

Panasonic

T.M.
HHC

Portacalc™

A VERSATILE SPREAD SHEET
PROGRAM FOR THE HHC™

RL-S6013A7

Portacalc™

**a versatile spread sheet program
for the HHC™**

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HHC™
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OVERVIEW

The Portacalc™ Capsule is a state-of-the-art achievement designed to produce a dynamic, electronic spreadsheet. The spreadsheet uses a file system of data organization that is adaptable to countless situations. With the Portacalc Capsule you can command your HHC™ to:

- create a file to represent your spreadsheet. Except for possible memory restrictions, the file framework can contain up to 250 columns and 250 rows.
- create and later modify a header (spreadsheet title) and a footer (information at the bottom of the spreadsheet) up to 40 characters long.
- accept and later modify column and row designations up to six characters in length.
- display a predetermined number of decimal places for the entries in your spreadsheet. The digits can be set for an individual entry (called a cell) or an entire column or row.
- construct a framework of alternate labels so that you can replace a cell's column, row designation with a shortened descriptor or create a better cell name than that provided by the column, row label.
- set up formulas that use entries from your spreadsheet as well as constants to compute new values for a single cell or for multiple cells.
- write formulas which use any of ten mathematical functions built into your Portacalc Capsule.
- enter tabs so that with a touch of a single key you can progress through a series of cells in a predetermined sequence.
- rapidly jump to any location on your spreadsheet.
- transfer a formula from any cell in your spreadsheet to any other cell or consecutive series of cells.
- print out all or part of your spreadsheet.
- print out all formulas used in computing values of your spreadsheet.
- print out tabs and alternate labels used in your spreadsheet.

Your Portacalc Capsule and your HHC represent the leading edge of high technology. The sophistications of both enable you to efficiently organize and manipulate your data in ways that can facilitate decision making. Applications range from the most general business situations to the most specialized scientific research. Although the example used throughout the tutorial is drawn from business, do not let it act as blinders to the countless possible applications of Portacalc. As you read through the tutorial, treat the example as a paradigm (pattern, for those of you who don't want to look paradigm up in the dictionary) on which thousands of variations can be played.

In addition, your Portacalc spreadsheet organizes data in a format that is compatible with the HHC Portagraph™ Capsule and Color Plotter as well as the Portastat™ Capsule. This interfacing ability allows you to produce six specialized graphs from the data in your Portacalc spreadsheet and produce descriptive statistics and perform inferential statistical tests on the data. You can also output your spreadsheet to a printer (or any attached peripheral).

Use of Manual

The manual that follows is divided into three sections: a tutorial, an example section with sample spreadsheets from a variety of disciplines, and a technical section. Mastery of the principles presented in the tutorial is necessary so that you can realize the potential of the Portacalc spreadsheet. Skipping the tutorial will probably cost you much time (and grief) in the long run for it demonstrates the only acceptable data organization and explains important operational procedures. There are seven lessons in the tutorial section. They are designed to be studied in the order in which they are presented since each lesson builds on the previous one. Each lesson takes approximately a half hour. The example section is intended to suggest a few applications as well as stimulate your imagination to devise hitherto undreamed of possibilities. This section is not meant to be exhaustive, so feel to adapt, modify and even ignore the models as you create spreadsheets unique to your own particular situation. The technical section is designed as a reference resource; and will not hold your attention like your favorite who-done-it. Use this section as you would an encyclopedia, to look up display messages, error messages, etc., about which you have a question.

PART I: TUTORIAL

The following lessons have been designed to be used in conjunction with your Hand Held Computer and Portacalc Capsule. We assume that you have studied the **Owner's Manual for the HHC** and are familiar with the HHC's basic features and functions. If you have not already done so, insert your Portacalc Capsule according to the instructions given in the **Owner's Manual for the HHC**. Also place the special Portacalc Capsule overlay on the HHC keyboard.

LESSON 1: Setting Up a New File

"File" is the term used to describe the holding area for the data in the Portacalc spreadsheet. Files contain numbers arranged in a table of columns and rows. Portacalc files must be created by your Portacalc Capsule rather than from the file system accessed directly from the HHC Primary Menu.

The following scenario simulates the use of the Portacalc spreadsheet in a business environment. Imagine yourself the president of a small book company that is currently published three different titles. You need some way to summarize the current status of your business. You also need to make projections and subsequent decisions on such matters as how many books you need to sell to break even and how increasing dealer discounts might affect profits.

Initially—for this lesson as well as in future personal applications—you should set up on paper the organization to be used in your Portacalc spreadsheet. The labels for the columns and rows cannot be longer than six characters. Originally, you started with the row designations on the left and then abbreviated them to the shorter row labels on the right.

Unit sales price	=unit\$
Number produced	=#prod
Number sold	=#sold
Number on hand	=#hand
Value of inventory	=inven
Printing and binding	=pandb
Commission percentage	=com%
Dealer discount	=disc
Royalties	=royal
Variable cost	=vcost
Fixed cost	=fcost
Profit	=profit

Although you will not enter all of these labels in this lesson, you will use them later to define all the row labels of your spreadsheet.

The sample spreadsheet given below will serve as your model throughout this and later tutorials.

	title1	title2	title3
unit\$	2.95	6.00	9.95
#prod	25000	15000	20000
#sold	18000	13500	6000
#hand	?	?	?
inven	?	?	?
pandb	.85	1.40	3.25
com%	.05	.06	.07
disc	.35	.50	1.10
royal	.10	.25	.50
vcost	?	?	?
fcost	9000	9000	9000
profit	?	?	?

Many of the entries have question marks rather than numeric values. These question marks will eventually be calculated and replaced with numeric values once you get initial formulas in place and can engage the powerful formula handling capabilities of Portacalc.

You are now ready to begin creating part of the sample spreadsheet. Turn on your HHC and enter its Primary Menu. This will list intrinsic programs, any HHC capsule programs, and programs for certain peripherals (if you have them). At some point you will see the name "Portacalc" preceded by a number and an equals sign. For example:

```
5=Portacalc
```

The point printing used for Portacalc above will be used throughout this manual whenever the representation mirrors exactly what appears in the window of your HHC. Press the number corresponding to Portacalc. In this example you would press the 5 key. Throughout this tutorial, square brackets will be placed around keys that you should press. Thus, [5] will denote pressing the 5 key.

After pressing the key, you will see the title Portacalc momentarily followed by the cycling Portacalc file menu:

```
1=NEW FILE  
NO FILES
```

You see NO FILES because you have not yet created any files for your Portacalc spreadsheet. After you have created some files, you will see the names of the files in the window instead of NO FILES.

Press [1] to have the HHC create a new file. You should see:

```
FILE NAME:
```

The blinking box is called a cursor and is prompting you to enter the file name. For your spreadsheet enter the name:

[P] [r] [o] [d] [u] [c] [t] [A] [n] [a] [l] [y] [s] [i] [s]

File names do have a maximum of 15 characters. This is why you did not include the space between "Product" and "Analysis". If you make an error in typing the file name, you can correct it by pressing [↵] and typing over the error. This is called overtyping. If you try to enter a file name that is longer than 15 characters, your HHC will beep at you to let you know that it will not accept any more characters.

When you finish typing the file name, push the [ENTER] key, and you will see:

COL1 LABEL:

Column labels run horizontally across the top of your spreadsheet and define a single line of vertical positions. Row labels run up and down the left side of your spreadsheet and define a single line of horizontal positions. You can use up to six characters to label a column or row.

There are some restrictions regarding characters acceptable in column and row labels. Do not use any spaces within a column or row label, e.g., "#sold". If you do use a space and you press the [ENTER] key, your HHC will beep to catch your attention and will not accept the offending space. Furthermore, the following characters:

[+] [-] [*] [/] [\] [@] [,] [(] [)] [?]

also will not be accepted because they will interfere with the formula manipulations of your Portacalc spreadsheet.

It is possible to give both a column and a row the same label, but do this only when you have a very good reason. If you try to enter the same label for two different columns or rows, you will usually get the message DUPLICATE and the HHC will beep to warn you that it will not accept duplicate names within the same column or row. The one way in which you can get duplicate row labels (or duplicate column labels) is to use the [INSERT] key and type the same label as the row immediately below (or the column immediately to the right) of the inserted row (or column). However, don't do this!

Use column 1 to hold title1 Press:

[t] [i] [t] [l] [e] [1] [ENTER]

and you will see:

ROW1 LABEL:

Type the row 1 label:

[u] [n] [i] [t] [\$] [ENTER]

You will see:

title1,unit\$?.00

The column label will always be displayed first, followed by a comma and the row label. The cursor is prompting you to put a value in column 1, row 1—the cell in the top left hand corner of the spreadsheet. Instead of doing that at this time, you decide to label some more of your spreadsheet prior to entering any values. Hence, press the [↓] key. In response to the prompt:

ROW2 LABEL:

type the row 2 label:

[#] [p] [r] [o] [d] [ENTER] [↓]

Continue to enter the row labels:

[#] [s] [o] [l] [d] [ENTER] [↓]
[#] [h] [a] [n] [d] [ENTER] [↓]
[i] [n] [v] [e] [n] [ENTER]

At this point you have entered all the row labels needed in this lesson. You may have seen, if you have quick eyes, the message:

* DO NOT PRESS CLEAR *

As your file gets larger, your Portacalc Capsule may require a few moments to ready a row or column. The message is to warn you not to press the [CLEAR] key while the HHC is busy with file manipulations. If you ignore the warning and press [CLEAR], you will probably have your file damaged beyond repair and will have to delete the file and start all over. We realize that some of you may not believe us and may wish to try this. When you start seeing strange labels or garbage in your formulas, we will bite our tongues so as not to say, "We told you so".

To enter the remaining column labels, press [→] once and you should see:

COL2 LABEL:

Enter the second column label:

[t] [i] [t] [l] [e] [2] [ENTER]

Unless you have moved your position from the bottom row, you should see:

title2, inven ?.00

Press [↵] and in response to COL3 LABEL: type:

[t] [i] [t] [l] [e] [3] [ENTER]

If you have not already discovered it, pressing the [↑] moves you up a vertical column of your spreadsheet and pressing the [↓] moves you down a vertical column. Similarly, pressing [←] and [→] moves you left and right across a horizontal row. Experiment with the arrow keys. Note that when you bump into the left edge or the top edge of the spreadsheet, you will hear a beep and be unable to move beyond that point. However, if you bump into the right edge, you are given the chance to add another column. If this happens, you can press [←] and you will be returned to the point where you left the defined spreadsheet. If you bump into the bottom of the sheet, you are given the chance to add another row. Touch [↑] and you will be returned to the point where you left the spreadsheet.

Each column of the Portacalc spreadsheet must have the same number of cells; similarly, each row must have the same number of cells. Thus, the spreadsheet will always be either square or rectangular. You can have a spreadsheet with up to 250 rows and 250 columns. However, because of memory restriction, you will not be able to make a file this large in both directions. After entering some rows and columns, you can check to see how much free memory you have by pressing [I/O]. If you run out of memory space for your spreadsheet, you may want to delete some old files or part of old files.

Exiting and Entering a File

To exit a file, press the [CLEAR] key (once or twice) and you will be returned to your Portacalc file menu. If you wish to enter the HHC Primary Menu, press the [CLEAR] key one more time. In the Portacalc file menu accessed from the HHC Primary Menu you will see the file name Product-Analysis preceded by a letter or a number. In order to return to the file for examining, modifying or printing it, press the corresponding number or letter. The file name ProductAnalysis will appear momentarily in usual graphics followed by inverse graphics (white on black). Any time the file name has been selected and is displayed it can be changed by overtyping, or the entire file can be deleted by pressing the [DELETE] key and then the [ENTER] key. If you edit a Portacalc file name to longer than 15 characters, the name will be shortened to the first 15 characters when used within Portacalc.

This concludes Lesson 1. You have named a file, constructed its row and column framework and learned how to enter, exit and delete it. You are now ready to proceed to Lesson 2 which demonstrates how to enter the values that occupy the positions in that framework.

LESSON 2: Entering Data

Turn on your HHC. If you are not in the ProductAnalysis file, enter it via the appropriate menu selections. Note that when you press the [ENTER] key when the inverse file name is displayed, you are always placed in the upper left hand corner of your spreadsheet. If, when you turned on your HHC, you were in the spreadsheet, press the [▲] and [◀] keys until you are positioned in the first column and first row. Using either route, you should see:

```
title1,unit$  ?.00
```

Observe that the file system is set to automatically accept dollars and cents, i.e., two places to the right of the decimal point. NOTE: You will not be able to type in commas or dollar signs when you enter numbers. When entering dollar amounts, you must enter only numbers and, if needed, a decimal point and two additional numbers. If you do not enter a decimal point and two numbers, the figure will still carry “.00” in its representation. This feature makes entering even dollar amounts easy.

Setting Digits

There are times when two places to the right of the decimal don't make much sense, e.g., when the data represents such quantities as people or number of books produced. There are also times when you may wish to display more than two digits to the right of the decimal. In both cases, you can selectively set the number of digits to the right of the decimal to be displayed in each column, row or entry (cell) in your file. But no matter how many digits you chose to have displayed, the HHC memory will retain 12 significant digits and will make calculations using numbers in memory, not those displayed. If you select 11 or fewer digits to be displayed, the right most digit is the result of rounding, rather than truncating; with 12 digits the last digit is the result of truncating.

