MODEL

30

HEWLETT-PACKARD 9830A CALCULATOR ADVANCED PROGRAMMING 1 ROM

OPERATING MANUAL

FOR

11279B & OPTION 279

OPERATING MANUAL

ADVANCED PROGRAMMING I ROM

11279B & OPTION 279

9830A CALCULATOR SHOWN WITH 9866A PRINTER

HEWLETT–PACKARD CALCULATOR PRODUCTS DIVISION
P.O. Box 301, Loveland, Colorado 80537, Tel. (303) 667-5000
Rue du Bois-du-Lan 7, CH-1217 Meyrin 2, Geneva, Tel. (022) 41 54 00

TABLE OF CONTENTS

PREFACE

The Advanced Programming I ROM can be purchased as an accessory plug-in block or as an internal modification to the calculator.

The Plug-in Version:

The 11279B Advanced Programming I ROM block is installable by the user. It plugs into any of the five slots behind the ROM door on the left side of the calculator.

The Calculator Modification:

The Option 279 Advanced Programming I ROM must be installed by qualified HP personnel. When it is installed, a decal showing the option number (Option 279) is attached to the inside of the ROM door.

Should you wish to add the option after you have received your calculator, please order accessory number HP 11279F from the sales office nearest to you (see the back of this manual). Option 279 will then be installed for you by our field personnel.

Once either version of the ROM (the plug-in block or the internal modification) has been installed, the operation is identical. Therefore, this manual makes no further distinction between the two types of ROM.

Chapter 1

GENERAL INFORMATION

The Advanced Programming I ROM provides the Model 30 with several additional capabilities as described in Chapter 2. These capabilities are also briefly described below.

Program Statements:

BEEP — allows an audible signal to be output by the calculator at specified places in a program.

DFC — is used much like the DEF FN statement; it allows functions to be called by name; so there is no limit to the number of functions that can be in a program.

DUP — beginning with file Ø, the information on the internal cassette can be duplicated on a peripheral cassette (secured or binary files are not duplicated, however); also beginning with file Ø, a specified number of files can be duplicated. DUP can effectively be used as a keyboard command, too.

HIGHCASE & LOWCASE — if your printing device has both upper and lower-case capabilities, these can be very convenient tools; with LOWCASE in effect, the Model 30 keyboard operates like a standard typewriter; that is, alphabetics keyed in without SHIFT being held down are output in lower case, etc.

SCROLL — a 72-character display can be viewed if SCROLL is used.

TRANSFER — is used with the String Variables ROM; it allows strings to be converted to numeric data and vice versa, and it simplifies multiple string storage.

Keyboard Executable Command:

XREF — lists each variable in your program along with the line numbers in which it appears.

Function:

OCT — converts base 8 (octal) numbers to base 10 (decimal) numbers.

EQUIPMENT SUPPLIED

Two Operating Manuals, -hp- Part Number 09830-90006, are supplied with this ROM.

INSPECTION PROCEDURE

Refer to Appendix A in the 9830A Calculator Operating and Programming Manual for the calculator 'Inspection Procedure'. ROM inspection is discussed there.

INSTALLING THE PLUG-IN ROM

The complete procedure for installing a plug-in ROM is given in Appendix C of the Operating and Programming Manual. Following are some reminders:

The ROM can be installed in any of the five external ROM slots.

Switch the calculator off before installing or removing a ROM.

The label on the ROM should be 'right-side-up' and facing the ROM door when properly installed.

Ensure that the ROM is properly mated to the connector at the back of the slot before you turn the calculator on.

OTHER REQUIREMENTS

It is assumed that you are already familiar with BASIC programming and with the operating procedures for the HP 9830A Calculator.

Chapter 2

ROM FEATURES

The syntax notation used to describe the statements and commands in this chapter are as follows:

- Colored items are required and must appear in the statement or command as shown.
- Items contained in brackets, [ ], are optional.

BEEP

The sound emitted by the calculator, either when an error occurs or when 72 of the allowable 80 characters have been input, can be duplicated by the BEEP statement.

Appropriately, the syntax is:

BEEP

It can be executed in either the calculator† or the programming mode. Typical programming mode applications include:

- Signaling that a particular calculation has been completed or that a particular program sequence has been accessed.
- Referencing an INPUT statement. This allows you to do other things while the program is running; and when the beep occurs, you are alerted to enter your data.
- Making a constant beeping noise, much like an alarm clock. For instance, a three line loop can be set up at the end of your program to signal the program's conclusion.

Examples

No. 1

```
10 X=2
20 FOR I=1 TO 100
30 X=X*2
40 NEXT I
50 BEEP
•
•
•
1000 END
```

No. 2

```
10 A=0
•
•
•
800 BEEP
810 INPUT M,N
•
•
•
2500 END
```

Example 1: After the FOR . . . NEXT loop (lines 20 through 40) is completed, the beep occurs to indicate to the user that the final value of X has been reached. In long programs, different milestones can be observed this way.

Example 2: The beep, line 800, occurs immediately before the INPUT statement. So if you run the program, you will be audibly informed when the INPUT statement is accessed. (A '?' appears on the display, anyway, but if you're not watching the display, that doesn't help.)

†The calculator mode refers to non-programming applications.

No. 3

```
10 P=3
 •
 •
 •
998 BEEP
999 WAIT 200
1000 GOTO 998
```

Example 3: At the program's conclusion, the beep continues to occur until the STOP key is pressed. The loop, lines 998 through 1000 contains a WAIT statement. This statement is needed for performing successive beeps (see below).

For successive program beeps, a WAIT statement is needed between BEEP statements so that the timing cycle of one beep can be completed before the beep is repeated. WAIT 120 – that is, a delay of at least 120 milliseconds between beeps – should ensure that the timing cycle has been completed.

DFC

The DFC (Define Characters) statement is used in the same manner as is the DEF FN statement, discussed in the Operating and Programming Manual. Both single-line and multiple-line DFC statements are allowed.

The difference between DEF FN and DFC is as follows:

- A DEF FN statement always defines a function by a letter from A through Z, as in DEF FNQ;
- Whereas a DFC statement can define a function by a name of any length, as long as the statement falls within the 80 character limit.

Thus, if you use DFC, you have an unlimited number of function names available.

Here is the syntax:

DFC "any combination of characters" (local variable[†])
or
DFC "any combination of characters" (local variable) = expression

Any statement that calls the function, for example, a PRINT statement, must have the following general syntax:

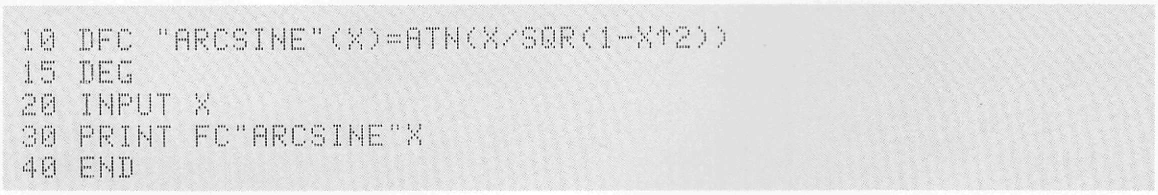
PRINT[‡] FC "identical combination of characters to DFC statement" value

Notice this syntax uses FC, not DFC.

As stated, the function name called must correspond character for character with those in the DFC statement; that is, within the quotation marks blank spaces must correspond to blank spaces, upper case letters must correspond to upper case letters, etc.

Examples

No. 1



```
10 DFC "ARCSINE"(X)=ATN(X/SQR(1-X↑2))
15 DEG
20 INPUT X
30 PRINT FC"ARCSINE"X
40 END
```

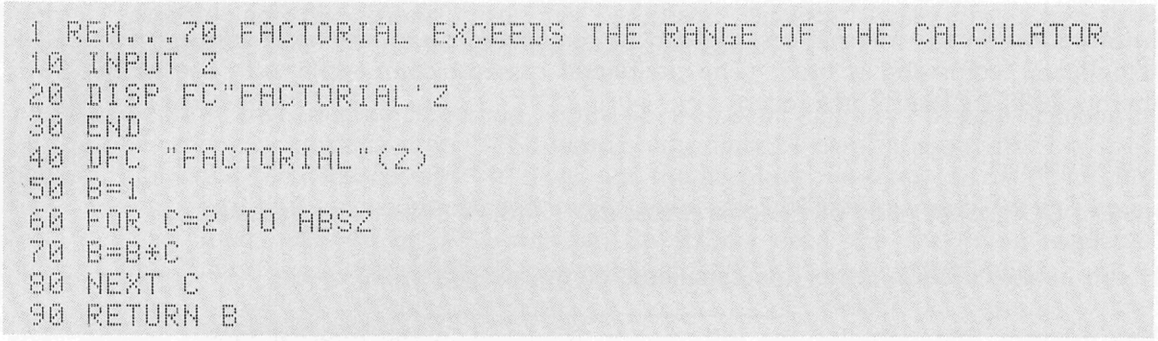
Example 1: In line 10, the single-line function (arcsine) is defined by name with X as the local variable; this line is not executed until the identical function name is called. In line 20, a value is input for X. Then the PRINT statement in line 30 calls the function by name; so the arcsine of X is calculated and printed.

Notice that the single-line function precedes all other program statements; although this is not necessary, it ensures maximum program execution speed – for when the function is called, the search for the DFC statement begins with the lowest-numbered program line in memory.

[†] A local variable is a simple variable defined only in relation to the function (see DEF FN statement in the Operating and Programming Manual).

[‡] Could also be a DISP, WRITE, assignment statement, etc.

