# DYNACALC™

Electronic Spread Sheet program

for

6809 FLEX

User's Manual

Sold by:

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## System Requirements

This version of DYNACALC is designed to operate under the 6809 FLEX operating system. Normally FLEX systems have at least two disk drive units, and this is also recommended for DYNACALC. However, if your system has only a single drive, DYNACALC will not be any more difficult to use than any other system program you have previously used.

At least 32k bytes of total system memory is required, but any additional amount is desirable up to the maximum 56k permitted by FLEX. Your system must have at least 40k RAM to permit use of DYNACALC's HELP messages. The larger your system's memory, the larger will be the maximum workspace on your DYNACALC worksheets.

The system terminal must be a crt with certain cursor-control features; this rules out TTY and other printing-terminal devices. The terminal used MUST have direct cursor addressing. This means that primitive crt terminals such as TV typewriters, CT-64's and ACT-I's are not usable with DYNACALC. If your terminal is fairly smart, don't despair if it's not in the list of terminals supported by CSC. It is quite easy to customize DYNACALC to most any terminal with the required minimum features. The supplied utility INSTALL will help you to do this.

DYNACALC does lots of writing to the crt screen. Because of this, you will want to use the highest baud rate at which your terminal can reliably operate. On most terminals, this will be 9600 baud, which is fine. On some SWTPC terminals, the higher baud rates result in strange happenings, and it is best to stick to 9600 baud. If you are using a SWTPC terminal, its DTR (pin 20) output line MUST be connected to a ready-sensing input on the computer. On the MP-S2 board (used since 1979), this is very simple, and merely requires pin 20 on the terminal to be connected to pin 20 on the computer. On the older MP-S board and possibly on serial boards of other manufacturers, you will have to provide a way to sense the ready condition, otherwise the terminal will not be able to keep up with DYNACALC. See your SWTPC terminal manual for suggestions on how to do this. We are not aware of any other brands of terminal that have this problem.

Use of a printer with DYNACALC is entirely optional, and you can use any hard copy device which you currently use under FLEX. The user has control of all important printer parameters: column width (up to 255), line spacing and number of lines per page, pagination on/off, and DYNACALC borders on/off.

This manual was prepared using the TSC 6809 Text Editor and Text Processor, and was output to a DIABLO model 1640 printer.

FLEX is a trademark of Technical Systems Consultants, Inc.

## Getting Started

The DYNACALC package includes two items: this manual and a single 5" or 8" FLEX diskette. Before you attempt to use DYNACALC, make a COPY of THE SUPPLIED DISKETTE, and STORE THE ORIGINAL IN A SAFE PLACE. Then, verify that the copy you have made contains the following files:

```
DYNACALC.COR this is the 'core' program
DYNAC-1 .BIN Command overlay #1 (Move and Replicate)
DYNAC-2 .BIN Command overlay #2 (Printer routines)
INSTALL .CMD Customization utility, used with .TRM files
CT-82   .TRM terminal overlay for SWTPC CT-82
C8200   .TRM    "        "    for SWTPC 8209 or 8212 (old kbd)
C82-W   .TRM    "        "    for SWTPC 8209, 8212, or 8212W
H-1400  .TRM    "        "    for Hazeltine 1400
H-1420  .TRM    "        "    for Hazeltine 1420
H-1500  .TRM    "        "    for Hazeltine 1500, 1510, or 1520
ADDS-VPT.TRM    "        "    for ADDS Viewpoint
H-19    .TRM    "        "    for Heath H-19
ACT-IV  .TRM    "        "    for Micro-Term ACT-IV
ADM-3A  .TRM    "        "    for Lear Siegler ADM-3A
ANSI    .TRM    "        "    for DEC VT-100, etc.
             and other .TRM files as available
DEMO-xxx.CAL several demonstration/tutorial screens
```

To generate the version of DYNACALC that you will use on your system, put the COPY of the DYNACALC release disk in your System drive, then type INSTALL, followed by the name of the .TRM file listed above which matches your terminal (at this time you may also change the default values of DYNACALC's time delay, printer/textfile, and miscellaneous parameters). If your terminal is not listed, simply type INSTALL and you will be asked for information about your terminal. See the System Configuration section for details.

This command will create a new file, DYNACALC.CMD. Put copies of this new DYNACALC.CMD and the DYNAC-x.BIN files on your system disk.

DYNACALC is now ready for use. Make several backup copies of DYNACALC.CMD so you won't have to go through this procedure again. A friendly reminder: we have deliberately not played any tricks on you to prevent making backup copies of DYNACALC. We give you the freedom to make as many backup copies as you like. Please keep in mind that DYNACALC represents an investment on our part of thousands of programming hours, and that copies are for backup use on a single system only.

On the following pages, the basic operation of DYNACALC is described. Please remember that it is virtually impossible to damage your computer by typing incorrect commands. Feel free to try each feature as you read about it. The best way to learn how to use DYNACALC is by actually using it.

## DYNACALC Basics

DYNACALC is a computer program that simulates a large sheet of paper (worksheet) arranged as a rectangular array of 'columns' (vertical) and 'rows' (horizontal). At each intersection of a column and a row there is a space, called a 'cell', which can hold a 'value' (numeric constant), an 'expression' (describes mathematical operations), or a 'label' (an alphanumeric message). See the illustrations on pages 34-35.

To enter a value, expression, or label into a cell, you must first move the 'cursor' (pointer) to the cell you wish to use. You may move the cursor with the arrow keys on your terminal, if it has such special keys, or with a combination of the 'control' key and various alphabetic keys such as 'u' for up and 'd' for down, or the curly and square bracket keys. See the Key Assignments section for details on your terminal.

Using the arrow (or equivalent) keys you can move the cursor up, down, right, or left from its current position. Each time the cursor moves, the cell 'address' (column and row information) is changed. You will see the address continuously updated at the extreme top left corner of the crt screen.

If you attempt to move the cursor beyond the edges of the screen, the column and row borders will change to reflect the new location. Of course, if there is any data in a cell, that data will move to a new physical location on the screen, or may even scroll off to make room for new cells. The actual contents of cells is not changed, however. If you restore the cursor to where it was before, you will see some of the same cells appear.

The arrow keys are very useful for moving short distances, but may be cumbersome when long moves become necessary. Immediate cursor positioning to a given cell address is provided by the 'Goto : ' command, invoked by typing the 'greater than' symbol, '>'. As soon as you hit this key (shift-period on most terminals), the message 'Goto : ' is displayed near the top of the screen. Now enter the address of the cell you want, for example 'A3' or 'BA23', and the cursor will move immediately to that cell.

Since it is frequently necessary to move to the top-left corner of the worksheet, a special key 'home' has been implemented to do just that. Normally, 'home' will cause a the cursor to move to cell A1. However, if titles (see) are enabled, that won't be possible. The cursor will in that case go as close to A1 as it can. On most terminals 'home' will be labeled 'home' or 'top'. On terminals where no other suitable key is available, control-T is used. Check the Key Assignments section for the key applicable for your terminal.

Once you move DYNACALC's cursor to the cell you wish to examine, you will note that the contents of that cell are now displayed on the very top line of your screen. This cell to which the cursor points is called the 'current cell'. To examine another location, move the cursor as

explained above. When you reach a cell whose contents you wish to change, simply type in the new value, expression, or label. When you hit the 'return' key, the new information will be transferred to the current cell.