To enter the values for the first row given on your sample spreadsheet, press:

```
[2] [.] [9] [5] [▶]
```

and you will see:

```
title2,unit$  ?.00
```

The [▶] has entered the value and moved you one entry across to you right. Since the second entry in row 1 is an even dollar amount, to enter it all you need press is:

```
[6] [▶]
```

and you end up in the third entry across in row one. Enter the remaining value for row one:

[9] [.] [9] [5] [ENTER]

To check your entries, press [◀] until you bump into the left edge of the spreadsheet. If you find a discrepancy, merely overtype the correct value. Note that even though you did not enter the “.00” for title2,unit\$, the HHC has automatically supplied it.

When you reach the left edge of row one, press [▼] and you will see:

title1,#prod ? .00

Since the number of books produced is a whole number, there is no point in displaying two places to the right of the decimal. To adjust the number of digits, press the [SET DIGITS] key and you will see:

SET ONLY THIS CELL Y/N?

Because the entire row should be expressed as whole numbers, press [n] for no. (If you had wanted to set the digits for only this particular cell, you would have pressed [y] for yes and you would skip the next prompt.) To set the digits in an entire column or row, you can enter the set digit mode by pressing the [SET DIGITS] key while in any cell on that column or row. You should now see:

SET ROW OR COL (R/C)?

Press [r] for row. (If you had wanted to set the digits for the first column, you would have pressed [c] for column.) You will see:

DIGITS (0-12)

For whole number display, type [0] and press the [ENTER] key.

You will see:

title1,#prod ?

Notice that the “.00” has disappeared from the prompt. Type:

[2] [5] [0] [0] [0] [▶]
[1] [5] [0] [0] [0] [▶]
[2] [0] [0] [0] [0] [ENTER]

Checking your entries, press the [▶] key and move back to the left edge of your spreadsheet.

Press [▼] and you will see:

title1,#sold ? .00

Repeat the procedure for setting the digits to zero by pressing [SET DIGITS] [n] [r] [0] [ENTER]. Enter the values for the third row:

```
[1] [8] [0] [0] [0] [▶]
[1] [3] [5] [0] [0] [▶]
[6] [0] [0] [0] [ENTER]
```

Check your entries by pressing [◀] and move to the fourth row by pressing [▼].

You should see:

```
title1, #hand  ?.00
```

Set digits to zero by pressing [SET DIGITS] [n] [r] [0] [ENTER]. Since the entries on this row and the next are the result for formula calculations explained in the next lesson, leave this row alone for now.

Editing Labels

If you would like to change a column or row label after it has been entered, you can modify the label by pressing the [EDIT LABELS] key while in the column or row whose label needs to be changed. For this example, position yourself anywhere in the “inven” row. You have decided that the “inven” label is confusing because inventory can sometimes refer to units and other times refer to dollar value. What’s more, you would like your inventory expressed as a dollar value and a label that suggests your choice. You decide to change the label “inven” to “inven\$”.

Press the [EDIT LABELS] key and you will see:

```
LABEL ROW OR COL (R/C)?
```

Since you are going to change the row label, press [r]. (If you had wished to change a column label you would have pressed [c].) You should see:

```
ROW5 LABEL: inven
```

with the cursor flashing on the first letter of the label. Simply overwrite your new label:

```
[i] [n] [v] [e] [n] [$]
```

and press the [ENTER] key. You will be returned to the spreadsheet at the point from which you left it with the new label displayed.

While in the edit label mode, [▶] and [◀] will only position the cursor, not move you to adjacent columns. If you decide not to change a label after you have entered the edit mode, press either [r] or [c] and then the [ENTER] key or simply

press the [CLEAR] key. You will be returned to the spreadsheet with the original label intact.

If you ever have need to shorten an existing label, enter the edit label mode, position the cursor on the character to be deleted, and press the [DELETE] key followed by either [▶] or [◀]. If you ever have need to insert a character into a label that is less than six characters in length, enter the edit label mode and overwrite the entire label. As an alternate method of insertion, you can position the cursor on the character immediately following the place for the insertion. Press the [INSERT] key and type the character to be inserted. The same techniques are demonstrated in a later lesson on the editing of formulas. It doesn't make a difference whether the character to be inserted or deleted is a number, a symbol, a space or a letter.

Headers and Footers

You can create a title (or header as it is known in the world of computer buffs) for your spreadsheet. The header will be shown only when you print all or part of your file. You will learn how to print files later on.

Let's give your example file the title "Product Analysis". It is super easy to do. Simply press the [EDIT HEADER] key and you will see the blinking cursor and a blank line. Type:

```
[P] [r] [o] [d] [u] [c] [t] [SPACE]  
[A] [n] [a] [l] [y] [s] [i] [s] [ENTER]
```

and you will be returned to the cell you were in when you pressed the [EDIT HEADER] key. Notice that you can use the space or any of the characters you may wish in the header. The header can be no longer than 40 characters and can be modified by pressing the [EDIT HEADER] key and using the same procedures as in editing labels.

Creating a footer (information printed at the bottom of a file) is done in a similar fashion. Let's add the footer "Baker and Nelson, Associates" to your example file. Press the [EDIT FOOTER] key and type:

```
[B] [a] [k] [e] [r] [SPACE] [a] [n] [d] [SPACE]  
[N] [e] [l] [s] [o] [n] [,] [SPACE]  
[A] [s] [s] [o] [c] [i] [a] [t] [e] [s] [ENTER]
```

As with the header, editing the footer can be accomplished by pressing the [EDIT FOOTER] key and using the same procedures as in editing labels.

You have now completed Lesson 2. In this lesson you have partially filled out the network of columns and rows established in Lesson 1. You have learned how to display the

appropriate number of digits to the right of the decimal for individual cells or entire columns or rows. You have also discovered how to modify existing labels with the [EDIT LABELS] key, as well as how to create and modify headers and footers. In the next lesson you will learn how to have your Portacalc Capsule calculate values for two of the rows in your present spreadsheet example.

LESSON 3: Formulas, Part 1

The formula handling capability of your Portacalc Capsule is extremely powerful and sophisticated. You may enter formulas up to 80 characters long containing perhaps as many as 6 – 10 levels of nested parentheses. Formula manipulation lies at the heart of your spreadsheet, and mastery of its principles is essential if Portacalc is to be used to its potential.

Enter the ProductAnalysis file and position yourself in column1, row4. You should see:

```
title1,#hand  ?
```

To calculate the number of title1's on hand you would subtract the number sold (#sold) from the number produced (#prod). To have the spreadsheet perform the calculation, first press the [EDIT FORMULAS] key. A blinking cursor appears in the window prompting you to enter your formula. Enter the formula: title1,#prod – title1,#sold.

```
[t] [i] [t] [l] [e] [1] [,] [#] [p] [r] [o] [d] [-]
```

```
[t] [i] [t] [l] [e] [1] [,] [#] [s] [o] [l] [d] [ENTER]
```

You should now briefly see a blinking asterisk, which tells you the spreadsheet is calculating the answer, followed by

```
title1,#hand  7000
```

Notice that the label title1, #hand is now displayed in inverse graphics (white on black). This type of display is always used to alert you that the values in this cell were arrived at by means of a formula calculation.

If you make an error in setting up the formula, either in the formula itself or in a faulty reference to a cell which does not exist, you will see one of several possible error messages. For a precise explanation of the error, refer to the "Error Messages" part of the TECHNICAL SECTION of this manual. An error message will not appear for a formula that is technically correct but logically unsound. For example, if you had mistakenly substituted a "+" sign for the "-" sign in the above formula, your spreadsheet would not have caught the error.

If you get an error message, touch any key and you will see your formula again. By pressing [▶] or [◀] you can move the cursor across the formula and can retype it correctly. You can also use the [INSERT] and [DELETE] keys to edit the formula in the same manner explained in the "Editing Labels" section of Lesson 2. If the mistake is not immediately apparent, you can escape the edit formula mode by pressing [CLEAR] and reentering the spreadsheet in order to verify the accuracy of the labels used in the formula. Before pressing [CLEAR] you may wish to make a copy of the offending formula by hand or by pressing the [PRINT FORMULAS] key; with some errors, the formula will be lost when you leave the edit formulas mode.

Proceed to have the Portacalc Capsule compute the remaining values in row 4 by pressing the [EDIT FORMULAS] key while in the appropriate cells and, if needed, consulting the following list of keystrokes.

```
[EDIT FORMULAS] [t] [i] [t] [l] [e] [2] [,]
[#] [p] [r] [o] [d] [-] [t] [i] [t] [l] [e] [2] [,]
[#] [s] [o] [l] [d] [ENTER] [▶]
[EDIT FORMULAS] [t] [i] [t] [l] [e] [3] [,]
[#] [p] [r] [o] [d] [-] [t] [i] [t] [l] [e] [3] [,]
[#] [s] [o] [l] [d] [ENTER]
```

Entering the formulas for each of the three titles was not extremely taxing. Imagine, however, the monotony of entering the same formula for over one hundred titles. Fortunately, the Portacalc spreadsheet has a solution to this problem.

Formula Duplication

Position yourself in any cell on the inven\$ row. If you are in the first column, you should see:

```
title1, inven$ ? .00
```

In order to determine the dollar value of the inventory, you can use two possible formulas. You could multiply the unit price by the number of books on hand, or you could subtract the number sold from the number produced (giving you the number on hand) and multiply that result by the unit price. Although you can use the entries from the "#hand" row in a formula, the latter method will give you practice setting up a series of calculations. The longer the formulas, the more you will appreciate that you only have to type in a formula once.

Before you set up the formula, there are some very important facts about arithmetic operations you should know. Unless it is told otherwise, the computer will always raise a value to a power before it multiplies or divides and will always multiply or divide before it adds or subtracts. You

tell the computer otherwise by means of parentheses. As you are in column 1, your formula should look like this:

(title1, #prod - title1, #sold)* title1, unit\$

If you were in column 2, the only difference between this formula and the one you would now use would be that you would use a "2" where above you used a "1". Replacing 1 with 3 would be the only change made for column 3. Since it is only the column part of the cell label that varies in the formula, you can shorten your typing considerably by replacing the column label with "?". This allows the spreadsheet to determine which column you are in and make the appropriate substitution for you.

Press the [MEMORY] key and in response to:

MEMORY:

type:

[() [?] [,] [#] [p] [r] [o] [d] [-]
[?] [,] [#] [s] [o] [l] [d] [)] [*]
[?] [,] [u] [n] [i] [t] [\$] [ENTER]

When you pressed the [ENTER] key, the HHC window accepts the formula in its memory and returns you to your position in the inven\$ row. To enter the formula across the row, press the [M→F] key (Memory to Formula key) and you will see:

INSERT FORMULA ->

This prompt is simply a double-check prompt. If you change your mind and do not wish to insert a formula, press the [CLEAR] key. However, you do wish to insert a formula so press the [ENTER] key and you will see the formula currently held in memory scroll across the HHC window, coming to rest with

rod-?, #sold)*?, unit\$ Y/N?

visible in the window. The "Y/N" gives you an opportunity to accept the formula you saw scroll across the window, or to reject it. Since this is the formula you wish to use, press [y] and you see:

ONLY THIS CELL Y/N?

Since you wish to have this formula to compute the inventory value all across the inven\$ row, press [n]. If you were moving a formula from memory to this cell only, then you would have pressed [y] and been returned to your spreadsheet and placed in this cell with the value computed. When you pressed [n] you should see:

SELECT ROW OR COL (R/C)?

You have a choice of duplicating the formula for the entire row that you are in or for the entire column that you are in. Since you wish to move the formula to other cells in the row, press [r].

You will see ENTER BOUNDS momentarily, followed by the prompt:

```
FIRST COL
```

Press the [ENTER] key and the formula will be duplicated for the entire row. You should see the warning:

```
* DO NOT PRESS CLEAR *
```

for a few moments, followed by

```
title3,inven$ 139300.00
```

The HHC has calculated the inventories for titles1, 2 and 3 and has placed you in the last cell calculated. In inserting row and column labels you were warned not to press the [CLEAR] key while the HHC performed file manipulations. This injunction applies here and must be heeded whenever you see the warning. Whenever you see a flashing asterisk (that often follows this warning message) you can not press the [CLEAR] key. It will not damage your file; however, calculated values may not be accurate since you may have interrupted the HHC during calculations.

If you had wished to restrict the formula to the cells in columns 1 and 2, you would have typed:

```
[t] [i] [t] [l] [e] [1] [ENTER]
```

You would then see:

```
LAST COL
```

Since your spreadsheet has only three columns, your choice here is not very great. You could type the label for column 1, and the formula would then be restricted from column 1 to column 1 (the same effect as pressing [y] to ONLY THIS CELL Y/N?). At this point, you could type the label for column 2:

```
[t] [i] [t] [l] [e] [2] [ENTER]
```

and you would be placed in the title2, inven\$ cell with the values calculated for titles 1 and 2.

Now press [←] and move across the row. You should see that the title2 inventory has been calculated to be 9000.00 and the title1 inventory has been calculated to be 20650.00. The labels for all the cells on the inven\$ row should be in inverse graphics.

CAUTION

When you define a formula into a memory, you must place a space between “?” and “+” or “-”. For example,

title1,?-title2,?

produces a wrong result. It should be

title1,? -title2,?

When you define a formula by the [EDIT FORMULAS] key, you can ignore this restriction.

Relative Referencing

When you used the question mark in the formula that was moved across the row, you used a form of something that is called relative referencing. This form of referencing is called “relative” since the actual column or row label that the question mark assumes is related to the column or row in which the formula appears.

For example, the formula: ?,unit\$ * ?,#prod will multiply the unit price of title1 times the number produced of title1 if the formula is inserted in the title1 column. However, if the formula is inserted in the title3 column, then the formula will multiply the unit price times the number of title3 printed.