No. 2

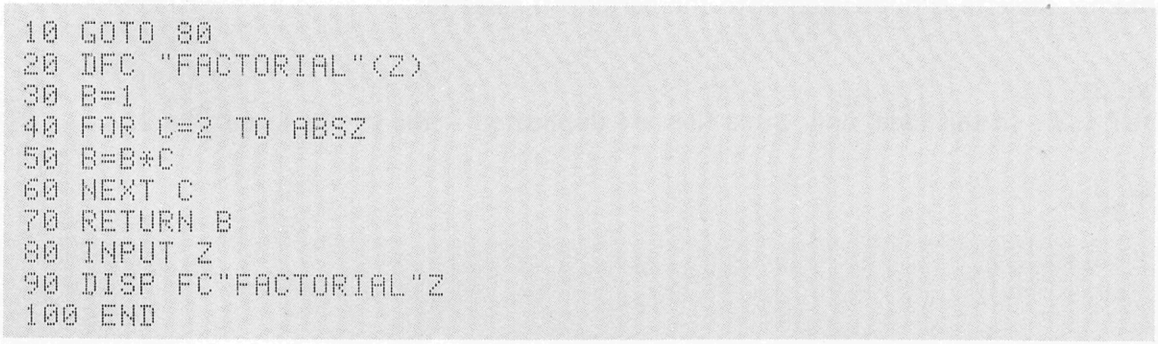


```
1 REM...70 FACTORIAL EXCEEDS THE RANGE OF THE CALCULATOR
10 INPUT Z
20 DISP FC"FACTORIAL'Z
30 END
40 DFC "FACTORIAL"(Z)
50 B=1
60 FOR C=2 TO ABSZ
70 B=B*C
80 NEXT C
90 RETURN B
```

Example 2: In line 40 a multiple-line function is defined by name; the function continues through line 90, the RETURN statement. When the program is run, a value is input for Z in line 10; then the DISP statement, line 20, calls the function by name. The function is calculated and the value of B is returned to the calling statement and displayed.

Notice an END statement immediately precedes the multiple-line function; this ensures that the function won't be inadvertently accessed.

Example 2 could be rearranged to increase the search speed when the function is called. As in Example 1, the closer the function is to the beginning of the program, the quicker the access time. But for multiple-line functions, you must also make sure that you don't inadvertently access the function. The GOTO statement, in line 10 below, eliminates this problem and allows the DFC statement to be the second lowest program statement.



```
10 GOTO 80
20 DFC "FACTORIAL"(Z)
30 B=1
40 FOR C=2 TO ABSZ
50 B=B*C
60 NEXT C
70 RETURN B
80 INPUT Z
90 DISP FC"FACTORIAL"Z
100 END
```

DUP

Information on the internal cassette can be duplicated on a peripheral cassette if the DUP (Duplicate) command is used. (The peripheral cassette compatible with the Model 30 is the hp 9865A Cassette Memory.)

The syntax is:

DUP select code of peripheral cassette [, no. of files to be duplicated]

It can be executed in either the calculator or the programming mode.

The cassette that contains the information is placed in the internal tape transport. The other cassette is placed in a peripheral cassette memory (this cassette need not be blank – just be sure that it's not protected and that you don't need the information in it).

Be sure that both cassettes are fully rewound. If the internal cassette is not rewound, ERROR 87, will occur. If the peripheral cassette is not rewound, the file numbers in the peripheral cassette will be inaccurate after the tape is duplicated.

If the internal cassette has either binary or secured files, these files will not be duplicated by the DUP command. Blank files (the same lengths as the original files) are created whenever binary or secured files are encountered; this allows the duplication process to be continued even though the contents of a particular file cannot be duplicated.

If the number of files to be duplicated is not specified, the entire tape is duplicated. It takes about 20 to 25 minutes to duplicate a tape that is completely filled with files.

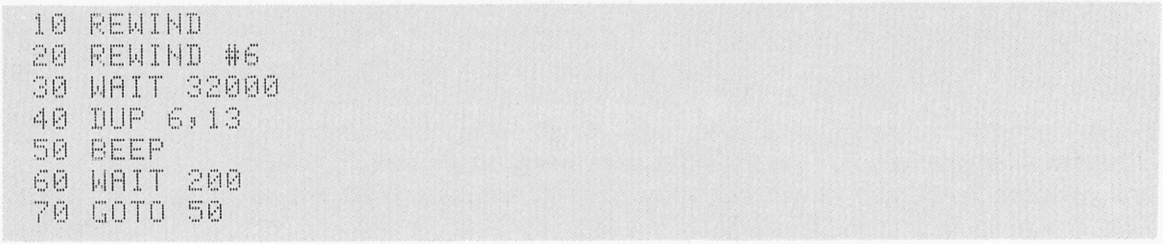
After DUP is successfully completed, both cassettes are automatically rewound.

Examples

No. 1
DUP 5: In this example the peripheral cassette is specified as having select code 5. When the command is executed, information (except for binary or secured files) that is on the internal cassette is duplicated onto the peripheral cassette.

No. 2
DUP 5,3: In this case, only three files are duplicated – file Ø, file 1, and file 2.

No. 3



```
10 REWIND
20 REWIND #6
30 WAIT 32000
40 DUP 6,13
50 BEEP
60 WAIT 200
70 GOTO 50
```

In this example assume the peripheral cassette memory is set to select code 6. In line 10 the internal cassette is rewound; in line 20 the peripheral cassette is rewound. Since other cassette comands, say DUP, override REWIND commands, the WAIT statement (line 30) is needed to delay the execution of DUP and ensure that both tapes are fully rewound prior to the DUP command.† The DUP command, line 40, specifies both the peripheral cassette and the number of files to be duplicated; thirteen files (files Ø through 12 on the internal cassette) are duplicated onto the peripheral cassette. After the duplication process is completed, the user is signaled by a beeping sound.

During execution this program takes up about 45 words of memory. If your calculator has the basic memory configuration, 1760 words, you must be careful about the file sizes that are duplicated (i.e., the current file sizes, not the absolute file sizes). Error 88 occurs if the current file size being duplicated is larger than the available memory (in this case, if it is larger than 1760-45 or 1715 words). So if you need the maximum available memory, you should erase memory and then execute DUP in the calculator mode.

NOTE

Tapes made with either the hp Model 10 or the hp Model 20 calculator can also be duplicated with this command.

†Please note that a wait of about 32 seconds (WAIT 32000) does not ensure that the tape is fully rewound either. If you are near the end of the tape, you will need much more than 32 seconds to rewind it. In these cases, you can use multiple WAIT statements, but it is probably much easier just to manually rewind the tapes.

LOWCASE, HIGHCASE

These statements are useful if the printing device for your Model 30 has both upper and lower-case capabilities.†

The LOWCASE statement allows the Model 30 keyboard to operate like a standard typewriter; that is, alphabetics (A through Z) keyed in normally would be output in lower case, and alphabetics keyed in with the SHIFT key held down would be output in upper cases. (On the Model 30, alphabetics are generally output in just the reverse manner.) No other keys are affected by this statement; that is, if $\binom{\$}{4}$ is pressed with the SHIFT key held down, the $ is still output just as it is on a standard typewriter.

The HIGHCASE statement cancels LOWCASE. After it is executed, the alphabetic keys resume their normal operating characteristics.

The syntax is:

```
LOWCASE
   or
HIGHCASE
```

LOWCASE and HIGHCASE can also be executed in the keyboard mode.

Examples

(after executing the LOWCASE command)

Press:

```
               SHIFT
             ↙       ↘
PRINT "JACK AND JILL WENT UP THE HILL"
```

Execute it and the printout (using the 9861A Typewriter) is:

```
Jack and Jill went up the hill
```

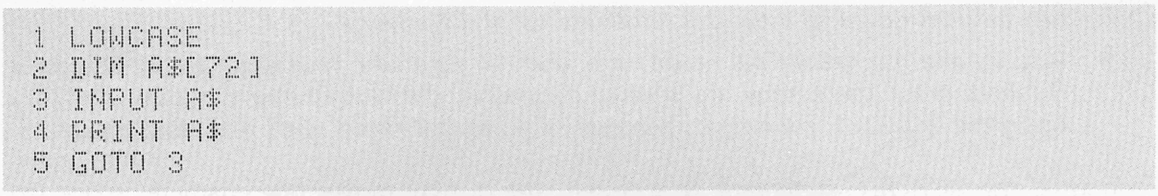
If HIGHCASE is then executed and the PRINT command is again keyed in and executed exactly as before, the printout is:

```
jACK AND jILL WENT UP THE HILL
```

† These statements can be used if you have, say the 9861A Output Typewriter or the Teletype 38 Data Terminal; but not if you have, say, the 9866A Printer.

No. 2

If you have the String Variables ROM, the LOWCASE statement can be very useful as shown in the following example:



```
1 LOWCASE
2 DIM A$[72]
3 INPUT A$
4 PRINT A$
5 GOTO 3
```

When this program is executed, a ? appears on the display. The calculator keyboard can then be used like a standard typewriter to key in a line of text; execute the input and it is printed (line 4). The program then returns to line 3 so another line of text can be typed in.

SCROLL

The display can output up to 72 characters at one time, but only the first 32 characters output are immediately visible on the display.

- In the calculator mode, this presents no problem since ← (the left-arrow key) can be held down to view the remainder of the display.
- But in the programming mode, the user is generally restricted to 32-character displays since there may be several successive displays in the program. Now by using the SCROLL statement, the user is no longer faced with this restriction.

Each time the SCROLL statement is accessed, the display moves one character space (to the left for SCROLL L or to the right for SCROLL R). After the scrolling operation, the program halts for a designated number of milliseconds (1000 milliseconds = 1 second). The syntax is:

SCROLL L millisecond delay
or
SCROLL R millisecond delay

The millisecond delay can be a constant, a variable, or an expression. Delays can range from about 16 milliseconds to about 33,000 milliseconds. Delays less than 16 milliseconds cause the SCROLL statement to be terminated. Delays greater than 32767 milliseconds cause the wait to be about 33 seconds.

Example

Assume X is input as 47 and Y is input as 1104.

