + with perhaps a space.

Numeric Cells

This cell type may contain a number which is formatted to the specified FIX setting. To enter a Numeric cell first enter an = then either the number or a formula which will result in a single result. The formula will be computed then the equals sign and results of the formula are entered into the cell with as many decimal places as specified by the current FIX format. Enter:

=7*8 Now press RUN =56.00 (assuming FIX 2)

Formula/Results Cells

There is another numeric cell type available. A Formula/Results cell (usually referred to as just a Formula cell) is entered in the same manner. However, the formula is retained in the cell.

When you are using a monitor, only the number will be displayed in the cell coordinate. However, the formula is still available on the edit line.

You've changed your mind, the cell should be 7*7. Move the cursor over the 8 and press 7 then RUN.

Any time you change any part of the cell it is recomputed when you press RUN or move to another cell. To recompute a cell without changing the formula overwrite part of the number with, for instance, spaces. Either Numeric or Formula cells will only calculate a formula following an e. Even if a cell has been calculated by pressing RUN, it will again be calculated when you exit the cell if the cell contents have changed from what they were when you first began editing that cell.

Program Variables

Your own calculator variables are not available when using WorkBook, in fact, they are ignored. A separate set of variables used by the program may be useful in some formulas.

- C Current edit column
- R Current edit row
- C9 Last Col in this file
- R9 Last Row in this file
- D Location of display device
- G Global (whole file) display format
- L Max number of characters in cell

Cell Refrences

In addition to simple formulas and the variables above, cells may refrence other cells. Cells are refrenced by their col and row number. When used in formulas enter a bracket ([) then col number, a comma (,), then row number and, finally a closing bracket (]).

This formula says take the value in cell [2,4], the second column, fourth row, and multiply it by two and return the result. Brackets are used like parentheses except that they are used ONLY to delimit cell refrences. They may be used without extra parentheses to separate functions.

$$+SQR[2,4]*(7+[1,3])$$

Mathematical Functions

Standard HP-71 or LEX file functions which requires only numbers and returns a single numerical result should operate satisfactorily. The restrictions on functions (such as those in the Math ROM) in regards to their use in CALC mode also apply in formulas in cells. Unlike CALC mode, simple string functions are allowed.

Formulas refrencing other cells recall the value of that cell to the FIX precision of the number in the cell whether it is a Numeric or Formula cell. Refrences to Text or empty cells return zero. Mathematical exception flags are not altered by this program.

Spaces within formulas are not allowed. Remarks are allowed at the end of a formula if preceded by an exclamation point (!). Improperly entered formulas will not necessarily display an error, instead as much of the formula as makes sense to the computer will be interpreted. This may or may not provide useful data. So, spelling in formulas should be on a higher level than spelling exhibited in this manual.

Flags

The WorkBook71 editor uses flags 0-1. Any other user or system flags may be used in formulas. WB also stores the status of flags 2-3 with the file, and they may be used in formulas. Other flags are not used by this program.

SUM Function

The sum function (called FNS) is used in formulas to look up the value in a range of cells and add them together, returning their sum. The function is used when you need to sum more cells than can be entered into the maximum cell length of the cell.

Specify a starting coordinate and ending coordinate. All of the cells between those two points will be read, their values summed, and the results returned.

In the example, each cell between [3,1] and [3,7] will be read. Any range of cells may be specified. As with recalculation, cells are read by Cols, the range may extend to two or more Cols as desired. FNS may be used only once in a formula; if it is used more than once in a formula then the results of the first usage will be repeated.

User Labels

Many operations require the refrence to a Col or Row coordinate, separated by a comma without extra spaces. To simplify viewing and editing the file, we can substitute Text labels for these Col and Row refrences:

goto: wk,total goto: 6,total
view: wk,7 view: 6,7
+[mon,misc]+[tue,misc]

It is not necessary to use the entire label, just enough to insure that it is not confused with a similar, but earlier label in the file. In the above we have a Col labeled "Mon" and a row labeled "Total". "m,to" or "1,tot" can be used to refer to that cell coordinate.

When formulas containing user labels are calculated the default Col and Row labels replace the User labels in the formula. This is done for faster recalculation and so that the formula will still be valid if the User labels are not available later.

Label Specifications

Labels may be up to five characters. The first character may not be a number or any other character below ASCII65. Basically, this means that no control codes, spaces, numbers or punctuation may be the first character in a label, but both upper and lowercase letters are allowed. Embeded spaces are not allowed, anything following a space will be ignored when you edit the labels.

You may write multiple identical labels. However, only the first one with a given name will be found by any program. The same label names may be used for both Col and Row without confusion. For example, "TOTAL" could appear as both Col and Row labels. Since labels are always compared in uppercase, it is suggested that you not use "total" and "TOTAL" in the same file because they appear the same to the WorkBook programs. It is not necessary to have a label for every Col and Row; default numbers will be used when a label contains only spaces. A Label file may have more Labels than are actually used by the WorkBook file; extra Labels are ignored.

The Label Text file is a standard HP-71 Text file. It is separate from the current WB file and the same Label file may be used with several WB files. The Label file is created and assigned in Command Level using the L command. Command level U toggles between displaying User and default labels.

The label file itself is quite simple. The first two lines list the number of Col then Row labels. The actual Col labels are on the third and Row labels on the fourth line of the file. A total of six characters are used for each label: a leading space plus as many as five characters for the label itself. If the label is shorter than five characters then it

is filled with spaces on the right. That leading space is mandatory; it is the "hook" used by WB to find labels and tell the end of one label from the beginning of the next.

The maximum line length which may be edited with a Text Editor is 96 characters, you may edit any Label file with 16 or fewer Col or Row labels directly using a Text Editor as long as you are sure to maintain six characters including the leading space for each label and keep the totals on the first two lines accurate. Any label file with more than 16 Col or Row labels must be edited with the editor in the WB Command Level.

Recalculating the WorkBook File

Numeric/Formula cells may have refrences to other cells. Change the refrenced cell and the first cell no longer contains up to date data. This happens each time you change a cell which is refrenced by another cell. Periodically you may want to be sure that all cells are current.

Another reason for wanting to update the Worksheet is to do "what if..." with the file You might change [units,sold] and then view how it affects [net,profit]. To do this we recalculate the Worksheet. In any level press f-CALC and the display will show:

calc from:1.1

This refers to the beginning cell to calculate from. The default is the upper left corner or 1,1. You may change to any other cell in the file using either default or user labels, then press **ENDLINE**. Brackets are not necessary but both Col and Row must be specified. You may specify USER labels for Col and Row refrences. Then next prompt is:

to:8.8

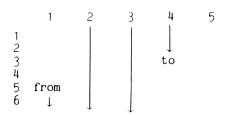
The default is the lower right corner in the file. Again you may change it or leave this value. When you press **ENDLINE** this time the display will change to:

working

This will remain in the display while the file is recalculated. Recalculation will take from a few seconds to several minutes depending on the complexity, size and if the file is in RAM or on mass storage.

Recalculation Range

The two prompts asking for first then last cell to compute are inclusive. That is, any cells between those two extremes is calculated.



In the example above, if you had specified [1,5] as the starting cell and [4,3] as the last cell then all cells between those two will be calculated. This includes [2,1], [3,1] and so forth.

Order of Calculation

The physical WorkBook file is organized with one Col following the previous one. Col 2 physically follows Col 1 in the file. To minimize the time needed, recalculation is always done by Cols. After the last Row in one Col is calculated the first Row in the next Col to the right is calculated.

How Recalculation Works

During recalculation each cell is read. If it is not a formula then it is ignored and WB moves on to the next cell. When Numeric/Formula cells are encountered the data following the @ is read. Each cell refrence is looked up, again Text or blank cells are read as zero and numeric cells are interpreted to the precision of their Fix setting. Once cell refrences are replaced with the actual values the formula is computed. Finally, the cell is rebuilt with number, @ delimiter, and the original formula (with cell refrences). WB then moves to the next cell down in the same Col, or, if it is already at the last Row, will start at the first Row in the next Col.

Circular Refrences

There is a formula in cell [2,2] in a hypothetical Worksheet which refers to cell [3,4]. Cell [3,4] has another formula, this one referring to the value in cell [2,2]. When we recalculate the file cell [2,2] refrences [3,4] and is changed accordingly. A moment later the program comes upon cell [3,4] which itself refers to [2,2] so it reads that cell and updates [3,4].

As you can see, each time the Worksheet is recalculated the two cells will change. There can be no answer to these formulas except an eventual overflow or underflow error. This is called a circular refrence, and it isn't always as obvious as in this example. Any number of cells may be involved.

Using Virtual Files

Memory constraints become much less of a problem by the use of virtual files. By virtual we mean a file which is resident on Disc or Cassette with only a small portion being kept in RAM at one time. If the file is kept to a reasonable size it may, at different times, be used either from RAM or Disc. The obvious advantages of Virtual Files are that files as large as the capacity of the Disc may be used, or a file that you would

usually use from RAM may be used even if you suddenly find yourself with a computer filled to the brim with data you don't want to delete.

There are disadvantages to using Virtual Files. A "worst case" test file recalculated in RAM took 27 seconds. The same file resident on the HP 9114A Disc took 36 seconds. The very same file running on the HP 82161A Cassette Drive took 130 seconds. The file had a formula in each cell refer to the previous cell. Fewer refrences to other cells would have narrowed the speed gap. It is obvious that, especially with Cassette, only the portion of the file that needs updating should be recalculated. During recalculation each cell is examined to determine if it has a formula, even if it is an empty cell. Of course, if the cell doesn't have a formula then it is ignored, however it does require some time to make this determination.

Formulas with refrences to other cells take a special importance with Virtual Files. The file is stored on Cassette by cols. That is, the last row on Col 1 immediately preceeds the first Row in Col 2. For this reason formulas refering to cells to the left or right of themselves will calculate somewhat slower than if the refrence had been to a cell above or below.

Mass Storage Warnings

The Early HP9114A Disc Drive (since replaced by the 9114B) should be used with caution with Virtual Files. This one scenario is not meant to discourage the use of either the Disc or Virtual files, it is mentioned to make you aware of a potential problem. The HP9114B will not be as likely to experience the following.

Files on the 9114A run nearly as fast as in RAM. For this reason it is easy to forget how hard the Disc is working. The 9114A's battery is rated at 8 hours of intermittent use or about 40 minutes of continuous use. It is quite possible that, by constantly moving around the file or recalculating several times, the recharger won't be able to keep up with the The flashing red fault light comes on to warn us of the problem but, it will probably have been on for some time before being noticed. When you exit the program, which you will probably try to do when the Disc faults, WB tries to save current status to the beginning of the file. The Disc may not allow this operation, in which case the program won't be able to terminate properly. If possible, leave the computer and Disc Drive idle until the battery has had a chance to catch up, then try to exit again. As a last resort INIT 1 (ON-/) can be used to stop the program. The problem with this method is that it leaves the channel associated with the Disc file assigned. Again don't turn off the computer or Disc. When the Disc seems to be up to it enter END ALL to close the file. This will not update the status of the file, but will do an orderly exit.

PERPERENCE NOTES PERPERE

WorkBook71 operates in three main levels (or modes). This program has a different implementation of the three levels than many spreadsheet programs to better take advantage of handheld use and flexible data input. In Edit level the current cell is displayed with the flashing cursor present. The entire keyboard is active and you may change the cell contents.

Whenever the program displays a prompt and asks for a decision there are two different forms it may take. When the cursor is present you may alter the displayed line as needed, then press ENDLINE to signify that you have completed data entry. When the cursor is not on and you are presented a prompt then only the uppercase characters displayed (in alternate character set, if it is active) are valid inputs, and it is not necessary to press ENDLINE. In either case you may cancel with the RUN key or cancel and return to Command Level with the ON key.

Browse Level

Pressing **g_CMDS** toggles between Edit and Browse levels. Browse level (called "Top level" on many spreadsheets) is used for looking about without the possibility of accidently altering a cell by a misplaced keystroke. You can tell that you are in Browse level because the annunciator for FLAG 1 is lit and the flashing cursor is not present, though the cell is still in the display. In this level only the bottom row black keys and the f-shifted function keys are active. You may also find moving from cell to cell somewhat faster than in Edit.

To edit the current cell while still in Browse press the RUN key, Browse returns when you exit the current cell.

Command Level

The third operating mode is called Command level. Enter Command level from Edit or Browse by pressing ON. Occasionally the program will enter this level if an error has occured (such as interruption of continuity on the HP-IL or not enough memory for the task at hand). The Command prompt shows some of the current file status and available memory. The Browse Level keys are still active; additionally several other keys are active which allow you to perform functions other than editing cells or looking about (which are done in the other levels). The Command level prompt displays a one to three character abreviation of the available functions and is on two lines. The number at the right end of the first prompt is currently free RAM memory. The second Command prompt may be displayed by pressing a non-command key (such as any of the unshifted white keys) and will remain in the display as long as the key is held down; release the key to return to the first Command prompt. The three numbers on the end of the second Command prompt represent the number of cols and number of rows in the current file followed by the maximum number of

characters a cell may contain. Command Level functions require a single keystroke to activate, it is not necessary to press ENDLINE to enter them.

The way it works is that you enter Command level, perform your task, and when it is completed Browse or Edit level (which ever had been active) returns. When you are offered a keystroke from among several, such as 'Global/Cell' you may cancel the operation and return to Command level by pressing ON or return to Edit/Browse level by pressing RUN.

As a reminder, while in Command Level, you may press and hold down a Command key for a short description of the function the key performs. Release the key within one second and the function will be performed. Hold the key down for longer than one second and the operation will be canceled; release the key and the Command prompt will return. If you press and immediately release the key then the function will be performed without displaying the help line.

WB Keystrokes

	MIG	End				(F)	an		Pyr			
		Сру	VId						9-040:			
0N 0N	<u>(-</u>	g-	r-sst	1	 و		<u></u>	٠ <u>٠</u>	mag-r		CALC	1-00NT

WB EDIT LEVEL KEYS

The entire keyboard is active for data input and review. In addition, several keystrokes perform special operations. Each of these keystrokes will terminate input in the current cell and, if you have changed the cell from the last time you edited the it, will recalculate the contents of that cell. Note that the entire file is only recalculated when you specificially command it. The following keystrokes are active in Edit, Browse and and Command levels.

• ON (enter Command Level)

Press this key to enter Command level. Also used to cancel an operation (except data entry in the current cell) and return to Command level.

• RUN (edit cell)

Terminate entry in the current cell, calculates any formula. The cursor does not move from the current cell. If you are currently in Browse level will allow you to edit the current cell. Note that the cell will be recalculated when you exit the cell if it had been changed, it is not necessary to press RUN to terminate input.

UP ARROW

Terminate input as with **RUN** but moves up one row in the current col.

DOWN ARROW

Terminate input and move down one row in the current col. If you are at the bottom row will stay there.

• g-UP ARROW (move to first row)

Terminate entry and move up to the first row in the current col. If you are currently at the first row in the col then it will stay there.

g-DOWN ARROW (move to last row)

Terminate entry and move down to the last row in the current col.

ENDLINE

Terminates input in the current cell as with **DN ARROW** but, if you are at the bottom cell in the current col, will move to the first Row in the next col to the right. This is helpful for continuous data input such as filling in names in a Data Base.

• f-CALC "recalculate"

Terminates input, but also recalculates the other cells in the file which have formulas. The first prompt asks you the cell from which you would like to begin recalculation, the default is cell 1,1. Press **ENDLINE** without changing the prompt to begin recalculation from cell 1,1. Cell coordinates may be specified with either USER or default labels.

calc from: 1.1

The second prompt asks for the last cell you would like to recalculate. The default is the cell in the lower right corner of the WorkBook file.

to: 8,8

To recalculate the entire just press **ENDLINE** at both prompts. The cells are recalculated sequentially so that if you specify 1,4 as the first cell and 3,3 as the last cell, all cells between them, including, for instance, 2,1 will be recalculated.

Do not interrupt the computer while "working" is displayed. Larger and more complex files take longer to recalculate. Assume a few seconds for a simple file up to several minutes for a very large file, a virtual file or one with very complex formulas. If you are using a large file residing on cassette with cell refrences spread throughout the file it is very highly recommended that you only recalculate the part of the file that you really need to or the life expectancy and reliability of the tape may be seriously affected. You may not find this to be a problem with Disc based files.

Because of the structure of the files, to keep recalculation as fast as possible, recalculation is by columns. Recalculation progresses from the first cell specified to the bottom of that col then from the beginning of the next col to the right and so on.

The problem with specifying too short of a line length for the job at hand is that if the resulting contents of a cell are longer than the allowed line length the recalculation will halt and the long line will become the current cell for you correct. After correction you will have to again press f-CALC.

• f-CONT (rebuild display)

Rebuild the display and continue from where you are. This is helpful if you are using a display device and, through unseen forces, the display device has become an inaccurate representation of the file. It clears the display then completely rebuilds the display on the monitor. This keystroke acts as a terminator key if you are not using a display device.

• g-ON (view a cell)

Display contents of a cell without actually moving the cursor there. While the requested cell is in the display, you are effectively in Browse level with the current cell (not the cell you are viewing) as your starting point. Terminate the display of this alternate cell by pressing an edit key. For

instance, press RUN and the current cell will return to the display. Please do not confuse the use of g-ON with the use of f-VIEW which is used to view key redefinitions or f-SST which is used to search for a series of characters.

• g-CMDS "browse/edit toggle"

Toggle between Edit and Browse level. That is, if you are currently in Browse, will change to Edit; the reverse is also true. The FLAG 1 annunciator is lit to indicate that you are in Browse level and cleared to indicate Edit level.

f-SST "search for string"

Search for a string or number and, if it is found, make that the current cell. It is easy to remember the action of this key by remembering that SST stands for Search for STring. This function is especially useful in a DataBase file to find, for instance, a phone number when all you can remember is a last name. The first prompt is:

Abs/Rel

Abs is short for absolute and means to search from the beginning of the file. Rel is short for relitive and pressing R means that you would like to search from your current position in the WorkBook file. The second prompt is:

Col/Row

Pressing C specifies search by columns, R specifies by rows. At the third prompt enter the string which you would like to find, then press **ENDLINE**.

find:

The search can take from a second or two to quite some time depending on if the file is in RAM or on Disc and where the string is relative to your starting position.