Relative referencing can be more powerful than this, although it becomes slightly less intuitive. You can add or subtract a positive integer from a question mark used for a column label to refer to the column either to the right (when added) or to the left (when subtracted) that number of units away. Similarly, when a positive integer is added to a question mark used in a row label, the formula uses the value in the row that many units below the question mark.

The formula that you inserted into the inven\$ row above could have been shorted even more to the formula that follows.

(?,?,-3-?,?,-2) * ?,?-4

You can see that this formula is much shorter, but is not nearly as self-evident. For this to work you must have inserted this formula into the inven\$ row. The first question mark in the label ?,?-3 refers to whatever column you are in. The second question mark refers to the row that is 3 above the row the formula is in. For the rows to work out, the row with the formula and the row you are in must be 3 below the #prod row.

When using question marks in formulas, you must be very

careful about your spacing. For example:

title1,?-3

refers to the cell in the title1 column that is three rows above the position of the formula. However, the formula:

title1,? -3

subtracts 3 from the value of the cell in the title1 column that contains the formula. So, if you do not wish to relate your formula to rows or columns other than the row or column the formula is in, be sure to leave a space (or a comma) after all question marks.

Function Keys

The function keys can be very useful when handling formulas. You can use them to store constants, such as pi, the exponential e or any frequently used value. You can also use them to store long column or row labels and functions. By storing these frequently used expressions in the function keys you can greatly facilitate the writing of formulas by reducing the number of keystrokes. For example, if you are using pi=3.14159625 in formulas, you can get 10 keystrokes for the price of one.

This completes Lesson 3. In this lesson you have learned how to enter a formula that operates on the values contained in various cells. Further, you have learned how to move a formula in one cell to another cell, to part of a row or column or to an entire row or column. You have also learned the order of arithmetic operations, how to construct a formula using parentheses to alter this operational order and how to store constants in any of the function keys. Because the formula handling capacity of Portacalc is much more involved than can be presented in a single lesson, future lessons will explore other avenues of formula manipulation.

LESSON 4: File Management

In the last lesson you learned how to use formulas. Before you study some more advanced formula operations, it is necessary that you expand your file handling techniques.

Deleting and Inserting

While in the spreadsheet, the [DELETE] and [INSERT] keys can be used to delete or insert whole rows or columns. To delete a row, position the window on any entry within the row and press the [DELETE] key. You will see the prompt:

DELETE ROW OR COL (R/C)?

Press [r] and you will see the specific row label to be deleted preceded by DELETE and followed by Y/N?. This gives you an opportunity to change your mind. If you still wish to delete the row, press [y] and the row will vanish. If you change your mind, press [n] and you are returned to the row entry you started from. If you press [y] to delete the row you will see the warning:

* DO NOT PRESS CLEAR *

This warning must be heeded while the HHC performs the necessary file manipulations to delete the row. The same warning appears while the HHC inserts rows or columns and must be similarly obeyed upon penalty of file death!!!

Similarly, if you wish to delete a column, position the window on any entry in that column and press the [DELETE] key. Then press [c] in response to:

DELETE ROW OR COL (R/C)?

You will see the column label to be deleted preceded by DELETE and followed by Y/N?. Press [y] and the column will vanish. We haven't had you delete any of the rows or columns in your sample sheet since this would necessitate your typing the deleted row back in.

Enter the spreadsheet sample file and press [▼] until you see the prompt:

ROW6 LABEL:

Through an intentional oversight, enter the label "com%" instead of the label "pandb"; type:

[c] [o] [m] [%] [ENTER]

When you press the [ENTER] key, you will see: title1, com% @?.00. Since you are going to use a formula to compute the entries in this row, don't bother to try filling the data in yourself.

Instead, suddenly realize that you have omitted the row labeled "pandb". However, you are not one to panic, so you position yourself in any cell in the "com%" row and press the [INSERT] key. You will see:

INSERT ROW OR COL (R/C)?

Press [r] for row, and you should see:

ROW6 LABEL:

Type in the new row label:

[p] [a] [n] [d] [b] [ENTER]

You will then be prompted to enter the values in the inserted row. Rows are inserted above the row you were in when you pressed the [INSERT] key. Columns are inserted to the left of the column you were in when you entered the insert mode.

Now complete the sample spreadsheet found in Lesson 1, page 4. Try to enter the values without consulting the list of keystrokes below. Starting from title1, pandb,

```
[.] [8] [5] [▶]
[1] [.] [4] [0] [▶]
[3] [.] [2] [5] [ENTER] [◀]
[◀] [▼]
[.] [0] [5] [▶]
[.] [0] [6] [▶]
[.] [0] [7] [ENTER] [◀]
[◀] [▼]
[d] [i] [s] [c] [ENTER]
[.] [3] [5] [▶]
[.] [5] [0] [▶]
[1] [.] [1] [0] [ENTER] [◀]
[◀] [▼]
[r] [o] [y] [a] [l] [ENTER]
[.] [1] [0] [▶]
[.] [2] [5] [▶]
[.] [5] [0] [ENTER] [◀]
[◀] [▼]
[v] [c] [o] [s] [t] [ENTER]
[▼] [f] [c] [o] [s] [t] [ENTER]
[9] [0] [0] [0] [▶]
[9] [0] [0] [0] [▶]
[9] [0] [0] [0] [ENTER] [◀]
[◀] [▼]
[p] [r] [o] [f] [i] [t] [ENTER]
```

Press [▶] until you see:

```
COL4 LABEL:
```

We will use this column to show the totals of the values in the rows. Type:

```
[t] [o] [t] [a] [l] [ENTER]
```

Move to the top of the spreadsheet by pressing [▲]. As you move up the total column, notice that the total of some rows could prove to be quite useful. However, the total of other rows is really rather meaningless.

Sum Function

To get total values into the fourth column, position yourself anywhere in the fourth column and press the [MEMORY] key. You want to add the row entries across the first, second

and third columns. Before you enter the formula to do this, you must erase the formula currently held by the [MEMORY] key since the HHC will accept only one formula at a time from the [MEMORY] key. Deleting the formula from the [MEMORY] key area does not affect any formula previously established to perform a calculation for a cell or row or column. When you press [MEMORY] you should see the last formula used to calculate the inventory. To delete a single character from a formula you may press the [DELETE] key followed by the [▶] key. You may use this method many times to delete an entire formula. However, to speed up the deletion process, press the [LOCK] key followed by the [DELETE] key. Holding down the [▶] key will delete all characters to the right of the cursor. Holding down the [◀] key will delete all characters to the left of the cursor. If your finger gets tired holding down the [▶] key you can press the [LOCK] key and the [▶] key one time and get the same results.

Once the formula has been cleared, press the [DELETE] key a second time, and you are ready to enter the new formula that will total the rows. To do this, we will use a very useful function called @SUM. Type:

```
[@] [s] [u] [m] [(] [t] [i] [t] [)] [e] [1] [,]
[?] [SPACE] [t] [i] [t] [)] [e] [3] [,]
[?] [)] [ENTER]
```

Take special note of the space inserted after the question mark in the @SUM function. The space is used to separate the starting cell and ending cell for whatever row the formula is used in. The question marks allow you to use the formula in any row without having to specify the row label.

The formula is entered into memory and you are returned to the cell in the fourth column from when you pressed the [MEMORY] key.

Before you go roaming, press the [M→F] key and in response to INSERT FORMULA → press the [ENTER] key. You will see the formula pass by and the question prompt "Y/N?". Press [y] and in response to ONLY THIS CELL Y/N? press [n]. You are asked SELECT ROW OR COL (Y/C)?. Press [c] because you wish to use the formula to compute the total values found in the total column.

Very briefly ENTER BOUNDS will appear, followed by:

```
FIRST ROW
```

Since you are going to compute the totals for all rows, press the [ENTER] key. After the warning message * DO NOT PRESS CLEAR * you are returned to the bottom cell of the fourth column. You can now press the [▲] and [▼] keys to see the row totals.

Alternate Labels

As you move up the fourth column, you may notice that some of the totals make sense, while others are essentially meaningless. For example, at the top of the column you should see:

```
total,unit$ 18.90
```

This total (\$18.90) has little relevance to most situations since it is the sum of unit prices. Even average price of books sold wouldn't use this since the average price would need to take into account the numbers of each unit sold. To alert you that some values in the total column don't make much sense and exist only because your spreadsheet must be rectangular, you can substitute a new label in place of the old one, total, unit\$.

Press the [EDIT ALT.LABELS] key and you will see:

```
ALT. LABEL:
```

You can select any label up to 12 characters. You will not be able to use a space or any of the reserved characters: [,] [(] [)] [/] [?] [+] [-] [*] [@] [^]. You will be unable to enter duplicate alternate labels. You will be unable to use a number for an alternate label. However, you can use numbers in an alternate label. For this example type:

```
[i] [g] [n] [o] [r] [e] [1] [ENTER]
```

You should see:

```
ignore1 18.90
```

Once you enter an alternate label for a cell, that label will be displayed instead of the column, row label. A similar procedure is warranted for the "pandb", "com%", "disc" and "royal" rows. Since you can't repeat alternate labels, you might enter alternate labels "ignore2", "ignore3", etc. You may notice that these five cells represent wasted space in your spreadsheet. It is possible to use this space, together with alternate labels, to hold useful values such as tax rate, social security rate, etc. You will explore this further in the next lesson.

For now, though, you've been through quite a bit of typing and are probably ready to quit. But you've learned several important features of your Portacalc spreadsheet: how to insert and delete entire rows and columns; how to use the @SUM function (more on functions later) and how to make alternate labels.

LESSON 5: Potpourri

In this lesson you will learn various and sundry characteristics of your spreadsheet. Familiarity with these features will enable you to avoid and correct problems and make your life with Portacalc easier.

Force

When you press the [FORCE CALC] key, you will see a blinking asterisk. The asterisk will blink for as long as it takes to recalculate every formula in your spreadsheet. Whenever you first enter a cell whose value is determined by a formula you may see the blinking asterisk as the HHC calculates formulas for all cells above and to the left of the cell you entered. However, some of the cells below or to the right of the cell may not have been recalculated. If you wish to ensure that all formulas are working with updated data, you can press the [FORCE CALC] key. For example, you can use the [FORCE CALC] key after having entered new data into some cells in order to ensure that the figures in a printout are current. Entering new data will generally force the proper calculations unless forward referencing is used.

Another use of the [FORCE CALC] key is to perform repeated calculations on the same data. This is called recursion. For example, suppose a cell contains 100.00 principal. Using the formula: $\text{cell label} * .05 + \text{cell label}$ will compute the amount of principle after one compounding period at 5%. You may note that this formula can be shortened to the more efficient formula: $1.05 * \text{cell label}$. After the formula is entered and the [FORCE CALC] key is pressed, the cell will display 105.00. After the [FORCE CALC] key is pressed a second time, the cell will display 110.25. Pressing the key a third time will yield 115.76. Continuing to press the [FORCE CALC] key will continue the compounding process.

Clearing Formulas

There are times when you may have a formula which just doesn't work; for example, each time you attempt to enter the cell that contains the formula you see INVALID VAR ->. This may be caused by typing errors in the formula (such as mistyping the row or column label or putting a space between column and row labels). At other times the error may be that you are referencing a label that was misspelled when the label was first entered. In any case, you may escape the INVALID VAR -> by pressing the [ENTER] key and editing the formula. You may elect to delete the entire formula and start over.

Deleting a formula is not that difficult. If you see INVALID VAR →, touch any key and you will be returned to the formula that is causing your grief. To delete the formula, position the cursor in the first character of the formula by pressing [◀] until it bumps into the left margin with a beep. Press the [LOCK] key followed by the [DELETE] key. In the HHC window you should see the small triangular attention marker above window label "DELETE". Then hold down the [▶] key. The cursor becomes a square box and gobbles the characters rapidly. When the last letter has been deleted, only the box remains and the HHC beeps to let you know it's finished. Press the [DELETE] key again. Because you can remove a formula with little trouble, there may be times in which it would be easier for you to duplicate a formula for an entire column or row and then clear the formula from selected cells rather than duplicating the formula for several sections of a column or row.

When a formula is deleted from a cell, the existing data value (which was probably calculated by that formula) remains unchanged. Another cell using that cell in a formula will use that value in any successive calculations. You may wonder what happens if you delete an entire row or column and there are formulas that use cells in the deleted row or column. Those formulas will also be deleted. You will be given no prior warning message and no after the fact message that this has occurred.

Print File

There will be times when you want a printout of part or all of your entire spreadsheet. To do so, press the [PRINT FILE] key. You should see:

```
ENTER UPPER LEFT
```

If you wish a copy of the entire file, you should press then [ENTER] key. There are times in which you wish to print only part of your spreadsheet. You must enter two coordinates. The first must correspond to the upper left hand corner of the rectangular block of entries to be printed. This label would be typed in response to the above prompt.

Once the upper left hand corner label has been entered, you should see:

```
ENTER LOWER RIGHT
```

This second coordinate must correspond to the lower right hand corner of the rectangular block to be printed. For examples, if you wanted to have a hard copy of the second and third columns from the printing and binding row (pandb) to the royalty row (royal), then you would enter "title2, pandb" to the prompt ENTER UPPER LEFT and you would

enter "title3,royal" to the prompt ENTER LOWER RIGHT. If you want to print all or part of a single row or column, simply enter the coordinates that define the beginning and ending entries.

Whether you elect to print your entire file or only a portion of it, your next prompt will be:

ENTER MAX PRINT WIDTH

You should then enter the number of characters that the particular printer you are using will accommodate. For example, the HHC Color Plotter will print 40 characters per line, as will the HHC Mini Printer. However, you may have your HHC connected to a line printer with a width of 80, 120 or 132 characters. You can restrict the width to any number of characters between 13 and 132. In any case, type the appropriate number and press the [ENTER] key. If you do not specify the maximum print width, the default number 40 is used when you press the [ENTER] key.