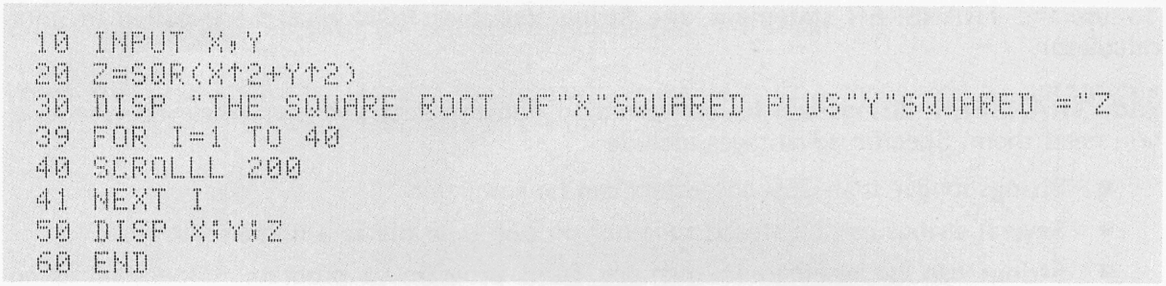
```
10 INPUT X,Y
20 Z=SQR(X↑2+Y↑2)
30 DISP "THE SQUARE ROOT OF"X"SQUARED PLUS"Y"SQUARED ="Z
40 WAIT 1000
50 DISP X;Y;Z
60 END
```

When this program is run, the displays will be:

```
    THE SQUARE ROOT OF 47    SQUARED
```

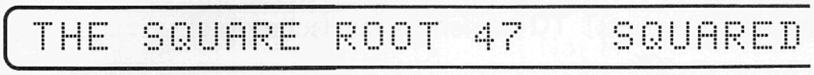
```
    47       1104       1105
```

Notice the first display is incomplete.



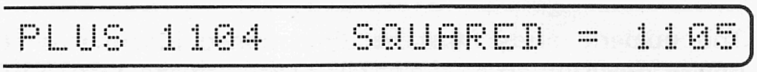
```
10 INPUT X,Y
20 Z=SQR(X↑2+Y↑2)
30 DISP "THE SQUARE ROOT OF"X"SQUARED PLUS"Y"SQUARED ="Z
39 FOR I=1 TO 40
40 SCROLLL 200
41 NEXT I
50 DISP X;Y;Z
60 END
```

When this program is run, the displays will be:

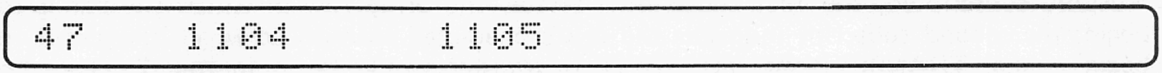


```
THE SQUARE ROOT 47   SQUARED
```

scrolls one character at a time
till display finally shows



```
PLUS 1104   SQUARED = 1105
```



```
47     1104       1105
```

By putting the SCROLL statement in a FOR . . . NEXT loop (lines 39 through 41), the display immediately prior to the loop scrolls one character position to the left, waits for 200 milliseconds, moves another character position to the left, waits another 200 milliseconds, etc.

Since only 72 characters can be output per line through a DISP statement, a FOR . . . NEXT loop occurring 40 times ensures that all the characters in the display will be made visible through SCROLL L. (The 32-character display plus the 40-character scroll shows all 72 character positions if required.)

NOTE

Displays with outputs over 72 characters in length cannot be effectively viewed, with or without SCROLL. In cases like this, use PRINT instead.

TRANSFER

To use the TRANSFER statement, the String Variables ROM must be installed in your calculator.

With TRANSFER, strings can be converted to numeric data and then retrieved whenever you need them. Specific advantages include:

- Strings longer than 255 characters can be simulated.
- Several strings can be stored together on one tape file as a numeric array.
- Strings can be retained in memory from program to program if specified as an integer-precision array in COM.

The syntax is:

TRANSFER string name [subscripts] TO numeric array (subscripts)
or
TRANSFER numeric array (subscripts) TO string name [subscripts]

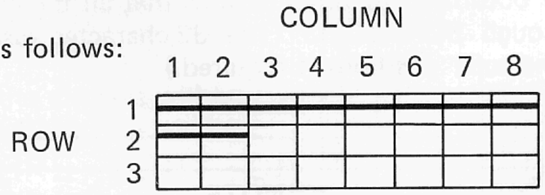
The string name, say A$, need not have subscripts following it. Without subscripts, the entire string is transferred; with subscripts, the specified substring is transferred.

The numeric array must be dimensioned in either a DIM or a COM statement as an integer-precision array – e.g. AI[20,60]. In the TRANSFER statement, the numeric array must be subscripted; the first subscript indicates the array row in which transfer is to begin; the second subscript indicates the row's character position at which transfer is to begin – e.g. TRANSFER A$ TO B[2,1] – transfer would begin in row 2, character position 1 of the numeric array B.

String characters are stored into the array row-by-row, with two string characters contained in each array element. If for example, a numeric array is dimensioned – AI[3,8] – and a string, B$, is 20 characters, by executing:

```
TRANSFER B$ TO A[1,1]
```

the array would be filled as follows:



Then to pack another string, say C$, in the same numeric array, you could execute;

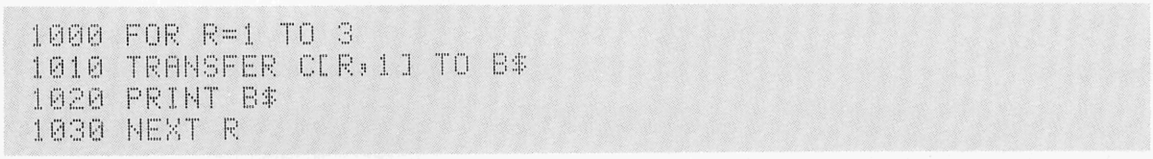
```
TRANSFER C$ TO A[2,3]
```

Although this process maximizes the use of the numeric array, for referencing purposes it is often easier, when storing more than one string, to transfer one string per numeric-array row. This can be done as follows:

```
1 DIM B$[70],CI[3,35]
10 FOR R=1 TO 3
20 INPUT B$
30 TRANSFER B$ TO C[R,1]
40 NEXT R
```

Since the second subscript of the numeric array is at least one half the maximum string length and since each TRANSFER statement begins the transfer at a new row, each string is saved in a separate row of the numeric array; and since the loop is performed three times, three strings, all with the same string name, A$, are saved.

When the time comes to transfer the numeric array back to a string and to output the three strings, the following loop can be set up:

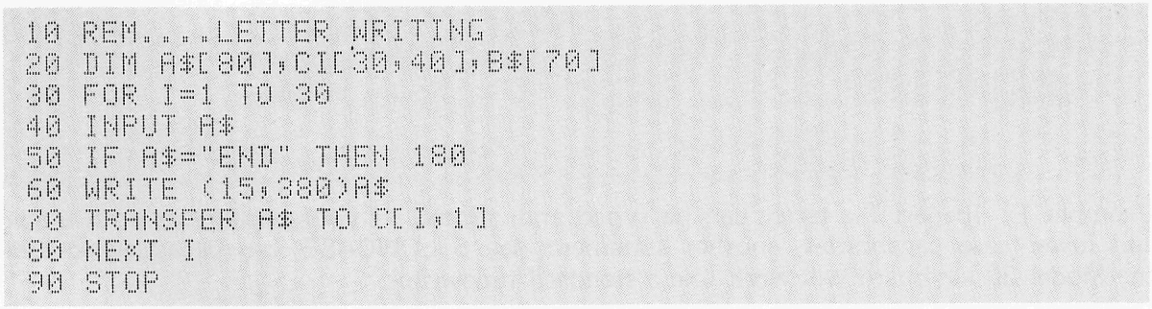


```
1000 FOR R=1 TO 3
1010 TRANSFER C[R,1] TO B$
1020 PRINT B$
1030 NEXT R
```

Examples

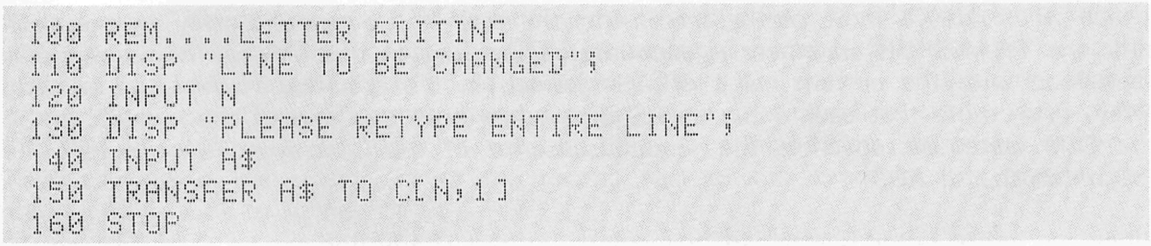
No. 1

Part I



```
10 REM....LETTER WRITING
20 DIM A$[80],CI[30,40],B$[70]
30 FOR I=1 TO 30
40 INPUT A$
50 IF A$="END" THEN 180
60 WRITE (15,380)A$
70 TRANSFER A$ TO C[I,1]
80 NEXT I
90 STOP
```

Part II



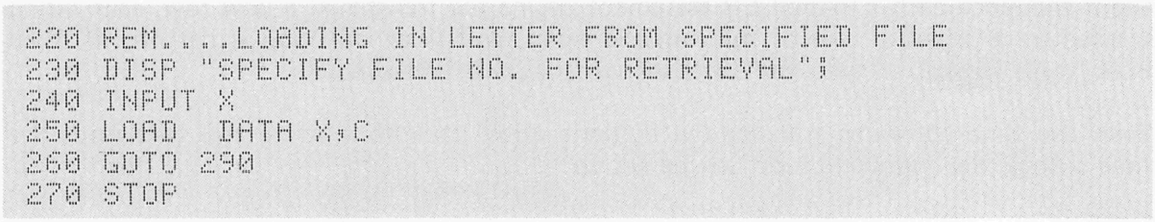
```
100 REM....LETTER EDITING
110 DISP "LINE TO BE CHANGED";
120 INPUT N
130 DISP "PLEASE RETYPE ENTIRE LINE";
140 INPUT A$
150 TRANSFER A$ TO C[N,1]
160 STOP
```

Part III

```
170 REM....STORING LETTER ON SPECIFIED TAPE FILE
180 DISP "SPECIFY FILE NO. FOR STORAGE";
190 INPUT X
200 STORE  DATA X,C
210 STOP
```