WB BROWSE LEVEL KEYS

In addition to the EDIT level keys discussed above, several other keys are enabled in Browse level. Line editing arrow keys are used while editing cells but they are not needed in Browse so they become available to move between columns. RUN is used in Browse to edit the current cell. When you exit the cell Browse level is again in effect. These keys are also active in Command level.

LEFT ARROW

Move to the column to the immediate left of the current col while remaining in the current row.

RIGHT ARROW

Move to the next col to the right while remaining in the current row.

g-LEFT ARROW

Move to col number 1.

g-RIGHT ARROW

Move to the rightmost col in the file while staying in the current row.

g-UP ARROW

Move to row number 1 while remaining in the same col.

g-DOWN ARROW

Move to the last row in the file.

WB COMMAND LEVEL KEYS

In addition to the Browse level keystrokes, several other keys become active in Command level. These single letter keystrokes represent the first letter in the command name. For example, P to call a Program.

The command level prompt is split up onto two lines, to view the second line press and hold down a non-Command level key, such as the un-shifted white keys, for as long as you wish to view the prompt. The first prompt shows three of the Command level functions and currently free main RAM memory. The second Command prompt shows the remainder of the functions plus the total number of cols then rows in the current file.

Besides enabling these extra functions, Command level makes it easy to temporarily activate the additional arrow keys which have other uses in Edit level. Press ON then an arrow key to move to another col.

A "add col/row"

This function is used to add a new Col or Row at the end (extreme right or bottom) or the WorkBook file. The file size is increased by that number of cells. Since mass storage based files must, of necessity, be of a fixed length, you may only increase the size of a RAM based file. The file size will not be increased if there is insufficient memory to add the complete Col or Row. Note the difference between the Add and Ins commands. Adding a Col, especially when the file size is quite large, takes less time than adding a Row.

• C "copy a cell to range"

This function is used to copy a cell to a range of cells. As with recalculation, Copy is column oriented and works sequentially on all cells between the specified range.

At the first prompt specify the source cell. The second prompt is "start:"; enter the first cell coordinate in the range. The final prompt, "end:", is used to specify the end of the range. The source cell, including cell format, will be copied to each cell in the specified range. The cells will not be recalculated, nor will formulas with cell refrences be adjusted.

This function is useful when a similar formula or standard piece of information will be needed in several locations in the file.

• D "delete col/row"

The computer will ask if you would like to delete a Col or Row, then will ask you to specify which Col (or Row). The contents of the specified Col or Row are lost and all other data moves up by one Col or Row. The file size does not decrease, instead a blank Col or Row is placed at the extreme right or bottom of the file.

● E "exit"

Exit the program. At this point the current status of the file (current edit cell, label file) is updated, user flags and system status are restored then the program ends. If there had been a display device active the final screen will remain.

F "fix precision"

Set the format used to display numbers. The first prompt is "fix:Global/Cell". Global refers to the setting for the whole file (that is, cells without a local format). Cell refers to the format of the current edit cell. Press either G or C to change either the fix setting for the whole file, or the current cell.

When a new WorkBook file is created the Fix for the file (global Fix) is set to Fix 2 and each cell is set to Global setting. That is, each cell will display numbers to the precision specified by the global Fix. At the second prompt the fix may be set for values of 0-9 and G. A cell set to "G" assumes the Global Fix precision.

• G "goto cell"

Goto a cell. The prompt begins with the current cell, change it to any valid cell coordinate in the file. You may specify either default or user labels or a combination of both. As when used in formulas, separate the col and row label coordinates with a comma, and user labels may be entered using just the first character or two, (enough to insure the name is not confused with another label).

Note the difference between Goto and View (activated with the ${f g}-{\bf ON}$ key) functions. Goto will make the specified cell the current edit cell while View will not move from the current cell.

• I "insert col/row"

Inserts a Col or Row at the specified location. Data from that location throught to the last Col or Row will be shifted. Cell refrences are not adjusted.

Any data in the last Col or Row (whichever is appropriate) in the file will be lost. To insert a Col or Row without losing data first use the Add command to create a new blank Col or Row.

● L "write/assign labels"

Create or change the assigned Col/Row Label file. The label file is a separate Text file and may be used by several different WorkBook files. While a label file may be assigned, it is necessary to have the labels active before use; the Command Level User label toggle sets flag 0 and lets WB recognize the labels. If the label file is in RAM and you have used the User command then the User labels will be active each time you edit the WorkBook file.

The first prompt asks you for the name of a Text file. If the WorkBook file has had a label file associated with it before then that file name will be displayed. If the Label

file name you specified is not available in RAM then you will be offered the following options:

New/Load

Press N and a new Text file will be created. Pressing L will cause the computer to search the first (or only) Disc for that file and load it to RAM.

Once the Label file is assigned you have three options: exit to Command Level (by pressing ATTN) or edit either Col or Row labels (by pressing C or R) at the prompt:

Col/Row

When you exit to Command Level press **f-CONT** if you have a monitor active to display the labels on the monitor.

Editing either Col and Row labels is essentially the same. The cursor is flashing and you may directly edit the labels; up and down arrow keys are active to move you through the labels. ATTN will complete the session and return you to the previous prompt. It may take a few seconds to enter the labels and return to Command Level after you press ATTN.

col#1 Mon

P "call program"

Calls a sub-program without passing any parameters. If the called program is not in RAM or ROM it will be searched for on the first or only Disc. If the name is not valid or the program is not found, this program will continue from where it was left. If the called program ends with an END statement then this program will continue exactly where it was left. To continue this program after using a program that stopped after an error or PAUSE enter END then press CONT.

• U "user/# label toggle"

Toggles between displaying with User or default Labels. You can tell which is specified by the status of the FLAG 0 anunciator. If FLAG 0 is set then the user Labels, if available, are active.

• V "video on/off toggle"

Toggles Video display updating on/off. The cell is still displayed on the bottom of the display but cell changes and movement do not change the grid as shown on the top lines of the display. This is helpful for viewing one section of the

file while editing another. Has virtually no effect when no display is used. This status is not saved with the file.

● W "column width"

Set col width. Default is 8 and may be set between 1 and the width of the display device. Designates the width of each col to be displayed on a monitor. Does not affect the number of characters which may be stored in each cell or the display on the built-in LCD. The col width may be changed when printing a file, so this setting is primarily important for use with a monitor.

The program maintains a record of the current cell coordinate as well as the range of cells which will fit on a display device, even if the monitor is not currently active. This may occasionally cause a slight pause as coordinates are updated. Setting the col width to 1 when not using a monitor will cause this pause to occur less frequently.



Much of data entry is in the form of Text files. TED (short for Text EDitor) can be used with a video interface and monitor or handheld in the field without a monitor.

Text files must be in :MAIN or :PORT RAM, virtual files may not be used. A design goal of TED was full screen editing and for that reason it operates in blocks of screens — as many lines as will fit on one monitor screen if there is a monitor connected. Without a monitor it works a line at a time and does not try to fill the screen.

TED is always in "replace" mode when entering data. That is, data is always entered after the last data in the file or it replaces the data being displayed. While the INPUT function is not used in the programs, the effect is much the same as a series of INPUTs.

The two operational levels (or "modes") are Edit and Command. Edit level is used for data entry and review and there are only a few control keys. Command level is used to gain access to other functions. For example, to add new blank lines between lines use the command level function "Ins" to add blank lines. Since the minimum file for TED is one screen full when using a monitor, and several operations can leave extra blank lines, the command level "Bln" is used to eliminate these blank lines. "Del" is used to delete a series of lines regardless of if they contain data.

Since Text file records begin with zero, line (record) one in the file is actually record zero, we will refer to actual record number to avoid ambiguity. Several commands in TED and the REPORT program refer to the record number in the Text file so it is important to become comfortable with Text file record (line) numbering. The record number of the current edit line is displayed on the bottom left of the screen when a monitor is being used with TED.

It is not necessary to press **ENDLINE** to enter the current line. Moving the cursor up or down through the file (using the arrow keys) enters the data from the current line into the file. Unlike EDTEXT, you may hold down an arrow key or ENDLINE to move continuously through the file.

Getting Started

As furnished, TED is configured for a 40 column by 20 row display device. The proceedure for customizing the WorkBook Editor (WB), as discussed in the addendum, also applies to TED. It is not necessary to configure TED for the maximum size the interface can display. Of course, display size is unimportant when used without a monitor.

Running TED

RUN or CALL the program. The first prompt will ask for a file name; enter a new file name or the name of a TEXT file in RAM

or on Disc then press **ENDLINE.** If the file is not in RAM the computer will ask if you would like to create a new one or load it from the frist (or only) mass storage device. At the prompt press **N** to create a new Text file, **L** to load it from Disc, or any other key to return to the file name prompt.

New/Load

Any error such as not enough memory or wrong file type will cause the original file name prompt to return. Be sure you have at least 500 bytes of RAM free before running TED.

When you have assigned the Text file to edit the screen will show the first portion of that file. If it is a new file, the screen will be blank except for the the flashing cursor in the upper left corner and the line number in the lower left. Of course, if no monitor is connected, the LCD will be blank except for the flashing cursor. To begin using the program just start typing. There is no "wraparound", that is, a line is a line. When you reach the end of the line press a terminator key (discussed next) to enter the line and move to the next line. Some conservation should be observed when filling a line with Text. If the line is wider than the display width then you could end up with a nearly unreadable display whenever you move to a new line on the monitor, though no data will be lost.

Arrow keys can take you up or down a single line or a full screen. **f-SST** will find the first or next occurance of a word and place that line at the top of the screen and the cursor on the first character of the word. Command level is entered by pressing **ATTN.** The Command Level "Go" function can be used to move to a specified line number.

TED EDIT LEVEL KEYS

ON (enter command level)

Terminates input in the current line then enters Command Level. May also be used to cancel an operation (except data entry) and return to command level.

ENDLINE

Terminates input on the current line. Moves the cursor to the beginning of the next line. If the line had been at the bottom of the screen then TED will move to the next screen. If the line had been at the end of the file then a new screen of blanks will be created. Only a single blank line will be added when no monitor is active.

RUN

Terminate input and remain on the same line. Also used to exit Command Level and return to the current edit line.

• DOWN ARROW (move down one screen)

Terminates input on the current line then moves to the next line in the file. If at the bottom line in the screen will move to the next screen. Note that the cursor will not move farther right than the last character on the line when moving up or down.

• g-DOWN ARROW (move down one screen)

Terminate input and move to the top of the next screen without homing the cursor.

• UP ARROW (move up one line)

Terminates input on the current line then moves up one line without homing the cursor. If you are at the top of the screen will move to the previous screen.

• g-UP ARROW (move up one screen)

Terminates input on the current line then moves to the top of the previous screen.

• f-CONT (rebuild screen)

Terminate input on the current line then rebuilds the display. Useful if the display has scrolled inadvertently and you wish to eliminate the jibberish.

• f-SST "search for string"

Search for a string within the file and, if it is found, place that line at the top of the screen with the cursor on the first character of the string. Comparisons are made without concern for case so that "BEEP" and "beep" both will be interpreted the same.

The first prompt is "Abs/Rel". Abs means to search from the absolute beginning of the file regardless of where you currently are. Rel means to search starting with the line following the current line.

TED COMMAND LEVEL KEYS

The Command prompt is displayed on two lines. View the second line by pressing a non-command key, such as an un-shifted white key. The line will remain in the display for as long as you hold down the key; releasing the key returns to the first Command prompt. The number displayed on the first line is currently available memory. The numbers on the second prompt are first the record number of the current edit line followed by the number of the last record in the file.

Command Level functions are activated by pressing the key corresponding to the first letter of the name of the function, for example I for "Insert"; is not necessary to press ENDLINE. Edit level control keys (such as the arrow keys) are also active in Command Level. Pressing ON will cancel an operation and place you in Command Level. RUN cancels operations and returns you to the edit line.

As a reminder, you can view a short description of Command Level key functions by pressing and holding the key. Hold the key for one second and the function will cancel. Release the key before one second and the function will be activated. If you wish to activate the function without viewing the help line then press and release the key quickly.

• B "delete blank lines"

Deletes all blank lines and lines containing only spaces from the entire file. Remember, when a monitor is being used, the minimum file size is one screen.

• D "delete lines"

Specify a number of lines, including the current edit line and they will be deleted. Lines are deleted regardless of if they are blank or contain data. When a monitor is active, blank lines will be added if the resulting file is less than one screen.

■ E "exit"

Exit the program.

● G "goto line"

Goto a record (line) number. Enter "O" to move to the beginning of the file. A large number moves to the end of the file. The line will be placed at the top of the screen.

I "insert blank lines"

Specify a number of blank lines to insert following the current line. It is suggested that a moderate number of lines be inserted; If you, for instance, insert 23,791 lines then the computer will actually try to create that many lines. It is not necessary to use this function to add lines at the end of a file, the computer will add lines as needed on the end of the file.

M "merge file"

Specify the Text file name. TED will merge the contents of the specified file following the current edit line. Data following the current line will be moved down following the merged data. The REPORT program can merge files just for printing, consider whether you wish to actually concatenate the two files with this command or just use the REPORT merge (^ME) command during printing.

● P "call program"

The program must be either in RAM or ROM, it will not be found if on mass storage. If the called program ends properly (with END, not an error or pressing ATTN) then this program will continue with the cursor on the same line of the file. Be sure, if you call this program recursively to edit the same file, not to delete lines and place the previous edit line outside of the file size. When a program is CALLed a new environment is created, be sure that there is enough memory available.

• S "search & replace"

Search for a string and replace each occurance of that string with new Text. Unlike the search for string function (activated by pressing f-SST), Upper and lower case characters are treated as different characters. One occurance of the string per line will be checked. If the resulting line would become longer than 96 characters then the change will not be made.

At the first prompt enter the string you would like to find:

search for:

The second prompt asks for the string you would like to replace the search string in the file. When replacing one word with another be sure that spaces following or preceeding the word are not altered or you will find that the words will runtogether.

new text:

The final prompt asks for the range of lines in the file to search. enter the range separated by a comma.

lines: 0,23

The search can take from a few seconds to a few minutes depending on the number of occurances of the string within the range specified.

T "truncate to width"

Truncate all lines to the specified display width. Not as violent as it sounds. What actually happens is that lines longer than will fit on the monitor will be split into two or more lines. Lines are split between words, those with words longer than the display width will not be shortened. This function is helpful if you often use the computer in the field, in which case data may be entered without concern for line length. When you later edit the file with a monitor this function will make it more readable. Since commands for REPORT may be placed anywhere in the line, this function helps make "train of thought" writing easier to read without concern for final printed form, though be sure that parameters for REPORT commands are not moved to separate lines when lines are shortened. This function will take from a few seconds to several minutes depending on the size of the file and the number of long lines.

V "video on/off toggle"

Toggle formatted video display on or off. When display formatting is disabled the monitor is still active. TED will operate as a simple line editor when video formatting is disabled; the line currently being edited is displayed and prompts still appear at appropriate times in on the display. The advantages of disabling formatted display are for a slight increase in program speed and for those times when line length may exceed the number of characters the monitor can display and you may not wish to shorten the lines.



Practical uses for REPORT include printing personal letters, memos, form letters, simple reports and extensive reports (merging files and taking advantage of your printers functions). Other commands interract with WorkBook71 Data files to form a Data Base programming language. This manual was printed with this program as was the book "The BASIC HP-71", also by this author. While there are many commands available, only an understanding of the most basic commands is needed to print most reports.

REPORT reads the data in your file, printing the data using commands you have placed within the text. Text may be entered free form in the Text file and the program will organize it into neat paragraphs during printing. Commands tell the program to center a line, indent for a paragraph or merge another file.

A Little More in Depth

A command consists of the command character (^) followed by a two character abreviation of the command name. For example, "^PA" is the command to start a new paragraph. Whenever REPORT finds the command character, it interprets what immediately follows as a command, otherwise it is interpreted as text to be printed. These commands are actually the backbone of a simple Text Formatting language.

REPORT will read Text files written by TED (the Text Editor) or other programs such as EDTEXT (available in several HP ROMs). Files must be either in RAM, or on the first (or only) mass storage device connected to the computer on the Hewlett-Packard Interface Loop (HP-IL). If you wish to use files from Disc be sure to include the ID of the Disc (such as ":TAPE") with the file name, they will be read from Disc (or Cassette) without first loading them to RAM. If the device ID is not specified then the program will search through RAM for the file then, if it is not found, attempt to load it from Disc.

Any files loaded by the program will be purged from RAM when they are no longer needed.

About Your Printer

REPORT will run without a printer (or even without an HP-IL Module). Be sure your printer is set to the needed mode and assigned as the PRINTER IS before running REPORT. If you are using an HP printer (such as the ThinkJet) then the 71 will automatically assign it as the printer at power up. Note how the following HP-IL commands will affect output which is destined for a printer.

PRINTER IS PRINTER Send data to printer PRINTER IS RS232 Send data to Interface PRINTER IS NULL Ignore any printer data

PRINTER IS DISPLAY Send data to monitor PRINTER IS * Sent data to LCD display

You may test a file by "printing" it to a display device or by designating PRINTER IS NULL (if the HP-IL is active) to run the program without any printing at all.

Be sure that automatic perforation skip, If it is available on your printer, is deactivated because REPORT advances paper between pages by printing blank lines, not by printing the formfeed character. If you are using a printer which requires form feeds at the end of each page (perhaps a Laser printer) then the page length command (PL) can be set to include a form feed at the end of each page.

Paper should be loaded with the print head at the first line on the page. If a sheet fed printer is being used, see the section on the page length (^PL) command for instructions to have the program pause for you to load paper.

Refer to your printer manual for codes to change type size, style and number of characters per line and page. There will probably be a cryptic chart listing most of the commands. Often the commands are listed in "hexadecimal" (base 16) format. The function "HTD" will convert the codes to their decimal equivalent and you can find the appropriate key to press in the table on page 322 in the HP-71 Refrence Manual. The easiest way to enter often used (and difficult to remember) printer codes is to include them in a macro file and use an extension command to call the macro when you need the code. Some ThinkJet extension commands are included in the ROM; see the discussion on extension commands for information.

Some printers use characters above 127 decimal for graphics. This may be to your advantage if you want to use those characters. For many uses, such as listing programs, it might be preferable to ignore these graphic characters. This can often be accomplished by telling your printer (and interface) to use only 7-bit data.