## Entering Data and Equations

As mentioned earlier, each DYNACALC cell can store any of three types of data: values, labels, and expressions. When you move the cursor to a particular cell (let's call this pointing to a cell), its contents are displayed on the top line of the screen. The symbols (V), (L), and (E) are used to indicate Value, Label, and Expression. A given cell can contain only a single type of data at a time. When the cell is changed, the new data may be of any of the three types, but never mixed at the same time.

To enter a value, move the cursor to the desired cell and then type the number, for example 2, 3.4, -12, .Ø9, -3487.345, 3.8e6, 6.8e-18. These are all valid numbers. Commas are not allowed within a number, however. As soon as you type the first character of the number, DYNACALC will detect that it is part of a number, and will display 'Value' on line 2 of your screen. When you finish entering the number, hit the 'return' key, and the number will be transferred to the current cell.

To enter a label, move the cursor to the desired cell and then type the message you wish displayed at that place in your worksheet. When you type the first character of the label, DYNACALC will display 'Label' on line 2. But what if you want to enter a number as the first part of a message? Or if you want to enter a string of periods? If you try doing this, DYNACALC will think you are trying to input a number. To 'fool' DYNACALC, precede your label with a single-quote character ('), and it will know that what is to follow is a label. No trailing quote is required, and the leading quote will be 'swallowed', so as not to spoil the appearance of your message. When you are finished entering the message, hit 'return' to copy the label to the current cell.

To enter an expression, move to the desired cell and enter the equation you need. The result of the equation will be transferred to the current cell, and each time the contents of any referenced cell are changed, the expression will be re-evaluated and the new answer put in the target cell. For example, if the current cell is A3, and you wish that cell to contain the product of the contents of cells A1 and A2, the expression will be A1*A2. However if you type just that, DYNACALC will think it's a label (since it starts with an alphabetic character). To get around this, you must fool DYNACALC by giving it an operator character first. For example, you could type +A1*A2, or (A1*A2). The leading '+' is better because it will be 'swallowed' and your expression may be easier to read. If your expression begins with a function, the '@' character will accomplish the same thing by itself. Thus if you want the current cell to hold the square root of 2, simply type @SQ2 (those who love to type will be happy to know that @SQRT(2) will also work). Note that upper-case characters are NOT required. If you type a lower-case letter when a cell address or function name is required, it will be automatically converted.

In each of the above cases you have transferred the new value to the current cell by hitting the 'return' key. Since frequently several adjacent cells are entered in a series, DYNACALC also allows use of the arrow keys to do this, and at the same time move to the next cell, thereby saving a keystroke for each cell entered.

Let's try a simple example to make sure we haven't missed anything. If you don't already have DYNACALC running, bring up your FLEX computer and, when you see the '+++' prompt, type DYNACALC. After a few seconds you will see the 'Hello' screen, which displays DYNACALC's version number. Type any key to continue, or just wait for the screen to 'time out'.

When the screen is rewritten you will see the basic worksheet, as shown on page 34. If you already have DYNACALC running, type /CY to clear the current worksheet (don't forget to save it first, if it's anything important).

The cursor now points to cell A1. Type 23 (down-arrow) 45 (down-arrow). You have placed constants in cells A1 and A2, and the cursor now points to A3. To add cells A1 and A2 and place the sum in A3, type +A1+A2 (return). Now A3 displays 68, the sum of 23 and 45.

Now move the cursor back to A1 and enter a different value. When you hit 'return', A1 is updated to its new value. No surprise. But A3 is also changed, and still shows the correct sum of the other two numbers. This is the real power of DYNACALC, and the basis for even the largest and most complex spread-sheet.

## Error Correction

Line 2 of the DYNACALC screen displays information about the current operating mode and the settings of various options. One of the most important things displayed on line 2 is the 'Ready' message. Whenever you see 'Ready', you know that DYNACALC is in its 'Ready' mode, and is able to accept commands from the keyboard. The Ready message will not be displayed, for example, while the printer is printing, or while a command menu is being displayed.

If you are uncertain about 'where you are' in DYNACALC, hitting the ESCAPE key will always leave whatever mode the program is in and immediately go to Ready. Thus you can abort from any command or data input at any time by hitting ESCAPE.

Whenever you are typing in data to be put into a cell, you can use the backspace key to correct recent errors without retyping the whole line. Note that the backspace and left-arrow keys are two different keys and produce much different results in DYNACALC.

You can at any time edit the contents of any cell by moving the cursor to that location and using the edit command. After you reach the desired cell, type /E to enter the editor. Now the contents of the current cell are displayed on the edit line (line 3), and you can insert new characters, delete existing ones, or overlay old characters with new, all without retyping the entire line.

When you are using the editor, the right-arrow and left-arrow keys take on a new function: that of moving the cursor left and right on the edit line. Note that the arrow keys do not change anything; they just bring the cursor to the point where you want to make a change.

Once you have reached the desired spot in the line, characters you type in will be inserted at that point. If you want to delete a character, move the cursor one character past the one to be deleted, then strike the backspace key. The character will disappear and the right side of the line will move one position to the left.

To overlay, hit the overlay key ('tab' on most terminals) and type the new character(s). The old will be replaced with the new, without changing the length of the line. While you are in the overlay mode, you can still use the arrow keys to move the cursor without making changes. Note, however, that the backspace key is ignored in this mode. To exit overlay, hit the overlay key again.

When you are finished editing, hit 'return' to transfer the data to the current cell.

As described above, the editor is normally entered from the 'Ready' mode, by typing /E. However, you can also get into the editor directly from the data entry mode by typing the 'edit' key (control-E on most terminals). You might want to do this if you are typing a long entry and notice that its beginning is messed up. The editor works the same as described earlier; only the method of entry is different.

## Calling DYNACALC

DYNACALC works with any printer you can currently use with FLEX. You should know the name of the printer driver you normally use. You will use this same driver to allow DYNACALC to talk to your printer.

You tell DYNACALC the name of your printer driver when you call DYNACALC from the FLEX command mode.

For example, if you have a standard parallel printer, and you want to print a diskette catalog, you would type 'P CAT'. If you have a standard serial printer, you might type 'S CAT'. The filename you use to precede the command is the name of your printer driver.

To hook this driver to DYNACALC, and the name of your printer driver is 'P', for example, type 'P DYNACALC'. If you type just 'DYNACALC' instead, DYNACALC will work normally, but will not output to the printer. If you forget to call the printer, and DYNACALC tells you that no driver is present, just save your worksheet to disk (type /SSfilename and hit 'return'), then leave DYNACALC (type /QFY) and type the proper FLEX command including your printer driver's name.

If you are using a SWTPC or other printer driver that loads under MEMEND, you must reserve memory (RM) for the printer driver before you call DYNACALC. The RM command is best placed in your system's STARTUP file. See your FLEX manual for details.

There are five printer controls available in the command /AP (printer attributes). See the section on the attribute commands for details.

When you call DYNACALC from FLEX, you can optionally specify a worksheet to be automatically loaded upon entering DYNACALC. Do this by typing 'DYNACALC filename' on the FLEX command line, where 'filename' is the name of the worksheet to be loaded. This file defaults to .CAL extension on the Work drive. If you want, you can combine this feature with calling the printer driver, so your command line would be something like 'P DYNACALC SHEET'. Any of these forms can additionally be included in your system's STARTUP file.

If for any reason the computer is reset while you are in DYNACALC, you may re-enter at the Warm Start address ($1003) without losing the current worksheet.

## DYNACALC commands

You enter the command mode by typing '/' when you are in the Ready mode. When you do this, you will note that the Ready message is replaced on line 2 of the display by the main command menu, which consists of a number of single letters, each representing a command: A B C D E F I M O P Q R S T W ?