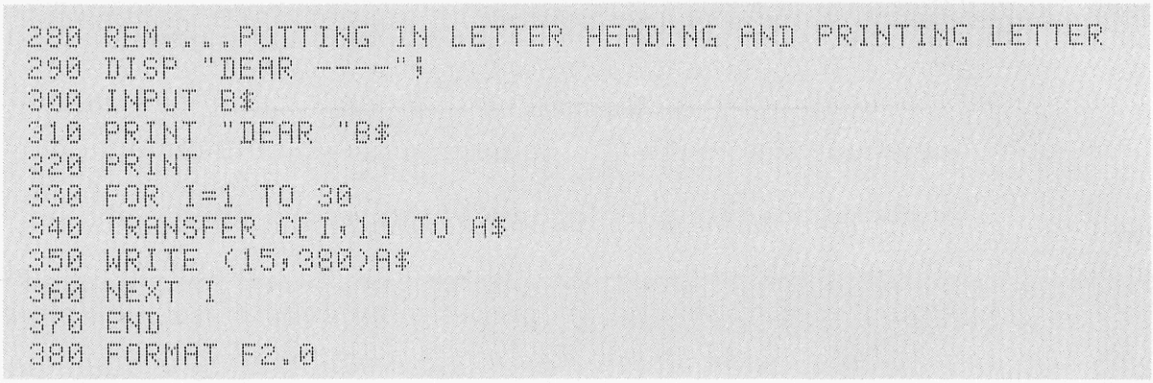
(continued)

Part IV



```
220 REM....LOADING IN LETTER FROM SPECIFIED FILE
230 DISP "SPECIFY FILE NO. FOR RETRIEVAL";
240 INPUT X
250 LOAD  DATA X,C
260 GOTO 290
270 STOP
```

Part V



```
280 REM....PUTTING IN LETTER HEADING AND PRINTING LETTER
290 DISP "DEAR ----";
300 INPUT B$
310 PRINT "DEAR "B$
320 PRINT
330 FOR I=1 TO 30
340 TRANSFER C[I,1] TO A$
350 WRITE (15,380)A$
360 NEXT I
370 END
380 FORMAT F2.0
```

Example 1: In part I a letter can be typed and printed. If your printer has both upper and lower case capabilities, another statement, say 5 LOWCASE, can be added so that the Model 30 keyboard will work like a standard typewriter.

When all the lines are typed, key in END to terminate this part of the program.

The FOR . . . NEXT loop, part I, increments the row of the numeric array by one each time the TRANSFER statement is encountered; because of this, A$ can be redefined in each loop with the current value of A$ retained in the specified row of the numeric array. (To ensure that each value of A$ is saved in only one row of the numeric array, the DIM statement specifies the second subscript of the C array to be one half the maximum size of A$.)

Since the entire letter is retained in memory, in part II any line can be corrected merely by specifying the line number and then retyping it. Part II can be accessed by executing – CONT 100.

In part III the entire letter can be stored on tape. Without the TRANSFER statement, this would be a very cumbersome process.

In part IV any letter you have on tape can be retrieved (just execute – RUN 220); after it is retrieved, the program immediately jumps to part V where you can put in the letter heading for a form letter; immediately thereafter the letter is printed out. The way this program is set up (with WRITE executed thirty times within the loop), thirty lines are output whether the lines are blank or not.

No. 2

in memory (prior to LOAD)

```
1 COM D$[50],E$[35],GI[1,25],
                         HI[1,18]
10 DISP "ENTER FULL NAME";
20 INPUT D$
30 DISP "ENTER TODAY'S DATE";
40 INPUT E$
  •
  •
  •
1000 TRANSFER D$ TO G[1,1]
1010 TRANSFER E$ TO H[1,1]
1020 LOAD 2,10
```

in file 2

```
10 TRANSFER G[1,1] TO D$
20 TRANSFER H[1,1] TO E$
35 PRINT D$,E$
50 END
```

in memory (after LOAD)

```
1 COM D$[50],E$[35],GI[1,25],HI[1,18]
10 TRANSFER G[1,1] TO D$
20 TRANSFER H[1,1] TO E$
35 PRINT D$,E$
50 END
```

In this example, the D and E strings are also stored in COM as numeric arrays, G and H, respectively. This is necessary for preserving the strings when a second program is loaded into memory over the first. Since the COM statement is saved in this example after the LOAD command is executed, the data stored in COM is also saved – all the data, that is, except for string arrays; although strings are not saved as such, they can be saved if the TRANSFER statement was used to convert them to numeric data, as in this example. Then to output the strings, as in the second part of this example, just transfer the numeric data back to strings.

You can eliminate the TRANSFER statements by using LINK instead of LOAD since LINK retains all variables previously in memory, while LOAD retains only those variables specified in COM (except for strings). Occasionally, however, it is preferable to use LOAD if you have many program variables, but you wish to save only the few variables specified in COM; by doing so, you maximize memory availability.

XREF

The XREF (cross reference) command prints each variable in your program, along with the line numbers in which it appears.

The syntax is:

XREF

It can be executed only in the calculator mode.

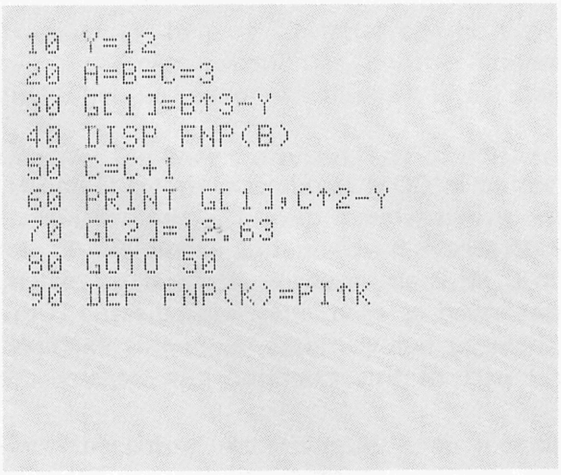
All variables referenced in mainline memory programs are listed by XREF unless you are currently located at a Special Function key; if so, only the variables referenced in the program lines on that key are listed by XREF.

The variables are listed in a column according to first program reference. Each program line that the variable appears in is referenced by line number. These line numbers are listed by row next to the variable name.

The XREF command is particularly useful in large programs where it is often difficult to keep track of the variables that have been used.

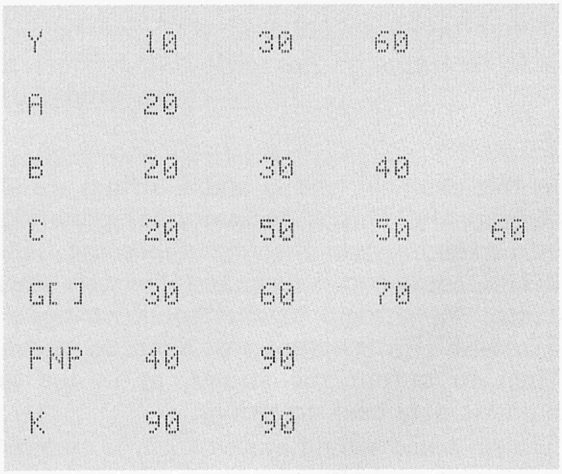
Example

In mainline memory



```
10 Y=12
20 A=B=C=3
30 G[1]=B↑3-Y
40 DISP FNP(B)
50 C=C+1
60 PRINT G[1],C↑2-Y
70 G[2]=12.63
80 GOTO 50
90 DEF FNP(K)=PI↑K
```

XREF printout



```
Y     10    30    60

A     20

B     20    30    40

C     20    50    50    60

G[]   30    60    70

FNP   40    90

K     90    90
```

When XREF is executed, the variables used in the mainline memory programs are listed along with the lines in which they appear.

Suppose you want to know where the variables B and C are used. With this listing you can quickly see that the variable B is used once in lines 20, 30, and 40; and the variable C is used once in line 20, twice in line 50, and once in line 60.

Notice that all array elements (the G array) are combined under the array name and are not referenced individually.

Also notice that function names (in this case, FNP) are referenced.

OCT

With the OCT (Octal) function, base 8 (octal) numbers are converted to base 10 (decimal) numbers.

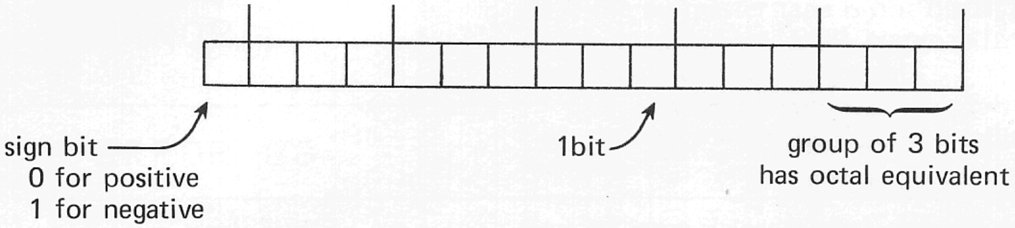
The syntax is:

OCT octal number

For example, executing OCT 31 causes the decimal equivalent, 25, of this octal number to be displayed.

In octal notation, the numbers 0 through 7 are used. The allowable octal numbers correspond to the allowable octal numbers in 16 bits, one word, of Model 30 memory.

Here is a representation of one word in memory:



Each bit has a binary representation of 0 or 1. Bits are grouped in three's and can be represented as octal numbers. The following are binary representations and their octal equivalents:

0 0 0	← 0	0 1 0	← 2	1 0 0	← 4	1 1 0	← 6
0 0 1	← 1	0 1 1	← 3	1 0 1	← 5	1 1 1	← 7

Here is an octal number in a word of memory:

+	0			2			5			3			1		
0	0	0	0	0	1	0	1	0	1	0	1	1	0	0	1

Hence this word is interpreted as an octal 2531. To find the decimal equivalent, execute OCT 2531 and the answer is 1369.

With the OCT function, positive octal numbers up to 077777 can be converted to their decimal equivalents; and negative octal numbers up to 100000 can be converted to their decimal equivalents. (The decimal equivalent of 000000 is 0, of 077777 is 32767, of 177777 is -1, and of 100000 is -32768.) Binary conversion of negative numbers is more complex than binary conversion of positive numbers and as such, it will not be explained in this book.

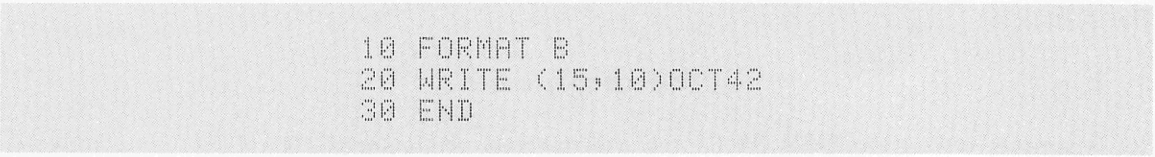
The OCT function can be used in logical evaluation; e.g.,

```
10 IF OCTX<9 THEN 50
```

If the decimal equivalent of the octal number X is less than 9, the program would continue at line 50.

