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It is my hope that you find the file of use to you personally – I know that I would have liked to have found some of these files years ago – they would have saved me a lot of time !

Colin Hinson

In the village of Blunham, Bedfordshire.



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# Quick Reference Guide

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To take full advantage of the features of TI-CALC, please read manual carefully. Important keystrokes are summarized here for your "quick reference".

## FUNCTION KEYS

### *TI-99/4A*

- |                    |  |
|--------------------|--|
| <b>FCTN 1</b>      | Delete a character.  |
| <b>FCTN 2</b>      | Insert a character.  |
| <b>FCTN 3</b>      | Delete a row in the Matrix, or delete a calculation line.  |
| <b>FCTN 4</b>      | Insert a row in the Matrix or insert a calculation line.   |
| <b>FCTN 5</b>      | HOME: Bring Matrix Window back to A1 position, or bring calculations back to 1st line.                           |
| <b>FCTN 6</b>      | REPOSITION: Reposition Matrix Window by specifying coordinate, or reposition calculations at the last statement. |
| <b>FCTN 7</b>      | Bring up Command Menu.   |
| <b>FCTN 8</b>      | Bring up the Calculation Window.   |
| <b>FCTN 9</b>      | Bring up the Matrix Window.  |
| <b>FCTN (QUIT)</b> | Leave TI-CALC. Matrix and calculations erased.   |

# *TI-CALC*

## *SPREAD SHEET CALCULATOR FOR THE TEXAS INSTRUMENTS HOME COMPUTER 99/4A*

	J	F	M	A	M	J	J	A	S	O	N	D
1			44									
2			8.08						84.8			
3											5.86	
4						66					2.52	
5							32					
6		2.1		12.1								
7	2.02											
8					1.41				2			18
9								777		88		

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**TEXAS INSTRUMENTS HOME COMPUTER**  
**ORDINATEUR FAMILIAL TEXAS INSTRUMENTS**

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## **1. INTRODUCTION.**

TI-CALC is a Spread Sheet Calculator.

Imagine a very large sheet of analysis paper, having up to 96 vertical columns, numbered 1 to 96, and up to 248 horizontal rows designated A to Z, AA to AZ etc. Each column can vary in width from 2 to 14 characters. This "sheet of paper" (Matrix) is held in the computer, with the TV screen acting as a window onto it. The window can, in effect, be moved over the surface of the Matrix, allowing you to view and enter data (words or numbers) at any point on the Matrix.

There is a second, smaller window at the bottom of the screen, know as "the Calculation Window", where you may specify the relationships between the numbers in the matrix. In addition, there is a menu (list) of commands (special functions), which can be called up at any time.

This collection of data (numbers & text in the Matrix, and calculations in the Calculations Window) is known as a computer model.

Let's take a very simple example :

Suppose you wished to calculate the repayments on a loan. You could type into the Matrix the value of the loan, the period (number of years) of the loan, and the interest rate. Then, in the Calculation Window, you would type the instructions necessary to calculate the monthly repayment. Having done this, you could then, for example, change the loan period, and ask TI-CALC to recalculate the repayment.

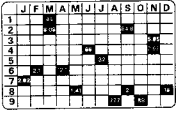
Once a model has been set up, it can be saved on cassette or disk, retrieved, modified, recalculated and reprinted as required.

### **Your Child and the Computer**

The Texas Instruments Home Computer is a rugged, durable device designed for easy use and care. Teach your child to give the computer the same good care and respect he or she would give a television set, record player, or any piece of electronic equipment :

1. Keep snacks and beverages away from the console.
2. Don't hammer on the keyboard or place heavy objects on it.





3. Don't touch the cartridge contacts. These are recessed in the cartridge to help prevent accidental soiling and/or damage.

If your child is not familiar with a typewriter or has not used your Home Computer before, take a few minutes to acquaint him or her with the keyboard. Point out the row of number keys at the top and the rows of letter keys below. Show your child how to insert the cartridge and select the activities. If your child is using Wired Remote Controllers, show him or her how to connect them to the console and practice using them in an activity. This brief "tour" of the computer will help reinforce correct procedures and instill confidence as your child starts out in a new world of computers.

Today, computers are involved in almost every aspect of life. Working with this cartridge can help your child become familiar with computers and their operation. Since computer-enhanced instruction is more common in the classroom every year, this knowledge can give your child an important advantage.

## 2. GENERAL INFORMATION.

### Terminology

- Matrix**                    2 dimensional table of numbers and pieces of text. Sometimes known as a "Spread Sheet".
- Cell**                        An item (number or text) within the Matrix.
- Coordinate**                Label used to refer to a cell. It is constructed from a matrix row letter and a column number. For example, C7 refers to the cell which lies at the intersection of row C with column seven.
- Coordinate Range**        This is a way of indicating a group of cells. A range can be a row, a column, a box (a group of cells), or a single cell.  
Example: B7 to B15    row range  
                  B7 to H7    column range  
                  B7 to H15   box range  
                  B7 to B7    single cell
- Cursor**                    The small blinking rectangle on the screen which indicates your current position.

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## Hardware required

The minimum requirement for using TI-CALC is the Home Computer Console and a T.V. set. (See page 41 for more information concerning the screen).

If you wish to see TI-CALC models (other than on the screen), then a printer is required.