Printer Graphics Commands

Using Underlined or graphics characters may not respond as expected when they are continued on a second line. The problem is that when the computer indents to the left margin, it does so with spaces. Plan it so that your printer goes out of graphics mode at the end of each line, and re-enters it after the margin has been printed. For this reason, copy mode is preferred when printing graphics. Copy mode ignores the current right margin setting, though follows the left margin. Graphics mode on your printer will probably interpret those leading spaces as the code 32. Because of this, a graphic can contain a maximum of the size setting (^SZ command) number of characters per line if entered in copy mode.

Usually, when you set a printer to underline, it will do so until instructed not to. This means that the spaces from the left of the page to the left margin will be underlined. An easy way out would be to make sure that all underlined in a series are on the same line.

To help eliminate the possibility of accidentally causing the printer to do an automatic carriage return, REPORT trims spaces on the right end of each line regardless of copy, center or fill modes.

Line Length Limits

While Text Editors limit line length to 96 characters, text from other programs or loaded from other computers might have very long lines. REPORT normally assumes that lines in your Text file are no longer than 132 characters. If a file may have extremely long lines the size command (^SZ) can be used to set the maximum line length of your file.

Since an extension command (^DO,^US) may alter the length of the line, being interpreted, keep this limit in mind when writing these macros. As a line is interpreted, the results of extensions commands are added to the line and are again interpreted. Since macros allow some recursion, the resulting line could possibly contain more macros which would again add to the line length.

The maximum printed line length is also set at 132 characters. This is the number of characters between left and right margins as set by the margin (^MA) command. Again, the size command (^SZ) can be used to alter this setting. This potential length is reduced by any non-printing control codes which may be on the line, though does not include the spaces to the left of the left margin. The actual maximum line length is the sum of the right margin minus left margin minus the total number of control codes.

For most uses the line length will never be of any consideration except when using a printer in condensed mode with an extremely large number of printer control (or graphics) codes. In actual, use the line is most often approximately 70 characters.

Running REPORT

REPORT may be CALLed or RUN; it requires no parameters. The program requires aproximately 1100 bytes of memory as it runs. When WorkBook DATA files or distribution lists are used with this program memory usage increases for such things as pointers and any user Labels.

There is only one prompt at the beginning of the program.

report file:

Enter the name of a file in RAM or on the first (or only) mass storage device.

There is an optional second usage for this prompt; you may specify data to be interpreted before the file is read. This is helpful to enter page control commands or mailing addresses without having to edit the file before each printing session. Any commands or text data which follow the syntax requirements of the program may be used. The following example would use the file called "myfile" and begin the printing session by setting the page length then assigning a WorkBook71 file when REPORT starts.

report file: myfile ^pl66 3 4 wa wbfile

Be sure not to specify a page length in this prompt if the file itself begins with a page length command or a blank page will be printed as the program interprets the second page length command.

If You Want to STOP

While the program runs there is little to do other than ponder the advancements being made in printer technology. If you watch the printout as it is progressing and see that it is doing something dreadful, press ON to suspend the program. If you have stopped the program in the middle of, for instance, several hundred line feeds, enter: END or ENDALL. This will not delete any files that were loaded, but will end the program and free the memory it uses. Also, if you entered this program from another program, the other program will not continue. Normally the program will continue reading your files (and displaying their catalog entries) then terminate properly. This method is only mentioned if you, for whatever reason, wish to terminate REPORT while it is still working.

Finished

When the report has been printed, the computer will display the number of words and the number of the last page printed. The word count includes any data separated by spaces excluding commands or any parameters required by commands. Two words separated by a hyphen or fixed space count as one word. The date, as entered with the date (^DA) command, counts as one word. Printer control codes (^CC,^CH,^EC) are not added to the word total. Copy mode counts as one word per line. If you have merged a WorkBook71 file (^WM) then that file will not affect the word count.

Any files which were loaded by the program during the run will be purged before the program ends.

If the program terminated with an error then the file, up to the last properly interpreted line, will be printed. Edit the file at that point and review commands or memory requirements it may have required to give you an indication of how to correct the error.

Remarks

Any line in a Text file which begins with an exclamation mark (!) will be ignored so that you may embed non-printing information as a note or remark. Exclamation marks which occur anywhere else but as the first character on the line are interpreted as that character and are printed.

Spaces

When printing, extra spaces between words are ignored; a single space follows each word. You may enter extra spaces between data as desired in the source Text file; they have virtually no effect on printing speed. Extra spaces may be helpful at times such as indenting lines to organize thoughts or designate places where data could be added later.

Two spaces are added following periods, exclamation marks, colons and question marks (.!:?) if they come at the end of a word or if they stand alone.

A long line with many words separated by multiple spaces will print faster than several shorter lines containing the same $\mathsf{Text}_{\:\raisebox{1pt}{\text{\circle*{1.5}}}}$

Fixed Spaces

Many times you will want to be certain that two words will not be split between two lines. Wherever REPORT finds the fixed space character (~) it will print a space. This is not a character that is normally part of your HP-71 keyboard. This character may be included at any point where you would like an extra space to be printed when it normally would not. As an example of usage consider "Portable Computer". Any number of fixed space characters may be used. To assign the key to, for instance, the f-shifted minus key use the following:

Of course, you can assign the character to the key of your choice. Be sure to end the DEF KEY statement with a semicolon (;) to designate it as a typing aid key assignment. Two examples of fixed spaces REPORT itself uses are the date command (^DA) which joins month and day with a fixed space and the format number (^FN) command which is used to right justify a number within a specified column width.

Writing Large Reports

The methods for printing reports larger than the RAM capacity of HP-71 are fairly simple. The following discussion is not necessary if you are writing letters or simple reports, however, please review it for a general overview of the programs capabilities.

Very large reports can be written by keeping them modular or on Disc. This is also helpful if you do not wish to delete other programs and files from your HP-71 to make room for the multiple files, or you have standard sections (like a logo)

that you do not wish to keep in the computer. A main file can be used which lists the names of the modules to be merged. The main file will stay in the computer throughout the run, merge files will be located, and read before going on to the next file. Any files that were found in RAM will be left there. CATALL might look like this when you run the program:

Name	Type	Length
keys	KEY	256
MYPROG	BASIC	1300
MAINFILE	TEXT	3200
MERGE1	TEXT	3000
WRKBK	DATA	1600

The file called "MAINFILE" is the name you would enter at the prompt at the beginning of the program. This is file which the program will use to find all files to merge. The file "MERGE1" is read from RAM then the next file called, perhaps, "MERGE2" might be read from Disc, and so on. Of course it is not necessary to use these file names. Main and merge files are always Text files. Files merged must be on the first (or only) mass storage device, or in RAM. They will not be found if stored on Magnetic Cards. This program has been tested with the HP82161A Cassette and 9114 Disc Drive, other mass storage devices supporting the same high level I/O standards should also be usable. It is not necessary to have any mass storage connected if all files are in RAM.

The same general approach is used when recalling data from Worksheets. The program does not require the WorkBook file to be in RAM. Only one Worksheet may be assigned (using the "^WA" command) at a time. Whenever data is recalled from cells it is again interpreted so that any data may be in the cells, for example a greeting or return address.

It is possible to have the Main file, a merged file, and a WorkBook file all being read from Disc at the same time. For this reason it is best to have only one file refrenced at a time from Disc/Cassette to avoid continual movement of the medium as sections of one, then another file are read.





REPORT SYNTAX GUIDELINES

You could run REPORT with a Text file containing only straight text, no commands at all. It would format the information, filling lines and deleting or adding spaces between words, seting page margins and advancing paper as it goes. Using the simplest of formatting commands will make any report more interesting and readable.

While the syntax rules are quite liberal (REPORT can understand your commands written in several different ways), an overview of these rules is in order. Basically, if you can read and understand the parameter, then it is likely that REPORT also can.

Commands and Parameters

A command always begins with the command character followed by the two character abreviation of the command name. Of course, commands may be entered in either upper or lower case. A command and its parameter(s) must be on the same line. Unlike many Text Formatters, REPORT can read commands appearing anywhere on the line. REPORT assumes that the data you give it is valid. For example, if you tell it to skip several thousand lines, it will try to.

Generally a command will require one or more of the following:

Nothing at all.
An optional number.
File name.
Mathematical formula.
WorkBook71 cell coordinate.

Any number of extra spaces may be added at any time between parameters, commands, or even text in the report. They are ignored as REPORT interprets your Text and have virtually no effect on printing speed. Since REPORT reads the file much as we would, there must be something to tell it when one word ends and another begins. This is easy with text when a space separates words or with simple commands (such as "^BE") which allow anything to immediately follow, even without spaces as a delimiter.

When it comes time to understand a command with data following it becomes a different proposition. A command which requires a simple (and possibly optional) number such as "^PA" (which indents paragraphs) can have text follow immediately because there is no ambiguity between text and paragraph indentations. When the parameter is a file name or a mathematical expression (formula) then it is more difficult to tell the end of the parameter from following (and possibly unrelated) data. In that case, one of the following must follow that data to designate the end of the parameter:

Another command with the command character (^) One or more spaces. The end of the line.

Looking at it from the other direction, a command is either the first item on a line, preceded by a space, or preceded by a command or a parameter used by the previous command.

Optional Numbers

If a command has an optional numeric parameter then it may not be followed by a number (even after several spaces) unless the parameter is also included. Otherwise REPORT would interpret that number as the number the command wanted. The commands for simple numbers as parameters are the only type that may generally be followed by virtually any data without concern for spaces.

^SK2^PAtext...

File Names

A file name may include a device specifier (such as ":tape"). However, since file names often resemble regular text, the rules of following with a space, another command, or the end of the line apply. When two file names are required, they are separated from each other by a space.

text... ^MEfile2:tape text...

Mathematical Expressions

Since the next space designates the end of a parameter, formulas cannot contain spaces. BASIC Functions which usually are set off by spaces, such as DIV or NOT, may be used within formulas if entered without spaces.

not[2,3]*6div[2,4]

Formulas are the only occasion where there may be a conflict with the command character itself. Since the default command character, the caret (often called "up arrow"), is also used in exponentiation within formulas, you cannot use it for both purposes. Either avoid exponentiation in formulas or change the command character to another character (with the "^CM" command) then change it back later.

Formulas are written as they are within the WorkBook71 spreadsheet format. The formula commands may be used without a WorkBook file assigned if they do not contain cell refrences. Though, if WorkBook cells are refrenced, obviously you must have opened the WorkBook file earlier in the Text file (use the "^WA" command). Use only simple string functions and do not use the function VAL in a formula.

The FNS (sum) function used in the WB spreadsheet editor may not be used in formulas interpreted by REPORT, though cells refrenced in a WorkBook data file may themselves use FNS.

Since the only limit on line length is the limit of the HP-71 itself, a formula may be as long as 96 characters and may contain any series of cell refrences, so sum may be easily simulated.

WorkBook71 Cell Coordinates

Cell refrences within formulas must, as usual, be contained within brackets and have col and row refrences separated by a comma. If the label file had been in RAM when the WB file was assigned, user labels, or an abreviated form (such as "to" for "total") may be used. A combination of user and default labels may be entered as desired.

When a command asks just for a cell coordinate, not a formula (such as the "^WM" command) then the brackets are optional, though col and row specifiers are separated by a comma and the cell refrences must still be separated from other data by a space.

Applying Syntax Rules

As we said earlier, REPORT can usually interpret any commands and data which the casual reader could understand. Often the first line in the file will contain commands to set margins, page length, page numbering, assigning WorkBook files and such. Since this information is self explanatory and fairly dull, we often write it in a very tight line without any extra spaces between. For example:

^PL66 3 3^MA8 91^PN^WAmyfile^CS^BE

While this line is nearly unreadable by us, REPORT takes it pretty much in stride. REPORT reads from left to right, finding a command, then looking for the parameter, then looking for the next command or text. This line contains six commands which could as easily have been written on six lines or separated by spaces for readability.

Since commands may be placed anywhere in the line, commands to, for example, turn on bold printing for just a single word, are often placed next to that word and other text will preceed and follow on the same line.

text... ^DObold text... ^DOnobold text...

Lets look at some other examples of syntax which are readable by REPORT. We will show commands in uppercase, though this is just for readability.

[^]IFmem<1200^BE^DImemory low ^MEmyfile^G030 ^AI7^PAtext...

```
^WMcol1,row1 [col2,row2] text...
^SK^PAtext... ^DOx^BE text... ^DOy text...
```

In each of these cases we have used the minimum number of spaces necessary and readability may, at times, suffer. As you can from the following, extra spaces can be an aid in making commands more readable.

```
^IF [wk,total]>650 ^GO 48 text...
^ME myfile ^AD ^PA text...
```

Syntax Errors

The errors most likely to occur are margins set improperly or an optional paramater not used then a number entered on the same line before any text.

The first example shows a tab followed by a Zip code. Since the tab was missing value, REPORT looks at the number immediately following on the same line, regardless of the number of spaces separating it, and tries to tab to column 85312.

The second problem is a missing space following the file name. In that case there is no way for REPORT to tell the end of the file name from the following text.

The third example simply has a missing, though mandatory, parameter.

```
Zip: ^TA 85312
^MEmyfiletext...
```

Leading Zeros

Perhaps the most elusive error to understand is multiple zeros in a parameter. A number which begins with leading zeros will have those zeros ignored when interpreting the number. However, when REPORT tries to jump over the number to the next data, it sees only the first zero, if the number is not zero then the those zeros following will not be jumped over and will be interpreted as other data. Even if the number is zero then only the first character will be ignored. The rules for zeros are simple:

Don't begin a number with leading zeros.
Don't enter the value zero with multiple zeros.

Right	Wrong
^pa5	^pa05
^sk0	^sk00

These commands allow you to extend the capabilities of REPORT by adding the ability to place often used or difficult to remember information in a separate program file, then have REPORT call that file. These extension commands form a type of macro language.

The three extension commands (^CA,^DO,^US) allow you to call BASIC language programs from REPORT while it is formatting text then return data to alter how text is formatted. These commands are as unstructured and as open as possible so that they do not restrict potential uses. The most often and, indeed easiest command to use, is "^DO"; for most applications "^DO" is prefferred. Please read the discussions of each command for an overview before writing extension commands. Please also review the HP-71 Refrence Manual discussions of the statements CALL and SUB. More information about program environments and data pointers is available in "The BASIC HP-71".

The unique file structure of the HP-71 allows as many programs in a program file as needed. Often we will have a single file with a series of sub programs and we load that file into RAM whenever we run REPORT and wish to use the extension commands. Since the sub may be contained in a file of any name, REPORT will not load the sub if it is not found. The extension may contain commands and text for printing a return address, or a series of commands for setting up page length, margins and printer controls. For example, a sub called "MANUAL" was used for setting the page format for printing this manual and other subs within that file handle bold printing and other printer controls.

The following sub programs (using "^DO") are contained in

The following sub programs (using "^DO") are contained in the WorkBook71 ROM and may be used with Hewlett-Packard printers like the ThinkJet:

^doNORM - set normal pitch
 doEXP - expanded pitch
 doCOMP - compressed pitch
 doBOLD - bold characters
 doSPACE6 - 6 lines per inch
 doSPACE8 - 8 lines per inch

Since these extension programs return information to the line, they are called using the "^DO" command. For example, to turn on bold printing for a single word, then turn it back off, enter the following in your Text:

text... ^doBOLD text... ^doNOBOLD

Of course, printer control commands could have been entered directly into the Text file, but this method is easier to remember than complicated escape sequences. And, if you often use printers which use non-compatible control codes, a separate "printer driver" file may be used for each printer. Now, let's look at the use of the individual extension commands:

The "^CA" command

"^CA" (short for "call") is used to call a program without any parameters passed. Since the HP-71 automatically passes opened file channels, they are open while the sub runs, and may be accessed if you wish. Since nothing is passed to your sub, and nothing is returned, perhaps the most useful applications are to alter an open WorkBook71 file or to change printer assignments or printer configuration.

The first line in your program will begin with the SUB statement, and, since nothing is passed, no following data.

10 SUB disptime @ DISP TIME\$ @ END SUB

As you can see, it is not necessary for the sub to relate directly with REPORT or printer control.

Do not close any data file within your sub. Do not call sub programs which alter data files or use channel numbers associated with the files used by REPORT. You cannot, for example, call WB or TED because they use channels (and probably the same files) as used by REPORT. While of dubious value, you could call RPN because it uses an SDATA file assigned to #41, and alters no other data files. It is also suggested that you avoid reading the main or merge Text files in your sub because this will alter the pointers used by REPORT and some information may not be printed. The (possible) open files are as follows:

- #1 Main Text file
- #2 Merge Text file
- #4 Distribution List
- #5 WorkBook71 Data file
- #6 WorkBook71 label Text file

The "^DO" Command

"^DO" is the most versatile and easiest command to use. "^DO" is most often used to add printer specific macros for such things as bold printing or changing to another character set. The remaining portion of the line following "^DO" is passed to your sub, then that line will again be interpreted by REPORT when your sub ends. You may alter the line in any way, adding or subtracting text and commands then, when REPORT continues, that line will be interpreted before the program continues with the rest of the file.

"^DO" is used instead of "^CA" to send printer commands because the sub is called while formatting the line and the printer codes are accumulated with the text. If "^CA" had been used to send the control codes directly to the printer then the codes would apply from the beginning of the line, instead of from the current position on the line.

Your sub begins with a SUB statement, but also a set of parentheses which refrence a string variable name.

10 SUB time(E\$) @ E\$=TIME\$&' '&E\$ @ END SUB

As you can see, the information is added to the BEGINNING of the line, then followed by a space (to separate it from the remainder), then whatever was passed to the sub on.

When the sub ends, REPORT continues by reading whatever was passed back from your sub in that string variable. Let's use a simple example. Suppose you want a function to set a ThinkJet printer in compressed pitch mode. This is done with the sequence CHR\$(27)&"&k2S". This can be done with REPORT commands by using escape code (^EC) followed by control code (^CC) and that strange string:

^EC& ^CCk2S

There many ways to do the same thing with a sub, let's take an easy method, though probably not the most memory efficient.

10 SUB comp(E\$)
20 E\$='^CC'&CHR\$(27)&'k2S '&E\$ @ END SUB

The sub enters a control code command followed by the acutal data, then a space. The original string is then added to the output in case it already contained some data. Since a string is furnished with the remaining data on the same line, we could do anything with that string.