At this point the printing device will spring to life, and you will see in the HHC window the characters that are being printed. Of course, you must have used the [I/O] key to turn on the printing device. Since you entered the printer line width, the HHC will print only the number of columns that your paper will accommodate. If there are more unprinted columns, the paper will be advanced and these remaining columns will be printed. The second set of columns to be printed will be separated from the first by several blank lines. The blank lines are intended to help you cut your paper so that you can duplicate the arrangement of your spreadsheet.

Print Alternate Labels

Since you are not allowed to enter duplicate alternate labels, you may wish to get a printout of all the alternate labels that are defined for your spreadsheet. From any cell, simply press the [PRINT ALT.LABELS] key and your printer will print each alternate label followed by the original column, row label it replaced. There is no provision to list column, row labels.

Print Formulas

You may wish to have a printout of your formulas, either to troubleshoot the formula or merely to keep a record of those formulas that are being used. From any cell, simply press the [PRINT FORMULAS] key and for those cells that have formulas defined, your printer will print each alternate label (if one has been defined) or column, row label followed by "=" and the formula for that cell.

If you have a long formula and then edit the labels in the formula to make the labels longer, the formula may exceed 80 characters. If you try to print the formula, when the HHC comes to a formula with more than 80 characters, the printer will stop and the HHC will display:

```
FORMULA TOO LONG ->
```

To continue printing, press the [ENTER] key and the message FORMULA TOO LONG will be printed together with the first 80 characters of the formula. If you want a printout of the complete formula, you must edit your labels to shorter labels.

Print Tabs

Although the tab function of your spreadsheet will not be explained until Lesson 7, it is an easy matter to list all tab-stop positions. All you do is press the [PRINT TAB] key. The printer will then print the alternate label (or column, row label if no alternate label has been specified) followed by the value in each tabbed cell.

Scientific Notation

Your spreadsheet will accommodate cell entries up to 12 characters (counting a decimal point as one, if included, and a minus sign as one, if included). Any larger or smaller numbers requiring more than 12 characters for expression cannot be directly entered as a cell value. In scientific applications, however, there is often need for very large or very small numbers. Cells in your spreadsheet can hold larger numbers when these numbers are generated by formulas.

For example, if you wished to enter the distance of a star which is 15 light years away, you could use the technique of positioning yourself in the cell to have this entry, pressing the [EDIT FORMULAS] key, and entering "15 * 6 * 10^12" and pressing the [ENTER] key. You should see in the HHC window:

```
8.999999E13
```

which stand for 8.999999 times 10 raised to the 13th power. The maximum limit in scientific notation is 10 raised to the 1023rd power or -1024th power (10^{-1022} to 10^{1023} for input). Similarly, a molecules weight could be entered using the [EDIT FORMULAS] key by typing $4.5 * 10^{-14}$ and pressing the [ENTER] key. You would see:

```
4.50000E-14
```

Enigmatic Errors and Dizzy Displays

You are by this point familiar with the display $?.00$ that indicates that no value has been entered into a cell. The question mark is sometimes referred to, by those more erudite than ourselves, as an enigma. Besides denoting empty (or null) cells, enigmas sometimes are the results of certain calculations. An enigma may occur when a negative number has been raised to a non-integer power and the computer, because it is digital, cannot determine whether the result is real or complex. For certain undefined quantities, such as the log of zero, an enigma may also occur.

The symbol i , familiar from elementary algebra, stands for the imaginary (or complex) number that is the square root of -1 . The Portacalc Capsule displays this symbol whenever the square root is computed for a negative number. It also occurs when 4th, 6th, 8th, etc. root of a negative number is calculated.

The symbol Z may be displayed whenever division by zero has occurred, or division by an expression that evaluates to zero. However, in the case that a divisor gets very small through successive calculations, it is likely that an overflow (V) error will result. For instance, if the calculated value exceeds 10^{1023} , an overflow error will occur. Using certain calculations, an underflow (U) may also occur. In particular, should the number be smaller than $9.999E-1024$ or $-9.999E-1024$, then an underflow error will occur.

An underflow (U) may also result if a non-zero number with absolute value less than one has no non-zero digits in the number of digits set by the [SET DIGITS] key. For example, if digits are set to 2 then the number $.007$ will not be displayed. Rather, the symbol U will be displayed. By setting digits to 3 or a larger number the number will be displayed. This holds for numbers in decimal notation. If a number is small enough to require that it be expressed in scientific notation, then it will be so expressed and will not be affected by the set digits value.

If you enter a formula involving one of the five errors mentioned above, if the Calc function is on and if the formula involves powers, roots, exponents or logarithms, then the HHC will beep and display one of the following:

ERR#1

ERR#2

ERR#3

ERR#4

ERR#5

These messages are intended as “helpers” and the absence of an error message does not imply that the formula

is error free. The error message and the cell label will remain until another key is pressed. Then the normal display of the cell label and a U for ERR#1, V for ERR#2, i for ERR#3, Z for ERR#4 or ? for ERR#5 will be seen unless there are other error messages. Division by zero in formulas will almost always by pass the ERR#4 message and display the cell label with a "Z". The same error may occur more than once in a formula. Further, errors will be displayed in the order of occurrence. If the formula is edited or viewed by using the [EDIT FORMULAS] key, unless the [CALC ON/OFF] key is off, the formula will be recalculated when the [ENTER] key is pressed and again any error messages will appear.

Of course, the purpose of the messages is to help you to correct or change factors causing the error. If you ignore the messages, you will be spending much unnecessary time looking at repeated error messages.

This completes Lesson 5 in which you learned various facts and techniques concerning your spreadsheet operation. Included were how to clear formulas from selected cells, how to force recalculation of all formulas, how to print all or part of your spreadsheet, print alternate labels, print tabs, print formulas and how to use scientific notation for small and large numbers. You also were given some explanations of five of the error displays. In the next lesson you will learn more about formulas, and functions that you can use in your formulas.

LESSON 6: Formulas, Part 2

In Lesson 3 you learned about some of the powerful features of Portacalc's formula handling. This lesson will enlarge upon the topics introduced so that you can develop much more complex formulas. Of course, we cannot present all of the possible formulas which you may wish to use. The examples we present can serve as departure points for your creation of virtually infinite combinations of formulas constructed to meet your specific needs.

Functions

Your Portacalc spreadsheet has built into it ten of the most useful mathematical functions. These functions both facilitate and increase the power of Portacalc's formula handling capability.

@SUM(startingcell endingcell (optional factor))=

The sum of all or part of a row, all or part of a column, all values in a rectangular portion of the spreadsheet, or the entire spreadsheet. The startingcell and endingcell may be referenced with either its column,row label or the alternate

label. The starting cell should be to the left or above the ending cell.

The @SUM function can be used for totaling columns of inventory, rows of grades, or just about any application in which you need to add a series of numbers.

The @SUM function can also use a mathematical expression attached to the right of the ending cell label. For example,

@SUM(col1,row1 col5,row1^2)

will square each value in the first row from columns 1 through 5 and will add up the squares. Similarly,

@SUM(col1,row1 col1,row6+@LN(col2,row4))

will add the natural logarithm of the value in the column2,row4 cell to each of the values in column 1 from row 1 through row 6, and then total the values from row 1 through row 6.

The optional expression must occur to the right of the ending cell. If you wish to double the values in a column before adding, you could not use

@SUM(2*col1,row1 col1,row6) or
@SUM(col1,row1 2*col1,row6).

Rather, you would need to write:

@SUM(col1,row1 col1,row6*2).

@ABS(number or cell-label or expression)=

Absolute value of a number or mathematical expression, or the value stored in the cell. The cell-label may be either the column,row label or an alternate label. The absolute value of zero is zero, of a positive number is the same positive number, or of a negative number is the positive number obtained by dropping the minus sign in front of the negative number. If an expression is used, it can combine cell-labels with numbers, operations (+ - * /) and functions.

@EXP(number or cell-label or expression)=

The exponential value of a number or mathematical expression, or the value stored in a cell. The exponential function @EXP(x) is the number e (approximately 2.71828...) raised to the x power. The exponential function is defined for all real numbers from -2355 to +2355, not inclusive. The cell-label can be either the column,row label or an alternate label. The expression can combine cell-labels with numbers, operations and functions. The exponential function is often used by biologists to describe growths of populations of cells or by physicists to describe the decay of radioactive substances.

@LOG(number or cell-label or expression)=

The common logarithm (logarithm base 10) of a number or mathematical expression, or the value stored in a cell. The logarithm function is defined for only positive numbers (numbers greater than zero). The cell-label can be either the column,row label or an alternate label. The expression can combine cell-labels with numbers, operations and functions.

@LN(number or cell-label or expression)=

The natural logarithm (logarithm base e) of a number or mathematical expression, or the value stored in a cell. The logarithm function is defined for only positive numbers ($x > 0$). The cell-label can be either the column, row label or an alternate label. The expression can combine cell-labels with numbers, operations and functions. Natural and common logarithms often appear in conjunction with the exponential function in describing growth rates of populations or radioactive decay rates. Some financial formulas for business and economics also utilize log and exponential functions.

@SQRT(number or cell-label or expression)=

The square root of a number or mathematical expression, or the value stored in a cell. The square root is defined for only positive numbers or zero ($X \geq 0$, sometimes called non-negative numbers). The cell-label can be either the column,row label or an alternate label. The expression can combine cell-labels with numbers, operations and functions. The square root function appears in formulas for just about any discipline, from math and physics to chemistry to economics.

@FIX(number or cell-label or expression)=

The fix function. The fix function returns the integer (whole number) portion of the number or mathematical expression, or the value stored in a cell; that is, it drops all numbers to the right of the decimal point. For example,

$$\begin{aligned} @FIX(3.7) &= 3 & @FIX(1.9999) &= 1 \\ @FIX(-2.712) &= -2 \end{aligned}$$

The fix function is defined for all real numbers. The cell-label can be either the column,row label or an alternate label. The expression can combine cell-labels with numbers, operations and functions. The fix function is used in business and accounting formulas.

@NPV(startingcell endingcell rate/period)=

The net present value function. This function calculates the net present value of a series of cash flows. The starting cell and the endingcell may be referenced either by their column,row labels or alternate labels. Values included may be all or part of a column, all or part of a row, all of a

rectangular portion of the spreadsheet or the entire spreadsheet. The starting cell is the upper left hand corner of a straight line or rectangular block of cash flows. The ending cell is the lower right hand corner of the line or rectangular block of cash flows. Cash flows are sequenced from left to right, top to bottom. The rate/period refers to the discount rate, which may be a cell-label, number or mathematical expression.

Many investment examples involve a stream of uneven cash flows. In order to select the most profitable long-term project from several competing alternatives, a businessman should discount the anticipated future cash flow to its present value. The project with the highest present value makes the best investment. See the Example Section of this manual for a typical spreadsheet using the net present value function.

@CNT(startingcell endingcell)=

The number of cells in the straight line or rectangular block of the spreadsheet defined by using the startingcell as the upper left hand corner of the line or block and the endingcell as the lower right hand corner of the line or block. The @CNT function counts the number of cells in the line or block, whether they contain values or not.

The @CNT function is often used in conjunction with the @SUM function for determining the average (arithmetic mean) value within a block of values on your spreadsheet. The average value is simply the @SUM function divided by the @CNT function.

@NRT(integerN number or expression or cell-label)=

The Nth root of the number or mathematical expression, or of the value stored in the cell. The integer N must be a positive integer (whole number greater than zero). For even Nth roots, the number or expression must be non-negative (positive or zero) or an error message will result. The Nth root is a function particularly suited to mathematical and scientific applications; it also appears occasionally in business formulas.

Formula Format

The above functions can be used in formulas to determine values for any cell in your spreadsheet. To use a function in a formula, you must press the [EDIT FORMULAS] key or the [MEMORY] key and type the formula you wish bearing in mind the following points:

1. A function must be preceded by the character “@”.
2. There must be no space between the “@” and the function.
3. Your spelling must correspond exactly to that presented in this lesson.

4. Parentheses are necessary for all functions.
5. There must be no space between the function and the left parenthesis.
6. There can be leading and trailing spaces around numbers and operation symbols (+ - * /). There may be spaces before column,row labels, but none may appear within the labels. For example:
`@EXP(5 * col1,row3 + col1,row7 / 5).`
 Another example:
`@ABS((5 + col1,row3 + col1,row7)/7^3)`
7. Several functions may be combined in a single formula.
8. Formulas might contain only numbers, for example,

$$2 * (1.23+4.56) * 10^{15}/21$$

Formulas might contain cell labels as variables, for example, in

$$.05 * \text{title1,sales}$$

the column,row label will vary as you vary the actual entry value in that cell.

9. Because formulas are restricted to 80 characters and long cell labels can rapidly deplete this amount, you can use short alternate labels in formulas. For example, the shortest alternate label, 1 character long (such as "A"), can save you up to 12 characters over the regular labels for the cell (such as "title1,profit").

Forward Referencing

Your Portacalc spreadsheet will compute formulas just as you normally read, that is, from left to right and from top to bottom. Therefore, you should be particularly careful should you ever "forward reference". Forward referencing means including in a formula the label of a cell that occurs to the right or below the cell containing the formula. It is possible to get undesired results if the value in the forward referenced cell is itself the result of another formula.

Back in Lesson 4, using alternate labels you changed "total,unit\$" to "ignore entry". In order to avoid having to set up an entire row or column to contain the inventory tax (which is 3% of the total inventory value), you may be tempted to change the alternate label for the upper right hand corner of your spreadsheet to "inventorytax" and enter the formula:

$$.03 * \text{total,inven\$}$$

This is dangerous, since the inventory value is computed after this cell. Thus, if you had changed the number of books

sold, the inventorytax value would not be computed until after the new inventory value.