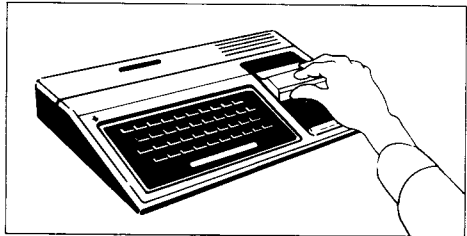
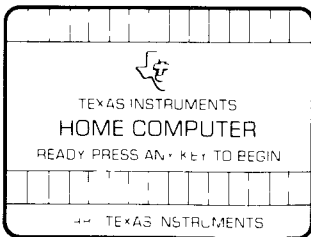
Should you wish to keep models, after the computer has been switched off, then either a cassette recorder or a disk drive will be required.

Expansion memory is not required. However if you have expansion memory, it will enable you to create larger models.

## Using the Solid State Cartridge

An automatic reset feature is built into the computer. When a cartridge is inserted into the console, the computer returns to the master title screen. All data or program material you have entered will be erased.

Note : Be sure the cartridge is free of static electricity before inserting it into the computer.



	J	F	M	A	M	J	J	A	S	O	N	D
1												
2												
3												
4												
5												
6												
7												
8												
9												

1. Turn the computer ON, and wait for the master title screen to appear. Then slide the cartridge into the slot on the console.
2. Press any key to make the master selection list appear. Press the key corresponding to the number beside the appropriate language. The program follows the same rules regardless of the language selected.

**Note :** To remove the cartridge, *first* return the computer to the master title screen by pressing **QUIT**. *Then* remove the cartridge from the slot.

## Errors

When you make the type of mistake which TI-CALC can detect, a sound will be heard and a message explaining the error will be displayed in the bottom right-hand corner of the screen.

Most errors are likely to occur when typing in calculation statements. When it can, TI-CALC will display an asterisk beneath the exact spot on the calculation where the error was found, as well as displaying the error message.

## Unused memory

At the bottom left of the screen, you will see a 2 digit number. This shows the percentage of unused memory. It is not on continuous display, but will always be redisplayed when the amount of memory you are using changes.

## **Summary of keys.**

### **THE FUNCTION KEYS.**

(Press the FUNCTION key and hold it down as you press the number key).

1. Delete Character.
2. Insert Character.
3. Delete row in Matrix or delete calculation line.
4. Insert row in Matrix or insert calculation line.
5. Bring Matrix Window back to the "A1" position i.e. top left hand corner of the Matrix, or bring calculations back to the first line. This key is called "Home".
6. Reposition Matrix Window anywhere. You specify by coordinate. Or, reposition calculations at the last statement.
7. Bring up the Command Menu.
8. Bring up the Calculation Window.
9. Bring up the Matrix Window, or, if more than one window, just keep pressing to hop from one window to the next.

Quit. This allows you to leave TI-CALC. It erases everything in the Matrix Window and in the Calculation Window, so be sure to save anything you wish to keep. (See Main Menu Option 9 explained on page 21).

### **OTHER IMPORTANT KEYS.**

#### **In the Matrix Window.**

ENTER: Move the cursor to the cell to the right of the current one.

ARROW keys: The 4 arrow keys (up, down, right, and left) move the cursor in the 4 directions. See page 11.

(You must press the Function key first and hold it down as you press the arrow key).

	J	F	M	A	M	J	J	A	S	O	N	D
1												
2												
3												
4												
5												
6												
7												
8												
9												

### In the Calculation Window.

- Up arrow            go to the previous calculation - do not execute.
- Down arrow        go to the next calculation - do not execute.
- Left arrow         move the cursor left. (If you are at the first position, the line will change colour).
- Right arrow        move the cursor right.
- Enter                will execute, and, if no errors, will save current calculation and move onto the next.

### When using the Main Menu (Function 7)

- Up and left arrows:            go back to previous step.
- Down & right arrows and Enter: accept reply and go to next step.

### Important note on functions 7,8 and 9.

Functions 7, 8 and 9 are the ones you will probably use the most. As you are learning to use TI-CALC, you will need to be able to move frequently back and forth between the Main Menu (7), the Calculation Window (8) and the Matrix Window (9).

## 3. IN THE MATRIX WINDOW

### Moving the Cursor

This section describes what you can do when the cursor is in the Matrix Window. In order to get into the matrix window, press FUNCTION and 9.

To move the cursor from cell to cell:

- Enter            go to the cell directly to the right.
- Up arrow        go to the cell directly above.
- Down arrow    go to the cell directly below.
- Left arrow     move the cursor one character left, unless already on first character of a cell - then go to cell on the left of the current cell.
- Right arrow    opposite of above.

A cell in the matrix may contain either numbers or text. Notice that text remains in the position you type it in, whereas numbers (except 0) are justified to the right. (0s remain exactly where you type them in).

## **Editing Numbers**

When the cursor is on a numeric cell:

- its current value (if any) is re-displayed left justified in another colour, with non-significant zeros removed.  
e.g., before cursor arrives you see 6204.20  
after cursor arrives you see 6204.2

In other words, the number is re-displayed in the same form as you probably first typed it in. (See page 16 for more explanation of decimal places).

- you may now, if you wish, change the number by typing over it, or convert the cell to text by typing non-numeric characters.  
Note that you can type a whole new number, or if you like, just change 1 or 2 digits of the old number. If you wish to change just 1 or 2 digits, be sure to use the arrow and not the space bar to move the cursor. Otherwise your number will be erased.
- when you are happy with the changes, press enter. The number will be re-displayed right justified and edited.

## **Editing Text**

When the cursor is on a text cell:

- the text is redisplayed in a different colour. Text justification is never altered, neither before nor after change. It stays where you put it.
- you may type in new text, change the existing text or, (by typing numbers), convert the cell into a number.