We'll write two other extensions. The first deletes the remainder of the string (that is, the remainder of the current line) if the time of day is before noon. The second uses the WBLEX functions NXTWORD\$ and WTRIM\$ to extract the first word, then HI\$ to set the high bit (add 128 to the NUM) of each character in that word.

- 50 SUB noon(S\$) @ IF TIME<43200 THEN S\$=""
- 60 END SUB

90 SUB hi(S\$) @
S\$=HI\$(NXTWORD\$(S\$))&WTRIM\$(S\$,NXTWORD\$(S\$))

As you can see, anything can be done with the string which will eventually supply a single string result at the end of the sub program. The maximum length of the string (including the part passed to the sub) is 132 characters unless you have previously used the size (^SZ) command to enlarge that string.

If there is a possibility of an error occuring in your sub be sure to include an error trap (ON ERROR) so that it will terminate properly and return control to REPORT without halting for the error.

The "^US" command

"^US" (short for "use") is the most specialized command of the three. It is similar to "^DO" in that the current line is passed. However it is more complicated in that the channel associated with the main file is also passed. In addition, if there is a current WorkBook71 file being used, its channel is also passed. In order to use this command successfully you will have to know if there is a WorkBook file open because the sub will be called differently and an error will be generated if a channel number is missing though needed or included when not needed. While it is not necessary to read from both files, the HP-71 operating system requires that parameters for CALL and SUB statements match exactly.

```
10 SUB nowbfile(X$,#1)
10 SUB withwb(X$,#1,#5)
```

Again, any operation which will eventually return a single string and does not alter any of the (possibly) open files is allowed. The primary use for "^US" is for reading or writing WorkBook71 data files from within the environment of the REPORT program. A general understanding of the format of the WorkBook file is required before altering data in that file type.

REPORT COMMAND SUMMARY

These commands are used to control how you would like this program to print your files. When the program is run it assumes some default values. You may change these values using commands in your files, or use them as is.

Page Length: 66 Left Margin: Top Margin: Top Margin.

Bottom Margin 6 Max Line Len.

No Page numbers 6 Right Margin: 70 Max Line Len: 132

Fill Mode

Page Control Commands

^AD (ADvance to new page) `adtext...

Causes a printing break. Advances the paper to begin printing on the next page. This command operates exactly like the Page Length (^PL) command.

• CE (CEnter on the line) ce this is centered

Causes a printing break. In center mode all of the data on each line is printed centered. Center mode remains in effect until another mode is used (^FI,^CO,^PA). The text is centered as entered on the line, leading and trailing spaces are ignored though any extra spaces embeded in the line are preserved.

• ^CO (COpy mode) co copied on one line

Causes a printing break. Enters copy mode during which the contents of each line is printed as written, no formatting is done. Other commands may be used while in copy mode if they preced the data on the line. You may, for example, use the date command (^DA).

Copy mode is preferred when printing information which is already formatted such as a list of numbers.

• ^FI (FIll mode) 'fi text...

Causes a printing break. Prints subsequent lines with as many whole words on each line as will fit within the margins. The left border is flush, the right border is not. Any extra spaces between words are deleted. Each time a word is

followed by a period, exclamation mark, question mark or colon (.!?:) an extra space is inserted between it and the following word. Any extra spaces between words in your Text file are ignored.

As with fill mode except extra spaces are added between words to make the right border of the text a straight line. Will not justify the line completely if it requires a great number of fill spaces. The last line in a paragraph is not right justified. Proportional spacing is not supported, you may set your printer for proportional characters, but REPORT will not do microspacing or fully justify.

• ^MA (set MArgins) ^ma10 70 text...

Causes a printing break. Set the left and right margins to other than the default settings of 10 and 70. Be sure to use the SZ command first if you set the margins wider than 96.

Causes a printing break. The default number of spaces to indent is 5. If you wish, you may change the number of spaces to indent to any practical number. Using the paragraph command without any number following assumes that you wish to indent the same number of spaces last used. A negative number of spaces WILL NOT cause a negative paragraph indentation.

The page length command is used to change the default settings to those you may prefer for your purposes. This command causes a page break, that is, it will stop printing on the current page (if anything has been printed) and begin a new page. Do not set your printer to skip perforations, REPORT maintains an accurate count of page length. The three parameters are page length, top margin, and bottom margin, each separated by a space.

Zero top and bottom margins may be used if desired. You may set all three values to zero for printing on continuous roll paper, though printing will slow somewhat when REPORT "advances to a new page" after each line.

If you are using a sheet fed printer, use a negative number for page length and the computer will stop printing after each page and ask you to insert a new sheet of paper. After changing paper, press any key to continue.

If your printer requires it, the bottom of the page may be printed with a form feed character (CHR\$(12)) instead of spaces. A negative bottom margin setting will enable the form feed, though remember, page numbers will not be printed.

Does not cause a printing break. Print page numbers. Pages are numbered from the beginning of the report. The page number with any value or none begins numbering. "^PNO" or "^PN-" stops printing page numbers. You may optionally include a starting page number to use.

Page numbers are centered at the bottom of the page and are only printed if the bottom page margin allows them to fit on the page.

• SK (SKip number of lines) sk1 text and commands...

Causes a printing break. Print the specified number of blank lines. The default value is 1 or the value last used. Using the skip command without any parameter will cause it to use the value last used. "^SKO" means "skip zero lines" and printing will halt on the current line and resume on the very next line.

Does not cause a printing break. REPORT assuames that you want all lines single spaced. To change to double (or more) spacing, use the skip command followed by, for instance, 2. There is no limit to the spacing imposed by REPORT, however, you will probably want to use a value of 5 or less. As with most commands, other data or commands may follow on the same line.

Does not cause a printing break unless the tab is to a position on the line which is already occupied. There is no default value, you must specify the number of spaces to indent the first time. The value last used is retained by REPORT, you may repeatedly tab to the same location on subsequent

lines by entering the value on the first tab, then just specify "^TA" on following lines.

Notice that the values to skip and tab are both specified only once until it is necessary to change them. However, if a command allows an optional parameter, it may not be followed by a number (even after several spaces) unless that parameter is also included. Any number would have been interpreted as the parameter for the command. This is illustrated above when using Zip codes where a parameter is specified, then a space before the Zip code.

Printer Control Commands

Tells the computer to send the data following the command to the printer as printer control characters. These characters are assumed to be control codes that will not be printed and, therefore, are not added to the line or word counts. All data up to the next space is interpreted as control codes. Any data or commands may follow the control codes on the same line if preceded by a space. You may accumulate spaces with the fixed space character (~).

Enters the ASCII code for the number specified as a printer control code. The character is not counted as part of the line length. Useful for entering special printer codes which are not part of the standard character set which can be entered from the keyboard.

The command is the equivalent of the BASIC function CHR\$. In the example above we entered CHR\$(27) and CHR\$(92) which will set unidirectional printing with many printers.

Sends each of the following characters to the printer preceded by the escape character (ASCII 27). In the example, the printer will receive $\langle esc \rangle$ H and $\langle esc \rangle$ C. With many

non-HP) printers, this will turn on bold and underlined printing mode. To send <esc> space use the fixed space character (~). As with other commands, data or commands may follow on the same line if separated from the escape string by a space.

HP printer commands often begin with "^EC&" followed by a space and the control code command (^CC) and more data. Examples of commands for the HP Thinkjet printer are shown in the addendum. Several HP compatible macro functions are included in the WB ROM.

Distribution List Commands

Designates the distribution list file name. A copy of the entire report will be printed for each line in the list. The distribution list command must be the first non-remark data in the file. Specify a mass storage device name with the file name if you wish to use a file which is not currently in RAM and you do not wish the program to load it.

The distribution list file is a Text is a Text file with each line containing related data. REPORT reads one line from the file for each copy of the report.

LaFong Plumbing, 123 Back St, Anaheim, CA, 92802 Bissenette Market, 789 Side St, Philadelphia, PA, 34567

Each field in the sample is separated by a comma, this is the field delimiter. The default is the accent grave (`), though this example uses a comma. The "^FD" command changes the Field Delimiter.

This command is one of the few with restrictions to remember: You may use only one Distribution List per report. It must be the first non-remark data in the file. Other data may follow on the same line if separated by a space, commands do not require a space to separate them from the file name. You may not use Distribution Lists in a report which also uses the New File (^NF) command.

To recall data from any field in the list use the Distribution Recall command (^DR). In the example you can recall the zip code field with "^DR5". Another use for distribution lists is to print several identical copies of the report; simply specify a List with as many lines in it as you need copies. Remember, it is not necessary to recall data from every field (or any field at all) in the list.

DR (Distribution Recall)Dear ^dr1 ^sk2Text...

The Distribution Recall command is used to recall a field from the current line in the Distribution List. The file must already have been assigned using the "^DL" command. The same field may be used repeatedly or not at all in the report.

• FD (distribution Field Delimiter) fd, text...

Specifies the single character which REPORT will recognize as separating fields in the Distribution List file. If you do not use this command the default will be the "`", in the example we set the delimiter to the comma. Be sure you know what delimiter is used in your source file. The first field is at the beginning of the line, regardless of the delimiter character.

Logical/Flow Commands

• AI (Advance If <expr> is true)
ai2text..

Advance to a new page if there are fewer than the specified number of lines remaining on the current page.

Move down the specified number of lines in the file and ignore any data between those lines. The remainder of the current line is still interpreted. Useful for creating multi-line conditional expressions when used with the IF command.

• GO (GOto line number) go50 text..

Move to the line (record) number specified in the file. Will use either main or merge file, whichever is currently being read. Remember that records in a Text file are numbered from zero. This function is quite useful when used in conjunction with the IF command.

• îF (do IF true)
 îf<expr> commands and text...

If the expression evaluates true then interpret the remainder otherwise ignore remainder of this line. Any data or commands may follow on the same line.

SUNDRY COMMANDS

• ^BE (BEep) ^betext..

Do a short three-note beep.

• CS (Clear Screen)

When used with a monitor it resets the display.

• ^CM (assign CoMmand character) ^cm. text..

Change the command character from " " to any single character. A space is not a valid command character. Only the first non-space character following will be interpreted as the command character.

Remember that the command character designates the end of a parameter for a previous function and therefore the beginning of a command. With this in mind, you can see that a real value of this command is if a mathematical expression contains the "^" for exponentiation. In this case you would want to be sure that the command character was changed before the expression was interpreted. You may change the command character as often as necessary in a report, even on the same line.

Places the current date in the printout. The month is spelled out completely, followed by the day and year in numerical form. The date is printed using a fixed space so that it will always be printed complete on one line. Be sure to leave a space or punctuation after this function (or have it the last data on the line), no trailing space will be added. The date 09/04/87 is printed as:

September 4.1987

The addendum gives directions for changing to day, month, year and changing the spelling of the months.

DI (DIsplay without printing)di this will be displayed...

Display the remainder of the current line on the LCD or DISPLAY device. The remainder of this line will be then ignored by the interpreter.

• FX (formula FiX setting) fx4text...

Specify precision to which the results of formulas will be rounded. This setting assumes fix2 when REPORT runs and then assumes the global fix setting whenever a WorkBook71 file is assigned. If you wish to use a fix setting other than that of the currently active WorkBook71 file than you will have to use this command again after assigning the WorkBook file.

Builds a star graph using the results of the formula following the command. Does not cause a printing break. Data may preced or follow the command and formula on the same line. Syntax for using formulas is the same as for "^WF", the WorkBook Formula command. If the number of stars exceeds the remaining width of the current printed line then the stars will be truncated to fit on the line. This command is very useful with a label at the beginning of the line then tab to a specific column so that graphs on other lines begin at the same column for comparison. If data will fit then it will be added following the start (so that trailing labels may be used). A subsequent tab can continue data on the same line following the graph. Be sure to use the SKip command (^SK) to stop printing data after the graph and move to the next line.

The example would print each line beginning with "Row n:" followed by the graph and, to show that other data may follow, the actual number from the cell is placed after graph on each line (using the WorkBook Formula command (^WF)).

Specify a Text file name. Any data on the same line as the merge command will be read before beginning to read from the merged file. REPORT will suspend formatting the current Text file and search for and merge data from the second file. Only one level of merge may be used. That is, you may not merge a file from a merged file. When the final data has been read

from the merge file, REPORT will continue from the next line in the main file. If you specify a device ID with the file name the progam will read the file directly from Disc. Otherwise, if it is not in RAM, it will be searched for on the first (or only) Disc and loaded to the computer to be read from RAM, then purged when it has been read. Files found in RAM will be left there.

• NF (assign a New main File) nf filename text...

Designates a new file to replace the current main file. Remaining data on the same line is interpreted but data on following lines (if any) in the original file is ignored. The main use of this function is to link a number of files. Note the difference between the new file command and merge (^ME); control returns to the original after the merged file is completed, while the "^NF" becomes the main file.

Do not use this command in a report which also uses the Distribution List command (^DL).

• ^SZ (SiZe of buffers) ^sz132 256text...

The REPORT program is set up for a maximum of 132 characters per line in either the line length being printed or the maximum line length of the source file. If a great number of control codes will be in the line, the source file may have lines longer than 132 characters, or the printed line size is greater than 132 then enter a new maximum line length and source file line size. The first parameter is maximum print buffer size, the second parameter is the source file size.

These settings are active for the current run only, the program returns to 132 at the beginning of each run. Of course, if the first line in the file is longer than 132 characters then the command would not be found before the program halts with an error. I that case enter the command when you specify the file name at the beginning of the program before any data has been read.

• ^ZZ (file line with repeating characters) ^zz x text...

Causes a printing break. Accepts the next series of non-space characters you specify up to the width of one printed line (in which case it wouldn't repeat at all). If no parameter follows the command then REPORT will print a full line of dashes "-". To embed spaces in your string use the fixed space character "~".

Extension Commands

• CA (CAll a program)
ca pgm text...

Call a sub-program without passing parameters. Note that the data files are still open when in the sub-program.

Call a sub-program while passing the contents remaining on the line. None of the active data files remain active in the called program. Your program begins with a SUB statement and you may alter the string in any way. The remainder of the string will be returned to REPORT and will be again interpreted, so any commands or data (up to the "^SZ" of the line) may be added.

• 'US (USe an extension)

usfilename text...

Passes the remaining portion of the current line to the subprogram. Also passes the channel associated with the main file and, if one is assigned, the current WorkBook71 file. Since this command will be handled differently depending on if there is a WB file active, your sub will require a different SUB statement depending on which case is true.

10 SUB nowb(X\$,#1) 10 SUB withwb(X\$,#1,#2)

WorkBook71 / Data Base Commands

• CP (CoPy one file to another)
cp file1 file2 text...

Copies a file from the first name entered to the second name. Device specifiers may be used with or instead of file names.

• ^CW (Column Width for wb cells)
^cw8text...

When a WorkBook71 file is assigned the column width of that file is read so that merging that file (^WM command) or formatting data (^FN, WC commands) will be will maintain that column width. The "^CW" command sets the column width for

formatting this data to other than the width of the WorkBook file. Note that this does not alter the width stored with the WB file, just the format for this printing session.

• FN (Format Number) fn [2,3]*3.75

Calculates the formula specified and returns it rounded to the current fix (^FX) setting and right justified in a field of fixed spaces to the current column width (^CW) setting. If fix0 is set then there will be no trailing decimal point.

This command is primarily intended for formatted printing of columnar data. Be sure that the fix and column width are set before using this command. It is not necessary to have a WorkBook file active to use the Format Number command if the formula does not contain any cell refrences.

Display remaining portion of current line as a prompt and halt formatting so that the user can input data. The data input will be added to the data being interpreted. Remember that the longer the prompt string is the less room will be available on the line for the input. An alternative use for IN is to halt printing between lines so that manually set print modes may be changed.

Copies the named file from the first (or only) HP-IL mass storage device to main RAM.

Purges the specified file using the mainframe PURGE statement. A device specifier may be included with the file name.

• SV (SaVe a file to mass storage) sv filename text...

Copies the specified file to the first (or only) HP-IL mass storage device. A device specifier may be included with the file name.

Data may be recalled from a WorkBook71 file using the "^WC", "^WF" and "^WR" commands and copied to the file using "^WS". The "^WM" command is used to merge a WorkBook71 file in the report. Before using these commands, REPORT must know from which file to use the data.

The "^WA" command assigns the WorkBook file then reads the current status from the specified file and reads the Col and Row user labels (if the label file is available in RAM).

The "^WA" command may be used to change the active WorkBook file whenever needed. Remember, if you have used the column width (^CW) or fix (^FX) commands, whenever a WorkBook file is assigned these values take on the current setting of that file.

Recalls the WorkBook cell specified formatted as it is for display. If the cell is text then it is left justified, numbers are right justified. The cell contents are returned filled with fixed spaces to the current col width (set by assigning a WB file or with the "CW" command). See also the similar "FN" command.

• `WF (Workbook Formula) `wf [wk,to]+.9 text...

This is much the same as entering data into a results only (=) WorkBook cell. The formula you specify is caluclated then the results entered into the report in the current fix setting (set by the "^FX" command or by "^WA"). It is not necessary to have a WorkBook file assigned if the formula does not use cell refrences.

Merges the currently active WorkBook71 file in the printed report. Causes a printing break. Current printing mode (^FI,^JU,^CO) is ignored while the WorkBook file is printed. The printout is added to the page count but ignored by the word count. The required parameters are upper left coordinate of col and row and lower right col and row.

The file is formatted using the column width of the file or the setting you have specified using the column width (^CW) command. The default is to print with col labels; optionally specify N following the coordinate specifiers if you do not

wish the labels to be printed. If the next non-space character on the same line in the Text file is either an upper or lower case "N" then labels are not printed and that character is deleted. Any other character, or nothing else on the line and labels will be printed normally. The limitations in syntax are that, if you wish to begin a word after that command with "N" then it must be on a separate line or that letter will be deleted.

If the file will not fit on the page then as many columns wide as will fit within the current page margins will be printed and remaining columns will be printed after that section. Printing may extend over several pages if the WorkBook file is quite large.

Do not set the effective printable page size (page length minus top and bottom margins) to fewer than 5 or page width narrower than the column width when merging WorkBook files.