You can then select any one of the commands by typing the letter associated with it. This will lead to another menu or other dialog, which will be described under the headings of individual commands. If you don't remember what the letters stand for, type '?' for HELP, which is a summary of instructions for the main command level. Each subsequent command menu also has its own HELP, which is called up by typing '?' in response to the menu prompt.

## Attributes

Attributes (/A) should really be listed last, since it is a catch-all for miscellaneous commands that don't fit under any other heading, but we will defer to the ASCII collating sequence and tell you about DYNACALC attribute commands here.

The attributes command menu is obtained by typing /A when you are in the Ready mode. The menu consists of these single-letter commands: B D G H L M O P R S T W ?

Attribute B (/AB) is a good one to start with, since it is very simple. Each time you type /AB you 'toggle' (reverse) a switch which controls whether or not the console bell ('bell' is a carryover from the mechanical teletype - crt terminals normally use an electronic beeper) is sounded to indicate operator error. If you get tired of hearing the beeper all the time, turn it off! (or quit making errors.) This switch is saved by /SS.

Attribute D (/AD) toggles the degrees/radians switch for all trigonometric functions. This switch defaults to 'degrees', but its current state is saved with /SS. Whenever trig calculations are done, the current state of this switch is used to determine whether to use degrees or radians to represent angles.

Attribute G (/AG) is used to change the character used for graphing (see plot format - /FP or /WFP). The default value is the pound sign (#). You can change it to any other printing character. Hit 'return' when the character is what you want it to be. This command affects future printing only - not what is already on the screen. To re-write the screen with the new character, type /AM. The selected character is saved with /SS.

Attribute H (/AH) is a command which you may execute to delete all HELP messages from memory. The memory formerly used by HELP is then available for user space. Since the HELP messages can be very handy, don't turn them off unless you really need the space.

A few related points: in a 32k system, there is not enough room for HELP messages, so they are automatically left out when DYNACALC is loaded; if you frequently need lots of workspace, you can permanently turn off HELP with an option in the INSTALL command (see); if you need to call up a very large worksheet on the FLEX command line when you call DYNACALC, you must permanently disable HELP messages with the INSTALL command.

To restore HELP messages you must leave DYNACALC and re-enter from FLEX. Don't forget to save your worksheet!

Attribute L (/AL) toggles the 'Label entry mode' flag (defaults to off). When label entry mode is on, labels typed in one cell will automatically continue across the row, and will be entered into following cells as necessary. To use this mode, simply point to the cell where you wish the label to begin, then start typing. The cell address will be automatically incremented as soon as you type one character more than will fit in the current column. If you later change any of these column widths, you will have to adjust your labels (retyping an entire long message may be the easiest method in this case).

Attribute M (/AM) is a command used to re-write (Modify) the screen at any time. Its main use is with the graph character command (/AG).

Attribute O (/AO) - note the O is a letter, and not the number zero (Ø) - toggles the switch that decides the order of calculation. Either the columns are done first (default), as A1,A2,A3...B1,B2,B3.... or the rows are done first as A1,B1,C1...A2,B2,C2.... The current setting is displayed as 'C' or 'R' after 'Mode=' on line 2 of the display. This switch can be very important on some worksheets, and of no concern at all on others. Just don't forget about it. The C/R switch setting is saved by /SS. See Operating Tips for further considerations.

Attribute P (/AP) allows you to examine and/or change the setting of printer/textfile attributes, and will lead to another menu consisting of: B L P S W ? Command B (/APB) toggles the flag that decides whether or not to print DYNACALC's borders on the printer/textfile (default is 'off'). Command L (/APL) lets you change the number of lines per page (default is 58). Command P (/APP) toggles the flag which decides whether or not to paginate the output (default is 'on'). Command S (/APS) allows you to set single (default) or multiple (2-8) spacing between printed lines. Command W (/APW) lets you change the maximum number of print positions across the page (default is 8Ø). If you find yourself frequently changing to a particular configuration, remember that all four of the DEFAULT values can be changed. See the System Configuration section for details. All printer/textfile parameters are saved by /SS.

Attribute R (/AR) toggles the flag which controls DYNACALC's automatic recalculate feature. When the flag is on (default), an 'A' is displayed after 'Mode=x,' on line 2, and the worksheet is automatically recalculated after any value is changed. If you turn off the flag, an 'M' is displayed to indicate manual recalculate. Now the sheet will be recalculated only when you type '!' in the Ready mode. This flag is also saved by /SS.

Attribute S (/AS) reports the highest column/row address in use in you current worksheet. This is an easy way to keep track of the size of your sheet, and avoid forgetting about tables, etc., which might be hidden from view. /AS is also very helpful in managing available memory to fit the job you have to do. Refer to the discussion of memory allocation in the Operating Tips section.

Attribute T (/AT) toggles the Type protection flag. When type protection is turned on, DYNACALC will ask 'Are you sure?' if you attempt to change a label or an expression. The idea is to prevent accidental changing of the 'guts' of your worksheet when you are typing in data. This feature defaults to 'off'. Its setting is saved by /SS.

Attribute W (/AW) lets you change displayed column width, and leads to another menu: C W ? which lets you elect to change the width of only the current column (/AWC) or of the entire current window (/AWW). The default width for individual columns is the current window column width, and the default width for all columns in a window is 9. All column width information is saved by /SS.

## Blank cell

This is an easy one. DYNACALC asks you if you really want to blank out the current cell. Answer Y or N. Only the data in the cell is erased. The format of the cell is preserved.

## Clear worksheet

Another easy one (maybe we should make it harder). Make sure the worksheet is saved on diskette if it's of any value to you. Then answer Y or N.

## Delete

The delete command (/D) lets you delete an entire column or row. DYNACALC asks you: C R ? to find out whether you want to delete a column or a row. If you can't make up your mind, hit 'escape' and think about it for a while (sorry, there is no 'un-delete' command). After the column or row has been removed from your worksheet, any references (in expressions) to cells in the deleted part are flagged with >ER< errors. You can tell whether an >ER< was caused by the delete or by operator error by pointing the cursor to the error cell in question. If a machine-generated error is present, the top line of the screen will display @ERROR? instead of the >ER< shown in the cell. Any references to cells beyond the deleted area are adjusted to take into account the new column letters or row numbers. Don't forget to take this into account yourself when typing in new expressions!

## Edit cell

The edit cell command (/E) allows you to edit the contents of any cell. See the full description under Error Correction on page 6.

## Format

DYNACALC offers a number of display formats, and the format command allows you to select the one(s) to use. If entered directly from the main command menu (/F), the format selected applies ONLY to the current cell. If entered through the window command (/WF), the format applies to ALL cells in the current window, except cells with explicit format set individually. All window and cell format information is saved by /SS.

When you enter the format command, you will be prompted with: C D G I L P R $ ? . Each of these letters represents a format to be described below.

Format C (/FC or /WFC) is continuous format, and is valid only for cells containing labels. Continuous format uses the character or characters entered in repetition to fill the width of the cell, regardless of how wide it may be now or later. A typical use for continuous format is to create borders between rows. For example, you might enter a dash ('-) as a label, and select continuous format for that cell (/FC). This would fill the cell with dashes (---------). Now use the replicate command (see below) to copy this cell into several others on the same row, and you have a nice border, and with only a few keystrokes. Other useful characters are period (enter as '.) and equals (=).

Format D (/FD or /WFD) is the default format. If the command is entered directly from the Ready mode (/FD), the current cell's format will default to the format of the current window. If entered through the window command (/WFD), the default format of all the cells in the current window will be the system default format, which is the same as the General format (see).