## **Inserting and Deleting Characters. (Functions 1 and 2)**

Pressing Function key 1 will delete the character the cursor is. The others will move over one space to the left.

Pressing Function key 2 will allow you to insert a blank space to the left of the cursor.

## **Inserting and Deleting Rows. (Functions 3 and 4)**

Pressing Function key 3 will cause the row (or line) which the cursor is on to be deleted. For example: If the cursor is in cell A5, then row "A" will be deleted. The data which was in row B will now be in row A. The data from C will be in B, and so on.

	J	F	M	A	M	J	J	A	S	O	I	N	D
1													
2													
3													
4													
5													
6													
7													
8													
9													

Similarly, if function key 4 is pressed, a new (blank) row will be created at the cursor position, displacing the old cursor row & subsequent rows downwards.

Functions 3 and 4 can be used together to erase the contents of a row: use F3 to delete the row then F4 to insert a blank one in the same place.

### **Moving the Matrix Window**

It is best to think of the matrix as stationary, and the window moving over it.

The simplest method of moving the window is by moving the cursor to a cell which currently outside the window. For example: suppose that the window is showing columns 13, 14, 15, 16 & 17. If you move the cursor to column 12, the window will also move the left, leaving columns 12-16 visible. However, while this method is good for moving the window short distances, it can be tedious if you wish to see a more distant part of the matrix. This is when you should use function key 5 or 6.

### **BRINGING MATRIX WINDOW "HOME" (FUNCTION 5)**

This key will reposition the window at the top left corner of the matrix. (The cursor will end up in the cell at the top left corner).

### **REPOSITIONING THE MATRIX WINDOW (FUNCTION 6)**

When you press Function 6, the coordinate reference for the cell currently in the top left corner of the screen will appear in the bottom left corner. Type in the reference of the appropriate coordinate. The window will be repositioned so that this new coordinate is in the top left corner. For example, if you type M2, the window will be repositioned so that cell M2 is in the top left corner. The cursor will also move to the cell in the top left corner.

You can use Function 6 to move the matrix window any distance you wish within the limits of your existing matrix. If you wish to move it beyond your current matrix, it is best to move it step by step, never exceeding the limits of what is visible on the screen.

### **Setting Matrix Size: Important note**

A cell does not exist until it has been in the window. For example, if the furthest down the matrix the window has ever been, is to row "BT" and the furthest across is to column "25", then row "BT" & column "25" will be the current matrix limits. If, elsewhere in TI-CALC, you refer to a row, column or cell outside of the current limits, the error message "outside current matrix" will appear.

You can expand the limits of your matrix by moving the cursor using the arrows.

## **4. COMMANDS ON MAIN MENU**

The Command Menu can be called up at any time by pressing function key 7.

The menu looks like this:

- 
1. COLUMN WIDTHS
  2. DECIMAL PLACES
  3. COLOURS
  4. FIX ROWS/COLUMN
  5. SPLIT SCREEN
  6. DEL/INS COLUMN
  7. RECALCULATE
  8. PRINT
  9. SAVE / LOAD
- PRESS SPACE FOR HELP

SELECT \_\_\_\_\_



	J	F	M	A	M	J	J	A	S	O	N	D
1												
2												
3												
4												
5												
6												
7												
8												
9												

## Question and Answer Mode

All of the commands work in a question and answer mode, and are therefore easy to use. The computer asks you the necessary questions and you just supply the answers. In response to a question, you can usually do one of several things:

1. You can press ENTER without answering. This means that you accept the proposed answer that you see displayed on the screen. This is called "defaulting".
2. You can reply to the question and then press ENTER.
3. You can go back to the previous question by pressing the left arrow or the up arrow.
4. You can give up on this series of questions and go back to the Command Menu (Function 7), or go to the Matrix Window (Function 9), or go to the Calculation Window (Function 8).

### Option 1: Column widths.

By using this command, the width of any column may be altered.

The width is measured in characters.

Minimum column width is 2 characters.

Maximum column width is 14 characters.

Default width is 6 characters. (All column widths are preset to 6 characters unless you change them.) Column one is an exception: default width is 10.

Obviously it is desirable, for printing purposes, that the columns should be kept narrow, so that you can print as many columns as possible on each page. However, large numbers in narrow columns can cause problems. For example, if a cell was displayed as: 12345.6789, and the column was then narrowed to 7 characters, the same cell would be displayed as: 1.234E4. In other words TI-CALC displays the number in scientific notation, to as great a degree of accuracy as space will allow. However the original full version of the number is not lost. Making the column wider again will bring it back.

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**Option 2: Decimal places.**

The purpose of this command is to specify how many decimal places a cell will have.

The method of telling TI-CALC which cells are to be changed, is to give a range of coordinates. As already explained, a range may be a row, a column, a box or a single cell. The only rules are that the second coordinate must not be less than the first, and that both must be within the matrix boundaries.

The number of decimal places specified may be 0, 2, 4 or F.

0, 2 & 4            are fixes point.  
F                    implied floating point.

E.G.

What was Typed	0 decimal Places	2 decimal Places	floating point.
1	1	1.00	1
135.67	135	135.67	135.67
-13.246293167	(13)	(13.24)	(13.246293167)

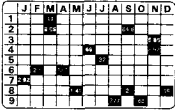
(Notice that TI-CALC puts negative numbers between parenthesis).