Saving memory by not enlarging the spreadsheet for a single entry is commendable, however. There is a safe cell available for you to use. The former total,royal cell won't be useful to you as it is, so you could have safely used the alternate label "inventorytax" for this cell and entered the above formula for it. Since the royalty row appears below the inventory row, all calculations to fix the inventory value will already have been made by the time the spreadsheet reaches royal row.

If there seems to be no easy way to avoid forward referencing, the file need not be abandoned as a lost cause. By pressing the [FORCE CALC] key several times, you can have the HHC calculate the forward referenced values and then the formula using these values will give you the correct results. With the example just given, if inventorytax is placed in the upper right hand corner of your spreadsheet, you would need to force calculations once to get a correct value in the total,inven\$ cell, then forced a second time to get a correct value in the upper right hand corner. If the value in the total,inven\$ cell is the result of forward referencing, you would need to force calculations once to get the correct value in the forward referenced cell, once to get the correct value in the total,inven\$ cell and once to get the correct value in the upper right hand corner cell. If you find this discussion confusing or tedious, simply avoid forward referencing.

Recursive Formulas

It is possible to use a cell's value in the same cell's formula. Each time the formula computes the value for the cell, it will use the current value in the formula to compute a new value. The process of using a formula referring to itself is called recursion. Recursion can be powerful and useful, but there are many dangers inherent in its use.

Suppose a cell has the alternate label "interest" and you wish to use the cell to compute the amount earned after several compounding periods. To keep matters simple, suppose the principal is \$1000 and the interest rate for a compounding period is 5%. Then you could insert the formula:

```
interest+.05 * interest
```

When you enter this formula into the "interest" cell (containing 1000.00) you will see the blinking asterisk followed by:

```
interest      1050.00
```

Press the [FORCE CALC] key and you will see:

```
interest      1102.50
```

which is the amount earned at the end of the second compounding period. Pressing the [FORCE CALC] key again will give you the amount earned at the end of the third compounding period. Each time you continue pressing the [FORCE CALC] key computes the interest for the next compounding period. A convenient shorthand for entering recursive formulas is to use $?,?$ for the label of the cell in which you are positioned.

When using recursion formulas you must take care in counting the number of times the value has been recomputed. For example, you may delete a column or row. When you do, all values will be recalculated, including that one in your recursion cell. You may leave to check the Portacalc file menu. When you return to the cell with the recursion formula, the value may have been recomputed. To avoid having the computer unintentionally recompute a recursion formula, you can press the [CALC ON/OFF] key to turn off computations. See Lesson 7 if this forward reference to the [CALC ON/OFF] key has piqued your curiosity. The [FORCE CALC] key is still activated to force the desired number of calculations.

Because it is easy to unintentionally alter the number of recursions performed. If you are unsure of the number of recursions and want to start over, you can move the formula to memory using the [F→M] key, clear the formula from the cell, reenter the initial value and move the formula back to the cell using the [M→F] key.

For recursion to occur, a cell's formula may not directly refer to that cell. For example, cell A may contain the formula $A=B+1$ while at the same time cell B may contain the formula $B=A+1$. This is analogous to the man who applied for a job as a technical writer. To the interviewer's marvel at the praise found in his letter of recommendation, the applicant retorted, "Well, what do you expect? It should be good. I wrote it myself." Beware of recursive formulas in sheep's clothing.

This completes Lesson 6. In it you have learned how to use the eight mathematical functions built into the Portacalc memory in setting up formulas. In addition, you have learned important rules that govern the formula construction, in particular the dangers of forward referencing and the proper use of recursive formulas. In the next lesson you will learn how to apply formulas in hypothetical situations.

LESSON 7: What If?

In this lesson you will learn how to use your Portacalc spreadsheet to examine alternative situations. One event will often cause ripples through a series of other events and

it is usually time consuming to determine precisely the effect one event has on the others.

Before you undertake some simulations, though, you must calculate profits. First, you need to calculate your variable costs.

Variable cost=

((percent commission times unit price)
+dealer discount+royalties) times number sold
+(printing and binding times the number produced)

Thus, you should position yourself in the "vcost" row, press the [MEMORY] key and type the formula:

```
[() [(] [(] [?] [,] [c] [o] [m] [%] [*]  
[?] [,] [u] [n] [i] [t] [$] [)] [+]  
[?] [,] [d] [i] [s] [c] [+]  
[?] [,] [r] [o] [y] [a] [l] [)] [*]  
[?] [,] [#] [s] [o] [l] [d] [)]  
[+] [(] [?] [,] [p] [a] [n] [d] [b] [*]  
[?] [,] [#] [p] [r] [o] [d] [)]
```

Press the [ENTER] key and you should be returned to the cell in the vcost row.

You should be very careful to type the formula correctly. Once the formula is entered into memory, the question marks are replaced by the column labels. Since there are seven question marks, this extends the length of the formula by 35 characters, thus exceeding the 80 character limit. Because of this you will be unable to edit the formula once it is entered. If you make an error in the formula, you have several options. One option would be to change the column labels from title1, title2 and title3 to t1, t2 and t3. Shortening the labels to these will be enough to keep the length of the formula to within 80 characters. Another choice would be to press the [MEMORY] key a second time and type in the formula once more, being very careful to get it right.

Move the formula into the cells in the vcost row by pressing the [M→F] key, pressing the [ENTER] key in response to INSERT FORMULA →, pressing [y] for the verification prompt at the end of the formula, pressing [n] to ONLY THIS CELL Y/N?, and pressing [r] in response to SELECT ROW OR COL(R/C)? In response to FIRST COL type [t] [i] [t] [l] [e][1] and press the [ENTER] key. In response to LAST COL type [t] [i] [t] [l] [e] [3] and press the [ENTER] key. You restricted the formula from entering the last column in your spreadsheet since you already have the formula for summing the rows there. A single cell cannot have two formulas at once. Just like people, cells cannot serve two masters at once.

When you press the [ENTER] key you should see:

```
* DO NOT PRESS CLEAR *
```

followed by:

```
title1,vcost 32005.00
```

Move to the "profit" row in order to set up the profit formula:

Profit=unit price times the number sold – (variable costs
+fixed costs)

Press the [MEMORY] key and see if you can type in the formula without consulting the list of key strokes listed below.

```
[?] [,] [u] [n] [i] [t] [$] [*]  
[?] [,] [#] [s] [o] [l] [d] [-]  
[(] [?] [,] [v] [c] [o] [s] [t] [+]  
[?] [,] [f] [c] [o] [s] [t] [)] [ENTER]
```

See if you can move this formula across the row without consulting the list of key strokes below.

```
[M→F] [ENTER] [y] [n] [r]  
[t] [i] [t] [l] [e] [1] [ENTER]  
[t] [i] [t] [l] [e] [3] [ENTER]
```

Move around your completed spreadsheet and compare your values with those in the spreadsheet below.

	title1	title2	title3	total
unit\$	2.95	6.00	9.95	18.90
#prod	25000	15000	20000	60000
#sold	18000	13500	6000	37500
#hand	7000	1500	14000	22500
inven\$	20650.00	9000.00	139300.00	168950.00
pandb	.85	1.40	3.25	5.50
com%	.05	.06	.07	.18
disc	.35	.50	1.10	1.95
royal	.10	.25	.50	.85
vcost	32005.00	35985.00	78779.00	146769.00
fcost	9000.00	9000.00	9000.00	27000.00
profit	12095.00	36015.00	-28079.00	20031.00

Calc On/Off

As you move about in your spreadsheet after changing some data values you may become tired of waiting for the spreadsheet to calculate formulas for cells affected by the changes. The [CALC ON/OFF] key acts as a toggle switch. It engages or disengages the formula recalculation ability. If you are entering a large number of data value changes, you may wish to suspend the calculations these changes involve

until you enter all the values. To do this, press the [CALC ON/OFF] key. Notice that the triangular blip above "ON LINE" is now visible in the HHC window. This blip indicates that the spreadsheet is not presently in the calculation mode. Now you are free to quickly move and edit data values without pausing while the HHC recomputes all the formulas affected by the changes. After you have completed your changes, merely press the [CALC ON/OFF] key a second time. Every formula will be computed with the changed data values.

Moving across to the "total" column, you can see that the total profit is \$20,031.00. However, as is immediately apparent, the loss sustained by title3 sales has gravely affected the total profits. You wonder how many of the title3 books you must sell in order just to break even.

Tabs

Before you continue, you need to first learn how to set and use tabs. Unlike the tabs on a typewriter, your spreadsheet tabs enable you to move forward and backwards, upwards and downwards. Since you are interested in the relationship between the profit for title3 and the number sold. You can set tabs to enable you to jump back and forth between these two cells (without going through the intervening cells).

To do this, press the [EDIT TABS] key while anywhere in your spreadsheet. You should see TABS briefly followed by a blinking cursor. Type:

```
[t] [i] [t] [l] [e] [3] [,] [#] [s] [o] [l] [d] [SPACE]
[t] [i] [t] [l] [e] [3] [,] [p] [r] [o] [f] [i] [t]
```

and press the [ENTER] key. Press the [TAB ADVANCE] key and you will be placed in the title3,#sold cell. Press [TAB ADVANCE] a second time, and you will instantly jump to the title3,profit cell.

The tab function will circle back on itself, so that if you press either [TAB BACK] or [TAB ADVANCE] you will be placed in the title3,#sold row. This is so merely because you have only two cells entered into the tab function. If you had more, then [TAB ADVANCE] would advance you to the third cell entered. If you press [TAB BACK] when you are in the second entry, you will go back to the location specified in the first entry. If you press [TAB BACK] when you are in the third entry, you will go back to the location specified in the second entry. If you press [TAB BACK] when you are in the first entry, you will go back to the location specified in the last entry.

Your arrow keys will still move you one cell at a time, should you wish to go to a cell that is not tabbed. As with formulas,

you can enter no more than 80 characters into tab memory. You can use your [DELETE] and [INSERT] keys in the same manner as with formulas. You must separate cell labels with a space. You can use alternate labels with tabs. Indeed, abbreviated labels may be needed if you wish to increase the number of cell labels that will fit into the 80 character limit.

Printing Results

Press a tab key to position yourself in the title3,#sold cell. Since you are interested in determining how many title3 books you must sell to get out of the red, increase the number from 6000 to 8000. Now press [TAB ADVANCE] and you will see that your losses have been cut to -12772.00. In order to get a printout of this possible scenerio without printing your entire spreadsheet, you can simply press the [FORCE CALC] key and the [PRINT TABS] key after you have changed the value. This will print the labels and values of the two cells that you are tabbing between without printing any of the intervening cells.

If you were tabbing to three or more cells, you can still use this feature. The HHC will print only those cells that are tabbed. For example, if you were computing payments for a mortgage, you might want to vary the years, or the amount of the payments or the interest or the principle and tab between these four cells. The calculations that would enable you to use these four cells would probably require several intermediate calculation cells. However, by using the [PRINT TABS] key you can essentially ignore the intervening cells since you are only interested in how a change in one of the four variables affects the other. After changing one of the four values you should press the [FORCE CALC] key (to make sure that all formulas have been recalculated with the new value) followed by the [PRINT TABS] key. This would give you a printout of how that change has affected the other four and the printout would not be cluttered with values in the intermediate calculation cells.

Now back to the example that we have been working on. Press [TAB ADVANCE] again and increase the number from 8000 to 10000. Press [TAB ADVANCE] again and you see that you have a modest profit of 2535.00. By jumping back and forth, see if you can determine the break-even point.

Now you can see why this is called the "What if?" section. By using tabs and changing entries you can readily answer all sorts of "What if?" questions which would otherwise take you a great deal of time to answer. If you have not yet discovered the break-even point, we won't spoil your surprise at this point.

As another example of “What if?”, you look at your example and see that only 6,000 out of 20,000 of the most expensive books have been sold. In order to increase sales of this book, you may consider increasing the dealer’s discount in anticipation that they would vigorously push the sales of a book on which they get larger discounts. In the past you have discovered that doubling discounts results in an approximate 30% increase in sales. Using these facts, you can speculate on the results such a change might generate.

Suppose a dealer offers to immediately take 1800 of your title3 if you will increase the dealer discount by \$1. Since title3 is moving slowly, this certainly seems like a reasonable deal. Before you commit yourself, however, you decide to ask your spreadsheet. “What if I increase the dealer discount by \$1. How will that affect the profits for title3?”

Enter the title3, disc cell, and change the value 1.10 to 2.10. Next, enter the title3, fcost cell and enter 3000.00 instead of the 9000.00 there. The reason for doing this is that if you increase the number of title3 sold from 6000 to 7800 and then check your profit for title3, your profit will appear smaller since the variable cost is subtracting 2.10 for each book instead of the 1.10 for the first 6000 sold. Now, jump with a tab to the title3, #sold cell and enter 7800. Press the [TAB ADVANCE] key, and you see:

```
title3,profit -16102.70
```

Your spreadsheet easily shows you that this deal will reduce the title3 deficit by \$11,976.30, and so you go ahead with the deal.

Go To

Suppose you decide to look at the variable cost for title3 when you are looking at the number sold. You can check the variable cost two ways. One is merely to press the [↕] key seven times. An alternative method when will appear much more attractive on large spreadsheets is to press the [GO TO] key. When you press it, you will see:

```
GO TO:
```

Type the cell-label for the variable cost:

```
[t] [i] [t] [l] [e] [3] [,] [v] [c] [o] [s] [t] [ENTER]
```

When you press the [ENTER] key you will jump directly to the variable cost cell for title3. Further, if you wish to resume your tab journey, you merely need to press [TAB ADVANCE] or [TAB BACK], since the [GOTO] key does not affect the order of tabs.