Format G (/FG or /WFG) is the general format. This format causes labels to be left-justified, and numbers right-justified within each cell.

Format I (/FI or /WFI) is the integer format. Cells formatted this way will be rounded to the nearest whole number, and right justified within the cell. The rounding affects only the display, and not the internal representation of the number. If the cell is referenced in an expression, the cell's original, unrounded, value is used.

Format L (/FL or /WFL) means left-justify. Numbers and/or labels will start at the left end of the cell.

Format P (/FP or /WFP) is the plotting format, which is used to create horizontal bar graphs within your worksheet. The number in the cell is rounded to the nearest integer, and the resulting number is used to count graph characters as they are printed. For example, if a cell has a value of 2.4, its integer value is 2, so 2 graph characters will be printed in the cell. If the number is subsequently increased to 5.1, a total of 5 graph characters will be seen. The /AP command can be used to change the graph character.

Format R (/FR or /WFR) means right-justify. Numbers and/or labels will end exactly at the right end of the cell.

Format $ (/F$ or /WF$) is the dollar format, used mainly for representing money in dollars and cents. In this format, the cell's value is rounded to the nearest cent (0.01), and displayed with a decimal point and two following digits, even if they are zero. The rounding affects only the display, and not the internal representation of the number. If the cell is referenced in an expression, the cell's original, unrounded, value is used.

## Insert

The insert command (/I) lets you insert a new (blank) column or row into an existing worksheet. Simply move the cursor to the column or row where you want the new one to be, and type the command. The new column or row will appear, and any references to cells beyond the inserted area will be automatically adjusted to take into account the new addresses. Remember this yourself when you type in new expressions.

## Move

The move command (/M) lets you move rows or columns from one place to another within your worksheet. You can do this manually, or with DYNACALC's built-in sort feature.

The ascending sort command (/MA) causes DYNACALC to sort all or part of your worksheet in ascending numeric and/or alphabetic order. When you type this command, DYNACALC will ask you 'Range?'. Respond with the addresses of the first and last cells you wish to use as the sort key. If you give two cells in a single column, that range of cells will be used as the key to sort all rows between the first and last addresses

given (inclusive). If you give two cells in a single row, that range of cells will be used as the key to sort all columns between the first and last addresses given (inclusive). Note that all cells in the same row (same column for row key) will be moved by the sort. If the sheet is laid out appropriately, this fact can be very useful.

The sort may be on numbers (values or expressions) or strings (labels), or both. Sequence is: alphabetic (case is ignored), numerics in label cells, and finally numbers (in algebraic order). You can force a label to sort first by preceding it with '@' (enter as '@).

The descending sort command (/MD) works the same as /MA, but the order of the sort is reversed.

The manual move command (/MM) allows you to move an existing column or row to a new location in your worksheet. After you type this command, DYNACALC will ask you 'From...to?'. Respond by typing the address of any cell in the column or row to be moved, a period (.), then the equivalent address in the destination column or row. For example to move column C to column F, you could type 'C1.F1' or 'C3.F3' but not 'C1.F3' or 'C3.F1'. If you are moving columns, the row specified must be the same in each case; if you are moving rows, the same column must be specified.

As in the case of the Delete and Insert commands, any references to cell addresses changed by the move commands will be automatically adjusted by DYNACALC. When you type in new expressions, remember that some things have been moved around.

## Output to textfile

The output to textfile command (/O) is used to send a copy of your worksheet, or any part of it, to a FLEX textfile. The textfile can then be used by other programs for any purpose you want. For example, you might append the file to some other text, and thereby include your DYNACALC worksheet in a letter or report.

After you enter the /O command, DYNACALC will ask for a filename. If the name you give is already in use, DYNACALC will ask if the old file should be deleted. After the file is opened, DYNACALC will ask you 'Range?'. Respond with the cell addresses of the top-left and bottom-right corners of the area you want to send to the textfile. When you see the Ready prompt re-appear, you know that the textfile has been written.

The textfile created is in standard FLEX format, with a single CR character ($ØD) at the end of each line. Maximum line length is 255 characters. Keep in mind that other FLEX utilities (such as EDIT) may have further restrictions on maximum line length. The output will default to .TXT extension on the Work drive, but of course you may override these defaults by typing in the complete file specification.

There are four parameters that you can adjust to alter the way DYNACALC outputs to the textfile: Borders (no/yes), number of Lines per page, Pagination (yes/no), and column width. See Attributes (/AP) section for details. Current settings are displayed before continuing.

If pagination is enabled, DYNACALC will ask you for a title. The string that you type in (terminate with 'return') will be placed at the top of each 'page' of the textfile.

## Printer output

The printer output command (/P) is used to send a copy of your worksheet, or any part of it, to your system printer.

After you enter the /P command, DYNACALC will ask you 'Range?'. Respond with the cell addresses of the top-left and bottom-right corners of the area you want to send to the printer.

There are five parameters that you can adjust to alter the way DYNACALC outputs to the printer: Borders (no/yes), number of Lines per page, Pagination (yes/no), line Spacing, and column Width. See Attributes (/AP) section for details. Current settings are displayed before continuing.

If pagination is enabled, DYNACALC will ask you for a title. The string that you type in (terminate with 'return') will be placed at the top of each page of the printout.

DYNACALC can output to any printer, but needs to use your system printer driver. Refer to 'Calling DYNACALC' on page 8 for details.

You can make the printer pause with the 'escape' key (just as in FLEX). Hitting 'escape' a second time will cause printing to resume. Hitting 'return' while the printer is pausing will cause the print command to terminate.

## Quit

The quit command (/Q) is used to exit DYNACALC. The normal exit is to FLEX (/QF). Normal re-entry will of course destroy your current worksheet, so make sure it's saved on diskette if it's of any value. DYNACALC will ask 'Are you sure?'. If you exit by accident, you can re-enter at DYNACALC's Warm Start ($1003). You can also put your computer 'to sleep' (/QS). This will blank the screen and keep the cursor moving (to avoid screen burns during long 'sleeps'). Hit any key to restore normal operation. You will find that your worksheet is intact.

## Replicate

The replicate command (/R) lets you copy the contents of a cell or range of cells into another part of the worksheet. This means that you can avoid re-typing long expressions, etc., and thus spend more of your valuable time on other things.

When you type /R, DYNACALC will prompt you for a range of source cells (the source means the cell or range of cells to be copied). If you want to copy just a single cell, enter its address and hit 'return'. If the single cell you want to copy happens to be the current cell, just hit return. Or, if the first of several cells you want to copy is the current cell, just hit '.' and the address of the last source cell, followed by 'return'. For a range of cells, enter the first cell, a period (.), and the last cell, then hit 'return'. If a range of cells is to be copied, they must all be in the same column or in the same row. You cannot replicate multiple columns or rows with a single command. You can transfer blocks of data with /S#S and /S#L (see).

DYNACALC will now ask you for the destination. If the destination is a single cell, column, or row, type its address (not necessary if it happens to be the current address) and hit return. If the source is to be copied a number of times, enter the first address, a period (.), and the last address, followed by 'return'.

Next you are asked '(S)ame or (R)elative' for each value reference in the source. If you answer 'S', that reference will be copied literally into the destination cell(s). However, if you answer 'R', all occurences of that value reference will be modified according to the position of the destination within your worksheet. For example, if you want to copy @SUM(A1...A5) from A7 to B7...F7, and you want the separate sums to represent individual column totals, you would specify 'R', so that in cell B7 you would wind up with @SUM(B1...B5), and so on. If this seems confusing at first, try it. After a few times it will make sense, and you will develop the ability to get a significant amount of work done with just a few keystrokes.