It is not necessary to type ENTER after selecting the 0, 2, 4 or F. in fact if you do, the cursor will move one step too far ahead.

If you type a number with more than 2 decimal places into a cell where you have already specified only 2 places, it will be displayed with 2 places. However, when you place the cursor directly on the cell, you will see the number as it was originally typed in.

**Option 3: Colours.**

The purpose of this command is to allow you to change the colour of any cell, or group of cells.



Like the previous command, it asks for a coordinate range. It then asks which colour you would like the cells within that range to be.

- |                 |                   |
|-----------------|-------------------|
| colour number 1 | YELLOW on BLACK.  |
| 2               | BLACK on YELLOW.  |
| 3               | WHITE on BLUE.    |
| 4               | WHITE on MAGENTA. |

#### **Option 4: Fix rows and/or columns.**

The usual practice, when constructing a matrix, is to put row description down the left side of the matrix, and column headings along the top of the matrix. However, when the window is moved away from the edges of the matrix, the fact that these descriptions are no longer visible can be inconvenient. You may, if you wish, "fix" (freeze) up to 4 rows at the top of the matrix and/or column one. This means that the descriptive text is always visible, regardless of the window's location.

When there is more than one window (see next command) then "fix" is window dependent. For example, there are 3 windows. The cursor, let's say, is in the middle window. You call up the command menu and ask for column one to be "fixed". Then only column one in the middle window will be "fixed". You can unfix by using the answer 0.

#### **Option 5: Split screen**

You may have 2 or 3 windows onto the matrix. This allows you to view separate parts of the matrix simultaneously. Each smaller window behaves exactly like the single full size window. To get from one window to the other, press function key 9. To return to the single full size window, select 1 instead of 2 or 3.

Several of the menu commands described here (e.g. COLOURS) will display one window while the command is being executed. This is done so that you can see what is happening. The window chosen for this purpose is the one in which the cursor was last.

### **Option 6: Delete or Insert Columns.**

This command will ask if you wish to delete or insert a column, and then which column.

If you insert, say column 5, then column 5 becomes column 6, column 6 becomes column 7 etc. and a new (blank) column 5 is created.

If you delete, for example, column 24, then column 25 becomes column 24, 26 becomes 25... and so on.

See page 40 for more information.

### **Option 7: Recalculate**

In the next section, there is a description of how to set up the calculations which will operate on the data in the matrix. Once you have typed in the calculations, you may change the matrix data and, using this command, request TI-CALC to do the calculations again. This process may be repeated as often as you like. Recalculation will stop when TI-CALC encounters a blank line in the Calculation Window.

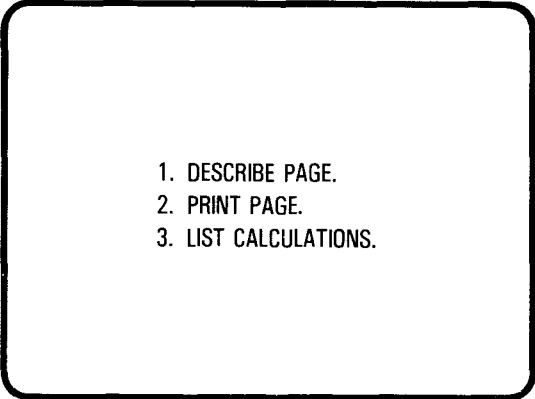
Be sure to remember that any time data are changed after the calculations have been written, you must use the Recalculate in order to have accurate results.

### **Option 8: Print**

The purpose of this command is to enable the printing of selected parts of the matrix and/or listing of the calculations. If you do not have a printer yet, please ignore this command,

	J	F	M	A	M	J	J	A	S	O	N	D
1												
2												
3												
4												
5												
6												
7												
8												
9												

When PRINT is selected, a sub menu will appear:

- 
1. DESCRIBE PAGE.
  2. PRINT PAGE.
  3. LIST CALCULATIONS.

### **DESCRIBE PAGE.**

Since most models would be much too big to fit onto a page, you must describe exactly which cells are to be printed on a given page. In any model you may describe up to 16 pages. These descriptions will be filed with the model when you SAVE it. Therefore you do not have to re-describe a page in order to reprint it.

If you wish to look up a page description previously saved, use the "describe page" option. As soon as you enter the page number, the description previously saved will appear on the screen. If you wish to change it, be sure to re-save the complete model in the same way you did the first time. When you save it the second time, you will see the message "already exists". Answer "yes" to the question "overwrite" and the new version will be saved.

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When "DESCRIBE PAGE" is selected, you will be asked:

- What page number do you wish to describe? (1 to 16)
- How long a line can the printer print? (measured in characters... default = 80).
- Which columns do you wish to print?
- Of these columns, which rows?
- Give a title to this page. (This is an optional piece of text which, if supplied, will be printed at the top of the page. (Maximum 28 character spaces).

Here is an example of a print description:

PAGE NO. \_\_\_\_\_ 1

LINE LENGTH \_\_\_\_\_ 132

COLUMNS  
1, 4 8, 10, 12, 1

ROWS  
A C,H,K R///A C,AB AF

TITLE  
YEAR ENDED OCTOBER 1984.

What the example says is:

Print columns 1,4,5,6,7,8,10,12 & 1. However do not print the whole of these columns; only rows A,B,C,H,K,L,M,N,O,P,Q,R,A,B,C,AB,AC,AD and AF.

Note that column one will be printed twice, and so will rows A,B & C.

Comma (,) means "AND".

Underscore (   ) means "THROUGH".