Specify a col,row coordinate and the contents of the specified cell will be added to the date being interpreted. Text data from the file is recalled as written. Numbers and results of formulas are recalled to the fix precision they contain in the file, formulas and the leading "=" or "+" are deleted. Blank cells are recalled as the null string, not the number zero.

• WS (Workbook Store) ws col, row place this in cell

Store the value or the results of the next command in a WorkBook cell. The remainder of the line is placed in the file in the cell specified.

If the first data is a command than that command will be interpreted and the results placed in the cell. The appropriate commands are those which return a result such as "WR" or an extension command (^DO,^US).



Basic Formatting

IA simple letter which changes margins plo6 3 4 mais 65 cela Fong Plumbing 123 Back St. Anaheim, California 92802 da 'sk'fiWe are proud to announce the opening of our newest branch. You are cordially invited to the grand opening celebration to be held next Wednesday evening at eight P.M. We have reserved the Crystal Room at the newly remodeled Greasewater Country club. sk pal know you will enjoy yourself. As an extra added attraction I will give a slide show and demonstration on slip fitted joints. ^sk2So, mark your calendar, and I'll see you there. Their address is: 'n Greasewater Country Club 1285 South Sluce Anaheim, CA

I am looking forward to seeing you.

La Fong Plumbing 123 Back St. Anaheim, California 92802 August 27,1986

We are proud to announce the opening of our newest branch. You are condially invited to the grand opening celebration to be held next Wednesday evening at eight P.M. We have reserved the Crystal Room at the newly remodeled Greasewater Country club.

I know you will enjoy yourself. As an extra added attraction I will give a slide show and demonstration on slip fitted joints.

So, mark your calendar, and I'll see you there. Their address is:

Greasewater Country Club 1285 South Sluce Anaheim, CA

I am looking forward to seeing you.

Yours Etc.

Yours Etc.

!"GUNGADIN"

pl20 1 1 ma10 55
ceGUNGA DIN

by
Rudyard Kipling
sk1 fi Din ! Din ! Din !
coYou Lazarushian-Leather Gunga Din !
Tho' I've belted you an' flayed you.
By the livin' Gawd that made you,
You're a better man than I am, Gunga Din !

GUNGA DIN by Rudyard Kipling

Din! Din! Din! You Lazarushian-Leather Gunga Din! Tho! I've belted you an! flayed you. By the livin! Gawd that made you, You're a better man than I am, Gunga Din!

! "TXSAMPLE" Text file used by REPORT ta50 Richard Harvey ma 10 72 ta Box 5695 îta Glendale, AZ ~~85312 îta îda ^sk2 pa This is a demonstration of some ecW is Diablo printer code for bold ! use HP codes for the ThinkJet ecW WorkBook71 ec& printing features. REPORT reads the Text and commands and prints the data formatted according to your instructions.

! skip a line, print a line of dashes `sk1^zz CEWeight of Computers ta25 ^gr1 ^ta ^gr40 ^ta ^gr20 fi HP-71 00.75 sk0 IBM PC 40.00 ^ta sk APPLE][gr20 20.00 ! same data entered without spaces: skHP-115 tagr10 10.00 ^zz "sk1"paThere are several ways to print reports. PRINTWB can print formatted ecW WorkBook71 ec& files or listings of cell contents. REPORT can merge a WB file during printing and has commands for calculating formulas and tabular printing the results. ! open WB file, set col wid "WAwbsample"CW9 ! print WB file: enter cell coord range sk1 WM mon,1 wk,total "sk We can print columnar data left or right justified: ! set col width !1. In right justifies ! the WB file fix is 2, format 2 places ! a space is printed between cols CW 11 ^sk1Line #1: ^ta25^fn123 m45678 ^m .33333 ^sk0Line #2: îtaîn.75 m1.25 m0 ^sk Line #3: îtaîn[mon,tot] fn[wk,tot] fn[wk,to]-[m,to] ^fx0 "sk Line #4: ^ta^fn[mon,tot] fn[wk,tot] m[wk,to]-[m,to] îskî îpaîecW WorkBook71 îec& is often used to maintain a portable Data Base. Report Generator and Data Base, ecW WorkBook71 EC& has an

easy to use Text Editor (with screen editing when used with a monitor)

The RPN calculator makes your HP-71

and several utilities.

act like an HP-41.

Richard Harvey Box 5695 Glendale, AZ 85312 August 27,1986

This is a demonstration of some WorkBook71 printing features. REPORT reads the Text and commands and prints the data formatted according to your instructions.

	Weight of Computers
HP-71	• 00.75
IBM PC	•••••••••••••••••••••••••••••••
APPLE][20.00
HP-115	********* 10.00

There are several ways to print reports. PRINTMB can print formatted threshold fit files or listings of cell contents. REPORT can serge a WB file during printing and has commands for calculating formulas and tabular printing the results.

		Hon	Tue	Wed	Thu	Fr1	W ktot
City	Ť	PALO ALTOSAN	JOSE	MONTEREY P	ALO ALTO	HOME	
Hotel	;	50.88	40.28	78.81	40.28		210.25
Trans	;	2.05		43.60	4.10	137.30	187.05
Auto	;	12.00		14.50	10.40		36.90
Phone	÷	5.10	14.55	3.60		12.40	35.65
Food	;	16.30	3.27	42.60	16.20	7.00	85.37
Misc	;	27.50	4.60	43.00			75.10
Total	:	113.83	62.70	226.11	70.98	156.70	630.32

We can print columnar data left or right justified:

Line #1:	123.00	45678.00	0.33
Line #2:	0.75	1.25	0.00
Line #3:	113.83	630.32	516.49
Line #4:	114	630	516

WorkStock? 1 is often used to maintain a portable Data Base. Besides Spreadsheet, Report Generator and Data Base, WorkStock? 1 has an easy to use Text Editor (with screen editing when used with a monitor) and several utilities. The RPN calculator makes your HP-71 act like an HP-31. This calculator program shares many of the operations of the HP-41 calculator but modified to better take advantage of the capabilities of the HP-71. While many common math functions are provided, if you wish to use others then you may enter them by editing the computers command stack or temporarily entering Calc mode; the results will be returned to the X register. Very little power is consumed by the computer when the calculator is running and the X register is displayed; power consumption rises only when keys are being pressed.

RPN Calculator Stack

RPN calculators maintain a stack. That is, a group of registers containing numbers which may be manipulated together. For convenience these registers are called X, Y, Z and T; the X register is constantly in the display and is always the current register upon which calculations are performed. A fifth register, called L, or LastX, contains the value X contained before the last calculation. LastX is useful to make it easier to back out of erroniously entered formulas or to recall the value for further use of the number as a constant.

The Stack

	0.0000	LastX
Always Displayed	0.0000 0.0000 0.0000 0.0000	T register Z register Y register X register

Operations involving a single number (such as COS) use only the X register and return the previous contents of X to LastX. Most common operations compare two numbers in one way or another (such as simple addition); these operations are performed on the X and Y registers, and the results are returned to X.

All calculators have at least two registers (otherwise they would be limited to monadic functions), however most RPN calculators have four; Z and T are pigeon holes in which to save numbers for later calculations.

While number keys obviously control data entry, editing keys control how data is handled. The ENDLINE key (usually called "ENTER^") separates numbers and will cause data to be "pushed" onto the stack. This is stack lift which means the contents of each stack register is pushed up one, that is the Y register is copied to Z, Z to T and the previous contents of Z are discarded. Functions which operate on two numbers (in the X and Y registers) cause the results to be returned to X and the previous contents of Y to be lost; at this point the stack is "popped", that is, the contents of Z and T are copied

to Y and Z respectively and the contents of T are unchanged. If you need more information on the use of RPN calculators any of the excellent HP manuals will offer a general introduction.

Key Operations

This program "takes over" the keyboard; typing aids and key assignments are ignored. The operation of all keys (except number entry keys) may be viewed by holding down the key. Hold the key down for more than a second and the operation will be canceled, release it before one second has elapsed and the function will be performed. Press and release the key immediately and the operation will be performed without displaying the key name. Most keys perform the same function as their key label, the exceptions may be tested by pressing the key.

With RPN calculators, the CLX key is rarely needed, just begin entering the new data, however, CLX is provided for the times when you wish to enter a new value in X without stack lift occuring.

On most RPN calculators, the Back Arrow key will reset the X register to zero if the number had been terminated. Numbers are usually terminated by performing any non-data entry function. Since it is often helpful to modify the result of a function instead of re-entering the entire number, the back arrow key operates as an "un-terminator" key; it deleter the rightmost character and allows you to modify the number remaining in the display.

Required SDATA File

The stack and 10 storage registers are maintained in an SDATA file called "RPNDATA" if the file does not exist it will be created when the program starts. However, if "RPNDATA" does exist, it must be an SDATA file with a minimum size of 15 registers. The contents of the registers are as follows:

RPNDATA: 0 1 2 3 4 5-14 Calculator: X Y Z T L 0-9

Running The RPN Calculator

The program checks then reads the RPNDATA file and assigns some program status, this takes about one second. If you often use just this program then you can suspend it by pressing the ON key, then press f-CONT to continue from where you left it. You may CALL other programs while the RPN calculator is suspended, however, if you RUN another program or change the current edit file then this program is automatically terminated and cannot continue, so it must be restarted. You can tell if the calculator can be continued by checking to see if the "SUSP" annunciator on the right side of the display is lit.

If you wish to turn off your 71 and have the calculator continue automatically at power-up then, while the calculator is running, press **f-ON** and the 71 will turn off. When you turn the computer back on the program will automatically continue.

The program will not automatically continue if you suspended it with **ON** before turning off the 71. This feature may not work if you have a special STARTUP sequence active in your 71.

The E key is used to exit the calculator when you do not plan on re-entering it soon. After exiting with the E key you will have to re-start the program with RUN or CONT.

Errors and Math Exceptions

Most errors, such as division by zero, will display a warning message, then the BASIC default value will be returned to X. Overflow errors will generally return a value representing the maximum displayable value the 71 can represent. Math exception flags are neither altered nor tested by this calculator.

Storage Registers

Your BASIC mode variables are not used by this calculator, they are ignored. The calculator maintains its own variables (usually called "registers" with RPN calculators). The 10 data registers (0-9) are maintained in RPNDATA, they are not in variables within the program. You may use the variables X,Y,Z,T and L in expressions if the calculator is suspended (such as in Calc mode); when the calculator continues the registers will maintain those values.

Register Functions

Three functions are used with the contents of the calculator registers as well as with the stack. These functions are S for store, R for recall, and V (or the **f-VIEW** key) to view the contents of a register without recalling it to the X register.

R (recall)

Recalls the contents of the specified register to the X register. Press S, then, at the prompt, press the key corresponding to the register: register numbers 0-9 and stack registers X, Y, Z, T, L. In the example we will recall the contents of register 7 to X.

Keystroke Display [R] recall [7]

S (store)

Copies the contents of the displayed X register to the specified register. To copy the current value of register 2 enter:

Keystroke Display
[S] store
[2]

V (view)

At the prompt enter a register name and the contents of that register will be displayed for aproximately one half second. If you would like to view the register for longer than 1/2 second then press and hold the key.

The register is displayed with an equals (=) on the left of the display. Contents of the stack are not changed and the X register will return to the display when you release the key.

Storage Register Arithmetic

In addition to recalling from, storing to, and viewing the contents of a register, you may also perform arithmetic using that register and the X register as arguments. Storage register math keys are +, -, *, /, $^{\circ}$. The following keystrokes add the contents of X and R3 and return the sum to R3:

Keystroke	Display	Remark
[S]	store	
[+]	store +X	
[3]	_	Shows X contents

The computer will prompt you for a register number. You may cancel the operation by pressing a non-register key.

When storing numbers from X the operation is performed on the number in the register, then the results placed in that register. In the example we will take the contents of register R8 and divide it by the contents of X then return the results to R8.

keystroke	Display	Remark
7.5	7.5	enter a number
[S]	store	prompts for reg
[8]	7.5	done, displays X
[2]		enter 2 to X reg
[S]	store	3
[/]	sto /X	storage math
[8]	7.5	done, displays X

What this says is "take the number in R8 and divide it by the number in X and return it to R8". Now, lets confirm that R8 contains the results.

[V]	view	
[8]	4.25	R8 contents
	2	1/2 second later

Register arithmetic works in reverse when recallingling and viewing registers. That is, it would say "take the number in X and divide it by the number in R8 and return the results to X. We can confirm that the above example is correct by multiplying X and R8. Instead of recalling the results to X, lets just view the results of the formula without altering X or R8:

[V]	view	the view prompt
[*] [8]	view X*_ 8.5	register math results
	2	1/2 second later

As you can see, the view function allows you to test formulas and see results without altering the data registers.

RPN Calculator Keystrokes

RUN, g-CMDS "cmd stack" Enables the command stack. Enter any mathematical expression (including string functions) and the results will be returned to the X register.

f-CALC "calc mode"
Suspends the RPN calculator and enters Calc mode. Exit Calc mode normally then press f-CONT to continue. The results of the final Calc mode expression will be placed in the X register, previous contents of X will be in LastX. DO NOT re-start the program by pressing RUN when you exit Calc mode because the current contents of the stack will be lost. The contents of X, Y, Z, T, and L may be used in Calc mode formulas.

ENDLINE "enter" Copies the contents of X to Y.

ON (suspend calculator)
Suspends the program. You may continue from where you left by pressing f-CONT when the SUSP annunciator is lit.

f-ON (off)
Turns the HP-71 off. The RPN calculator will continue when you turn the computer back on.

UP ARROW "roll up" Rolls the contents of the stack up. That is, Y becomes X, Z becomes Y and so forth.

Down Arrow "roll down" Rolls the contents of the stack down. X becomes Y, Y becomes Z.

Left Arrow "back"
Deletes the rightmost character in the number in the X
register. If the number had been terminated (a non-data entry
key had been used) then this key deletes the rightmost
character and "un-terminates" the number so that it may again
be modified with the number keys. If the number had been
un-terminated be sure not to delete the entire number or stack
lift will take place and the single number remaining before
the number was nulled will be copied to Y.

-LINE "clx"
Resets the contents of the X register to zero.

f-LC "clr"
Resets the contents of ALL registers (including the stack) to
zero.

C "chs"
Change the sign of the number in the X register. X=-X.

D "div"

E "exit"

Updates the contents of the stack in the "RPNDATA" file then ends the program. The contents of the X register are displayed when the program ends and may be used in a BASIC mode expression with the RES keyword.

F "fix"
Set the numerical display format. Valid values are 0-8; entering 9 resets display format to STD. Numbers are stored in full 12-digit precision regardless of Fix setting.

I "int"
Returns the integer part of X to X.

L "last X"
Recalls the contents of register L to X. When a function is executed the value of X is placed in the L register before execution of the function.

M "mod"

P "pi"
The constant 3.14159265359.

U "frac" Returns the fractional part of X to X. χ "X<Y" Exchanges the contents of the X and Y registers.

I/R "1/"
Returns the reciprical of X to X.

f-FACT "fact"

f-MEAN "log10" Logarithm (base 10).

f-SDEV "X^2" X squared returned to X.

f-SIN "sin"

f-COS "cos"

f-TAN "tan"

f-EXP "exp"

f-ASIN "asin"

Arcsine.

f-ACOS "acos"

f-ATAN "atan"

f-LOG "ln"

Natural log.

f_^ "^"

Returns Y^X to X.

^, %, +, -, *, /



PRINTUB WORKBOOK PRINTER PROGRAM

PRINTWB prints WorkBook Files in a grid of columns and rows, much as they are displayed on a monitor, or they may be listed sequentially with formulas.

Column and row labels cannot be printed "inverse" with most printers so they are delimited with vertical bars "!". In addition to this difference you can supress labels, print sections of files and use a different Col width than you might use with a monitor. Listing a file in unformatted form is helpful to review formulas or to list data base files. When printed unformatted a blank line will be printed after each column.

When you use the WorkBook Editor (WB) with a monitor you will notice the display builds by columns, from left to right. This is done to try to keep the process as fast as possible. As you will recall from the discussions of formulas and recalculation, this is because the file is being read sequentially.

Now we come to this program. When formatting the file, it is necessary to print one entire Row before printing the next; most printers can't back-up. While it is permissable to print formatted Virtual files with this program, they will print much slower than RAM based files because of this method of reading data from the file. When using the program to list a file and its formulas, it is read by cols and there is no speed (or media wear) penalty.

The Printer

The program does not assign the printer. Whichever device is assigned and active when the program begins will be used. If there is no printer then the output will be sent to the LCD and, if there is one, an active display device. The ThinkJet and other Hewlett Packard printers usually are automatically assigned as the active printer by the HP-71. Printers using RS-232 or other interfaces must be assigned, please read the HP-IL Module owners manual for instructions. Be sure, before running this program, that you know the number of characters your printer can print on one line.

Run the Program

PRINTWB may either be RUN or CALLed, it requires no parameters. Once the program begins you will be lead through a series of prompts.

PRINTWB can print the file in many different forms, your responses to the following prompts determine how the final printed format will look. Many prompts begins with a default value, such as current PWIDTH and range of cells to print. You may may press ENDLINE and use the values offered, or change them. Others require a single keystroke such as after "Y/N", in that case it is not necessary to press ENDLINE. If at any time when entering data at these prompts, you become

lost, you may suspend the program by pressing ATTN then restart it with the ${\hbox{\it RUN}}$ key. Now, let's work through the prompts:

print WB file:

Enter the name of a WorkBook file in RAM, :PORT on on Disc. If you specify a device name the file will be read directly without loading.

Load/Virt

If you had not specified a device name and the file was not found in RAM you have the option of loading it or using it from Disc.

start col, row: 1,1

This prompt is asking for the Col, Row coordinate of the the first cell you would like to print. The default is the the first cell: 1,1 in the upper left corner of the file. You may enter coordinates using default or user labels (if the label file is in RAM).

last col, row: 6,8

The default is the last cell in the last Col; that is, in the lower right corner. If you had pressed **ENDLINE** at this and the previous prompt without changing the values then the entire file would be printed.