(continued)

It can also be used to represent an ASCII code if you are more familiar with the base 8 representation than with the base 10 equivalent.



```
10 FORMAT B
20 WRITE (15,10)OCT42
30 END
```

Appendix

ERROR MESSAGES

One of the following error codes appears if the DUP command is not executed correctly. No additional error codes are peculiar to this ROM.

code	meaning
ERROR 87	First file on master tape is not file 0; negative file count specified in DUP command; or files on master tape are not sequential.
ERROR 88	File size on master tape is larger than available memory.
ERROR 89	End of tape (clear-leader) reached before DUP command is completed.

ELECTRONIC

SALES & SERVICE OFFICES

UNITED STATES

ALABAMA
P.O. Box 4207
2003 Byrd Spring Road S.W.
Huntsville 35802
Tel: (205) 881-4591
TWX: 810-726-2204

ARIZONA
2336 E. Magnolia St.
Phoenix 85034
Tel: (602) 244-1361
TWX: 910-951-1330

5737 East Broadway
Tucson 85711
Tel: (602) 298-2313
TWX: 910-952-1162

CALIFORNIA
1430 East Orangethorpe Ave.
Fullerton 92631
Tel: (714) 870-1000
TWX: 910-592-1288

3939 Lankershim Boulevard
North Hollywood 91604
Tel: (213) 877-1282
TWX: 910-499-2170

6305 Arizona Place
Los Angeles 90045
Tel: (213) 649-2511
TWX: 910-328-6148

1101 Embarcadero Road
Palo Alto 94303
Tel: (415) 327-6500
TWX: 910-373-1280

2220 Watt Ave.
Sacramento 95825
Tel: (916) 482-1463
TWX: 910-367-2092

9606 Aero Drive
San Diego 92123
Tel: (714) 279-3200
TWX: 910-335-2000

COLORADO
7965 East Prentice
Englewood 80110
Tel: (303) 771-3455
TWX: 910-935-0705

CONNECTICUT
12 Lunar Drive
New Haven 06525
Tel: (203) 389-6551
TWX: 710-465-2029

FLORIDA
P.O. Box 24210
2806 W. Oakland Park Blvd.
Ft. Lauderdale 33307
Tel: (305) 731-2020
TWX: 510-955-4099

P.O. Box 13910
6177 Lake Ellenor Dr.
Orlando, 32809
Tel: (305) 859-2900
TWX: 810-850-0113

GEORGIA
P.O. Box 28234
450 Interstate North
Atlanta 30328
Tel: (404) 436-6181
TWX: 810-766-4890

HAWAII
2875 So. King Street
Honolulu 96814
Tel: (808) 955-4455

ILLINOIS
5500 Howard Street
Skokie 60076
Tel: (312) 677-0400
TWX: 910-223-3613

INDIANA
3839 Meadows Drive
Indianapolis 46205
Tel: (317) 546-4891
TWX: 810-341-3263

LOUISIANA
P.O. Box 856
3239 Williams Boulevard
Kenner 70062
Tel: (504) 721-6201
TWX: 810-955-5524

MARYLAND
6707 Whitestone Road
Baltimore 21207
Tel: (301) 944-5400
TWX: 710-862-9157

P.O. Box 1648
2 Choke Cherry Road
Rockville 20850
Tel: (301) 948-6370
TWX: 710-828-9684

MASSACHUSETTS
32 Hartwell Ave.
Lexington 02173
Tel: (617) 861-8960
TWX: 710-326-6904

MICHIGAN
21840 West Nine Mile Road
Southfield 48075
Tel: (313) 353-9100
TWX: 810-224-4882

MINNESOTA
2459 University Avenue
St. Paul 55114
Tel: (612) 645-9461
TWX: 910-563-3734

MISSOURI
11131 Colorado Ave.
Kansas City 64137
Tel: (816) 763-8000
TWX: 910-771-2087

148 Weldon Parkway
Maryland Heights 63043
Tel: (314) 567-1455
TWX: 910-764-0830

***NEVADA**
Las Vegas
Tel: (702) 382-5777

NEW JERSEY
W. 120 Century Road
Paramus 07652
Tel: (201) 265-5000
TWX: 710-990-4951

1060 N. Kings Highway
Cherry Hill 08034
Tel: (609) 667-4000
TWX: 710-892-4945

NEW MEXICO
P.O. Box 8366
Station C
6501 Lomas Boulevard N.E.
Albuquerque 87108
Tel: (505) 265-3713
TWX: 910-989-1665

156 Wyatt Drive
Las Cruces 88001
Tel: (505) 526-2485
TWX: 910-983-0550

NEW YORK
6 Automation Lane
Computer Park
Albany 12205
Tel: (518) 458-1550
TWX: 710-441-8270

1219 Campville Road
Endicott 13760
Tel: (607) 754-0050
TWX: 510-252-0890

New York City
Manhattan, Bronx
Contact Paramus, NJ Office
Tel: (201) 265-5000
Brooklyn, Queens, Richmond
Contact Woodbury, NY Office
Tel: (516) 921-0300

82 Washington Street
Poughkeepsie 12601
Tel: (914) 454-7330
TWX: 510-248-0012

39 Saginaw Drive
Rochester 14623
Tel: (716) 473-9500
TWX: 510-253-5981

5858 East Molloy Road
Syracuse 13211
Tel: (315) 454-2486
TWX: 710-541-0482

1 Crossways Park West
Woodbury 11797
Tel: (516) 921-0300
TWX: 510-221-2168

NORTH CAROLINA
P.O. Box 5188
1923 North Main Street
High Point 27262
Tel: (919) 885-8101
TWX: 510-926-1516

OHIO
25575 Center Ridge Road
Cleveland 44145
Tel: (216) 835-0300
TWX: 810-427-9129

3460 South Dixie Drive
Dayton 45439
Tel: (513) 298-0351
TWX: 810-459-1925

1120 Morse Road
Columbus 43229
Tel: (614) 846-1300

OKLAHOMA
P.O. Box 32008
Oklahoma City 73132
Tel: (405) 721-0200
TWX: 910-830-6862

OREGON
17890 SW Boones Ferry Road
Tualatin 97062
Tel: (503) 620-3350
TWX: 910-467-8714

PENNSYLVANIA
2500 Moss Side Boulevard
Monroeville 15146
Tel: (412) 271-0724
TWX: 710-797-3650

1021 8th Avenue
King of Prussia Industrial Park
King of Prussia 19406
Tel: (215) 265-7000
TWX: 510-660-2670

RHODE ISLAND
873 Waterman Ave.
East Providence 02914
Tel: (401) 434-5535
TWX: 710-381-7573

***TENNESSEE**
Memphis
Tel: (901) 274-7472

TEXAS
P.O. Box 1270
201 E. Arapaho Rd.
Richardson 75080
Tel: (214) 231-6101
TWX: 910-867-4723

P.O. Box 27409
6300 Westpark Drive
Suite 100
Houston 77027
Tel: (713) 781-6000
TWX: 910-881-2645

231 Billy Mitchell Road
San Antonio 78226
Tel: (512) 434-4171
TWX: 910-871-1170

UTAH
2890 South Main Street
Salt Lake City 84115
Tel: (801) 487-0715
TWX: 910-925-5681

VIRGINIA
P.O. Box 6514
2111 Spencer Road
Richmond 23230
Tel: (703) 285-3431
TWX: 710-956-0157

WASHINGTON
433-108th N.E.
Bellevue 98004
Tel: (206) 454-3971
TWX: 910-443-2303

***WEST VIRGINIA**
Charleston
Tel: (304) 768-1232

WISCONSIN
9431 W. Beloit Road
Suite 117
Milwaukee 53227
Tel: (414) 541-0550

FOR U.S. AREAS NOT LISTED:
Contact the regional office nearest you: Atlanta, Georgia . . . North Hollywood, California . . . Paramus, New Jersey . . . Skokie, Illinois. Their complete addresses are listed above.

***Service Only**

CANADA

ALBERTA
Hewlett-Packard (Canada) Ltd.
11748 Kingsway Ave.
Edmonton
Tel: (403) 452-3670
TWX: 610-831-2431

BRITISH COLUMBIA
Hewlett-Packard (Canada) Ltd.
4519 Canada Way
North Burnaby 2
Tel: (604) 433-8213
TWX: 610-922-5059

MANITOBA
Hewlett-Packard (Canada) Ltd.
513 Century St.
Winnipeg
Tel: (204) 786-7581
TWX: 610-671-3531

NOVA SCOTIA
Hewlett-Packard (Canada) Ltd.
2745 Dutch Village Rd.
Suite 206
Halifax
Tel: (902) 455-0511
TWX: 610-271-4482

ONTARIO
Hewlett-Packard (Canada) Ltd.
1785 Woodward Dr.
Ottawa 3
Tel: (613) 255-6180, 255-6530
TWX: 610-562-8968

Hewlett-Packard (Canada) Ltd.
50 Galaxy Blvd.
Rexdale
Tel: (416) 677-9611
TWX: 610-492-4246

QUEBEC
Hewlett-Packard (Canada) Ltd.
275 Hymus Boulevard
Pointe Claire
Tel: (514) 697-4232
TWX: 610-422-3022
Telex: 01-20607

FOR CANADIAN AREAS NOT LISTED:
Contact Hewlett-Packard (Canada) Ltd. in Pointe Claire, at the complete address listed above.