Slash (/) means print a blank line.

	J	F	M	A	M	J	J	A	S	O	N	D
1												
2												
3												
4												
5												
6												
7												
8												
9												

The main purpose of supplying the printline length, is so that TI-CALC can check that you are not trying to print too many columns on one page. You will get the message "outside current matrix" in this case. You could then try making some of the columns narrower using the "COLUMN WIDTHS" command.

You can, of course, change a page description any time you like, and either re-save it or not, depending on which version you wish to keep.

### PRINT PAGE.

When "PRINT PAGE" is selected, you will be asked:

- Which page number? (You must previously have described the page).
- Would you like the coordinate references to be printed?
- On which device would you like the page to be printed? E.G. "RS232.BA = 9600" (see the manual which was supplied with the RS232 controller card. BA means baud and 9600 is the speed).

If you request COORDINATE REFERENCES, the column numbers will be printed along the top of the page, and the row references down the left side of the page. This facility is very useful when planning the calculations. Note that, because of the row references, the effective line length will be reduced by 3. This means that part of the last column may not be printed.

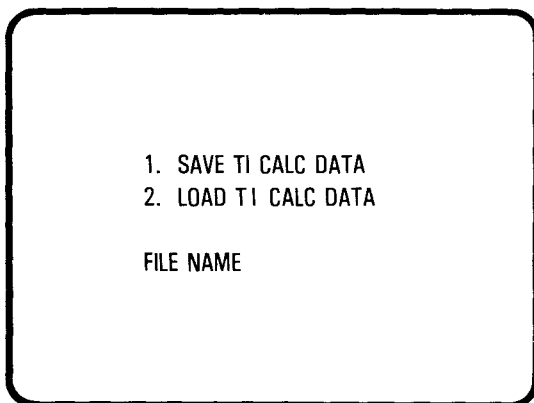
### LIST CALCULATIONS.

When the Calculations Window is being used, only three calculations can be seen at any one time. This can sometimes be awkward. The "LIST CALCULATIONS" option will print all the calculations. It will, however, stop at the first blank line encountered.

**Option 9: Save/Load.**

This command should be used when you want to file (save) a model onto diskette or cassette, or when you wish to retrieve (load) a previously filed model.

When selected, the following sub-menu will appear:



1. SAVE TI CALC DATA  
2. LOAD TI CALC DATA

FILE NAME

Select option 1 or 2. If you are using a cassette, position it in the correct place. If you are using a disk, you will be asked for a file name. Reply with any suitable disk file name, for example:

DSK1. LOAN

If you are saving, TI-CALC will check to see if a title with the same name already exists on the disk. If it does, you will see a message to that effect and will be asked if you want to overwrite (replace) existing file. If you answer yes, the new version will replace the old one. If you answer no, the cursor will move back to "File name" so that you can give a different name.



	J	F	M	A	M	J	J	A	S	O	N	D
1												
2												
3												
4												
5												
6												
7												
8												
9												

Note that, if you have expansion memory, it is quite possible to create a model which is too big to be loaded into Home Computer without expansion memory.

## 5. THE CALCULATIONS.

The calculations window may be entered by pressing the FUNCTION & 8 keys. As already stated, this is where you specify how the cells in the matrix relate to one another. It is a little like a "BASIC" program, but much simpler.

The window consists of 3 lines. The cursor is always on the second line, and new calculations are always entered on this line. This is so that you can see the previous, and the next, calculation.

Example :

```

* START
E3=D3*4842
RE CO 11

```

The calculations window should be thought of as a window onto a list of calculations. Each calculation occupies one line. The first line of the list is a Note Line. It is preset to: "\* START" and cannot be changed.

To get a new calculation line accepted by TI-CALC type in the calculation and press "ENTER". TI-CALC will:

- check to see if the line is valid
- execute the calculation
- accept the line

Note that a new or altered line will only be accepted when you press "ENTER". Other keys won't do (see later) and even then, it will not be accepted if it cannot be executed because of errors.

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### The Function Keys as used in the Calculation Window.

The following is a list of function keys which you can press when editing and executing calculations and manipulating the calculations window :

ENTER	As already explained, will check, execute and accept the current calculation and, if successful, will move the window down one line.
RIGHT ARROW	Moves the cursor to the right. Note that while there are only 28 characters of calculation line visible, a calculation line is 84 characters long. The window will scroll (move) left or right in such a way as to maintain the cursor in the window.
LEFT ARROW	Is the opposite of RIGHT ARROW. However, if the cursor is at the start of a line, LEFT ARROW will change the line's colour. You can get any of the 4 colour combinations by hitting the arrow 1, 2 or 3 times. This can be quite useful for highlighting important calculations. Note however, that the colour will not stay changed unless you press ENTER.
DOWN ARROW	Will move the window down one line, just like "ENTER". However it does not cause execution.
UP ARROW	Is the reverse of "DOWN ARROW".
FUNCTION 1	Delete character where the cursor is.
FUNCTION 2	Insert character to the left of where cursor is.
FUNCTION 3	Will delete the second line in the window. The third and subsequent lines will be moved up to fill the gap.
FUNCTION 4	Will move the centre and bottom window line down one line, thus opening up a line at the current line position. This is to allow you to insert a new line between existing calculations.

	J	F	M	A	M	J	J	A	S	O	N	D
1												
2												
3												
4												
5												
6												
7												
8												
9												

- FUNCTION 5 Will reposition the window at the start of the calculations.
- FUNCTION 6 Will reposition the window at the end of the calculations, or more accurately, at the first blank line encountered. Once it has reached a blank line, it will move no farther.