You can copy all or part of any column or row to one or more places on your worksheet. To continue the example above, let's say that there is data (values) in cells A1 through A5. We want to copy this data and the sum in A7 to another column. To do this, type "/R A1.A7 B1 'return' R". Now you will see a replica of column A in column B. Move the cursor to B1 and type /DC to delete column B. Then type '/R A1.A7 B1.F1 R'. The contents of column A now fill columns B through F. Pretty neat, eh?

You should also be aware that when Replicate copies the contents of a cell, not only does it copy the label, value, or expression contained in the cell, but also its format. Therefore you can use replicate to change the format of a large number of cells at one time, without changing the window format.

## System

The system command (/S) lets DYNACALC communicate with the rest of your computer, through the FLEX operating system. Using /S, you can save and load full or partial worksheets, and do other system-related tasks.

The worksheet load command (/SL) loads a previously-saved worksheet into your computer's memory. It DOES NOT CLEAR THE CURRENT WORKSHEET. Instead, the file being loaded overlays cells on an individual basis. Any cell that was unused (blank) on the sheet when it was saved will have no effect on the contents of the worksheet when it is re-loaded (if a cell had a specific format when it was saved, however, that will become the format of the target cell). Cells that are non-blank in the file will over-write existing cells. This gives you the powerful ability to combine worksheets. For example, you might save a pricing table in a diskette file, and then use that one table to overlay a variety of worksheets based on it. Then, when prices change (translated: increase), you have only one file to change. All /SL operations default to .CAL extension on the Work drive.

If you do not want to overlay the present worksheet, type /C (and answer Y) to clear the sheet before loading a new one.

DYNACALC can automatically load a worksheet from diskette on startup. See the section 'Calling DYNACALC' on page 8.

The worksheet save command (/SS) saves the entire current worksheet on diskette. When you type this command, DYNACALC will ask you for a filename, which defaults to .CAL extension on the Work drive. If the file already exists, DYNACALC will ask if it should be deleted. If you don't want to delete the old file, type 'N' and then /SS and a different filename.

When you save a worksheet, all cells in the sheet are written to diskette, even if they are currently out of sight. Column widths, windows, titles, cursor location, graph character selection, printer attributes, formats, and the type protection, auto/manual, beeper, label entry mode, and column/row order flags are also saved, and will be restored when the file is loaded. To save a partial worksheet, refer to /S#S.

The eXecute command (/SX) gives you a FLEX command prompt to which you can type any valid FLEX command. Just be sure to use only those commands that don't clobber DYNACALC. In general, you can use any command that stays inside the FLEX UCS ($C1ØØ area). Some useful commands that are permitted are CAT, DIR, ASN, LIST, RENAME, and PROTECT. Avoid commands such as COPY, NEWDISK, MIRROR, EDIT, BASIC, etc., which use low memory. If your printer driver loads under MEMEND, don't use any printer commands. This means that SWTPC printer operations are ruled out, but the original TSC FLEX printer driver is OK. The TSC utility MAP can be used to see if a file loads into low memory. Just remember that some commands, such as COPY, load only into the UCS, but use low memory in execution.

When the FLEX command is completed, DYNACALC will ask if you want to do any more FLEXing. An 'N' response will return to DYNACALC, with your worksheet undisturbed.

The data storage commands (/S#L and /S#S) allow you to save part (or all) of a worksheet in a text file format compatible with other FLEX software, such as BASIC, C, PASCAL, RMS, SORT/MERGE, and so on.

When you type /S#L, DYNACALC will ask you for a filename, then it will load the data from the specified file into your worksheet, beginning at the current cell. This means that you must position the cursor to the desired spot before typing /S#L. Before the data transfer occurs, DYNACALC will ask you if the data is to be loaded by Column or by Row. To load the data the same way as it was saved, type D for default. The load operation will usually affect only those cells being loaded whose new contents are non-blank. This permits you to overlay a worksheet with data tables prepared previously with DYNACALC or other system programs. See 'Using Data Files' for more information.

The data save command, /S#S, will also ask for a filename, and whether data is to be saved by column or by row. The default option (D) will choose whichever direction was used last; in the case of the first /S#S operation after loading DYNACALC, the default is by Column. The cursor location is unimportant, however, since DYNACALC will ask you for a range of cells to save. Respond with the addresses of the top-left and bottom-right cells in the rectangular area you wish to save.

Only value and label information may be saved and loaded. Cells containing expressions will be evaluated, and their current value saved. If you want to save expressions, use the worksheet save and load commands (/SS and /SL). Also note that /S#S does not save anything other than the data in the cells. Any cells containing errors are saved as blank cells in the data file. Widths, formats, etc. are lost. To save these, use /SS.

DYNACALC examines each line of incoming data during a /S#L operation to determine if it contains value or label information. If the line looks like a number (begins with Ø-9, minus, plus, or decimal point), it will be treated as a value. Other lines will be treated as labels. To input a number something that looks like a number as a label, precede it with a single-quote character ('). DYNACALC will swallow the quote, and treat the cell as a label.

The data storage commands /S#L and /S#S default to .DAT extension on the current Work drive. For formatting information, see the section 'Using Data Files'.

## Titles

The titles command (/T) controls the operation of horizontal and/or vertical titles. Titles are columns and/or rows set aside by the DYNACALC user (that means you) to identify important areas of your worksheet at all times. Titles do not scroll off the screen when the displayed area changes. This lets you easily see, for example, the name of the salesman who did so well in October, even though the salesmen's names are in column A, and October is in column L.

When you call up /T, you get another menu: B H N V ? to which you respond with one of the title command letters, described in the following paragraphs.

Title command B (/TB) turns on Both horizontal and vertical titles together. Before you type this command, place the cursor just below and just to the right of the intersection of the horizontal and vertical titles.

Title command H (/TH) turns on Horizontal titles. Before you type this command, move the cursor just below the title row (below the bottom title row if you are using more than one). After you type /TH, try scrolling your data off the screen, and watch what happens to the title row(s). If vertical titles are already turned on, they will be left undisturbed.

Title command N (/TN) selects No titles, and disables any that might be turned on.

Title command V (/TV) turns on Vertical titles. Before you type this command, move the cursor just to the right of the title column (to the right of the rightmost title column if you are using more than one). After you type /TV, try scrolling your data off the screen, and watch what happens to the title column(s). If horizontal titles are already turned on, they will be left undisturbed.

Whenever the title feature is in use, you will find that you are unable to move the cursor to any column and/or row being used as a title. To get the cursor into these areas, turn off titles (/TN), do what you have to do, then turn the titles back on. All title information is saved by /SS.

## Windows

The windows command (/W) is one of the primary screen formatting controls. Normally, the screen displays a single window, or portion, of the total worksheet. With the cursor movement controls you can move the window to any part of the worksheet. However, sometimes it is very handy

to be able to see two widely separated areas of the worksheet at the same time. This is what the windows command allows.

In addition, there are two formatting commands built into the windows menu: Display and Format. These don't really have much to do with the idea of two separate windows, but are at this command level because they each affect all cells in the current window.

When you type /W, you will be prompted with this menu: D F H N S U V ? to which you should respond with one of the following single-letter commands:

Window command D (/WD) toggles the value/formula display flag. This flag, which defaults to 'value' decides whether to print calculated values or actual data as entered. The primary use of the formula display mode is to tell at a glance whether a cell contains a formula or a constant. Of course, you could examine each cell by pointing to it, but the formula display mode gives you a whole window-full at a time. This mode affects the entire current window, and only the current window. That means that the other window can be set to the opposite display mode, and you can thus see the same area of your worksheet displayed both ways at the same time.