CENTRAL AND SOUTH AMERICA

ARGENTINA
Hewlett-Packard Argentina
S.A.C.e.I
Lavalle 1171 - 3°
Buenos Aires
Tel: 35-0436, 35-0627, 35-0341
Telex: 012-1009
Cable: HEWPACK ARG

BRAZIL
Hewlett-Packard Do Brasil
I.E.C. LTDA.
Rua Frei Caneca 1119
01307-**Sao Paulo** - 3, SP
Tel: 288-7111, 287-5858
Cable: HEWPACK Sao Paulo

Hewlett-Packard Do Brasil
I.E.C. LTDA.
Praca Dom Feliciano 78
Salas 806/808
9000-Porto Alegre RS
Rio Grande do Sul (RS)-Brasil
Tel: 25-8470
Cable: HEWPACK Porto Alegre

Hewlett-Packard Do Brasil
I.E.C. LTDA.
Rua da Matriz 29
2000-**Rio de Janeiro,** GB
Tel: 266-2643
Cable: HEWPACK Rio de Janeiro

BOLIVIA
Stambuk & Mark (Bolivia) LTDA.
Av. Mariscal, Santa Cruz 1342
La Paz
Tel: 40626, 53163, 52421
Telex: 3560014
Cable: BUKMAR

CHILE
Héctor Calcagni y Cia, Ltda.
Casilla 16.475
Santiago
Tel: 423 96
Cable: CALCAGNI Santiago

COLOMBIA
Instrumentación
Henrik A. Langebaek & Kier S.A.
Carrera 7 No. 48-59
Apartado Aéreo 6287
Bogota, 1 D.E.
Tel: 45-78-06, 45-55-46
Cable: AARIS Bogota
Telex: 44400INSTCO

COSTA RICA
Lic. Alfredo Gallegos Gurdián
Apartado 10159
San José
Tel: 21-86-13
Cable: GALGUR San José

ECUADOR
Laboratorios de Radio-Ingenieria
Calle Guayaquil 1246
Post Office Box 3199
Quito
Tel: 212-496; 219-185
Cable: HORVATH Quito

EL SALVADOR
Electronic Associates
Apartado Postal 1682
Centro Comercial Gigante
San Salvador, El Salvador C.A.
Paseo Escalon 4649-4° Piso
Tel: 23-44-60, 23-32-37
Cable: ELECAS

GUATEMALA
IPESA
5a via 2-01, Zona 4
Guatemala City
Tel: 63-6-27 & 64-7-86
Telex: 4192 TELTRO GU

MEXICO
Hewlett-Packard Mexicana, S.A.
de C.V.
Adolfo Prieto 622
Col. del Valle
Mexico 12, D.F.
Tel: 543-4232; 523-1874
Telex: 017-74-507

NICARAGUA
Roberto Terán G.
Apartado Postal 689
Edificio Terán
Managua
Tel: 3451, 3452
Cable: ROTERAN Managua

PANAMA
Electrónico Balboa, S.A.
P.O. Box 4929
Ave. Manuel Espinosa No. 13-50
Bldg. Alina
Panama City
Tel: 230833
Telex: 3481003, Curundu,
Canal Zone
Cable: ELECTRON Panama City

PARAGUAY
Z.J. Melamed S.R.L.
Division: Aparatos y Equipos
Médicos
Salón de Exposición y Escritorio:
Chile 482
Edificio Victoria—Planta Baja
Asuncion, Paraguay
Tel: 4-5069, 4-6272
Cable: RAMEL

PERU
Compañia Electro Médica S.A.
Ave. Enrique Canaual 312
San Isidro
Casilla 1030
Lima
Tel: 22-3900
Cable: ELMED Lima

PUERTO RICO
San Juan Electronics, Inc.
P.O. Box 5167
Ponce de Leon 154
Pda. 3-PTA de Tierra
San Juan 00906
Tel: (809) 725-3342, 722-3342
Cable: SATRONICS San Juan
Telex: SATRON 3450 332

URUGUAY
Pablo Ferrando S.A.
Comercial e Industrial
Avenida Italia 2877
Casilla de Correo 370
Montevideo
Tel: 40-3102
Cable: RADIUM Montevideo

VENEZUELA
Hewlett-Packard De Venezuela
C.A.
Apartado 50933
Caracas
Tel: 71.88.05, 71.88.69, 71.99.30
Cable: HEWPACK Caracas
Telex: 21146 HEWPACK

FOR AREAS NOT LISTED,

CONTACT:
Hewlett-Packard
Inter-Americas
3200 Hillview Ave.
Palo Alto, California 94304
Tel: (415) 493-1501
TWX: 910-373-1267
Cable: HEWPACK Palo Alto
Telex: 034-8300, 034-8493

EUROPE

AUSTRIA
Hewlett-Packard Ges.m.b.H
Handelska 52/3
P.O. Box 7
A-1205 **Vienna**
Tel: (0222) 33 66 06 to 09
Cable: HEWPAK Vienna
Telex: 75923 hewpak a

BELGIUM
Hewlett-Packard Benelux
S.A./N.V.
Avenue du Col-Vert, 1
B-1170 **Brussels**
Tel: (02) 72 22 40
Cable: PALOBEN Brussels
Telex: 23 494 paloben bru

DENMARK
Hewlett-Packard A/S
Datavej 38
DK-3460 **Birkerod**
Tel: (01) 81 66 40
Cable: HEWPACK AS
Telex: 166 40 hp as

Hewlett-Packard A/S
Torvet 9
DK-8600 **Silkeborg**
Tel: (06) 82-71-66
Telex: 166 40 hp as
Cable: HEWPACK AS

FINLAND
Hewlett-Packard Oy
Bulevardi 26
P.O. Box 12185
SF-00120 **Helsinki** 12
Tel: (90) 13730
Cable: HEWPACKOY Helsinki
Telex: 12-15363 hel

FRANCE
Hewlett-Packard France
Quartier de Courtaboeuf
Boite Postale No. 6
F-91401 **Orsay**
Tel: (1) 907 78 25
Cable: HEWPACK Orsay
Telex: 60048

Hewlett-Packard France
4 Quai des Etroits
F-69321 **Lyon Cedex** 1
Tel: (78) 42 63 45
Cable: HEWPACK Lyon
Telex: 31617

Hewlett-Packard France
29 rue de la Gare
F-31700 **Blagnac**
Tel: (61) 85 82 29
Telex: 51957

GERMAN FEDERAL REPUBLIC
Hewlett-Packard GmbH
Vertriebszentrale Frankfurt
Bernerstrasse 117
Postfach 560 140
D-6000 **Frankfurt** 56
Tel: (0611) 50 04-1
Cable: HEWPACKSA Frankfurt
Telex: 41 32 49 fra

Hewlett-Packard GmbH
Vertriebsbüro Böblingen
Herrenbergerstrasse 110
D-7030 **Böblingen,** Württemberg
Tel: (07031) 66 72 87
Cable: HEPAK Böblingen
Telex: 72 65 739 bbn

Hewlett-Packard GmbH
Vertriebsbüro Düsseldorf
Vogelsanger Weg 38
D-4000 **Düsseldorf**
Tel: (0211) 63 80 31/35
Telex: 85/86 533 hpdd d

Hewlett-Packard GmbH
Vertriebsbüro Hamburg
Wendenstr. 23
D-2000 **Hamburg** 1
Tel: (0411) 24 05 51/52
Cable: HEWPACKSA Hamburg
Telex: 21 63 032 hphh d

Hewlett-Packard GmbH
Vertriebsbüro München
Unterhachinger Strasse 28
ISAR Center
D-8012 **Ottobrunn**
Tel: (0811) 601 30 61/7
Telex: 52 49 85
Cable: HEWPACKSA Müchen

(West Berlin)
Hewlett-Packard GmbH
Vertriebsbüro Berlin
Wilmersdorfer Strasse 113/114
D-1000 **Berlin W.** 12
Tel: (0311) 3137046
Telex: 18 34 05 hpbln d

GREECE
Kostas Karayannis
18, Ermou Street
GR-**Athens** 126
Tel: 3230-303
Cable: RAKAR Athens
Telex: 21 59 62 rkar gr

IRELAND
Hewlett-Packard Ltd.
224 Bath Road
GB-**Slough,** SL1 4 DS, Bucks
Tel: Slough (0753) 33341
Cable: HEWPIE Slough
Telex: 84413

Hewlett-Packard Ltd.
The Graftons
Stamford New Road
Altrincham, Cheshire, England
Tel: (061) 928-8626
Telex: 668068

ITALY
Hewlett-Packard Italiana S.p.A.
Via Amerigo Vespucci 2
I-20124 **Milan**
Tel: (2) 6251 (10 lines)
Cable: HEWPACKIT Milan
Telex: 32046

Hewlett-Packard Italiana S.p.A.
Piazza Marconi
I-00144 **Rome** - Eur
Tel: (6) 5912544/5, 5915947
Cable: HEWPACKIT Rome
Telex: 61514

Hewlett-Packard Italiana S.p.A.
Vicolo Pastori, 3
I-35100 **Padova**
Tel: (49) 66 40 62
Telex: 32046 via Milan

Hewlett-Packard Italiana S.p.A.
Via Colli, 24
I-10129 **Turin**
Tel: (11) 53 82 64
Telex: 32046 via Milan

LUXEMBURG
Hewlett-Packard Benelux
S.A./N.V.
Avenue du Col-Vert, 1
B-1170 **Brussels**
Tel: (03/02) 72 22 40
Cable: PALOBEN Brussels
Telex: 23 494

NETHERLANDS
Hewlett-Packard Benelux, N.V.
Weerdestein 117
P.O. Box 7825
NL-**Amsterdam,** Z 11
Tel: (020) 42 77 77
Cable: PALOBEN Amsterdam
Telex: 13 216 hepa nl

NORWAY
Hewlett-Packard Norge A/S
Nesveien 13
Box 149
N-1344 **Haslum**
Tel: (02) 53 83 60
Telex: 16621 hpnas n

PORTUGAL
Telectra-Empresa Técnica de
Eléctricos S.a.r.l.
Rua Rodrigo da Fonseca 103
P.O. Box 2531
P-**Lisbon 1**
Tel: (19) 68 60 72
Cable: TELECTRA Lisbon
Telex: 1598

SPAIN
Hewlett-Packard Española, S.A.
Jerez No 8
E-**Madrid** 16
Tel: 458 26 00
Telex: 23515 hpe

Hewlett-Packard Españoia, S.A.
Milanesado 21-23
E-**Barcelona 17**
Tel: (3) 203 62 00
Telex: 52603 hpbe e

SWEDEN
Hewlett-Packard Sverige AB
Enighetsvägen 1-3
Fack
S-161 20 **Bromma** 20
Tel: (08) 98 12 50
Cable: MEASUREMENTS
Stockholm
Telex: 10721