In this lesson you have practiced entering formulas, have learned to use tabs to jump around in your spreadsheet, and have learned how to answer the sort of hypothetical question that your boss might ask you to answer before a meeting in the morning. If you did not have the power of your Portacalc Capsule to use, you would be up all night. You have also learned the name of the next section. Yes, that's right. It is the Example section and it contains examples of spreadsheet situations with some formulas indicated. These examples are intended to suggest a few of the countless applications possible.

PART II: EXAMPLES

1. Net Present Value Analysis

**Cash Flow of Three Investments
With a Discount Rate of 15%**

	Inv1	Inv2	Inv3
1983	9669	500	20000
1984	11900	3000	8000
1985	12900	10000	5000
1986	14500	18500	5000
1987	15000	19500	3000
1988	13000	20000	0
NPV	?	?	?

Net Present Value is computed with the formula for the first investment:

$$\text{@NPV}(\text{Inv1}, 1983, \text{Inv1}, 1988, .15)$$

or

$$\text{@NPV}(?, 1983, ?, 1988, .15)$$

2. Teacher's Grade Book

	Test1	Test2	Test3	MidEx	Hmwk1	Hmwk2	Paper	Final
JAB	83	95	88	91	94	80	79	87
GCC	91	99	97	92	100	85	98	93
⋮								
ZZZ	77	51	89	46	25	81	78	80
GD%	.1	.1	.1	.15	.05	.05	.22	.23
Average	A	B	C	D	E	F	G	H
Standard Deviation	AA	BB	CC	DD	EE	FF	GG	HH

Alternate Label A contains the class average for Test1 using the formula:

$$\frac{\text{@SUM}(\text{Test1}, \text{JAB}, \text{Test1}, \text{ZZZ})}{\text{@CNT}(\text{Test}, \text{JAB}, \text{Test1}, \text{ZZZ})}$$

Alternate Label AA contains the standard deviation for Test1 using the formula:

$$\text{@SQR}((\text{@SUM}(\text{Test1}, \text{JAB}, \text{Test1}, \text{ZZZ}^2) - 25 * A^2 / 24))$$

where there are 25 students. The 25 and 24 could be replaced using the @CNT function.

Another possible formulas would be those to average the students' grades, weighting the grades as in the GD% row.

3. Contractor's Cost Analysis

Spreadsheet for Bids

	Concrt	Steel	Wood	Glass	Labor	#Units
Houses	4.3	1.9	17	11	18	11
Factor	15.8	21.4	18.3	7	20.5	5
Aparts	12.3	16	32.8	19.9	27	8
Totals	C	S	W	G	L	Cost

Thousands of Dollars per Unit

The total amount of concrete needed is computed by multiplying the amount needed for each by the number of units, and then summing the column. The formula in cell C to do this could be:

$@SUM(Concrt, Houses \text{ } Concrt, Aparts * Units, ?)$

The total Cost of all projects would then be the sum across the last row. The formula for Cost could be:

$@SUM(C \text{ } L)$

4. Investment Portfolio

Investment Analysis Portfolio Mix

	Value	Year1	Year2	Year3
Stocks	25000	2500	2750	3025
Deeds	17800	3204	3781	4461
CDs	80000	12000	13800	15870
Savngs	5500	440	475	513
SubTot	128300	18144	20806	23869
Tax		5443	6242	7161
Bonds	55000	4950	4950	4950
Income		17651	19514	21658

Results in the above spreadsheet represent stocks returning 10%, trust deeds returning 18%, CDs returning 15%, savings returning 8%, and tax free bonds at 9%. Tax was figured at 30%. A typical formula for the second year of savings might look like:

$(Value, Savngs * 1.08) * .08$

Income might be figured by the formula:

$.7 * Year1, SubTot + Value, Bonds * .09$

5. Dairy Feed Analysis

	Cow1	Cow2	• • •	Cow100
FeedDD	18	14	}}	15
•				
•				
•				
FeedBR	5	7		3
Output	11	9		6
Ratio	?	?		?

To compute the Output to Feed Ratio, this formula might be used for the Ratio row:

$$?,? / @SUM(?,FeedDD \quad ?,FeedBR)$$

6. Sportscaster Stat Sheet

	Play1	Play2	• • •	Play15
FG2pt	5	2	}}	0
FG2try	7	6		1
FG3pt	4	3		0
FG3try	8	4		0
%2pt	?	?		?
%3pt	?	?		?
Total%	?	?		?
Assist	1	6		2
Steals	2	3		1
Fouls	4	2		3
MinPld	35	32		6

With this spreadsheet you can monitor a basketball player's performance for one game, away games, home games, or all games. What's more, the portability of the HHC would permit a sportscaster to keep records during the game, analyze the results instantaneously, inform his audience on the air, and later use a printout of the results in an account of the game.

A representative formula might be the formula for the percent of 3 point goals made:

$$?,? - 3 / ?,? - 2$$

where this formula is in the %3pt row.

7. Casino Royale

	#inRun	Black	Red	2Same
4:00	3	1	0	1
4:20	5	0	1	0
4:40	2	0	1	1
5:00	7	1	0	1
•				
•				
•				
Predic	?	?	?	?

This might be the sheet of a person who intends to beating the odds of roulette. The person gathers data at a fixed time schedule and notes the number of times the same color comes up on a roulette wheel at that time. The person notes whether the run at that time was black or red and whether the second turn of the wheel came up with the same color as the color that ended the run.

The formula for prediction has been confiscated by the casino since it was going broke paying off.

8. Church Visitation and Pledges

	VisitP	VisitE	VisitS	Pledge	Paid	Commun
MemAAA	1	1	1	1200	1350	17
MemBBB	2	0	1	650	575	8
•						
•						
•						
MemZZZ	0	0	1	475	325	2
Total	?	?	?	?	?	?

This sheet shows a possible use by the stewardship committee. Possible entries might be the number of visits on members by the pastor, the evangelism committee, the stewardship committee, the amount pledged for the current year, the amount actually paid for the last year and the number of communions taken during the year. Keeping the amount pledged up to date would be no problem, using the formula for total pledged:

@SUM(Pledge,MemAAA Pledge,MemZZZ)

9. Inventory Sheet

	RoomA	RoomB	RoomC	Total	Unit\$	Value
StyleA	25	5	0	?	37.50	?
StyleB	20	7	0	?	24.99	?
StyleC	0	0	0	?	53.65	?
StyleD	0	8	25	?	23.33	?
•						
•						
•						
Total	?	?	?	?	?	?

This shows the inventory for a shoe store. The inventory could easily be kept current by changing the entry whenever a pair of shoes is removed from a storeroom. The value for a particular style might be:

$$\text{@SUM(?-5,StyleN ?-3,StyleN) * ?-1,StyleN}$$

10. Traffic Engineer

Number of vehicles per minute at 10:00 a.m.

		Streets					
		1	2	3	4	5	• • •
Avenues	1A	35	25	28	15	17	
	2A	32	26	29	18	15	
	•						
	NA	33	28	27	17	19	
	YY	?	?	?	?	?	

In analyzing this data, the traffic engineer might transfer the file to the Portastat Capsule or she might use some specialized formulas in row YY, such as:

$$\text{@LN(@SUM(? ,1A ? ,NA * 3.271852) + @ABS(?+1,1A - ?+1,NA))}$$

PART III: TECHNICAL SECTION

Memory Considerations

Each cell in a file requires 8 bytes to store the number plus two bytes for formula manipulation if there is no formula for the cell (see below for memory requirements of formulas). Each column and row label requires 7 bytes. Thus, the total memory required by a file can be found by the following formula:

$$\text{Memory} = \text{Number of rows} \times \text{Number of columns} \times 10 \\ + (\text{Number of rows} + \text{Number of columns}) \times 7$$

For example, if you have a file with 12 rows and 15 columns, the total memory required by the file is:

$$\text{Memory} = 10 \times 12 \times 15 + (12 + 15) \times 7 \\ = 1800 + 189 = 1989 \text{ bytes.}$$

If you move outside the spreadsheet to the next unlabeled column or row and there is insufficient memory to create the column or row, you will see the message:

```
NO ROOM ->
```

If you attempt to insert a column or row when there is insufficient memory for the entire column or row or if you try to enter a formula or an alternate label with insufficient memory, you will get the same message. If you press the [ENTER] key, you will be returned to the spreadsheet without the attempted entry having been accepted.

If you attempt to enter a header or footer to your spreadsheet and you do not have sufficient memory, you will get the message:

```
NO ROOM, DELETE FILE
```

followed by the file menu. If you attempt to create a new file or to enter tabs and there is insufficient memory, the same message will appear. The menu will include all files in the main file menu, not simply your Portacalc files. If you do not want to delete a file, press the [CLEAR] key. You have a number of options other than deleting a file. You may want to delete certain rows or columns from a file, or delete certain formulas, headers or footers, or alternate labels. You may want to look at some of the files before you decide what to delete.

You may attempt to conserve memory by using short labels, but this is to no avail. Each label requires 7 bytes of memory. Of course, to shorten formulas, you can use shorter labels.

Creating a file requires 25 bytes plus 1 byte for each character in the file name. The shape of the spreadsheet will affect the amount of memory used, even if the number of

cells are the same. For instance, a spreadsheet with 1 row and 100 columns requires 101 times 7 (707) bytes in labels alone. A 10 row, 10 column spreadsheet has the same number of cells, but requires only 20 times 7 (140) bytes for labels.

Alternate labels require 1 byte per character, so there will a savings by using shorter alternate labels. However, the memory required for alternate labels is in addition to that required for the standard column, row labels. Tabs, headers and footers also require 1 byte per character.

In formulas numbers require 1 byte plus 1 byte for each character in the number to a maximum of 9 bytes. Algebraic symbols require 1 byte. Cell labels (alternate or standard) require 3 bytes. Functions used in formulas require 1 byte for the function, 1 byte for the parentheses and 1 byte for each character in the parentheses. You can save memory by the way in which you construct a formula. For example, $A*B+A*C$ (where A, B and C are alternate labels) requires 15 bytes of memory. However, the equivalent expression $A*(B+C)$ requires only 13 bytes.

Often a file contains rows or columns with intermediate computational results that are of no interest to the user. For example, when determining the average value, the total may be of little interest. If the total is unimportant, do not use an entire column or row to hold the value. Rather, a formula can be constructed that will total the values, will count the entries and will determine the mean value in one step. In more complicated formulas, such as the formula for standard deviation, there may be 10 or more intermediate steps that can be combined into one formula, saving a great deal of memory.

Often, after using a formula or formulas there is not further need for them. In such cases, the formulas can be deleted to provide additional memory. Where formulas have been inserted across the entire row or column by relative referencing, you may want to retain the formula in only one of the cells of the row or column to facilitate reinserting the formula. To reinsert the formula, move the formula to memory, edit it to the relative reference form (with question marks instead of row or column labels) and then move it across the row or column using the [M→F] key.

Length Limitations

	Maximum Characters
File Names	15
Column Labels	6
Row Labels	6
Alternate Labels	12
Formulas	80
Tabs	80
Footers	40
Headers	40
Numbers (in decimal notation, entered directly)	12
Numbers (in scientific notation)	10^{-1024} to 10^{1023} (10^{-1022} to 10^{1022} for input)

Functions can be embedded to 10 levels of parentheses. (However, the actual number may vary depending upon the particular formula.)

Reserved Characters

Row and column labels cannot contain a space. Further, the following characters cannot be used in labels:

[+] [-] [*] [/] [\] [?] [@] [,] [(] [)]

Portacalc will not accept any reserved characters for file labels. However, if you use the Portastat or Portagraph Capsules to create files, these will accept reserved characters, so be sure not to use any files with these characters in the file's labels.

Keyboard Organization

The overlay redefines the function of several keys for spreadsheet operations.

HHC key	Abbreviation	Purpose
[I]	[PRINT ALT.LABELS]	Print alternate labels
[O]	[PRINT FILE]	Print all or part of file
[P]	[PRINT FORMULAS]	Print formulas
[H]	[EDIT ALT.LABELS]	Create or edit alternate labels
[J]	[EDIT LABELS]	Edit column, row labels
[K]	[EDIT HEADER]	Create or edit header
[L]	[PRINT TABS]	Print tab stops
[N]	[EDIT TABS]	Create or edit tab stops
[M]	[SET DIGITS]	Set digits for display
[SPACE]	[GOTO]	Jump to a particular cell

[SEARCH]	[TAB BACK]	Jump to previous tab stop
[ROTATE]	[TAB ADVANCE]	Jump to next tab stop
[,]	[EDIT FOOTER]	Create or edit footer
[Z]	[FORCE CALC]	Forces calculations of all formulas
[X]	[CALC ON/OFF]	Engage or disengage automatic formula calculations
[C1]	[EDIT FORMULAS]	Edit cell formula
[C2]	[MEMORY]	Create a formula in memory or display one there
[C3]	[F→M]	Move a formula from a cell to memory
[C4]	[M→F]	Move a formula from memory to a cell or to a column or row

Refer to the **Owner's Manual for the Hand Held Computer** for explanations regarding the use of any of the other keys.