You may specify any range of cells, representing a square or rectangular portion of the file.

print labels Y/N

You have the option of printing the file with user (if a label file is present), default (if no label file), or without any labels at all. This third option is specified at this prompt. Pressing N will cause the file to be printed without any labels. This will cause the cells to be printed in order, but without any printed indication of Col/Row specifiers.

format: Y/N

Press Y to have the file formatted in a grid of cols and rows. Press N to list entire cell contents, including formulas, by cols. If you specified unformatted listing then the following two prompts will not be shown.

col width:8

The default is the width specified with the WorkBook71 Editor Command level "Wid" operation. The width you specify will not change the width used by WB, it is only used during this printing session. This is helpful if you normally keep a fairly narrow Col width to display a lot of data on a monitor, but prefer to have a little more room with printed reports.

printer width:96

Set the maximum number of characters that can be printed on one line. The default is the current PWIDTH setting. The PWIDTH will return to the original setting when this printing session ends.

The PWIDTH setting is very important when printing WorkBook Files which have too many Cols or too great a Col width to fit on a single page. The program will print the Col and Row labels and as many Cols as will fit on one line. Any Cols which did not fit will be printed, with Col and Row labels, following that section. This is especially important to remember when using a sheet fed printer. Be sure that the col width specified plus the row label width is less than will fit on a single printed line.

As an example, assume we have a 24 column printer. We have a WorkBook file with 5 Cols and 6 Rows, and Col width is set at 7. Row labels will take 8 characters (5 chars for the label plus a space, a vertical bar (¦) and another space), that leaves 16 characters. Only two 7 character Cols will fit within 16 characters so the file will be printed in 3 sections. The same logic holds true for a 132 column printer, but on a grander scale.

printer set-up:

You may specify anything, up to 96 characters, to be printed on the line immediately preceding the report. This is useful to add a note such as "Summary of January Sales" or for sending non-printing control codes to the printer to alter printing modes before printing the file.

Escape sequences may be included by using the exponentiation (^) character wherever a CHR\$(27) is required; the program will then replace each with a CHR\$(27) when it prints the set-up string. It is not necessary to include any set-up string, in that case press **ENDLINE** without any input.

Notes

At this point, printing will start and will proceed automatically until the file is printed as specified. There is purposfully no error trapping as the program runs. If the program halts during the run it is likely that it is because the output file was mass storage based and was full, there was insufficient RAM memory, a device failed or a loss of continuity of the HP-IL (a plug was pulled). Be sure you understand the cause of any error conditions before running the program again.

Printed With User Labels

		Mon	Tue	Wed	Thu	Fri	Wktot	
City	I PA	LO ALTOSA	N JOSE MO	INTEREY	PALO ALTO	HOME		
Hotel	1	50.88	40.28	78.81	40.28		210.25	
Trans	1	2.05		43.60	4.10	137.30	187.05	
Auto	1	12.00		14.50	10.40		36,90	
Phone	1	5.10	14.55	3,60		12.40	35.65	
Food	1	16.30	3.27	42.60	16,20	7.00	85.37	
Misc	1	27.50	4.60	43.00			75.10	
Totai	1	113.83	62,70	226.11	70.98	156.70	630.32	
		1	2	?	3	4		5
Cmpny	ı Bi	ssenette	MKBYTE	С	alumet	Cartoon	ColouChi	cago Broth
Adrs	1 78	9 Side St	70 Mair	St 8	90 Supreme	D9024 Li	ndb1ad456	Main
City	I Ph	iladelphi	a Peterbo	orough B	ensenville	Culver	City San	Diego
State	I PA		NH	1	L	CA	CA	-
Zip	1 34	567	03458	6	0106	90230	920	03
Dept	1 Pr	oduce	Publist	ner P	urchasing	Purchas	ing Del	ivery
Attn	I CI	aude Biss	enGene W.	, SimpsS	ir	Linus V	an PelLui	gi

Printed With Default Labels

		1	2	3	4	5	6
1	I P	ALO ALTOSA	N JOSE M	ONTEREY PA	LO ALTO I	HOME	
2 ·	1	50.88	40.28	78.81	40.28		210,25
3	1	2.05		43.60	4.10	137.30	187.05
4	1	12.00		14.50	10.40		36.90
5	1	5.10	14.55	3.60		12,40	35.65
6	1	16.30	3.27	42.60	16,20	7.00	85.37
7	1	27.50	4.60	43.00			75.10
8	1	113.83	62.70	226.11	70.98	156,70	630.32

Printed Without Labels

PALO ALTOSAN JOSE MONTEREY PALO ALTO HOME

50,88 4	0.28	78.81	40.28		210.25	
2.05	4	43.60	4.10	137,30	187.05	
12,00		14.50	10.40		36.90	
5.10 1	4.55	3.60		12,40	35,65	
16.30	3.27	42.60	16.20	7.00	85 . 37	
27.50	4.60	43.00			75.10	
113.83 6	2.70 2	26.11	70.98	156.70	630,32	
Bissenette Mkt	BYTE		Calumet	t	Cartoon Colour	OChicago Brothers
789 Side St	70 Mair	n St	890 Sup	oreme Dr	9024 Lindblade	
Philadelphia	Peterbo	orough	Bensen	ville	Culver City	San Diego
PA	NH		IL		CA	CA
34567	03458		60106		90230	92003
Produce	Publis	her	Purchas	sing	Purchasing	Delivery
Claude Bissene	ttGene W	Simpson	Sir	-	Linus Van Pelt	Luigi

Unformatted Without Labels

```
Bissenette Mkt
789 Side St
Phi ladelphi a
PA
                       Unformatted With User Labels
34567
Produce
                             ,City PALO ALTO / HYATT
                       Mon
Claude Bissenette
                             ,Hotel =50.88
                       Mon
                             ,Trans =2.05
                       Mon
BYTE
                             ,Auto = 12.00
                       Mon
70 Main St
                             ,Phone +5.10 @.25+3.8+.8+.25
                       Mon
Peterborough
                             .Food = 16.30
                       Mon
NH
                       Mon
                             .Misc +27.50 @27.5!LUGGAGE REPAIR
03458
                             Total +113.83 @[1,2]+[1,3]+[1,4]+[1,5]+[1,6]+[1,7]
                       Mon
Publisher
Gene W. Simpson
                             .City SAN JOSE
                        Tue
                             .Hotel =40.28
                        Tue
Calumet
                             ,Trans
                        Tue
890 Supreme Dr
                        Tue
                             ,Auto
Bensenville
                             ,Phone +14.55 @3.3+.25+2.6+8.4
                        Tue
IL
                             .Food = 3.27
                        Tue
60106
                             Misc +4.60 @4.6!BATTERIES
                        Tue
Purchasing
                             Total +62.70 @[2,2]+[2,3]+[2,4]+[2,5]+[2,6]+[2,7]
                        Tue
Sir
                             ,City MONTEREY
                        Wed
Cartoon Colour Co
                             ,Hotel =78.81
                        Wed
9024 Lindblade St
                             ,Trans =43.60
                        Wed
Culver City
                             ,Auto =14.50
                        Wed
CA
                        Wed
                             .Phone +3.60 @3.6
90230
                             ,Food =42.60
                        Wed
Purchasing
                             Misc +43.00 @43. !SCUBA RENTAL
                        Wed
Linus Van Pelt
                             ,Total +226.11 @[3,2]+[3,3]+[3,4]+[3,5]+[3,6]+[3,7]
                        Wed
                        Thu
                             ,City PALO ALTO /HYATT
                             ,Hotel =40.28
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                             ,Trans =4.10
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                        Thu
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                             ,Total +70.98 @[4,2]+[4,3]+[4,4]+[4,5]+[4,6]+[4,7]
                        Thu
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                        Wktot,City
                        Wktot, Hotel +210.25 @[1,2]+[2,2]+[3,2]+[4,2]+[5,2]
                        Wktot, Trans +187.05 @[1,3]+[2,3]+[3,3]+[4,3]+[5,3]
                        Wktot, Auto +36.90 @[1,4]+[2,4]+[3,4]+[4,4]+[5,4]
                        Wktot, Phone +35.65 @[1,5]+[2,5]+[3,5]+[4,5]+[5,5]
                        Wktot, F \infty d + 85.37 \ @[1,6] + [2,6] + [3,6] + [4,6] + [5,6]
                        Wktot, Misc +75, 10 @[1,7]+[2,7]+[3,7]+[4,7]+[5,7]
```

Wktot, Total +630.32 @[1,8]+[2,8]+[3,8]+[4,8]+[5,8]

Porter is used to "port" (or move) data between WorkBook71 and Text files. The purpose is to offer compatibility between WorkBook71 and files written with other programs and to exchange data with other computers.

Since fields within the file may be delimited by any displayable character, it is unlikely that there will be problems when exchanging data with, for instance, HP-75 or HP-85 spreadsheets and other programs which use Text files. Remember, if the line length is kept under 96 characters, then the Text output file may be edited with the TED program to correct any unusual lines. The limit on Text file line length is 255 characters, if any source or output lines exceed this length then the program will halt when it comes upon them.

If you need to exchange data with HP-75 VisiCalc (registered trademark of VisiCorp) files, use the SWAP program in "File Management Applications for the HP-75", also by this author.

Field Delimiters

When echanging data between Text and WorkBook files a character designates the end of one filed and the beginning of the next on the line of Text. A disadvantage of using commas to delimit fields is that formulas and text often contain them and each will be interpreted as a field separator and make for a very unreliable transfer. It is suggested that the accent grave (`) be used when practical since this character is rarely used for other purposes.

If the source file is Text then any blank lines will be ignored. Blank lines will be translated to blank WB cells if fields are ignored, so that purposfully entered blanks will be retained.

Getting Started

PORTER may be CALLed or RUN. It is aproximately 700 bytes of RAM while runing. The source file may be either in RAM or on Disc, you have the option of specifying a device name. Remember, to minimize medium wear, it is a good idea to not have both source and destination (also called "output") files on disc; also, Text destination files must be in RAM. The output file must be a new file name if it is a WorkBook71 file; if it is a Text file then the new data will be appended to the end.

There are several options which have a great influence on the format of the output file. Since the source file is not altered in any way, it might be helpful to experiment with how these various options affect the output file. The WBROM adds the capability to LIST and PLIST Text files, this may be done to quickly view the file.

Porter Prompts

The program begins with up to seven prompts (depending on the methods being used). Prompts for a single character input (such as Y/N) must not be followed by **ENDLINE.**

After the final prompt, when the computer does the actual conversion, the current time is displayed. The now current time is appended to the display when the program ends. Use the difference between the two times to help judge how long the program will take to run. The program takes from a few seconds to several minutes depending on the size of the source file and whether or not the files are RAM based.

source:

Enter the name of a Text or WorkBook71 file in RAM, :PORT or on :MASSMEM. The file will be accessed as a virtual file if you specify a mass storage device, it will not be loaded to RAM. If the file is not of the correct type then the prompt will return. If it is not found then PORTER will ask if you would like to load it or use it as a virtual file. The only acceptable file types are Text and WorkBook71 type Data files. Data files formatted using other systems may not be used.

output:

Specify a new WorkBook71 file or Text file. Remember, the output file can not be the same file type as the source file (if the source is WB then the output must be Text, and vice versa). If there is already data in the Text output file then this data will be appended to it. If it is a WorkBook71 file then a prompt will follow these next prompts requesting the size and configuration of the new WorkBook71 file.

Field delimited: Y/N

Your answer to this prompt determines what further prompts will be required. This question asks: if source file is WB then do you wish to place all of one col (or row) on the same line, with the data from each cell separated by a "delimiter" character.

If the source is Text then Y means you wish to place the delimited sections of the file in separate cells. Pressing N signifys that you wish all data to be transferred sequentially to separate lines (or cells) without interpreting separate fields. This second method is often used when transferring non-spreadsheet oriented Text between formats. In this case data will be copied beginning in the upper left corner and progressing through the end of the first col to the beginning of the second col, and so forth. Be sure the resulting Text file lines will be shorter than 255 characters.

If you have indicated ${\bf N}$ then the following prompts will not be displayed.

field delimiter: `

At this prompt specify the character that you want the program to place between fields when transferring to WB files or to interpret as field delimiters when transferring to Text. Specify any character you wish; while only a single character is usually used, you may specify up to 32 characters. The default character is the accent grave (`), this is done because the character is not assigned to a key and this method makes it easier to enter the character. Most programs for other computers use a comma (,) to separate fields, you may wish to change the prompt to this character. The REPORT program, furnished with this package, defaults to the accent grave to designate separate fields in Distribution List, though REPORT has a command to change it as needed. Many programs for the HP-75 use the accent grave. Moving data between the HP-71 and HP-85 may be easier using commas.

using:Cols/Rows

This specifies the direction within the WorkBook file in which data will be written or read. If you specify C then each line in the Text file will be transferred to separate cells within a Col (vertically). Specifying R will cause data to be transferred between cells in Rows and lines in the Text file.

delete formulas: Y/N

This prompt will only be displayed if the data is being transferred to a Text file. Pressing Y will cause only the results of the formulas (as displayed on a monitor or printed) to be transferred. This also causes trailing decimal places (found when using FIX 0) in numeric or formula cells to be deleted. If you press N then the entire cell contents will be transferred. Label cells are not affected by this option.

Remember, the line length may be longer than expected when copying cells which contain formulat. For most use, it is probably better to delete formulas.



FINDER DATA SEARCH PROGRAM

Searches WorkBook Data files for user determined data and provides a Text file with the results of the search.

Data Format

When the WorkBook program is used as a List Manager data is usually stored as a series of columns with each row representing a field. Any number of rows (fields) in the file may be used. When fields meet the qualifications you specify, as many rows in the column are copied to a Text file, this is called the output file.

The format of the output file is visually the opposite of WorkBook files. That is, columns are reproduced as lines in the Text file. Each column in the WorkBook file is copied to the Text file as a single line, rows within that col are separated by the accent grave (`) or other field delimiter as specified. It is suggested that you attempt to keep the total number of characters in each output line to a maximum of 96 so that the lines may be edited with TED, the Text Editor program.

Instructions

Load the program, it is called "FINDER". It may be RUN or CALLed. The first prompt is:

search file:

At the prompt enter a valid WorkBook file name in RAM or on the first (or only) Disc connected and active. You may optionally include a device specifier (such as ":TAPE").

Output File

Enter a Text file name or a new name at the next prompt. Data will be appended to the end of the file if some already exists.

output file:

Output Rows

The prompt is followed by the number of the first and last row in the file.

output rows: 1,8

You may change the range to any other rows. You must specify two rows, If you wish to use only one row, specify the same label for the whole range, for example "4,4". The second specified row must either be further down in the file or the same row. You may use either default or user Labels, providing that the Label file is present in RAM at the beginning of the program. Valid input can be "1,Zip" or "Name,4" or whatever, providing you spell them correctly.

Field Separator

Specify the character which you wish to be placed between fields in the output file. The default character is the accent grave (`).

field separator: `

While many programs use commas for field separators, this character is supplied as the default because of the dificulty of entering it from the keyboard, and because often fields may already contain commas. Be sure of the delimiter character needed before running this program.

Search Strings

Search for up to 12 different strings, each may be in a different row. Data may be entered in upper or lower case. Comparisons are made in upper case. Beginning spaces are taken literally, spaces at the end of the string are ignored. The maximum length of the string is 8 characters, including any control codes. The program will look for the position of your string within the cell, it may be in any position within the cell. As an example, if you specify the number "9" as the string and "Zip" as the row, any zip code with a "9" will be found.

Search Options

To specify the comparison from the beginning of a field, begin the search string with the slash "/". So, if you wish to find those Zip codes beginning with "9", use the combiniation "/9".

To specify comparison from the end of the string, specify, for instance, "123/" and it will make the comparison from the right end of the string. It is not necessary to enter the whole name, a significant portion, enough to insure that it does not look like another, is enough. For instance, to find Los Angeles, you may wish to enter "LOS AN" or perhaps "OS ANGEL". Odds are that there aren't other cities similar to "OS ANGEL". If there are you can eliminate them by specifying Exceptions (more later).

Search String Specifications

The search strings do not need to be searched for in the range of cells you specify for the Output file. You may use numbers as well as strings for comparisons. Numbers are compared without the leading "=" or "+". Formulas themselves are ignored. All numbers are compared to the number as displayed in the file.

Search Rows

The prompt will show the last row used. you may press **ENDLINE** and use that row or enter a new row label.

row: 4

To search more than one row for the same string it is necessary to use the same string again as a new string, and specifying the next row to be searched.

Mandatory Strings

If you have input more than one search string, the next prompt is:

strings mandatory Y/N

If all specified strings MUST be present in ALL search fields, press Y, all other times press N.

When you have entered the last search string, press ENDLINE without any input. If you press ENDLINE without specifying any search strings, it will be assumed that you wish to search columns for the exception strings.

The next comparisons are made in the cols found by search strings (or all if we didn't specify any strings at all). Pressing **ENDLINE** without any search strings is saying "I want to use all of the data EXCEPT what I am about to tell you".

< OR > COMPARISONS

Less than and greater than comparisons are next. If you don't wish to use them, press **ENDLINE** at the prompt without any input, and the program will move on.

Less than and greater than comparisons compare strings to each other. These comparisons will only be made in cols which have met the search string qualifications above. You may compare numbers, but remember they are strings. "-1" is smaller than "10" because we are comparing ASCII character codes. Numbers may only be compared accuraely if they have the same number of characters. "<STRING" means if the cell contents are smaller than the "STRING". " >STRING" is the opposite. Strings are compared with the same number of characters. If your search string has five characters and the cell has eight, only the first five will be compared. If the cell has two characters and your string has five, only the first two characters are compared. You may use up to eight characters, but the first character must be either "<" or ">" or the comparison will not be made. Up to twelve different comparisons may be specified.

The second prompt for each comparison is:

row:

Enter any valid row label.

Exception Strings

Using Exception strings is the same as search strings except, of course, if the program finds the string, it will not copy the specified column to the output file.

You may use up to 12 exception strings and they may be very specific to eliminate small groups from the output file. For example, you may wish to list everyone with "9" in the beginning of "Zip" EXCEPT if they live in the San Francisco area. You would use "/9" as the search string and "/94" as the exception string.

Notes

- * If no search strings are specified it will be assumed that you want to only look for exceptions.
- * If no search, < or >, or exception strings are specified, then all fields in the specified range will be copied.
- * The program will end if the computer runs out of memory.
- * The source file is not changed in any way.
- * The examples above include quotation marks for clarity. Do not enter the quote with your comparison strings.
- * Make sure you have enough battery power.
- * Execution time will vary considerably. For a single search of a small file, expect results in a few seconds. If you are comparing a large variety in a very large file you should plan you lunch break around it.
- * This program may create Text lines as long as 255 characters. The program will not operate correctly if the total number of characters in a line exceeds 255.
- * Each comparison you specify will be made on the entire file before moving on to the next comparison. If the file is cassette based there may be considerable tape wear (in addition to considerable delay).
- * Files may be transferred back into the WorkBook format with the PORTER program. That program may also be used to reverse the col/row orientation.