Hewlett-Packard Sverige AB
Hagakersgatan 9C
S-431 41 **Mölndal**
Tel: (031) 27 68 00/01
Telex: 21 312 hpmindl s

SWITZERLAND
Hewlett Packard (Schweiz) AG
Zürcherstrasse 20
P.O. Box 64
CH-8952 Schlieren **Zurich**
Tel: (01) 98 18 21/24
Cable: HPAG CH
Telex: 53933 hpag ch

Hewlett-Packard (Schweiz) AG
9, Chemin Louis-Pictet
CH-1214 Vernier—**Geneva**
Tel: (022) 41 4950
Cable: HEWPACKSA Geneva
Telex: 27 333 hpsa ch

TURKEY
Telekom Engineering Bureau
Saglik Sok No. 15/1
Ayaspasa-Beyoglu
P.O. Box 437 Beyoglu
TR-**Istanbul**
Tel: 49 40 40
Cable: TELEMATION Istanbul

UNITED KINGDOM
Hewlett-Packard Ltd.
224 Bath Road
GB-**Slough,** SL1 4 DS, Bucks
Tel: Slough (0753) 33341
Cable: HEWPIE Slough
Telex: 84413

Hewlett-Packard Ltd.
"The Graftons"
Stamford New Road
GB-**Altrincham,** Cheshire
Tel: (061) 928-8626
Telex: 668068

Hewlett-Packard Ltd's registered address for V.A.T. purposes only:
70, Finsbury Pavement
London, EC2A1SX
Registered No: 69057

SOCIALIST COUNTRIES PLEASE CONTACT:
Hewlett-Packard Ges.m.b.H.
Handelskai 52/3
P.O. Box 7
A-1205 **Vienna**
Ph: (0222) 33 66 06 to 09
Cable: HEWPACK Vienna
Telex: 75923 hewpak a

ALL OTHER EUROPEAN COUNTRIES CONTACT:
Hewlett-Packard S.A.
Rue du Bois-du-Lan 7
P.O. Box 85
CH-1217 Meyrin 2 **Geneva**
Switzerland
Tel: (022) 41 54 00
Cable: HEWPACKSA Geneva
Telex: 2 24 86

AFRICA, ASIA, AUSTRALIA

ANGOLA
Telectra Empresa Técnia
de Equipamentos Eléctricos
SAR
Rua de Barbosa Rodrigues
42-1°
Box 6487
Luanda
Cable: TELECTRA Luanda

AUSTRALIA
Hewlett-Packard Australia
Pty. Ltd.
22-26 Weir Street
Glen Iris, 3146
Victoria
Tel: 20-1371 (6 lines)
Cable: HEWPARD Melbourne
Telex: 31 024

Hewlett-Packard Australia
Pty. Ltd.
Corner Bridge & West Streets
Pymble, New South Wales, 2073
Tel: 449 6566
Cable: HEWPARD Sydney
Telex: 21561

Hewlett-Packard Australia
Pty. Ltd.
97 Churchill Road
Prospect 5082
South Australia
Tel: 65-2366
Cable: HEWPARD Adelaide

Hewlett Packard Australia
Pty. Ltd.
2nd Floor, Suite 13
Casablanca Buildings
196 Adelaide Terrace
Perth, W.A. 6000
Tel: 25-6800
Cable: HEWPARD Perth

Hewlett-Packard Australia
Pty. Ltd.
10 Woolley Street
P.O. Box 191
Dickson A.C.T. 2602
Tel: 49-8194
Cable: HEWPARD Canberra ACT

Hewlett-Packard Australia
Pty. Ltd.
2nd Floor, 49 Gregory Terrace
Brisbane, Queensland, 4000
Tel: 29 1544

CEYLON
United Electricals Ltd.
P.O. Box 681
60, Park St.
Colombo 2
Tel: 26696
Cable: HOTPOINT Colombo

CYPRUS
Kypronics
19 Gregorios & Xenopoulos Road
P.O. Box 1152
CY-**Nicosia**
Tel: 45628/29
Cable: KYPRONKS PANDEHIS

ETHIOPIA
African Salespower & Agency
Private Ltd., Co.
P. O. Box 718
58/59 Cunningham St.
Addis Ababa
Tel: 12285
Cable: ASACO Addisababa

HONG KONG
Schmidt & Co. (Hong Kong) Ltd.
P.O. Box 297
1511, Prince's Building 15th Floor
10, Chater Road
Hong Kong
Tel: 240168, 232735
Cable: SCHMIDTCO Hong Kong

INDIA
Blue Star Ltd.
Kasturi Buildings
Jamshedji Tata Rd.
Bombay 400 020
Tel: 29 50 21
Telex: 3751
Cable: BLUEFROST

Blue Star Ltd.
Band Box House
Prabhadevi
Bombay 400 025
Tel: 45 73 01
Telex: 3751
Cable: BLUESTAR

Blue Star Ltd.
14/40 Civil Lines
Kampur 208 001
Tel: 6 88 82
Cable: BLUESTAR

Blue Star, Ltd.
7 Hare Street
P.O. Box 506
Calcutta 700 001
Tel: 23-0131
Telex: 655
Cable: BLUESTAR

Blue Star Ltd.
Blue Star House,
34 Ring Road
Lajpat Nagar
New Delhi 110 024
Tel: 62 32 76
Telex: 463
Cable: BLUESTAR

Blue Star, Ltd.
Blue Star House
11/11A Magarath Road
Bangalore 560 025
Tel: 51473
Telex: 430
Cable: BLUESTAR

Blue Star, Ltd.
1-1-117/1
Sarojini Devi Road
Secunderabad 500 003
Tel: 7 63 91, 7 73 93
Cable: BLUEFROST
Telex: 459

Blue Star, Ltd.
23/24 Second Line Beach
Madras 600 001
Tel: 2 39 55
Telex: 379
Cable: BLUESTAR

Blue Star, Ltd.
1B Kaiser Bungalow
Dindli Road
Jamshedpur 831 001
Tel: 38 04
Cable: BLUESTAR
Telex: 240

INDONESIA
Bah Bolon Trading Coy. N.V.
Djalah Merdeka 29
Bandung
Tel: 4915; 51560
Cable: ILMU
Telex: 08-809

IRAN
Multicorp International Ltd.
Avenue Soraya 130
P.O. Box 1212
IR-**Teheran**
Tel: 83 10 35-39
Cable: MULTICORP Tehran
Telex: 2893 MCI TN

ISRAEL
Electronics & Engineering
Div. of Motorola Israel Ltd.
17 Aminadav Street
Tel-Aviv
Tel: 36941 (3 lines)
Cable: BASTEL Tel-Aviv
Telex: 33569

JAPAN
Yokogawa-Hewlett-Packard Ltd.
Ohashi Building
1-59-1 Yoyogi
Shibuya-ku, **Tokyo**
Tel: 03-370-2281/92
Telex: 232-2024YHP
Cable: YHPMARKET TOK 23-724

Yokogawa-Hewlett-Packard Ltd.
Nisei Ibaragi Bldg.
2-2-8 Kasuga
Ibaragi-Shi
Osaka
Tel: (0726) 23-1641
Telex: 5332-385 YHP OSAKA

Yokogawa-Hewlett-Packard Ltd.
Nakamo Building
No. 24 Kamisasazima-cho
Nakamura-ku, **Nagoya** City
Tel: (052) 571-5171

Yokogawa-Hewlett-Packard Ltd.
Nitto Bldg.
2-4-2 Shinohara-Kita
Kohoku-ku
Yokohama 222
Tel: 045-432-1504
Telex: 382-3204 YHP YOK

Yokogawa-Hewlett-Packard Ltd.
Chuo Bldg.
Rm. 603 3,
2-Chome
IZUMI-CHO,
Mito, 310
Tel: 0292-25-7470

KENYA
Kenya Kinetics
P.O. Box 18311
Nairobi, Kenya
Tel: 57726
Cable: PROTON

KOREA
Amtraco Corporation
Industrial Products Div.
Seoul P.O. Box 1103
8th floor, DaeKyung Bldg.
107 Sejong Ro
Chongro-Ku, Seoul
Tel: 73-8924-7
Cable: AMTRACO Seoul

LEBANON
Constantin E. Macridis
P.O. Box 7213
RL-**Beirut**
Tel: 220846
Cable: ELECTRONUCLEAR Beirut

MALAYSIA
MECOMB Malaysia Ltd.
2 Lorong 13/6A
Section 13
Petaling Jaya, **Selangor**
Cable: MECOMB Kuala Lumpur

MOZAMBIQUE
A. N. Goncalves, LDA.
4.1 Apt. 14 Av. D. Luis
P.O. Box 107
Lourenco Marques
Telex: 6-203 NEGON MO
Cable: NEGON

NEW ZEALAND
Hewlett-Packard (N.Z.) Ltd.
94-96 Dixson St.
P.O. Box 9443
Courtenay Place
Wellington, N.Z.
Tel: 56-559
Telex: 6-203 NEGON MU
Cable: HEWPACK Wellington

Hewlett Packard (N.Z.) Ltd.
Box 51092
Pukuranga
Tel: 56-9837
Cable: HEWPACK, Auckland

NIGERIA
Teil (MesaCom Division)
25 Moronll St, Suru-Lere,
P.O. Box 5705
Lagos
Cable: THETEIL LAGOS

PAKISTAN
Mushko & Company, Ltd.
Oosman Chambers
Abdullah Haroon Road
Karachi 3
Tel: 511027, 512927
Cable: COOPERATOR Karachi

Mushko & Company, Ltd.
38B, Satellite Town
Rawalpindi
Tel: 41924
Cable: FEMUS Rawalpindi

PHILIPPINES
Electromex Inc.
5th Floor, Architects
Center Bldg.
Ayala Ave., Makati, Rizal
C.C.P.O. Box 1028
Makati, Rizal
Tel: 86-18-87, 87-76-77
Cable: ELEMEX Manila

SINGAPORE
Mechanical and Combustion
Engineering Company Ltd.
9, Jalan Kilang
Red Hill Industrial Estate
Singapore, 3
Tel: 642361-3; 632611
Cable: MECOMB Singapore

Hewlett-Packard Far East
Area Office
P.O. Box 87
Alexandra Post Office
Singapore 3
Tel: 633022
Cable: HEWPACK SINGAPORE