Error Messages

INVALID SYM →

This message occurs when one of the following symbols is used incorrectly: + - * / ^ or space. Some examples of incorrect usages are:

4+	4 5
3**5	/col1,row3
2-*7	col1,row1+^2

Some combinations of plus and minus signs are correct, as long as they do not exceed 2 in a row. Correct examples include:

+ - 3	(+ - 3 + 4)
-------	-------------

Some examples of invalid combinations are:

4+ - + 5	3* - - col1,row2
col2,row2 ^ - + 3	

Most improper uses of space will give other error messages. Your HHC will beep at you when this error occurs. Pressing the [ENTER] key will cause the formula with the error to be displayed. Before you can do anything else with your spreadsheet, you must correct the error or delete the formula containing the error.

INVALID VAR ->

The message will occur under the following conditions: a missing @ in a function used in a formula; use of a nonexistent or misspelled cell label; two decimals in the same number, e.g., 4..5; attempting to enter a number in scientific notation, e.g., 9.8E16 instead of 9.8×10^6 .

When this error has occurred, you will hear a beep and see the error message displayed in the window of your HHC. Press the [ENTER] key and you will see the offending formula displayed. You will continue to get the message until the formula is corrected or deleted. If you press the [CLEAR] key, it will be automatically deleted.

INVALID FNC ->

If a function's name is misspelled, you will get this error message. Press the [ENTER] key to edit the formula. If you press the [CLEAR] key, the offending formula will be deleted. If the cell had a previous formula, the previous formula will be retained.

(MISSING -> or) MISSING ->

You will get this error message if a formula does not contain the same number of beginning and ending parentheses. If you have the same number of beginning and ending parentheses, but they are not in the correct order, you will probably get an INVALID VAR-> message. Press the [ENTER] key to edit the formula. If you press the [CLEAR] key, the offending formula will be deleted.

NESTING TOO DEEP ->

Putting an expression into parentheses is called nesting. Your HHC may accept up to 10 levels of parentheses within parentheses. However, the actual number may vary depending upon the particular formula used. If you get this error message, press the [ENTER] key and the offending formula will be displayed. You may be able to edit the formula to eliminate some of the parentheses. Then, if you press the [ENTER] key a second time it is possible that you have the correct answer calculated. If you do get a correct answer the second (or the third) time you press the [ENTER] key, you will no longer get this message, but will see the cell label in inverse graphics.

FORMULA TOO LONG ->

Using the [MEMORY] key you cannot create a formula that is longer than 80 characters. However, if you use relative referencing (question marks instead of cell labels), once the formula is moved to a particular row or column, the formula will substitute cell labels for the question marks, and may exceed 80 characters. Another way of extending a formula

beyond the 80 character limit is to delete alternate labels (which then inserts the possibly longer column, row labels) or to edit labels into longer labels. In fact, if you are really clever (and perhaps a little perverse), you can extend a formula to 559 characters.

No matter how a formula violates the 80 character rule, you will get the error message whenever you press the [EDIT FORMULAS] key. If you press the [ENTER] key you will see the first 80 characters of the formula. You will not be able to edit beyond the first 80 characters. However, the formula is still in memory. If you wish to keep the formula as it is, press the [CLEAR] key and you will be returned to the spreadsheet with the 80-plus character formula in operation. If you press the [ENTER] key a second time you will enter the formula that has been truncated (fancy word for cut off) at 80 characters. It is a good idea to train yourself to use the [CLEAR] key after looking at a formula without editing.

The formula, even though it exceeds 80 characters, will still calculate a value and you will not see an error message (unless you actually made an error). The only time this message occurs is when the [EDIT FORMULAS] key or the [PRINT FORMULAS] key has been pressed. In printing formulas, when the HHC comes to a formula longer than 80 characters, it will display this error message. Press the [ENTER] key to continue printing. The printer will print the error message followed by the first 80 characters of the formula.

CAUTION

If there are multiple errors in a formula and an error message occurs that deletes the formula when the [CLEAR] key is pressed, the formula will be deleted, regardless of what the other errors are!!!

ERR#1 or U

this message indicates an underflow and may be the result of setting digits to a smaller number of digits than the zero digits in a number whose absolute value is less than 1. Also, this message will appear if a cell contains a value that is smaller than 10^{-1024} .

ERR#2 or V

This message indicates an overflow and may result if a calculated value exceeds 10^{1023}

ERR#3 or i

This message indicates that the HHC has attempted to calculate the square root of a negative number or an even nth root of a negative number.

ERR#4 or Z

This message indicates that division by zero has occurred or that division by an expression that evaluates to zero has occurred.

ERR#5 or ?

This message indicates that a negative number has been raised to a non-integer power or that an undefined quantity such as the LOG(0) has occurred.

Portacalc Files with Portastat and Portagraph

A file created by any one of the three capsules, Portacalc, Portastat or Portagraph, can be used by each of the others. Nothing in the file menus will indicate by which capsule the file was created, unless you use some file naming scheme to so indicate.

If a Portacalc file has even one formula in it, you will not be able to create, delete or insert additional columns or rows using your Portastat or Portagraph Capsules. If you attempt to do this, you will get the message OPTIMIZED-> in your Portastat or OPTIMIZED FILE --> in your Portagraph Capsules. You can, however, edit column and row labels, headers and footers and filenames in either Portastat or Portagraph. If a Portacalc file has no formulas, it is not an optimized file and you can alter the file in Portagraph and Portastat by creating, deleting and inserting rows and columns. If a Portacalc file has formulas and you delete all the formulas, the file is not longer an optimized file and can be altered.

Cells having formulas will not display their labels in inverse graphics in Portastat or Portagraph. Furthermore, you cannot edit, view or print the formulas in these programs, nor can you calculate formula cells. You can, however, change cell values, even for cells that have formulas. WARNING! If you change a cell value that is used in a formula to calculate the value of a second cell, the second cells valus will not be recalculate in Portastat or Portagraph.

If you change a nonformula cell value in any of the three programs, the cell will keep that value when you exit one of the programs and go to another program. If you change the value of a formula cell while in Portagraph or Portastat and return to Portacalc, then the formulas, will still recalculate the formula values. If there are forward referenced formulas, more than one recalculation may be rquired to restore the proper values to formula cells.

In Portastat you can give a cell a nonnumerical value of? (an

enigma). This is equivalent to having never entered a value. If you do this and return to Portacalc, simply restore appropriate numerical values to the null cells. If you have forward referenced formulas you may still get error messages until you have recalculated the necessary number of times.

In Portagraph or Portastat you cannot create, delete or edit alternate labels. Alternate labels are not displayed or printed in these programs. If an alternate label is entered as data, these programs will not recognize and use the alternate label.

If a Portacalc or Portagraph file is to be used by Portastat, you should avoid using the same label for both a row and a column. Portastat allows the entry of data by row or column label without specifying which. No problem is encountered by duplicate row and column labels in Portacalc or Portagraph.

Portacalc does not allow the use of the characters: + - * / ^, () and space in column or row labels. Portastat and Portagraph do allow all these characters except a space. You should be careful not to use any of these characters in a Portastat or Portagraph file that will be used with Portacalc. Portacalc also will not allow the question mark as a row or column label. However, it will accept files that have a question mark as a row or column label. Such a row or column could be used by the Portacalc Capsule to save formulas in the relative referenced form. When a formula is in the question mark row or column, it interprets the question mark as a label; however, when the formula is moved to other rows or columns, the question mark is interpreted as the row or column into which the formula is inserted.

Portacalc greatly enhances the use of Portagraph and Portastat. Portagraph will do liner (straight line) forecasting and Portastat will compute the slope and intercept of the line along with the statistical properties of the data set. However, data of many applications will not conform to a linear interpretation. With Portacalc you can create a file to do non-linear curve fitting and forecasting (polynomial, exponential, logarithmic, etc.). With such a Portacalc file you can then plot the forecast and the data using the Portagraph Capsule and the HHC Color Plotter.

With Portacalc you can compute plotting coordinates for mathematical functions, construct a file with formulas for computing the slope (derivative) at a point, maximum and minimum points, x and y intercepts, asymptotes, length of a curve between two points, area under a curve, ad infinitum ad nauseum.

With both graphing and statistical analysis the situation often arises in which you want to convert from one unit of measurement to another — feet to inches, pounds to grams, yen to dollars, etc. Sometimes the raw data requires considerable mathematical manipulation before it can be used. You may even run into a situation in which you need statistical functions not contained in Portastat. Never worry! Never Fear! Portacalc is here! It will allow you to set up a file with the needed formulas.

If you have data consisting of very large or very small numbers you cannot enter the data through Portagraph or Portastat. The largest and smallest numbers which can be directly entered as data values are limited to numbers which can be expressed in decimal notation with 12 characters (including the decimal point and/or minus sign). Larger and smaller numbers can be entered as formulas in Portacalc, such as $7.839671 \times 10^{1000}$. After entry of such numbers, such formulas no longer serve any purpose and should then be deleted. Thus, data files can be created for Portastat and Portagraph containing very large or very small numbers.

The error symbols U, V, i, Z and ? will be displayed and printed using Portacalc and Portastat. Portagraph will not use cells having such values and will give the message: DATA ERROR! —>. Portastat will sometimes calculate data sets with these errors. In particular, in most cases it will ignore data cells with the question mark. However, results derived from cells containing one of these symbols should be suspect, and interpreted very carefully. Portagraph will not plot points in an interval when an overflow occurs in the computation. It will, however, plot the graph and the points that can be computed.

It is always best to correct any errors in Portacalc before using the file with other capsules. You will not be prohibited from using a Portacalc file containing errors and these error messages are not carried over to Portastat or Portagraph.

Display Index for the Portacalc Capsule

ALT. LABEL:

DEFINED

This prompt appears after you have pressed the [EDIT ALT. LABELS] key. Alternate labels permits you to replace the column, row cell label with another choice. Alternate labels are honored in all circumstances where column, row labels would be used to reference a cell.

RESPONSE

Type in an alternate label up to 12 characters long. If you make an error in typing you can correct it by overtyping or by using the [INSERT] and [DELETE] keys. Press the [ENTER] key to establish the alterante label and you will be returned to the cell from which you entered the alternate label mode with the alterante label displayed.

COLn LABEL:

DEFINED

This display appears after you have left a file by pressing the [EDIT LABELS] key, and responded to the prompt LABEL ROW OR COL(R/C)? by pressing [c]. The current column label is displayed to the right of the cursor. You can modify this label or return to the file at the point you left it.

RESPONSE

If you decide to leave the label as it is displayed, press the [ENTER] key and you will be returned to the file at the point you left it. If you wish to make a change in the label, you may modify the label by overtyping, by inserting characters using the [INSERT] key or by deleting characters using the [DELETE] key. After the label is correct, you can enter the correction by pressing the [ENTER] key and you will be returned to the file at the point you left it.

DATA ERROR! -->

DEFINED

This display occurs when using a Portacalc file containing any of the error symbols U, V, i, Z and ? with a Portagraph Capsule.

RESPONSE

Return to Portacalc and correct the formula. See the section "Portacalc Files with Portastat and Portagraph" in this manual for a more complete explanation.

DELETE COL<column name> Y/N?

DEFINED

This display appears when you are in a file in the column named in the prompt, and pressed the [DELETE] key and have responded to DELETE ROW OR COL(R/C)? by pressing [c]. This prompt allows you to change your mind about deleting the column.

RESPONSE

If you wish to delete the column, press [y] and the column will be deleted from the file and you will be returned to the column to the left of the deleted column. If you change your mind and do not wish to delete the column, press [n] and you will be returned to the position at which you pressed the [DELETE] key.

DELETE ROW<row name> Y/N?

DEFINED

This display appears when you are in a file in the row named in the prompt, have pressed the [DELETE] key and have responded to DELETE ROW OR COL(R/C)? by pressing [r]. This prompt allows you to change your mind about deleting the row.

RESPONSE

If you wish to delete the row, press [y] and the row will be deleted from the file and you will be returned to the row above the deleted row. If you change your mind and do not wish to delete the row, press [n] and you will be returned to the position at which you pressed the [DELETE] key.

DELETE ROW OR COL(R/C)?

DEFINED

This display appears after you have positioned the window on a row or column to be deleted and have pressed the [DELETE] key. You are given the choice of deleting an entire row or column.

RESPONSE

If you desire to delete a row, press [r] and you will be prompted DELETE ROW <row name> Y/N?. To delete a column, press [c] and you will be prompted DELETE COL <column name> Y/N?.

DIGITS (0-12)

DEFINED

This display appears after you have pressed the [SET DIGITS] key and have answered prompts regarding which cells to use. The HHC is waiting for you to tell it how many digits to display to the right of the decimal point.

RESPONSE

Type in a number between 0 and 12 and press the [ENTER] key. If you change your mind and want to leave the display as it was, press the [CLEAR] key.

* DO NOT PRESS CLEAR *

DEFINED

This display occurs as the Portacalc capsule performs file manipulations and warns you not to press the [CLEAR] key. If you do, you will probably be unable to use the file.

RESPONSE

Take this message to heart and do nothing whenever you see it or see a flashing asterisk. When the HHC completes its housekeeping chores you will be given a new display and can then press the [CLEAR] key if that is your great desire.

ENTER BOUNDS

DEFINED

This display appears briefly after you have pressed either [r] or [c] to the prompt SELECT ROW OR COL (R/C)?. The message indicates that you will need to specify the limits for duplicating the formula entered in memory or for setting the digits.

RESPONSE

No response required. After the message is displayed briefly, you will be prompted with either FIRST COL or FIRST ROW.

FILE NAME:

DEFINED

This display appears after you have pressed [1] in response to the prompt 1=NEW FILE indicated that you wish to create a new file. The HHC is waiting for you to give the new file a name.

RESPONSE

Type in a file name up to 15 characters and press the [ENTER] key. If you make a mistake in typing you can correct it by overtyping or by using the [INSERT] or [DELETE] keys. If you change your mind and do not wish to create a new file, press the [CLEAR] key.