Often we wish to view data in a sequence other than as it was entered. Most often we will want to alphabetize by a single data item such as last name or Zip code. Numeric values are stored in WorkBook71 files in much the same form as Text so they may be sorted in the same manner. This program has an unusual option in that you may specify which word in a field (cell) to use. This is helpful if you have a single field with, for instance, both first and last name; you may specify the second word and the program will sort by the last name. To eliminate any problems with data which may have been entered with leading or trailing spaces, any extra spaces are ignored and have virtually no effect on the speed of the program. Unlike most sorting programs, empty fields will be placed at the end of the output, not the beginning.

As with many other programs in WorkBook71, there are a number of different ways of handling the data and these various methods have a considerable impact on the outcome of the program. Please read this section and experiment with the options available before using the program with inportant data. Execution time can take from as little as 15 seconds to several hours; be sure you have a reliable power source for all devices connected to your 71.

Sorting Methods

Two different methods of sorting are available with SORTWB. Bubble sort allows data to "float to the top" while the Quick sort works to the divide and conquer as fast as possible. Quick sort is much faster when working with large quantities The primary advantage to the Bubble sort is that items within a given range, say "Smith" remain in near sequence they were entered while Quick sort will organize the Smiths in a seemly random order, though all grouped together. If the quantity of items is small, say 50 or fewer, or maintaining the sequence of items within a series is important then the Bubble sort is preferred. When dealing with a large quantity of items then Quick sort will be the obvious choice. The following table gives an approximate speed comparison for the two methods. Note that the time is for the actual sort only and does not include the time to read files and output results.

# Items	10	50	100	500
Bubble	3	50	200	5000
Quick	5	30	60	400

As you can see, Bubble sort would take aproximately 5000 seconds or over an hour and twenty minutes to sort 500 items while Quick sort takes about six and a half minutes.

How data is interpreted

All sorts are done in ASCII alphabetical order, regardless of the data type. If the field contains a number (the field begins with a plus or equals sign), then only the number itself will be used.

Text fields will use only a single word within the field; the default is the first word. Comparisons are made without respect for upper or lower case. In ASCII order sorts, numbers preced the letters A-Z, but follow most punctuation. ASCII characters and their values are listed beginning on page 322 of the "HP-71 Refrence Manual". All numbers should contain the same number of digits for proper sorting since shorter cells will be placed before longer cells. Blank (empty) fields will be placed at the end of the output.

How the Program Works

One problem with sorting programs is the constant movement of data. This can cause a considerable speed loss as well as extra wear on the Disc media (if a mass storage based file is being used). REPORT begins by reading the data from the specified range of cells into an array then sorts just a single word and data pointer for each field. Once the data in this array is sorted, the data pointers are read and the resulting output is prepared.

As an example, let's say you have a WorkBook file set up as a data base; each col represents an entry, and cells within that col represent fields. The file has six rows (or fields) and 100 cols (or entries). The first row label is "Name" and cells within that row contain first and last names, separated by a space (or multiple spaces). When you run the program you specify "Name" as the row and the range to include the entire file (cols 1-100). When the prompt asks you specify the second word (for the last name) in the cell. If the file is RAM based it will take about 18 seconds to load the cells into the array. The program will display the current time and a prompt to tell you what operation is being performed.

Once the array is filled the prompt will display the now current time (about 18 seconds later than the first time), then a prompt to tell you that it is now sorting. Using the Quick sort, the file will be sorted in just about one minute.

At this point the prompt will again change to tell you that the program is now writing the sorted output as you have specified.

SORTWB Prompts

sort WB file:

Enter the name of a WorkBook71 Data file in RAM or on mass storage. You may include a device specifier with the name. If the file was not found the following prompt will be displayed. 91

Load/Virt

Pressing L will cause the computer to try to load it to RAM. Press V and the 71 will search for the file on the first (or only) mass storage device.

sort on row: 1

Since a WorkBook file used as a data base is usually set up with one full column for each entry, fields are represented as rows. At this prompt enter the row, specifying user (if an apropriate label file is in RAM) or default row label.

range of cols: 1.8

The sorting can be restricted to a limited range of the file. The default is from the first Col to the last Col in the file. Press **ENDLINE** to use the entire file or change one or both parameters to use only a portion of the file.

max len: 5

The sort is always on a single word. You may set the precision of the word at this prompt. The default is five characters; you may change this to any reasonable value. For example, sorting by state will usually only require two characters, while sorting by Zip code works best with five and using last names can be as long as twelve characters or more.

It is not necessary to set this value to the full length of the word; you could sort by just the first few characters of the last name. Memory consumption during the sort increases with the maximum length, though this memory is reclaimed before forming the output.

word#: 1

If a single field contains several words you may choose which word within that field to sort on. A word is considered as any group of characters set of by spaces or at either end of the field. The following are examples of fields which you may want to sort by either the first or second word at different times. Note the City, State field contains a comma, but also a space following the comma to separate the items.

First Last City, State number street
Item code#

If the field contains fewer words than the number you specify then that field is considered to be empty.

The Output File

The final prompts ask how you would like the output formatted. You may send the data to a new WorkBook71 Data file or a Text File. If the output file does not exist you will be asked whether you would like it to be Text or WorkBook Data, and the file size. The file may be in RAM or on mass storage. If the output file is Text and on mass storage, be sure that it is large enough to contain the data created. If the output file is not large enough to contain the entire source then as much as will fit will be returned.

If the output file is Text then you have the option of appending the data to the file or overwriting existing data. Text files in RAM can be of any size since they will expand to hold the data.

Other Uses For SORT

SORTWB prompts for your data, sets up the parameters, then calls a separate program to do the actual sort. The SORT program may be used for general sorting purposes with other data and is discussed in the Utilities section of this manual.



WBLEX UTILITY LEX FILE

This custom LEX file was written for use with WorkBook71. It is a group of keywords which expand HP-71 BASIC with new forms of INPUT, data formatting and utilities to speed formula recalculation string extraction. You may find some of these keywords helpful in programs written for your own use. You may not distribute programs using this LEX file without express written permission of the author. The LEX ID is 61 (hex) with keywords beginning at 3D. These descriptions are informational only, no guarantee of operation is made.

CELVALS Q\$=CELVAL\$(Q\$)

Cell value. This is the most specialized function in WBLEX and is probably of limited usefulness elsewhere. If the first character in the string is a plus or equals (+=) then the next word, up to the next space in the string will be returned (without the +=). Zero length strings and strings not beginning with + or = will return the string "O". It is used by the WorkBook Editor during recalculation.

CLFLS

Close Files. A statement requiring no parameters. Does an ASSIGN #n TO * on all currently assigned files. This is helpful because the HP-71 does not automatically close files when exiting a SUB program. More memory efficient than individually closing even one file.

CUE\$ Q\$=CUE\$(S\$,C)

A specialized form of INPUT used as a function instead of a statement. \$\$ represents the default input string, C is the location within the string where you would like the cursor to begin at. Valid cursor position is 1-95. If the string is shorter than the cursor position specified then the computer will place the cursor at the end of the string.

The command stack is not enabled using the up/down arrow keys; instead they are terminator keys. The function returns a single character string representing the actual ASCII code of the terminator key, not the keymapped value used by the mainframe KEY\$ function. This function is compatible with WTKEY\$.

Terminator	CHR\$	Terminator	CHR\$
ENDLINE	13	q-CURSOR UP	20
ATTN	14	q-CURSOR DN	21
RUN	15	q-ATTN	22
f-CONT	16	f-CALC	23
f-SST	17	OFF	24
CURSOR UP	18	q-ENDLINE	25
CURSOR DN	19	3	

When CUE\$ terminates it returns the terminator key, the edited string may be recalled with the DISP\$ function. The location of the cursor at the end of input is returned in the RES register and may be recalled using C=RES if done before the next mathematical function.

ECP\$	E\$=ECP\$&CHR\$(C)&CHR\$(R)

Escape Percent. Requires no parameters. Returns the two character string CHR\$(27)&"\$". This is the beginning of the escape sequence used to move the cursor to a specific col & row on the display.

FMTCEL\$ X\$=FMTCEL\$('string',width)

Source Returns "=123, ????",12 " 123" "ABCD",10 "ABCD "

Format Cell. Used to format strings for display or printing. Specify a string and the number of characters in the string to return. The string will be filled or truncated to the specified width. The string will be left justified with as much as will fit within the width specified. If the width specified is greater than the length of the string then the string will be filled with spaces on the right. If the string begins with a plus or equals (+=) then that character will be deleted, the string will be truncated to the next space, and then right justified. When the string is right justified, if the last character is a period it will be deleted; this is done because FIXO returns a trailing period. If the string had been right justified but was too long to fit within the specified width then a '>' and as much of the string as will fit will be returned.

To sum what happens, the string will be left justified to the width specified. If the first character is + or = then it will be assumed that the string represents a number and possibly some following unwanted data (usually a formula) so it will be trimmed accordingly and right justified.

HI\$ S\$=HI\$(S\$)

Sets the high bit on all characters in a string. Useful for enabling the alternate character set on the computer's LCD and for displaying inverse video on a monitor.

NVAL	X=NVA	L('stri	ng')	
	Source	NVAL	VAL	
	"123"	123	123	
	"-2"	0	-2	
	"2*2"	2	4	
	"ABC"	0	(var contents)	
	"" (null)	0	(error)	

Number Value. A simplified version of the VAL function. First eliminates leading spaces then reads the string literally and terminates when the first non-integer character is found. Negative numbers, non-numerical, null or strings with greater than twelve digits return zero. Since it will not return negative values, it qualifies data and simplifies boolean arguments. Will not cause an error with bad data.

NOCTWORD\$ R\$=NXTWORD\$(S\$)

| Source | Returns | "ABCD" | "ABCD" | "ABCD" | "ABCD" | "ABCD" | "" (null) |

Next word. Returns the next series of non-space characters in a string. Ignores leading spaces and will return a null string if the source string contains only spaces.

PAK\$ R\$=PAK\$(S)

Pack number. Supply and integer from 0-65535 and it returns a two character "packed" representation of the number. This function is the opposite of UNPAK.

REVRS\$ R\$=REVRS\$(S\$)

Source "ABCDEF" Returns
"FEDCBA"

Reverse string. Reverses the order of characters in the string.

TVIS T=TVIS

TV is. Requires no parameters. Returns the location of the currently active display device on the HP-IL. If there is no active display device, OFFIO, CONTROL OFF, or there is no HP-IL module it returns zero. This function has been tested with standard HP and RS-232 display devices. This function is not useful for display devices assigned with extended addressing.

UNPAK R=UNPAK (R\$)

Unpack. Reads two characters from the string and returns a numerical value from 0-65535. The opposite of PAK\$.

WTKEY\$ K\$=WTKEY\$

Wait Key. Places the HP-71 in a low power state and waits for the next keystroke. Returns the uppercase value of the key regardless of the LC setting unless the user presses the [g] key first. Returns the ASCII value of any key, not the keycode. For instance, ENDLINE returns CHR\$(13), not "#38" which the HP function KEYWAIT\$ returns. Note that the LC setting inverts the case of the letters A-Z when using an external keyboard.

WTRIMS R\$=WTRIM\$(S1\$) R\$=WTRIM\$(S1\$,S2\$)

Source1 Source2 Returns
" ABCD" " A" "BCD"
" ABCD" " A????" "BCD"
"ABCD" " ABCD" "" (null)
" ABCD" (none) "ABCD"

Word Trim. Accepts one or two parameters. If only one string is specified then it trims leading spaces. When two strings are specified then it first trims leading spaces on both strings then compares the two strings. The first string will be trimmed by as many characters which match (in the same relative position) in the second string.

TEXTUTIL TEXT LEX FILE

The keywords in TEXTUTIL are used only with Text files in :MAIN or :PORT RAM; they do not work with other file types or files resident on mass storage. The mainframe keyword LIST is also expanded to work with RAM based Text files.

This discussion is informational only, no guarantee of operation is stated or implied. The publishers wish to thank Hewlett-Packard for permission to include TEXTUTIL with this package. Contact HP for permission to use keywords from this LEX file in your own programs.

DELETE# DELETE# < chn ! > , < record >

Deletes a single record from an open Text file. Specify first the channel number, then the record number. Remember that the first record in the file is record number zero; so, to delete line 10 from the file which is assigned to channel 3 we would enter:

DELETE#3,9

FILESZR X=FILESZR('txtfile')

A function which returns a numeric result. Furnish a file name and the function will return the number of records in the specified Text file. If the file does not exist, is not in RAM, or is not a Text file, then the function will return a number representing the error code instead of causing an actual error. To differentiate the message from a possible number of records, the function will return a negative number for the error number; obviously a file cannot contain a negative number of records, so, in the case of a negative result, you will know that the file is not a valid RAM-based Text file. For example, assuming the file 'ZYZZX' does not exist, FILESZR('ZYZZX') would return -57, the absolute value of which is 57 for the error message 'File Not Found'.

INSERT# INSERT#<chnl>,<rec>; "new record"

Adds a record to an open Text file. The new record is inserted before the specified record. All records from that point through to the end of the file are moved down to make room for the new record. This statement is often used instead of PRINT# because INSERT# does not write an end of file marker.

REPLACE# REPLACE#<chn1>,<rec>,'new record'

Similar to the PRINT# keyword except that it will not cause data following that record to be lost from the Text file and the record must already exist. Replaces the specified record in the Text file with the new text specified.

SEARCH ('str', <col>, <start rec>, <end rec>, <chnl>)

A function which returns a numerical result of the search performed. The required parameters are the search string, position within the record to start the search, the starting place (record) and final record to search, then the files channel number. The string is compared literally to the file; upper and lowercase of the same character will be treated as different characters.

If the file is empty or the string is not found then zero is returned. Otherwise it returns a very calculator-like result. In the example, R stands for record number, C is the position within the record (the column number) where the match was made, and L is the length of the string.

RRR.CCCLLL

There is a special option when using SEARCH# so that you may use symbols to specify special patterns of text and use multiple unknown characters (called "wild cards"). Keep in mind that the searches are usually made from the end of the line so that the longest occurance of any search string on each line will most likely be found.

The backslash (\) character is the switch to enable special functions. The backslash is CHR\$(92). If you do not wish to use these options do not begin the search string with the backslash. The control characters are as follows:

- \ (backslash) Start or stop a search feature.
- (period) Wild card character.
- **ℓ** (at) Multiple wild cards.
- ^ (up arrow) Search from beginning of line
- \$ (dollar) Search from end of line

Using the period (.)

The "wild card". A period represents any single character.

The example could find "quick" or "quack" or any word with that four character sequence and an unknown character in the middle.

^qu.ck

Using the at (@)

The commercial at (@) will, like the period, represent an unknown character. However, the at represents any number of unknown characters on a single line.

Since any number of characters may be represented by the @, the string should be specified carefully. For example, the following could find "quack". or "quarterback".

\q@k

Using up arrow (^)

The 'a" following the backslash specifies that the search be conducted from the beginning of the line. In the example we will look for the string "quack" beginning at the start of the line. The word will only be found if it occurs at the start of a line.

\^quack

Using Dollar (\$)

While up arrow (^) specifies a search starting at the beginning of the line, the dollar sign specifies that the comparison is made at the end of the line. The dollar must appear at the end of the line to designate this search; a dollar sign anywhere else in the line is interpreted at the character itself.

\quack\$

SUBPROGRAMS

REPORT Extension Commands

These programs return escape sequences for use with HP printers in conjunction with the REPORT program.

BOLD(X\$) NOBOLD(X\$)
COMP(X\$) NORM(X\$)
SPACE6(X\$) SPACE8(X\$)
EXP(X\$)

MONTHS CALL MONTHS(X\$)

Returns a string beginning with "MDY" and containing all twelve months spelled completely in English and separated by a single space.

8100 SUB MONTHS (M\$) @

M\$='MDY January February March April May June July' 8110 M\$=M\$&' August September October November December'

WBCOLROW CALL WBCOLROW(C,R) Returns values of 40 and 20. This sub is called by WB and TED to confirm display size.

8200 SUB WBCOLROW(C,R) @ C=40 @ R=20

CHARSET

Creates either an inverse (clear characters, dark background) or underlined alternate character set for use with WorkBook71 or other programs by using the keyword HI\$ from WBLEX. The program has a single prompt asking for the character set type. You can disable the character set (and regain the memory it consumes) by entering:

CHARSET ''

INCAT CALL INCAT('filename',X)
Useful to make sure a file is of the proper type before trying to, for instance, CALL or read data from it. Furnish a file name and a

instance, CALL or read data from it. Furnish a file name and a variable and the program will return a number representing the file type. The program will display the file entry if the file is found.

0 Nonexistent 6 KEY
1 TEXT 7 BASIC
2 SDATA 8 FORTH
3 DATA
4 BIN 20 Unknown type
5 LEX 21 Invalid name

The program works simply by doing a CAT then comparing the first two characters from the file type to known file types. The program will also work with device specifiers such as :TAPE or :PORT.

PRWB CALL PRWB(C,C1,C9,R,R1,R9,W,L,T,C\$,R\$,#1)
Used by both the REPORT and PRINTWB programs to print a WorkBook71
Data file. Sends the data to the current PRINTER IS by using the PRINT keyword.

The program does not check current PWIDTH and will print the entire range in one block. Located in the REPORT program file. The following are the required parameters. If zero column width is specified then the file will be printed in an un-formatted listing.

C first Col in range to print
C1 last Col in range to print
C9 last Col in the WorkBook file
R first Row in range to print
R1 last Row in range to print
R9 last Row in the WorkBook file
W WB column width (or zero)
L O= no labels, 1= with labels
T left margin (tab)
C\$ Col labels (may be null)
R\$ Row labels (may be null)
#1 open WorkBook file channel

SORT CALL SORT(X\$,X,E,T)

A sorting program which offers both Bubble and a modified Quick Sort. Both sorting methods have their advantages, see the chapter on the SORTWB program for a discussion on sort methods. The program sorts a string array and also related pointers in the numeric array. The numeric array may contain any values, but is most useful when it contains a pointer to the element; for example, X(1) could contain the number 1. For memory conservation it is suggested that the numeric array be integers and the string be DIMmed no larger than needed. Null strings will be placed at the beginning of the sort, so it is probably best to replace strings with strings containing multiple CHR\$(255)'s to place them at the end.