SOUTH AFRICA
Hewlett Packard South Africa
(Pty.), Ltd.
P.O. Box 31716
Braamfontein Transvaal
Milnerton
30 De Beer Street
Johannesburg
Tel: 725-2080, 725-2030
Telex: 0226 JH
Cable: HEWPACK Johannesburg

Hewlett Packard South Africa
(Pty.), Ltd.
Breecastle House
Bree Street
Cape Town
Tel: 3-6019, 3-6545
Cable: HEWPACK Cape Town
Telex: 5-0006

Hewlett Packard South Africa
(Pty.), Ltd.
641 Ridge Road, Durban
P.O. Box 99
Overport, Natal
Tel: 88-6102
Telex: 567954
Cable: HEWPACK

TAIWAN
Hewlett Packard Taiwan
39 Chung Shiao West Road
Sec. 1
Overseas Insurance
Corp. Bldg. 7th Floor
Taipei
Tel: 389160,1,2, 375121,
Ext. 240-249
Telex: TP824 HEWPACK
Cable: HEWPACK Taipei

THAILAND
UNIMESA Co., Ltd.
Chongkoinee Building
56 Suriwongse Road
Bangkok
Tel: 37956, 31300, 31307,
37540
Cable: UNIMESA Bangkok

UGANDA
Uganda Tele-Electric Co., Ltd.
P.O. Box 4449
Kampala
Tel: 57279
Cable: COMCO Kampala

VIETNAM
Peninsular Trading Inc.
P.O. Box H-3
216 Hien-Vuong
Saigon
Tel: 20-805, 93398
Cable: PENTRA, SAIGON 242

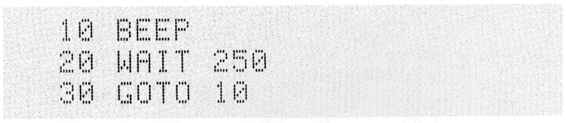
ZAMBIA
R. J. Tilbury (Zambia) Ltd.
P.O. Box 2792
Lusaka
Zambia, Central Africa
Tel: 73793
Cable: ARJAYTEE, Lusaka

MEDITERRANEAN AND MIDDLE EAST COUNTRIES NOT SHOWN PLEASE CONTACT:
Hewlett-Packard
Co-ordination Office for
Mediterranean and Middle
East Operations
Via Marocco, 7
I-00144 Rome-Eur, Italy
Tel: (6) 59 40 29
Cable: HEWPACKIT Rome
Telex: 61514

OTHER AREAS NOT LISTED, CONTACT:
Hewlett-Packard
Export Trade Company
3200 Hillview Ave.
Palo Alto, California 94304
Tel: (415) 326-7000
(Feb. 71 493-1501)
TWX: 910-373-1267
Cable: HEWPACK Palo Alto
Telex: 034-8300, 034-8493

AP 1 OPERATIONS

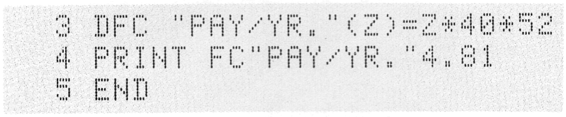
BEEP



```
10 BEEP
20 WAIT 250
30 GOTO 10
```

outputs audible sounds in designated places within the program.

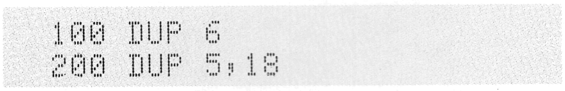
DFC



```
3 DFC "PAY/YR."(Z)=Z*40*52
4 PRINT FC"PAY/YR."4.81
5 END
```

allows single and multiple-line functions to be called by name.

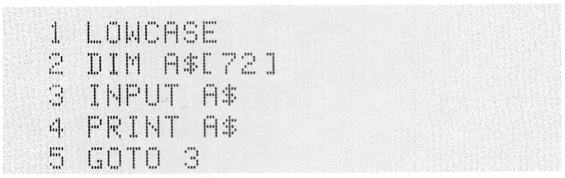
DUP



```
100 DUP 6
200 DUP 5,18
```

beginning with file 0, all or a portion of the internal cassette files can be duplicated on a peripheral cassette.

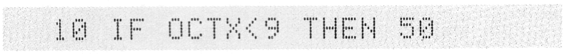
HIGHCASE
&
LOWCASE



```
1 LOWCASE
2 DIM A$[72]
3 INPUT A$
4 PRINT A$
5 GOTO 3
```

if your printer has lower-case capabilities, LOWCASE lets you use the printer like a standard typewriter.

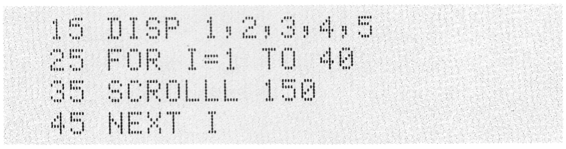
OCT



```
10 IF OCTX<9 THEN 50
```

converts base 8 (octal) numbers to base 10 (decimal) numbers.

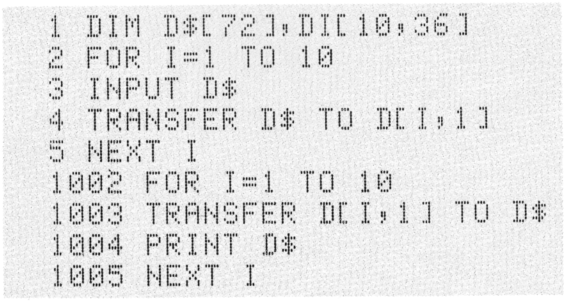
SCROLL



```
15 DISP 1,2,3,4,5
25 FOR I=1 TO 40
35 SCROLLL 150
45 NEXT I
```

allows a display, up to 72 characters in length, to be viewed in its entirety.

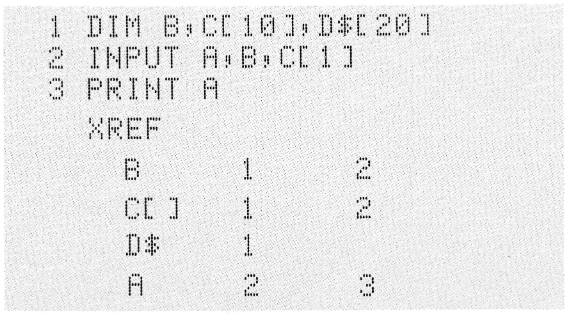
TRANSFER



```
1 DIM D$[72],D[10,36]
2 FOR I=1 TO 10
3 INPUT D$
4 TRANSFER D$ TO D[I,1]
5 NEXT I
1002 FOR I=1 TO 10
1003 TRANSFER D[I,1] TO D$
1004 PRINT D$
1005 NEXT I
```

used with the String Variables ROM, it allows strings to be saved in numeric arrays, and then retrieved when you need them.

XREF



```
1 DIM B,C[10],D$[20]
2 INPUT A,B,C[1]
3 PRINT A
  XREF
     B       1     2
     C[]     1     2
     D$      1
     A       2     3
```

lists each variable in your program, along with the line numbers in which it appears.

1 ROM 11279B & OPTION 279

Manual Changes

ADVANCED PROGRAMMING I ROM
Operating and Programming Manual
Part No. 09830-90006

Pages 2-8 and 2-9: Replace these two pages with the attached pages.

LOWCASE, HIGHCASE

These statements are useful if the printing device for your Model 30 has both upper and lower case capabilities.† They provide the user with a convenient method for entering lines of text.

The LOWCASE statement allows the Model 30 keyboard to operate like a standard typewriter; that is, alphabetics (A through Z) keyed in normally would be output in lower case, and alphabetics keyed in with the SHIFT key held down would be output in upper cases. (On the Model 30, alphabetics are generally output in just the reverse manner.) No other keys are affected by this statement; that is, if $ 4 is pressed with the SHIFT key held down, the $ is still output just as it is on a standard typewriter.

The HIGHCASE statement cancels LOWCASE. After it is executed, the alphabetic keys resume their normal operating characteristics.

The syntax is:

LOWCASE
or
HIGHCASE

LOWCASE and HIGHCASE can also be executed in the keyboard mode. In fact, if the program you want to enter consists of PRINT commands, execute LOWCASE from the keyboard *before* you key in your program.

Examples

No. 1
Execute the LOWCASE statement from the keyboard.

Then press: SHIFT

```
PRINT "JACK AND JILL WENT UP THE HILL"
```

Execute it and the printout (using the 9861A Typewriter) is:

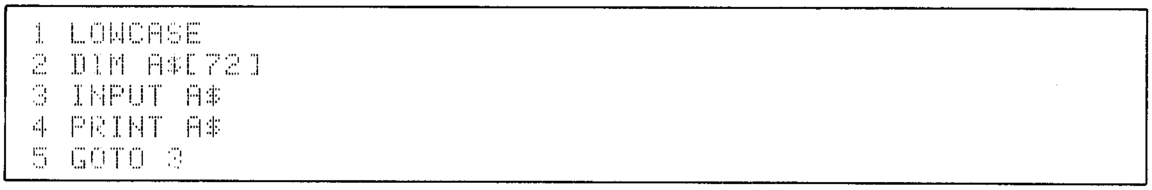
```
Jack and Jill went up the hill
```

If HIGHCASE is then executed from the keyboard and the PRINT command is again keyed in and executed exactly as before, the printout is:

```
jACK AND jILL WENT UP THE HILL
```

†These statements can be used if you have, say the 9861A Output Typewriter or the Teletype 38 Data Terminal; but not if you have, say, the 9866A Printer.

No. 2
You may wish to enter lines of text from the Model 30 keyboard, using the calculator SHIFT key as it is used on a standard typewriter. If you have the String Variables ROM, the LOWCASE statement can be very useful as shown in the following example:



```
1 LOWCASE
2 DIM A$[72]
3 INPUT A$
4 PRINT A$
5 GOTO 3
```

When this program is executed, a ? appears on the display. The calculator keyboard can then be used like a standard typewriter to key in a line of text; execute the input and it is printed (line 4). The program then returns to line 3 so another line of text can be typed in.

Do not use the cassette command, FIND, when in the lower case mode. If necessary, execute the HIGHCASE statement (either from the keyboard or a program) before using the FIND command.