ENTER LOWER RIGHT

DEFINED

This prompt will appear after the [PRINT FILE] key has been pressed and you have responded to the prompt ENTER UPPER LEFT by typing in the cell that defines the upper left hand corner of the block of cells to be printed. It is waiting for you to enter the label of the cell in the lower right hand corner of the block to be printed.

RESPONSE

Type the column, row or the alternate label for the cell at which the plotter or printer is to stop printing. If you wish to print through the cell at the bottom right hand corner of the file, simply press the [ENTER] key without typing a cell label.

ENTER MAX PRINT WIDTH

DEFINED

This prompt will appear after you have pressed the [PRINT FILE] key and have delimited the block of cells to be printed. The HHC is waiting for you to tell it the maximum number of

characters that the printing device can print per line. It will accept any number between 13 and 132.

RESPONSE

Type in the number corresponding to the maximum number of characters that the printing device will accept per line. If you press the [ENTER] key without specifying a number, the HHC will use the default value of 40 characters per line. Forty is the number for the HHC Mini Printer and the HHC Color Plotter.

ENTER UPPER LEFT

DEFINED

This display appears after you have pressed the [PRINT FILE] key. The HHC is waiting for you to enter the column,row or alternate label of the cell in the upper left hand corner of the straight line or rectangular block of cells to be printed.

RESPONSE

Type in the column,row or alternate label of the cell in the upper left hand corner of the block of cells to be printed. If you wish to print the entire file, press the [ENTER] key without typing a cell label and the HHC will print out the entire file.

ERR#1

DEFINED

This display indicates that a U or underflow error has occurred. This may indicate that the value in the cell is smaller than $9.999E-1024$ or $-9.99E-1024$. It may indicate that the cell contains a number with absolute value less than one and that the digits have been set to less than the number of zeros to the right of the decimal point. For example, if the cell contains the value .007 and digits is set for 2 you would see U.00

RESPONSE

If the number is out of range, either enter the number 0 or a number that is in range. If the problem is with the number of digits set, set digits to a larger number.

ERR#2

DEFINED

This display indicates that a V or overflow error has occurred. The most likely cause for this display is that the cell contains a value larger than 10^{1023} .

RESPONSE

Realize that the value is too large for accurate computation. See the sections "Scientific Notation" and "Enigmatic Errors and Dizzy Displays" of this manual.

ERR#3

DEFINED

This display indicates that an imaginary or i error has occurred in a cell. The symbol is displayed whenever the square root is computed for a negative number or when the even root of a negative number is calculated.

RESPONSE

Realize that you are working with complex or imaginary solutions that are outside the range of the HHC. See section "Enigmatic Errors and Dizzy Displays" of this manual.

ERR#4

DEFINED

This display indicates that a Z error or division by zero has occurred.

RESPONSE

Discover where in a formula you have divided by zero, and edit the formula. See the section "Enigmatic Errors and Dizzy Displays" of this manual.

ERR#5

DEFINED

This display indicates that an enigma or a ? error has occurred in a cell. Perhaps a negative number has been raised to a noninteger power or some function has a value computed outside the domain of the function, as in the case of taking the logarithm of zero.

RESPONSE

Realize that the computation is in error. See the section "Enigmatic Errors and Dizzy Displays" of this manual.

FIRST COL

DEFINED

This display is prompting you to make a choice when you are moving a formula. You can use all the columns in the file or you can restrict the number of columns to have the formula duplicated.

RESPONSE

If you desire to have the formula duplicated across the entire row, press the [ENTER] key. The formula will be duplicated in all the row values in your file and you will be returned to the file in the position at which you pressed the [M→F] key. If you wish to restrict formula duplication to only some of the cells in the row, type the label or alternate label of the first column cell to receive the formula and press the [ENTER] key. You will then see LAST COL.

FIRST ROW

DEFINED

This display is prompting you to make a choice when you are

moving a formula. You can use all the rows in the file or you can restrict the number of rows in which to have the formula duplicated.

RESPONSE

If you desire to have the formula duplicated down the entire column, press the [ENTER] key. The formula will be used for all column values in your file and you will be returned to the file in the position from which you left it. If you wish to restrict the formula duplication to only some of the cells in a column, type the label or alternate label of the first row cell to receive the formula and press the [ENTER] key. You will then see LAST ROW.

FORMULA TOO LONG ->

DEFINED

This display may occur when you press the [EDIT FORMULAS] key. It indicates that the formula in memory exceeds 80 characters. It may also occur when you are printing formulas and the HHC encounters a formula that exceeds 80 characters. See the sections "Print Formulas" in Lesson 5 and "Error Messages" in this section.

RESPONSE

If you see this display when editing a formula, if you press the [ENTER] key the formula will be truncated (cut off) to 80 characters; if you press the [CLEAR] key the full formula will be retained and you will be returned to the spreadsheet with the extended formula in operation. If you are printing formulas, press the [ENTER] key and the message "FORMULA TOO LONG" will be printed along with the first 80 characters of the formula.

GO TO:

DEFINED

This display indicates that you have pressed the [GOTO] key. The HHC is waiting for you to type in the cell label to which you wish to jump directly.

RESPONSE

Type the column, row label or alternate label of the cell to which you wish to jump and press the [ENTER] key. If you change your mind and do not wish to jump to a cell, press either the [ENTER] or the [CLEAR] key without typing a cell label.

1.

DEFINED

This display indicates that an Error 3 has occurred.

RESPONSE

See ERR#3 for explanation.

INSERT FORMULA ->

DEFINED

This display occurs when you press the [M→F] key. It is simply a double check prompt to make sure you wish to insert the formula in memory.

RESPONSE

If you wish to insert the formula, press the [ENTER] key. If you change your mind and do not wish to insert the formula, press the [CLEAR] key and you will be returned to the spreadsheet at the point you left it.

INSERT ROW OR COL (R/C)?

DEFINED

This display indicates that you have positioned the window in the row below or the column to the right of the desired row or column insertion.

RESPONSE

If you desire to insert a row, type [r] and you will see ROWn LABEL:. If you have changed your mind, press the [CLEAR] key and you will be returned to your spreadsheet.

INVALID FNC ->

DEFINED

This display indicates that a function's name in a formula has been misspelled.

RESPONSE

Press the [ENTER] key to edit the formula. If you press the [CLEAR] key, the offending formula will be deleted. If the cell has a previous formula, the previous formula will be retained.

INVALID SYM ->

DEFINED

This display indicates that one of the symbols + - * / ^ or space has been used incorrectly in a formula.

RESPONSE

Edit the offending formula. See "Error Messages" of this section of the manual.

INVALID VAR ->

DEFINED

This display indicates that a formula has not been accepted. Possibly a cell label has been misspelled or a space has been inserted between column and row labels.

RESPONSE

Press the [ENTER] key and edit the formula. You may choose to delete the formula entirely and start over if you do not readily see your error.

LABEL ROW OR COL (R/C)?

DEFINED

This display occurs when you have pressed the [EDIT LABELS] key. Your HHC is waiting for you to select either a row or column label for change.

RESPONSE

Press [r] to change a row label, [c] to change a column label or [CLEAR] if you change your mind.

LAST COL

DEFINED

This display will appear after you have set an initial row boundary. The purpose of this prompt is to allow you to further restrict the number of cells to receive a formula. This will allow you to omit a row which already has a formula in it.

RESPONSE

If you wish all columns to be used after the initial FIRST COL setting, press the [ENTER] key. You will then be returned the spreadsheet at the point from which you left it. If you do not wish to duplicate a formula in all the remaining cells in the row, type the column label of the last column in which you want the formula placed and press the [ENTER] key. You will be returned to the spreadsheet at the point from which you left it.

LAST ROW

DEFINED

This display will appear after you have set an initial row boundary. The purpose of this prompt is to allow you to further restrict the number of cells to receive a formula. This will allow you to omit a column which already has a formula in it.

RESPONSE

If you wish all rows to be used after the initial FIRST ROW setting, press the [ENTER] key and you will be returned to the spreadsheet at the point from which you left it. If you do not want to duplicate the formula in all the cells down in the column, type the last row label you do want included. Press the [ENTER] key and you will be returned to the spreadsheet at the point from which you left it.

MEMORY:

DEFINED

This display appears when the [MEMORY] key is pressed. You will see to the right of the colon the formula which is currently being held in memory.

RESPONSE

Either edit the current formula or delete it and type in a new formula. If you change your mind, press the [ENTER] key and you will be returned to the spreadsheet at the point from which you left it.

NO ROOM ->

DEFINED

This display indicates that there is not sufficient memory to create or insert a new row or column or enter a new formula or new alternate label.

RESPONSE

Press the [ENTER] key and you will be returned to the spreadsheet without the attempted entry having been made. If you still desire to make the entry, you must expand available memory by deleting part of the current spreadsheet or exiting from the spreadsheet and deleting all or part of another file.

NO ROOM, DELETE FILE

DEFINED

This display indicates that there is not sufficient memory to enter a header or footer, create a new file or enter tab stops.

RESPONSE

No response is required. The file menu will automatically appear. You can then delete unnecessary files.

ONLY THIS CELL Y/N?

DEFINED

This display occurs after you have elected to insert a formula. The HHC is waiting for you to tell it whether you wish the formula is to be inserted in only the cell from which you left the spreadsheet or is to be inserted across a row or down a column.

RESPONSE

If you desire to move a formula from memory to this cell only, press [y] and you will be returned to the spreadsheet and placed in this cell with the value computed. If you press [n] you will be given further prompts to select either a row or column. If you change your mind, you can exit to the cell by pressing the [CLEAR] key.

) MISSING-> or (MISSING->

DEFINED

This error message indicates that a formula does not contain the same number of beginning and ending parentheses.

RESPONSE

Press the [ENTER] key to edit the formula. If you press the [CLEAR] key the erroneous formula will be deleted.

NESTING TOO DEEP ->

DEFINED

This error message indicates that a formula contains too many levels of parentheses.

RESPONSE

Press the [ENTER] key to edit the formula. If you press the [CLEAR] key the offending formula will be deleted. If you press the [ENTER] key a second time it is possible that the formula may have computed the value correctly. See "Error Messages" of this section of the manual.

OPTIMIZED FILE --> (Portagraph)

OPTIMIZED-> (Portastat)

DEFINED

This error message indicates that you are in a Portagraph or Portastat Capsule and are trying to insert columns or rows into a file created by Portacalc that contains a formula.

RESPONSE

If you wish to insert a column or row, you must return the file to the Portacalc Capsule and there perform the insertion. You can delete ALL formulas and then insert or delete rows from Portagraph or Portastat. See "Error Messages" of this section of the manual.

? or ?.00

DEFINED

This display indicates that an enigma error has occurred.

RESPONSE

See ERR#5 in "Error Messages" of this section of the manual.

ROWn LABEL:

DEFINED

This display appears after you have pressed the [EDIT LABELS] key and responded to the prompt LABEL ROW OR COL (R/C)? by pressing [r]. The current row label is displayed to the right of the cursor. You can modify this label or return to the file at the point you left it.

RESPONSE

If you decide to leave the label as it is displayed, press the [ENTER] key and you will be returned to the file at the point you left it. If you wish to make a change in the label, you may modify the label by overtyping, by inserting characters using the [INSERT] key or by deleting characters using the [DELETE] key. After the label is correct, you can enter the correction by pressing the [ENTER] key and you will be returned to the file at the point you left it.

SELECT ROW OR COL (R/C)?

DEFINED

This display appears in the procedure to insert formulas when you have responded or ONLY THIS CELL Y/N? by pressing the [n] key.

RESPONSE

If you wish to insert the formula across all or part of a row, press [r]. If you wish to insert the formula down all or part of a column, press [c]. If you change your mind, press the [CLEAR] key.

SET ONLY THIS CELL Y/N?

DEFINED

This display appears after you have pressed the [SET DIGITS] key. The HHC is waiting for you to indicate whether you want to set digits only for the one cell you were in when you pressed the [SET DIGITS] key, or whether you wish to set the digits for all of a column or row.

RESPONSE

If you wish to set the digits for all of a column or row, press [n]. If you wish to set the digits for the one cell only, press [y]. If you change your mind, press the [CLEAR] key.

SET ROW OR COL (R/C)?

DEFINED

This display occurs after you have pressed the [n] key in response to SET ONLY THIS CELL Y/N?.

RESPONSE

If you wish to set the digits for all of a column, press [c]. If you wish to set the digits for all of a row, press [r]. If you change your mind, press the [CLEAR] key.

TABS

DEFINED

This display occurs after you have pressed the [EDIT TABS] key. You will see this display briefly followed by a blinking asterisk.

RESPONSE

No immediate response is required. After the blinking asterisk stops, you will be given a blinking cursor and any tab stops that have been set will scroll by in the window. DO NOT PRESS THE [CLEAR] KEY when the asterisk is blinking. If you change your mind, simply press the [ENTER] key once the blinking asterisk has stopped. Otherwise, using the usual editing methods, type in the cell labels for each tab stop, separating them by a space.

U or U. OO

DEFINED

This indicates that an underflow error has occurred.

RESPONSE

See ERR#1 in this section.

V or V.00

DEFINED

This indicates that an overflow error has occurred.

RESPONSE

See ERR#2 in this section.

<formula>Y/N?

DEFINED

This display occurs after you have pressed the [ENTER] key in response to the check INSERT FORMULA->. The Y/N? gives you a chance to accept the formula you saw scroll across the window or to reject it.

RESPONSE

If you wish to insert the formula, press the [y] key. Otherwise, press the [n] key.

Z or Z.00

DEFINED

This indicates that a division by zero error has occurred.

RESPONSE

See ERR#4 in this section.

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