Window command F (/WF) is used to change the default display format for all the cells in the current window. See the format command (/F) for details.

Window command H (/WH) is used to create a horizontal separation between the upper and lower portions of the crt screen. Each portion is then a separate window into the worksheet, and each can be moved and formatted independently of the other. Use the 'jump' key (see 'Key Assignments') to jump back and forth between the two windows. When you type /WH, the screen is split horizontally at the current row, so you may divide the screen into equal or unequal sections. The window in which the cursor resides is considered the 'current window'. Commands which affect a window will affect only the current window.

Window command N (/WN) selects No splitting of the screen, and returns to a single window display. The current window is unchanged.

Window command S (/WS) causes the two windows displayed to scroll Synchronously. If the windows are divided horizontally, synchronization is in the horizontal direction; if they are divided vertically, they will then scroll vertically together. If there is only a single window, this command is ignored.

Window command U (/WU) Unsynchronizes the motion of the two displayed windows. If there is only a single window, this command is ignored.

Window command V (/WV) is used to create a vertical separation between the left and right portions of the crt screen. Each portion is then a separate window into the worksheet, and each can be moved and formatted independently of the other. Use the 'jump' key (see 'Key

Assignments') to jump back and forth between the two windows. When you type /WV, the screen is split vertically at the current column, so you may divide the screen into equal or unequal sections. The window in which the cursor resides is considered the 'current window'. Commands which affect a window will affect only the current window.

Note that it is not possible to have both vertical and horizontal window division at the same time; only two display windows are allowed.

All information pertaining to window settings is saved by /SS, and will be restored upon loading a file with /SL.

## Help

The Help command (/?) lets DYNACALC tell you all about itself. Most of the important information about DYNACALC in this manual can be displayed on your crt screen while you are using DYNACALC; in other words, the information is right there when you need it.

The main Help command gives you information about the main command menu, and then lets you choose to ask for more information, or return to normal operation. Just follow the prompts at the bottom of each Help screen.

As you can imagine, all this text takes up quite a bit of room in your computer. If you need all the space you can get for a large worksheet, type /AH to delete all the Help messages from memory. Subsequent requests for Help will be ignored, unless you exit to FLEX and re-enter DYNACALC.

You can permanently turn off Help messages with an option in the INSTALL utility. You may want to do this if you are always running out of memory, and also feel that you have mastered DYNACALC to the point that you no longer need the Help messages. See the System Configuration section for details.

## Functions

DYNACALC has over two dozen built-in mathematical functions. As you probably know, a function is a mathematical relationship between independent and dependent variables. In DYNACALC, most functions require one or more independent variables, furnished as arguments. The function then returns the dependent variable. A minority of DYNACALC functions, namely @ERROR, @NA, and @PI, require no arguments, and return a pre-defined value or condition.

Let's use the square root function, @SQRT, as an example. This handy function requires a single numeric argument, and its return value is the square root of the argument. To generate the square root of 4, for example, you would type '@SQ4'. DYNACALC generates the extra characters to display the complete '@SQRT(4'. You could also type '@SQR4' or '@SQ(4' or '@SQR(4' or any of several other combinations. DYNACALC knows what you're up to, and does the right thing.

If you now hit return, the function @SQRT(4 is put into the current cell. From now on, each time the worksheet is recalculated, that function will be invoked. This can really waste some time if you have a lot of cells with functions of constant values, so what you do is to evaluate the function once, then place the value of the function in the current cell. You do this by typing '!' after the function, but before the 'return'. The '!' causes the expression on the edit line to be evaluated, and replaced by the resulting value. This value is then, of course, a constant, which will never require recalculation.

DYNACALC functions are not limited to using constants as arguments, however. The arguments can just as well be expressions, results of other functions, and/or cell addresses. For example, the function '@SQRT(G5' will return the square root of whatever value happens to be in cell G5. If the cell contents change, for whatever reason, the function is recalculated. If you are interested in the value of a cell at the present time only, and not subsequent changes, you can type '!' before hitting 'return', and the function will be evaluated once, and replaced with its current value, which is then a constant. You are in full control. If you don't require recalculation of a particular function, you don't need to wait for it.

Most DYNACALC functions that accept a range of cell addresses as an argument (@AVERAGE, @CHOOSE, @COUNT, @MAX, @MIN, @STDDEV, and @SUM) will also accept any rectangular area of the worksheet, including any number of columns and rows. Just supply the addresses of the top-left and bottom-right cells at the extremes of the area desired. For example, '@SUM(B3...E8' would return the sum of the values of all cells B3...B8, C3...C8, D3...D8, and E3...E8. Because of their list-related operation, @INDEX, @LOOKUP, and @NPV will accept ranges of cell addresses in a single column or row only.

Note that whenever address ranges are required in functions or commands, the '...' is entered by typing a single period.

All DYNACALC operations, including functions, accept either upper-case or lower-case letters wherever an alphabetic character is required. The letter is always displayed as upper case in the function name.

DYNACALC's trigonometric functions @COS, @SIN, and @TAN require angular arguments expressed in degrees or radians, depending on the current setting of the degrees/radians switch. The inverses of the functions, @ACOS, @ASIN, and @ATAN, return angles expressed in degrees or radians, also determined by the setting of the degrees/radians switch. This switch, whose default setting is 'degrees', may be toggled by attribute command /AD. When a worksheet is saved with /SS, the setting of this switch is saved, and will be correctly set when the worksheet is loaded with /SL.

HELP is available for DYNACALC functions by typing '/?@' in the Ready mode. Hit any key to see the second page. In the HELP messages, functions are listed by group. Here we list them in alphabetical order for ease of reference.

@ABS(x) is the absolute value function. This function returns the value of the argument with its sign forced to positive. This function is handy for checking to see if a number is negative. The expression '+H1-@ABS(H1' will be zero if the value in cell H1 is zero or positive, and non-zero if H1 holds a negative number.

@ACOS(x) is the arc-cosine function. This function returns the inverse cosine of the argument.

@ASIN(x) is the arc-sine function. This function returns the inverse sine of the argument.

@ATAN(x) is the arc-tangent function. This function returns the inverse tangent of the argument.

@AVERAGE(x...y) is the average, or arithmetic mean, function. This function returns the average numeric value of all the cells in the range x...y. The range need not be a single range, but may be any combination of cells, ranges of cells, expressions (including functions), and/or constants. For example, the function '@AVERAGE(E5,R6...R89,17, 23.5,@SQRT(A3),B7' would return the average value of the contents of cell E5, contents of cells in the range R6...R89, the constants 17 and 23.5, the square root of the contents of cell A3, and the contents of cell B7. Whatever you want to average in, include in the list of arguments. The function works by adding all arguments, then dividing by the number of arguments. Only those arguments representing numbers count as items, so blank cells and cells containing labels do not affect the average.

@CHOOSE(n,x...y) is a function that lets DYNACALC select a value from a list of two or more values. The first argument, n, is used as an index into the list of values x...y. For example, '@CHOOSE(A4,B5...E5' first looks at the value of cell A4. If it's 1, the value of cell B5 is returned; if it's 2, that of cell C5, and so on. But you are not limited to such a simple use of @CHOOSE (Gesundheit!). While the first argument

must be a constant, expression, or a single cell address, the list of values x...y can be spread all over the worksheet. '@CHOOSE(6-H4,13,G4, H3...H12,B1...G1' would subtract the value of cell H4 from the constant 6, then use the difference as a pointer to the list consisting of the constant 13, cell G4, and values from parts of column H and row 1.