The four parameters required are the string array, pointer array, number of elements, and sort type. The option base may be zero or one, the program ignores zero elements. Uses aproximately 250 bytes in addition to the variables passed. Located in the REPORT program file.

X\$() String Array to sort on

X() Pointer Array

E Number of elements in the array

T Sort type (1=Bubble, 2=Quick)



This section discusses some of the design philosophy and structure of the WorkBook Data file. It is not necessary to read or understand this section to use the ROM This data is provided on an as is basis and is not intended to be a tutorial. It cannot be overstated that casually altering the data stored in the files can make them unreadable by the WorkBook system. It is suggested that that data only be read from these files. Write data to the files only if no other methods can be found.

More information about programming the HP-71 and using Data files can be found in "The BASIC HP-71" by this author.

WorkBook File structure

The DATA file used by the WorkBook system is a standard file as written and read by the HP-71 BASIC Operating System. The size of the file is fixed at the time of creation. This format allows the creation of files on mass storage that can be randomly accessed.

There are 11 pieces of data which must be maintained within the file for proper access. The length of records in the file is determined by the user when the file is created. If the needed information had been stored one piece per record, it would consume 11 records, a considerable waste if the record length is quite long. It was determined that the minimum usable length for a record was about 10 characters so the data was packed to fit within that length for less waste. The file information is in 10 bytes each on record 0 and record 1.

File status includes length of each record, name of the label file, status of user flags 0-3, the global fix format, number of Cols and Rows in the file, the Col/Row coordinate of the last cell edited and the Col/Row coordinate of the cell in the upper left corner of the display regardless of if a monitor is active or not.

The largest number of cells possible is 64K cells; this value can be represented by two bytes each for Col and Row. The coordinate of the last cell edited is probably only useful for WB, so that data is packed again. Using a formula listed below, the actual location in the file of the last cell edited is stored as two bytes. This information can be unpacked if the number of Cols and Rows in the file are known. The functions PAK\$ and UNPAK are used to convert numbers between decimal and two byte binary. Think of these functions as two-byte versions of CHR\$ and NUM.

Files are dimensioned to a specific format when created. Each cell is filled with a byte (the fix setting) when the file when it is created and before being ready for editing. Be sure, if you write data to the file, that the fix byte is maintained and that the string is not so long that it overflows into the next record. When data is written which is too long for a single record, the excess falls into the next

record, thus trashing that record.

There is no restriction on the number of Cols and Rows, but, because of the limit imposed by DATA files, the total number of cells cannot exceed 64K (including rec 0-1) and the minimum line length is represented as 9 characters. The actual minimum line length is 10 characters because the first byte contains the cell fix. Each cell consumes an additional three bytes used by the Operating System for data about the cell (record). The fix byte and these three system bytes should be accounted for when the file is created.

A hypothetical file containing 5 Cols and 7 Rows is represented below. On the left is how the data is actually stored in the file, on the right, how it is represented to the user. Note that the cell coordinates are not actually stored in the file, but are computed as needed using a formula listed later. The physical position of a Col will move if extra Cols or Rows are added by the user; don't assume a cell will not have moved between runs of your program. Numbers in cells in this example relate to their actual location in the file.

rec#	cel#	User	User Format				
0	status						
1	status	2	9	16	23	30	
2	[1,1]	3	10	17	24	31	
2 3	[1,2]	4	11	18	25	32	
4	[1,3]	5	12	19	26	33	
	[1.4]	6	13	20	27	34	
5 6	[1,5]	7	14	21	28	35	
7	[1,6]	8	15	22	29	36	
8	[1,7]	J	1)	22	L	50	
9	[2,1]						
10	[2,2]						
11	[2,3]						
•							
•							

Status Records Format

Contents of record #0	_	_		
Line length	В	В	BBBBBBBB	
Flag 0-3				
Label file name				

Contents of record #1	R	R	RR	RR	BB	RR	RR
Global Format	_	,	DD	DD	DD	<i>DD</i>	טט
Column width		-					
Max col							
Max row				_			
Coord of cell last edite	ed_				_		
Coord of first cell on o	lis	g					

Format of Label File

User Labels are maintained in a Text file separate from the main WorkBook file because of the fixed format of the main file and to keep memory usage to a minimum. The file is first read to find the maximum length of the strings. then the strings are dimensioned to the number of labels*6 and the labels are read into the strings. It is faster to use the POS function on one long string than to sequentially read separate strings so this format is much prefered. Since the DIM can change when labels are added or deleted, the labels are edited in a string array (which can be easily re-DIMed) then returned to the long string when through.

Each label begins with a leading space then 5 characters and is filled with spaces on the right if it is shorter than 5 characters. Labels must begin with ASCII's above 48, otherwise programs will use default labels. Upper and lowercase are allowed. The leading space is used to separate the labels and avoid the possibility of finding part of one label and part of the next when actually searching for one later in the string.

NVAL is often used to see if the user has input a default (number) or user label. NVAL will extract an integer from a string, though it is quite unlike VAL because it returns zero for bad data. If NVAL returns zero then it is either a user label or bad data. We then look up the label in the string and, if it is found, add 5 then divide the result by 6 to find the Col or Row number.

In the example, R\$ is the Row labels, K\$ is the user input as a Row specifier and R9 is the MaxRow of the file. We will first use NVAL to see if there is a default number specified, then look up the label in R\$ if NVAL returned zero.

R=NVAL(K\$)

IF NOT R THEN R=IP((POS(UPRC\$(R\$)," "&UPRC\$(K\$))+5)/6)

IF R<1 OR R>R9 THEN error

Label File Format

Rec#	Data Type	Meaning
0	number	number of Col labels
1	number	number of Row labels
2	string	actual Col labels
3	string	actual Row labels

Formulas For Cell Coordinates

Often is is easier to create a user function than to write a complicated formula several times; in the ROM, the following are in the form of the keywords PAK\$ and UNPAK. User FNs to read and write data and some simplified code examples follow.

Decode the two-byte numbers in records 0 and 1 of the WorkBook file. This is the same as UNPAK.

```
DEF FND(Q$)=HTD(DTH$(NUM(Q$))[4]&DTH$(NUM(Q$)[2]))[4])
```

User FN to encode two bytes into the above format. The same as PAK\$.

```
DEF FNH(Q)=CHR(HTD(DTH(Q)[2,3])&CHR(HTD(DTH(Q)[4])
```

Recall a cell from a file when Col(C), Row(R), MaxCol(C9) and MaxRow(R9) are known:

```
READ #1,C*R9-R9+R+1;Q$
```

We can find Col and Row when all that are known are the MaxCol(C9), MaxRow(R9) and the coordinate(n). This is done in two steps; first we find the current Col(C):

```
C=CEIL((n-1)/R9)
```

Then, using the Col we found above, we find the Row(R):

```
R=n-(R9*(C-1))-1
```

Let's use the above formulas to recall the Col and Row that had been last edited when WB was run with the file:

```
READ #1,1;Q$ !read status line
C9=FND(Q$[3,4]) !find MaxCol
R9=FND(Q$[5,6]) !find MaxRow
Q=FND(Q$[7,8]) !find last coord
C=CEIL((Q-1)/R9) !Col last edited
R=Q-(R9*(C-1))-1 !Row last edited
```

We now have: C9=MaxCol, R9=Maxrow, C=current Col, R=Current Row.

The Fix Byte

Byte 1 of record 1 in the WorkBook file and the first byte in each cell are reserved for the format (FIX setting). These values are found simply by reading the appropriate data then using NUM(Q\$). If the value is 0-9 then this is the Fix notation. Values of 10 or larger indicate that the global format is to be used. When files are created, the Global fix is set for 2 and each cell is set to 10. Thus, unless individually changed, cells reflect the global fix.

Cell Contents

In each cell, bytes two through the maximum length allowed by the file configuration are stored as represented to the user. Byte two also designates the cell type. If the byte is "=" then the cell contains a number only. If the byte is "+" then there should be a number, followed by a space and "@" and finally a formula. Any other value for this byte designates the cell as non-numeric data and it is interpreted as a value of zero during recalculation.

Using The BASIC Keywords

CELVAL\$ is used to speed cell interpreting during recalculation. It checks the first character then, if it is "=" or "+" it extracts the next series of characters, otherwise it returns the string "0". To keep the string being interpreted as short as possible, if the number is formatted in FixO then the trailing "." is deleted. To recall the contents of a cell as a number, use the following.

READ #1,n;Q\$ @ Q\$=CELVAL\$(Q\$[2])

FMTCEL\$ is used to format cel contents for printing in a fixed width without having to first determine cell type. If the "=" or "+" is there then it extracts the number (using code much like CELVAL\$) and returns it right justified. Otherwise it returns the whole string left justified. In either case, specify a width of the string to return and it will be trimmed or filled accordingly.

WTKEY\$ and CUE\$ are forms of input for single and multiple keystrokes respectively which ignore the keymap and always return a single character which may be used in an expression for simplified branching. Internally, CUE\$ is quite complex and should only be used with simple syntax, avoid concatenation. WTKEY\$ can save a considerable amount of time and code for live branching; the example will branch to single character labels B-G if the user presses one of the proper keys or label A for a bad keystroke:

GOTO CHR\$(POS("QWERTY", UPRC\$(WTKEY\$))+65)

NXTWORD\$ and WTRIM\$ can be used as a simplified first step of a parser, to extract a word at a time from user data. Both functions trim leading spaces and WTRIM\$ leaves trailing spaces. In the example we will extract a single word from Q\$

to W\$ and delete that word from Q\$.

W\$=NXTWORD\$(Q\$) @ Q\$=WTRIM\$(Q\$,W\$)

Now we have W\$ containing a single word and Q\$ shortened by that word. Since WTRIM\$ leaves any characters which didn't match, Q\$ is either null or begins with the space following the extracted word. A second use for WTRIM\$ is to just trim leading spaces, or when used with REVRS\$, to trim trailing spaces.

Support

If you are developing systems to extend the WorkBook71 ROM, please contact the author. Support and training can be custom designed to help further development of your project.



ADDENDUM

Configuring WorkBook For Monitors

As furnished, WorkBook71 is set up to use a 40 column, 20 line video interface. When no monitor is being used, this configuration setting is not important. It is not necessary to set the value to the maximum size your video interface can support. WB and TED may be configured for a display device with other configurations by writing a one line program called "WBCOLROW". The version of this sub contained in the WB ROM is listed on page 99. The following example designates a 32 Col by 16 Row display such as the HP82163A Video Interface.

1000 SUB WBCOLROW(C,R) @ C=32 @ R=16 @ END SUB

The sub merely assigns values to the two variables, then ends. A program file may contain any number of subprograms, this line may be placed in any BASIC program file as long as it is in a lower numbered port than the WB ROM or in :MAIN RAM.

The maximum display size is effectively 255 characters by 24 rows, though TED will not edit lines longer than 96 characters.

Compatibility Caution

LEX files in RAM or ROM which take over the computer to provide new operations such as constant clock display, appointment mode or operating system shell may prove unreliable when used with this package. No compatibility warranty is implied or stated.

WBLEX Keyword Compatibility

The WB ROM contains WBLEX version "WB:D". If you have written programs using an earlier version of WBLEX they may be adapted for use with this ROM. Turn off your 71 then pull out the WB ROM. Turn your 71 back on then load the program you wish to update and WBLEX version "WB:C" (or "WB:B"), then enter:

TRANSFORM filename INTO TEXT

If the program uses the keyword "HGL\$" then you will have to edit the line (with a Text Editor) and change it to "HI\$". Now, purge WBLEX "WB:C" then turn the computer off again and plug the WB ROM back in then enter the following:

TRANSFORM filename INTO BASIC

Inverse Video & Alternate Character Set

WorkBook71 supports the HP-71 alternate character set. A BASIC subprogram called CHARSET in the ROM has three options: underlined or inverse characters or to restore the default character set. CALL CHARSET then press the appropriate key (UIN) at the prompt, the program will create the character set from the display. CHARSET works by displaying 8 characters at a time then reading their bit patterns and modifying them. It takes a few seconds to run.

Once the alternate character set is enabled, you can use it in any program or even assign the characters to keys. The WB ROM function HI\$ makes it easy to display these characters. To assign the characters to keys use:

DEFKEY "?".HI\$("?");

The alternate character set occupies 768 bytes of RAM. This character set may be eliminated, and the memory consumed regained by entering:

CHARSET ""

REPORT Date Format

Month day, year and each month fully spelled in English is the default method for printing the date with the "DA" command. REPORT can be modified to print the date in other forms. This is done by writing a little sub program. The purpose of the program is to return your custom spelling of the months to REPORT which then extracts the current month and uses that spelling. Your subprogram does not have to do any of the work.

The sub program is called "MONTHS"; the default version contained in the WB ROM is listed on page 99. Your custom copy of the "MONTHS" program returns a single string to REPORT. The string begins with "MDY" for "MMDD, YYYY" date format or "DMY" for "DDMM, YYYY" format. The remainder of the string contains your spelling of the months. The two examples will use a number instead of spelling the months, and a three character spelling for the months. Each word is separated by one or more spaces, no punctuation is needed.

10 SUB MONTHS(M\$) @ M\$="MDY 1 2 3 4 5 6 7 8 9 10 11 12" @ END SUB

10 SUB MONTHS(M\$) @ M\$="MDY Jan Feb Mar Apr May"

20 M\$=M\$&" Jun Jul Aug Sep Oct Nov Dec" @ END SUB

ThinkJet Printer Codes

Many printers use a single escape sequence to change printing modes. The REPORT "EC" command makes it easy to use these sequences. HP printers often use a sequence of codes which begin with the escape code. If you had used "EC" it would have sent CHR\$(27) with each character. The correct method is to use "EC" and the first character to send the escape, then "CC" to send the body of the command. Below is a list of HP printer codes. I is lowercase L. Extension commands for these codes are discussed on page 52.

Normal Spacing: EC& CC16D Close Spacing: EC& CC18D Compressed: EC& CCk2S Expanded Compressed: EC& CCk3S Normal Type: EC& CCk0S

ATTN KEY

A very rare occurance can happen if either the TED or the WB program was terminated by an HPIL error such as a Disc Drive failure. The ATTN key may have been disabled and will no longer function correctly. This key can be restored by either INIT-1 or by carefully entering the following:

POKE "2F441","0"

IF YOU NEED HELP

This manual is as complete as possible but, as is always the case, some things could always stand further explanation. Should you need help, feel free to write to the address at the front of this manual. Be sure to include printout or Disc/Tape to help explain the problem. Please remember that profit on this package is (at best) minimal; it is beyond the resources of the author to provide extensive free customizations.

A glossary of terms is available in the HP-71 Reference Manual beginning on page 346. Some other terms are used in this manual which are not described in that glossary.

BROWSE LEVEL An operational mode in the WorkBook Editor which allows inspection of data in a file without the possibility of accidently altering it. Often called top level.

CELL The intersection of a column and row in which data is stored. Represented as a record in in a Data file.

CELL TYPE Refers to the first displayed character in a cell. If it is an equals (=) then the cell contains a number. If the character is a plus (+) then the cell contains a number and the formula from which the number was computed. Any other first character means the cell is a general data cell.

CIRCULAR REFERENCE A formula contained in a cell which directly or indirectly (by referring to another cell which in turn refers to this cell) refrences itself. Since the value will change whenever the cell is recalculated, a reliable value can not be obtained.

COL Abreviation for the word COLUMN.

COLUMN The vertical arrangement of cells in a Worksheet.

COMMAND A keystroke or series of keystrokes which tell the computer to perform an operation (see command level). Also a sequence of characters preceded by a circumflex ($^{\odot}$) in a file which are interpreted by a formatter program.

COMMAND LEVEL An operational mode in the WorkBook Editor in which some edit keys perform special operations and cell editing is disabled.

COPYRIGHT A benevolent set of laws which allow the fruit of ones labor to remain ones own. Through respect of these laws comes the incentive to create new products and maintain those which are extant.

COORDINATE The cell refrence specified by a col and row.

DEFAULT Values which are supplied by a program if not specified by the user. For instance, global col width defaults to 8.

EDIT LEVEL An operational mode in the WorkBook Editor in which the entire keyboard is active. Horizontal arrow keys move the cursor within the current line. Vertical arrow keys move from cell to cell.

FIELD An entry in a Data Base such as Name or City. Generally fields are defigned by rows in WorkBook file.

FILE MANAGER A simplified form of Data Base Management system.

GLOBAL A value which represents status affecting an entire file. Such as global COL Width or global format.

FORMATTER A program which reads a file and prints a doccument using data and commands within that file for instructions.

HEADER Name given a col or row label by many spreadsheet programs.

HPAF Hewlett Packard Applications Format. A type of DATA file created by some HP programs. Uses the first three records for file status and multiple data items per record.

LABEL A refrence to either a col or row. May be either a numerical value or a series of user defigned string. Some Spreadsheet programs call a label a header.

MAXCOL Refers to the largest numbered col in a file.

MAXROW Refers to the largest numbered row in a file.

OUTPUT FILE A file to which the results of a requested operation are directed. Such as the file used by the PORTER program to store the results of a search.

ROW The horizontal range of cells in a Worksheet. Also a field in a Data Base.

SEARCH STRING Data which is specified to be compared for equality with data in a file. Such as the FETCH command in the WorkBook Editor or data input to the FINDER program.

SOURCE FILE The file from which data is to be found for comparisons or transforming into another data format.

SPREADSHEET A program in which data is represented in a tabular form of columns and rows. A file edited by a Spreadsheet program is sometimes also called a Spreadsheet.

STORE A simplified term for saving data to a file or the results of input to a variable. The term is sometimes inapropriately used but should be comfortable for users of HP calculators.

TEXT A cell in a spreadsheet which is either empty or contains non-numeric data. Cell contents which do not begin with + or = as the first character.

VIRTUAL FILE A file which is resident on Disc or Cassette and accessed there without first being loaded to RAM.

WORKSHEET A Spreadsheet. A term which attempts to designate a multiple purpose Spreadsheet file.