**NOTES:**

If the first character position of a line contains an asterisk (\*), then that line will be considered as a note line, and TI-CALC will not attempt to execute it. If an exclamation mark (!) is placed anywhere on a line, then that will be considered as the "End of Line" for the calculation, and any text to the right of it, will be treated as notes.

e.g. IF A7 < 0, A9 = A9 + A7 ! ONLY IF A7 NEGATIVE.

**The "coordinate = expression" Instruction.**

Let us deal with the most commonly used calculation first.  
Coordinate = Expression.

Example :

$$A1 = 123$$

This means give cell A1 a value of 123.

Example :

$$C5 = C4 + C3 - 15$$

This means change cell C5, so that its value is the sum of C4 and C3, minus 15.

Example :

$$D14 = C12/D4$$

Cell D14 will be made equal to cell C12 divided by cell D4.

Example :

$$D6 = B5 * 3 + C8/C2$$

---

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Sequence of events:

B5 is multiplied by 3 giving x.  
C8 is divided by C2 giving y.  
x is added to y giving D6

The next example uses the same cells and operators as the previous example. However, because of the brackets, the result will be quite different.

$$D6 = B5 * (3 + C8) / C2$$

Sequence of events:

C8 and 3 are added giving x.  
B5 and x are multiplied giving y.  
y is divided by C2 giving D6.

In other words "coordinate = expression" is much the same as BASIC. However there is an additional feature: You may include a range in the expression.

Example:

$$AZ4 = A4\_AX4$$

This means total all the cells between and including A4 and AX4. The two coordinates are separated by an underscore (not a minus). The range (as before) may be a cell, row, column or a box.

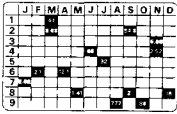
Example:

$$B4 = B5\_B12/B8 \quad ! \text{ CALC AVERAGE.}$$

### **RULES FOR RESOLVING AN EXPRESSION.**

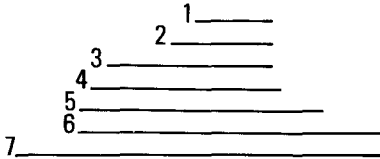
1. Innermost bracket pairs are resolved first.
2. Within any pair of brackets the arithmetic operators are resolved from left to right, in the following sequence:

FIRST	—	SUM COORDINATE RANGE.
SECOND	^	RAISE TO THE POWER OF.
THIRD	* /	MULTIPLY and DIVIDE.
FOURTH	+ -	PLUS and MINUS.



The following example would be resolved in the sequence indicated:

$$A1 = A7 + ((C3 - C8 \wedge (A3 + A4/A5)) / A7) / 1,234$$



### Math functions

Functions simply prefix any pair of brackets enclosing part of an expression.

Example:

$$E24 = \text{SQR}(E20 / (E16 + 2.5)) \quad ! \text{ Square Root}$$
$$G4 = G5 + G7 / \text{LOG}(50) \quad ! \text{ LOGe}$$

The following functions are available

INT	integer
ABS	absolute.
SQR	square root.
EXP	exponentiate.
LOG	log to base e.
COS	cosine.
SIN	sine.
TAN	tangent.
ATN	arctangent.

These are the same as the BASIC functions. See BASIC manual for more details.

You can use several functions within each other in the same line. (This is called "nested" functions). Be sure to use enough parentheses.

Example:

$$B6 = \text{SQR}(\text{EXP}(\text{LOG}(\text{SQR}(B6 \wedge 4))))$$

### **Rounding**

Intermediate result are held to 13 decimal places. However, the final result is rounded off according to the number of decimal places specified for that cell. Thus if B9 has 2 decimal places:

$B9 = 123.4692543$  is the same as  $B9 = 123.47$

### **Change cell colour instruction**

Format :

Coordinate = #n (where n = 1, 2, 3 or 4).

Example :

$AB6 = \#2$

Change colour of cell AB6 to yellow.

Values = 1 for yellow on black  
          2 for black on yellow  
          3 for white on dark blue  
          4 for white on magenta

### **Move Matrix Window instruction.**

Format :

Coordinate (on it's own)

Example :

F15

Reposition matrix window at F15.

This instruction can be used within the limits of what is visible on the screen.

### **The replicate instruction**

This function allows you to write one or several calculations and to repeat them in one or several rows or columns without rewriting them.

The elements involved in this instruction are the following :

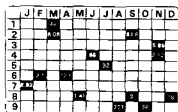
RE

ROW or COL

(number a)

number b

\* number c



RE is the only mandatory part and must come first. The other elements may come in any order you wish.

ROW or COL: ROW means that the row number will be increased by one; therefore the calculation(s) will be performed in the next row of the same column. COL means that the column number will be increased by one, thereby affecting the next column of the same row. Only the first 2 letters are taken into account, so you can type in either RO or ROW, either CO or COL.

(Number a) is the number of preceding calculations to be repeated. It must be enclosed in parentheses.

Number b is the number of time to repeat the preceding calculations.

\* number c is the number of times you want the row or column number to be increased by. This number must be preceded by an asterisk. For example, if you put \*2, one row or column will be skipped.

The default for all three numbers is 1. The numbers can be written in any order, but be sure to place the parentheses and the asterisk correctly.

A good way to learn the Replicate function is to use the following procedure: (Function 8) Write the calculations. (Function 9) Enter the data. (Function 8) Go back to Calculation window. (Function 5) Move the cursor to beginning of your calculations. Then hit ENTER step by step and watch the changes on the screen.