@COS(x) is the cosine function. This function returns the cosine of x, where x is an angle expressed in degrees or radians.

@COUNT is a function that returns the number of items in a list. @COUNT counts as described previously under @AVERAGE: only those arguments representing numbers count as items, so blank cells and cells containing labels do not affect the count.

@ERROR forces an >ER< error condition wherever it is used. This function is normally used with @CHOOSE, @INDEX, or @LOOKUP to report attempted accesses of invalid table entries. For example put @ERROR in cell B4. Then put '@CHOOSE(B1,B3...B5' someplace else. If B1 has the value 2, @CHOOSE will return >ER<.

@EXP(x) is the natural antilogarithm function. This function returns the value of e (2.718..., the base of the natural logarithm system) to the x power. This function is the inverse of @LN(x).

@INDEX(n,x...y,z) is used to return a value or label from a list or number of lists. The first argument, n, must be a value (rather than a label), but it may be a constant, cell address, or expression. This value is used as a comparison value for searching the range of cells specified in the second argument, x...y. The range must be a single range of cells in a column or row. The third argument, z, is optional, and specifies the column or row from which the returned value is taken. If the third argument is omitted, the returned value will come from the column just to the right of the column in the second argument, or, if a row was specified in the second argument, from the row just below that one.

@INDEX is pretty complicated for a written example, so fire up DYNACALC and load the sample worksheet DEMO-IND. This is about as simple a demonstration of @INDEX as can be. Here we have a list of five numbers in column A, and two lists of five names each in columns B and C. By changing the value in cell A1 over the range of 1-5, you change the name displayed in B9. The @INDEX function is in B9, as you will see if you move the cursor to that location. The function appears as '@INDEX(A1,A3...A7'.

The selected name is returned by @INDEX from column B by default, since no third argument is given. Column B is used as the default because it is just to the right of the column used for the match search (column A). Now, while you're pointing at B9, type '/E' and use the editor to add ',C1' to the end of the function. When you hit return you will see the name change to the corresponding one from column C. You might try changing the ',C1' to ',C2' or ',C50'. You will get the same results. All @INDEX is interested in is the column. As an exercise, try duplicating this arrangement on another worksheet using rows instead of columns for your lists. In that case, only the row number portion of the third argument is significant.

@INDEX works just like @LOOKUP except that the comparison is made for an exact match between the first argument and values in the second. See 'Operating Tips' for further considerations.

@INT(x) is the integer function. It returns the whole number part of the argument. The fractional part of the number is simply thrown away. Note that this is not the same as rounding. If you want to round, use @ROUND (see). Also note that @INT works exactly the same on positive and negative numbers, unlike the INT functions in some programming languages.

@LN(x) is the natural logarithm function. This function returns the logarithm of the argument to the base e (2.718...). This is the inverse of @EXP(x).

@LOG(x) is the common logarithm function. This function returns the logarithm of the argument to the base 10. The inverse of @LOG(x) is 10^x.

@LOOKUP(n,x...y,z) works just like @INDEX described above, except that the comparison between the first argument and values in the second is made for a 'greater than' condition rather than an exact match. See 'Operating Tips' for further considerations.

@MAX(x...y) is the maximum value function. It returns the greatest value found in the list x...y. The list can be simple or complex, just as in @AVERAGE, described previously.

@MIN(x...y) is the minimum value function. It returns the smallest value found in the list x...y. The list can be simple or complex, just as in @AVERAGE, described previously.

@NA forces a >NA< (not available) error condition wherever it is used. This function is normally used with @CHOOSE, @INDEX, or @LOOKUP to report attempted accesses of invalid table entries. For example put @NA in cell B4. Then put '@CHOOSE(B1,B3...B5' someplace else. If B1 has the value 2, @CHOOSE will return >NA<.

@NPV(r,x...y) is the Net Present Value function. It returns the Net Present Value at discount rate r for payback in range x...y. Load worksheet DEMO-NPV for a simple example. All the displayed values except that in cell D13 are arguments to the function. NPV is a financial planning tool whose explanation is far outside the scope of this manual. See any good, modern, book on business management for this information. Page 67 of of the first item in the Bibliography is a good place to start.

@PI returns the value of PI (3.14...), which is used in almost every branch of science and mathematics.

@ROUND(d,x) is the value rounding function, used to reduce the precision of calculation to a controllable degree. You might use @ROUND in some cases so that DYNACALC could duplicate exact results obtained by other calculators that round after all operations. The first argument is a value equal (or very close) to an exact power of 10 (.001, 1, 10, 1000, 1e6, etc.) which specifies the degree of rounding. Allowable range is from 1e-9 to 1e9. The second argument is the number to be rounded. Either argument can be a constant, cell address, or expression. Unlike the I and $ display formats, the @ROUND function actually changes the value of the cell in which it is used. Any subsequent calculation based on the rounded value will be affected.

@SIN(x) is the sine function. This function returns the sine of x, where x is an angle expressed in degrees or radians.

@SQRT(x) is the square root function. It returns the value of the positive number which, when multiplied by itself, equals the argument x.

@STDDEV(m,x...y) is the standard deviation function. This function returns the standard deviation of values in the range x...y, using method m. Like @AVERAGE (arithmetic mean - see above), @STDDEV can apply to any number of constants, cells, or ranges of cells. If m is negative, the population method of calculation is used. If m is zero or positive, the sample method is used. Variance can be calculated by squaring the standard deviation. See any good reference on statistics for information on the application of this function.

@SUM(x...y) is the summation function. It returns the total value of all cells in range x...y. As in @AVERAGE (see), the range may be any combination of constants, cell addresses, and ranges of cells.

@TAN(x) is the tangent function. This function returns the tangent of x, where x is an angle expressed in degrees or radians.

## Arithmetic Operations

The building blocks of DYNACALC's built in functions and user calculations are the basic mathematical operators plus (+), minus (-), times (*), divide (/), and exponentiate (^). These operators are used just as in everyday arithmetic, and can be combined in every imaginable way to do what you need to do.

The plus operator adds the terms it separates, and yields their sum. The minus operator subtracts the second value from the first, and yields the difference. The times operator multiplies the two values to give the product. The divide operator divides the first number by the second to give the quotient. Finally, the exponentiate operator raises the first value to the power of the second number.

Note that all these operators are diadic, that is, they require two operands. There is no monadic (single argument) minus operator as found in many programming languages. To negate a number, subtract it from zero (Ø-x). In other words, instead of typing '-G5', type 'Ø-G5'. Negative constants (-3, -3.4, -2.5e8, etc.) are permitted, however.

All regular math operations in DYNACALC are performed to full 16-digit accuracy. Trancendental functions are limited to about 15 digits for reasons of speed and memory consumption.

Numbers are limited to the range +/- 1.Øe-37 to 9.999...e37. They may be entered in any format (commas are not permitted to be embedded, however), and will be displayed according to the room available in the current column. If a number has too many digits to be displayed completely, the cell will be displayed in scientific notation (if allowed by the current format). Failing that, the cell will be filled with '>>>>>>' to indicate display overflow. Increase column width (/AWC or /AWW) to see the number.

Remember that you can use the @ROUND function to reduce the precision of any calculation. This may be necessary to duplicate the operation of manually-operated calculators.

