MODEL
30

HEWLETT-PACKARD 9830A CALCULATOR
11279B ADVANCED PROGRAMMING 1 ROM

OPERATING MANUAL

OPERATING MANUAL

11279B ADVANCED PROGRAMMING I ROM

9830A CALCULATOR SHOWN WITH 9866A PRINTER

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PREFACE

The Advanced Programming I Read-Only Memory (ROM) can be purchased only as an accessory plug-in block. Unlike other ROMs, the 11279B Advanced Programming I ROM is not available as a factory or field installable internal modification to the calculator.

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.

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

One Operating Manual, -hp- Part No. 09830-90006, is 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.† 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 (on J and J)

```
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.

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]

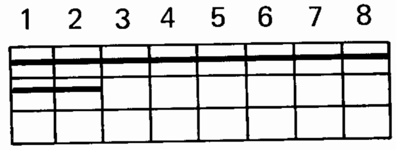
The string name, say A$, need not have subscripts following it. Without subscripts, the entire string is transferred; with subscripts, the specified substring is transferred.

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$[80],C[30,40],B$[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],G[1,25],
                    H[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],G[1,25],H[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.

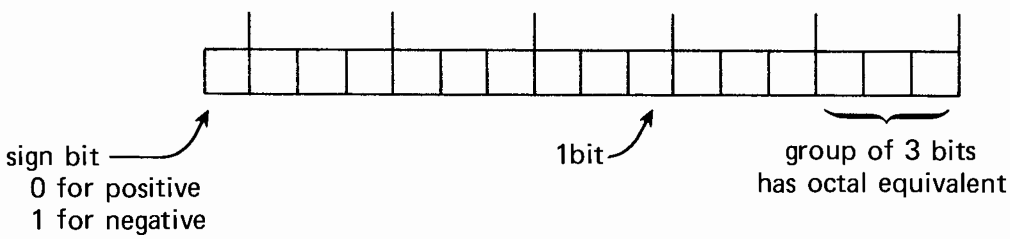
The syntax is:

OCT octal number

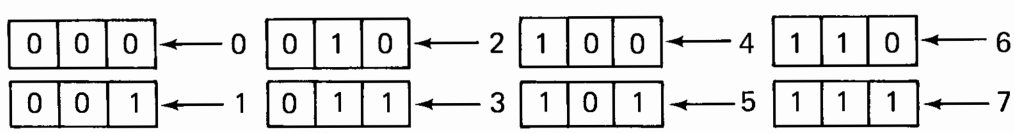
For example, executing OCT 31 causes the decimal equivalent, 25, of this octal number to be displayed.

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:



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

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Tel: 6 88 82
Cable: BLUESTAR

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Telex: 655
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Blue Star Ltd.
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Lajpat Nagar
New Delhi 110 024
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Telex: 2463
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Blue Star, Ltd.
Blue Star House
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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: 23954
Telex: 379
Cable: BLUESTAR

Blue Star, Ltd.
Nathraj Mansions
2nd Floor Bistupur
Jamshedpur 831 001
Tel: 38 04
Cable: BLUESTAR
Telex: 240

INDONESIA
Bah Bolon Trading Coy. N.V.
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Tel: 4915; 51560
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Telex: 2893 MCI TN

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Electronics & Engineering Div. of Motorola Israel Ltd.
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Cable: BASTEL Tel-Aviv
Telex: 33569

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Cable: ELECTRONUCLEAR Beirut

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The Electronics Instrumentations Ltd. (TEIL)
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PAKISTAN
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Oosman Chambers
Abdullah Haroon Road
Karachi 3
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Cable: COOPERATOR Karachi

Mushko & Company, Ltd.
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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.

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