Following are some examples with explanation.

**EXAMPLE 1:**

B1 = 100  
RE ROW

This is the same as writing:

B1 = 100  
C1 = 100

**EXAMPLE 2:**

B1 = 100  
RE COL

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**EXAMPLE 3:**

Try the following:

$$B2 = 10$$

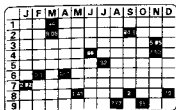
$$B3 = B2 + 2$$

RE (2) 6 ROW

The screen should display:

	1	2	3	4	5	6	7	8	9	10	11
A											
B		10	12								
C		10	12								
D		10	12								
E		10	12								
F		10	12								
G		10	12								
H		10	12								
I											
J											



**EXAMPLE 4:**

Now try the same calculation leaving out the 2 in parentheses. The screen should display:

	1	2	3	4	5	6	7	8	9	10	11
A											
B		10	12								
C			2								
D			2								
E			2								
F			2								
G			2								
H			2								
I											
J											

Notice that since you said to repeat only the preceding calculation and not the 2 preceding ones, the computer did not know the value of B 2. It therefore interpreted the second line as  $B3 = 2$ , and repeated this 6 times.

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**EXAMPLE 5:**

Try the following:

$$B2 = 10$$

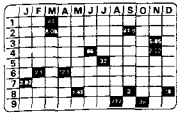
$$B3 = B2 + 2$$

RE (2) ROW \* 3

The screen should display:

	1	2	3	4	5	6	7	8	9	10	11
A											
B		10	12								
C											
D											
E		10	12								
F											
G											
H											

The computer skipped 2 rows because you specified that the row number should be increased by 3.



**EXAMPLE 6:**

Suppose you have 4 columns of figures that you wish to total. (Columns 2 through 5). Imagine that the columns run from B through H. You wish the totals to go on row J. Type in the following calculations:

J2 = B2\_H2  
 RE COL 3

The screen should display:

	1	2	3	4	5	6	7	8	9	10	11
A											
B		2	9	11	9						
C		10	10	12	9						
D		2	7	14	7						
E		14	8	13	14						
F		3	40	5	1						
G		4	3	4	11						
H		8	1	8	2						
I											
J	TOT	43	78	67	53						
K											
L											

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**EXAMPLE 7:**

Now suppose that you have a model where each column represents a month, and every fourth column a quarterly sub-total.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	J	F	M		A	M	J		J	A	S		O	N	D	
B				ST				ST				ST				ST
C	3	13	12		11	14	21		10	1	6		9	10	1	
D	5	23	9		9	2	21		12	55	17		8	19	23	
E	12	2	8		5	9	13		3	5	71		5	18	22	
F	13	1	5		16	8	31		3	4	4		6	17	19	
G	5	11	15		34	6	4		12	4	40		31	16	12	
H	11	12	9		43	16	4		10	12	9		12	11	11	
I																
J																

Type in the following:

C4=C1\_\_C3  
 RE 5 ROW  
 RE (2) 3 COL \*4

The first calculation totals the first row of the first quarter and fills in C4. The second calculation does the totals for the rest of column 4. The third line repeats the first and second calculations for the other 3 quarters (columns 8, 12 and 16.)

	J	F	M	A	M	J	J	A	S	O	N	D
1												
2												
3												
4												
5												
6												
7												
8												
9												

**EXAMPLE 8:**

Replicates within replicates are allowed. For example, suppose that your matrix size is Z 12 and that you wish to clear out the entire matrix:

A1=0  
 RE ROW 25  
 RE (2) CO 11

The 25 is the number of rows minus 1, and the 11 is the number of columns minus 1. This is handy way to clear out your matrix without losing your calculations.

If you accidentally get into a very long calculation because of replicates within replicates, you can stop the process by pressing any key.

**EXAMPLE 9:**

If you do not wish all the coordinates to be increased, enclose the non-varying ones in square brackets. Enter numbers into cells B2, B3, B4 and B5. Then perform the following calculations:

C3=[B2]+B3  
 RE 2 COL

		1	2	3	4	5	6
A							
B			10	2	5	10	
C				12	15	20	
D							
E							

---

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**EXAMPLE 10:**

It is not necessary to increase rows or columns. Try the following and watch the screen closely:

```
A1 = 0
A1 = A1 + 1
RE 99
```

**The "GO" instruction.**

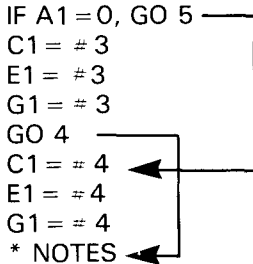
Format:

GO number

Examples:

- GO 1 means go 1 line forward (i.e. next line).
- GO 2 means go 2 lines forward (i.e. skip a line)..
- GO 9999 means go 9999 lines forward.
- GO - 1 means go back one line (i.e. to previous line).
- GO - 2 means go back 2 lines.
- GO - 99 means go back 99 lines.

Here is an example of "GO" in use.



If A1 is empty or contains a 0, you will get 3 magenta bars (colour 4). Put any other number in A1, recalculate (Function 7, option 7), and you will get 3 blue bars (colour 3).

When you type in a "GO" instruction, it will be executed. i.e. it is interactive, just like all other statements. So you will be able to check if it is GOing to the intended statement. A GO forward will stop if a blank line is encountered. A GO backward will stop if the start of calculations is encountered.

	J	F	M	A	M	J	J	A	S	O	N	D
1												
2												
3												
4												
5												
6												
7												
8												
9												

It is permissible to have GO's within a REPEAT. However, ensure that a GO within a REPEAT does not stray outside of the lines being repeated. The following example demonstrates what not to do:

```

IF A=0, GO 5
C1 = # 3
E1 = # 3
G1 = # 3
GO 5
C1 = # 4
E1 = # 4
G1 = # 4
RE (8) CO * 2 2
* NOTES
  
```

This program was supposed to display 3 columns of magenta bars if  $A1=0$ , or display the same three columns in blue if  $A1$  did not equal 0. You can get the magenta bars in the 3 columns if you set  $A1$  to 0, however, if you set  $A1$  to another number you cannot get the blue bars because the second "GO 5" goes outside the lines being repeated. Only the first column will appear blue because, when the computer reaches GO 5 the second time, it jumps to \*NOTES and cannot continue to replicate.

### The "IF, AND, OR" instruction.

Any one of the previously mentioned instructions may be preceded (on the same line) by one or more conditional statements

Example:

```
IF A1 = 3,
```

Example:

```
IF (B7 - B6)/2 >= (A9 * A8) ^ 2,
```

The condition symbols are:

- = IS EQUAL TO
- > IS GREATER THAN
- < IS LESS THAN

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You may use one, or two in any combination.

- $< >$  means "LESS THAN OR GREATER THAN"  
i.e. "IS NOT EQUAL TO"
- $> =$  means "IS EQUAL TO OR GREATER THAN"  
i.e. "IS NOT LESS THAN"
- $< =$  means "IS LESS THAN OR EQUAL TO"  
i.e. "IS NOT GREATER THAN"

When you use the IF/AND/OR, notice that:

- The COMMA is mandatory.
- Expressions must have already been explained.
- The instruction following the comma will only be executed if the condition is found to be true.
- You may use multiple conditional statements... as many as you can squeeze on one line.

Example:

IF G2 > 1000, AND G3 > G4 \* 3, AND H5 > H7 \_\_ H18, H19 = G2 - G3

Notice the following:

Commas are placed between each statement.

AND and IF are synonymous.

For TI-CALC, AN and AND are the same, since it reads just the first 2 letters.

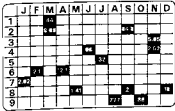
You may use OR to give multiple alternative conditions.

Example:

IF A1 = > 200, AND A1 = < 300, OR A1 > = 400, AND A1 = < 500,  
A2 = A1

- This statement says let A2 = A1 provided that A1 falls within one of the following two ranges:
  - 200 to 300
  - 400 to 500





### Summary of calculation words.

INT	IF
ABS	AND
SQR	OR
EXP	RE
LOG	ROW
COS	COL
SIN	
TAN	
ATN	

Calculation words may be any length, but only the first two characters are used. The third and subsequent characters are disregarded.

## 6. OTHER.

### Possible error messages.

NOT A COORD.	TOO MANY REPEATS
BAD RANGE	BAD NAME
OUTSIDE CURRENT MATRIX	WRITE PROTECTED
MEMORY FULL	CAN'T FIND IT
MAX.ROW"IN"	ERROR
MAX.COL.96	DISK FULL
ILLOGICAL !	DEVICE ERROR
OVERFLOW	READ ERROR
MATH ERROR	WRITE ERROR
INTEGER OVERFLOW	NOT TI-CALC FILE
SQR -VE NO.	MODEL TOO BIG
-VE NO.POWER NOT INTEGER	TOO LONG
LOG OF NON+VE NO.	ALREADY EXISTS
TRIG. ERROR	1 - 16
INVALID	2, 3, OR 4
INCOMPLETE	2 - 14
NOT ENOUGH "("	INTERRUPTED !

### **Deleting & inserting rows & columns.**

As previously mentioned, you may delete or insert rows and columns. When you delete or insert a row or a column, the calculation statements are also updated, to keep them in line.

Example :

Suppose you inserted column 2, then :

$$G1 = B1 + B2 + B3$$

would be changed to :

$$G1 = B1 + B3 + B4$$

Example :

Suppose you inserted column 2, then :

$$G1 = B1\_B4$$

would be changed to :

$$G1 = B1\_B5$$

Example :

If row "H" is deleted, then :

$$O6 = C6\_K6$$

would become :

$$N6 = C6\_J6$$

However if a cell is deleted which is directly referred to by a calculation, then TI-CALC cannot guess at what you intended. It will put a question mark in front of the offending coordinate.

Example :

Column 3 is deleted

$$L4 = L3 + L5$$

would become :

$$L3 = ?L3 + L4$$

This calculation is no longer acceptable, and will cause an error if an attempt is made to execute it.

	J	F	M	A	M	J	J	A	S	O	N	D
1												
2												
3												
4												
5												
6												
7												
8												
9												

### The T.V. screen.

It is sometimes the case, on the Home Computer, that not all of the display is visible on the screen.

If your problem is that the right hand edge is not visible, then provided you use only even numbers as column widths, the last character position of each screen line will never be used.

On the other hand, if you cannot see the left hand edge, then the following will be of interest:

The first character position on each line is not used. If you would also like to avoid the second character position, then, using the "COLUMN WIDTHS" command, change the width of column 0 (zero) from 3 to 4.

If your display is well centred, you could try changing the width of column 0 from 3 to 2. This would give you a slightly bigger window.

Column zero is not part of the data matrix. It is the narrow strip down the left side of the window, containing the row references.



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