## Operating Tips

### Determining function ranges:

Some DYNACALC functions such as @SUM, @AVERAGE, @MAX, @LOOKUP, etc. allow or require arguments to consist of ranges of cells within a column or row. For example, '@SUM(A1...A7' will return the sum of the value of cells A1, A2, A3, A4, A5, A6, and A7. However, due to the action of the Delete, Insert, and Move commands, the address ranges may be automatically changed by DYNACALC at some time after you type them in. Of course, these changes are beneficial. Since the data has moved around on your worksheet, the equations affected by the moves need to be altered. Just be happy that DYNACALC is smart enough to do all this busy-work for you.

You must, however, give careful consideration to the range boundaries if DYNACALC is to do what you want it to. A simple example should be convincing: starting with a clear worksheet, type ten random numbers into cells A2...A11. Now in cell A13 put the function '@SUM(A2...A11'. Cell A13 now holds the sum of the ten numbers you entered, right. Moving the numbers around wouldn't change the sum, would it? Right! Now rearrange the numbers by typing '/MAA2.A11'. The screen is re-written, and the numbers are put into ascending numeric order. But wait a minute! The sum in cell A13 changed, didn't it? To see why, point to A13 and look at the function range. It's not 'A2...A11' anymore, is it? DYNACALC has fooled you.

If you look carefully, you will see that the new range limits are the cells holding the values that were previously at A2 and A11. How do you get around this? Easy. Just put a blank cell (or one holding a label) on either end of the range, and INCLUDE THOSE BLANK CELLS when you type in the range. Clear the worksheet and try it again, this time giving the range as 'A1...A12'. Now when you move things around, the sum won't change.

The above information applies to all functions using column or row ranges. Remember, a cell containing a label looks just like a blank cell in these cases, so your border lines will work nicely as range limits.

### Moving blocks of data:

The move command (/MM) will move only a single column or row at a time. Of course, you could use several /MM's to move several adjacent columns or rows. But what if you want to move only the bottom half of several adjacent columns? Or if you want to move part of a few rows? You can't use /MM because that will move only entire columns or rows.

To move a rectangular block of data from one part of a worksheet to another, you use the data storage commands /S#S and /S#L. /S#S is used to save any rectangular area of any worksheet to a disk file, then /S#L is used to load it back in at any starting point on the same or any other worksheet.

Setting format of an entire column:

There are two format commands in DYNACALC: the window format command (/WF) and cell format command (/F). Unfortunately there is no single command to change the format of an entire row or column while leaving the window format undisturbed.

However, there is an easy way to do just that: set the first cell of the column or row to the desired format with /F, then replicate that cell to the range of cells where that format is desired. The replicate command (/R) copies not just the cell contents, but also the current cell format, to the target cells.

But what if you have already entered a column of data before you decide to change the format? Replicating the first value throughout the range will replace all your data with copies of the first value. Not too useful. To get around this, DYNACALC lets you use /R to copy a BLANK CELL into a range of cells without changing the data in the target cells. Simply set the format of the blank cell as desired, then use /R to move this format to the column or row of interest.

Order of calculation:

Whenever the worksheet is recalculated by DYNACALC, a certain order is followed. In most cases, Column order is used. In other words, A1 is calculated first, followed by A2, A3, to the end of column A, then B1, B2, and so on. This is the default order of calculation, and is indicated on line 2 of the display by 'Mode=C,x'.

The other choice is to calculate by rows, as A1, B1, C1, etc., A2, B2, C2, and so on. You switch between these two options with /AO. Line 2 will display 'Mode=R,x' when Row order is in use. Note that the calculation order is saved when a worksheet is saved to disk with /SS.

The idea is to avoid forward references whenever possible. That is, the value of any cell should normally not depend on the contents of any other cell whose value hasn't yet been calculated. Sometimes forward references are desirable, as in some successive approximation formulas, but usually they are bad news.

You can tell if there are forward references in your worksheet by repeatedly calculating the sheet without changing any data. Do this by hitting the '!' several times, and watching suspected cells. If they change in value, there is a forward reference somewhere in the sheet. Try changing the order of calculation (/AO) to see if the forward reference disappears. If not, you must look further. The formula dump mode (toggled on/off by /WD) can be very useful for further searching. If you don't see any changes anywhere on your worksheet when you hit '!', you have no forward references.

Speeding things up:

Although DYNACALC is very fast, there may be cases where you need to do a great amount of calculating, and you will then notice some delays. Fortunately there are several things you can do to reduce the delays, hopefully to an acceptable level. First, hardware. If your 6809 CPU has a 1 MHz clock, look into increasing it to 2 MHz. This will double DYNACALC's speed, and that of any other compute-bound program on your system. See your dealer for details on a 2 MHz upgrade.

Regardless of your CPU's clock rate, there are a few things you can do to assure maximum speed for a given application. First, plan your equations for 'simplicity; avoid recalculating the same value over and over - do it once and stick the answer in a cell, then reference that cell. Avoid calculating things like '1/(2*@PI)' over and over again. If you need a constant like this frequently, type it in on the edit line, and hit '!' before transferring to a cell. This will calculate the value right then, and the resulting constant can then be stored.

Whenever you need to enter several values into a worksheet containing lots of arithmetic, turn off the automatic recalculation feature (toggled on/off by /AR). Hit '!' in the 'Ready' mode whenever you want to recalculate, or type /AR to go back to automatic. Line 2 will show 'Mode=x,A' or 'Mode=x,M' to indicate Automatic or Manual recalculate.

Automatic cursor advancing:

Normally when you hit 'return' to enter the contents of the edit line to the current cell, the cursor stays positioned at that cell so that you can change it again if you want. To enter the value and advance to the next cell (in any direction), you hit an arrow key (or your terminal's equivalent). Wouldn't it be nice if you could use the 'return' key instead? Sure, so DYNACALC allows that, too. To get into this mode, just hit any arrow key to enter the first cell in a series. Now subsequent cells can be entered just by hitting 'return', and the cursor will advance in the same direction as your initial arrow key. To get out of this mode, just hit 'return' while the 'Ready' prompt is showing.

Pointing to cells:

Don't forget - whenever DYNACALC is expecting a cell address, you have the option of typing the address manually, or POINTING to the desired cell with the arrow keys. This can save time and eliminate errors. Watch the edit line...as you move the cursor, each cell's address will appear in the equation (or command argument) and will automatically change as you move in any direction. When you reach the desired cell, proceed with the operation as though you had typed in the address manually. The cursor will return to where it was before you started 'pointing'.

Incrementing cell values:

Normally when you want to change a cell's contents, you point to it, and type in the new value. But what if the value is $ 4876.39 and you want to decrease it by $20.00? Who needs to type in all those digits? Not you, certainly. You have DYNACALC, which allows you to point to a cell, hit the '#' key, which will transfer the value of that cell to the edit line, then use arithmetic on the current value. To add $20.00 to a cell, for example, you just point to the cell, then type '#+20' and hit 'return'. Any other arithmetic operation could be used as well.

Using @INDEX and @LOOKUP:

These two powerful functions are very similar. They are both used to compare a supplied value with values in a table; only the comparison itself is different. @INDEX looks for an exact match, while @LOOKUP checks for a 'greater than' condition. @LOOKUP is useful for checking tables to find the range applicable to a particular comparison value. For example, a table might list discount percentages for quantities 1, 2-5, 6-10, and 11-99. If the desired quantity is 7, that would be associated with the 6-10 range. @LOOKUP does this by returning the value or label associated with the 6-10 entry. Obviously an exact match would be useless here.

@LOOKUP fails when used in combination with @MIN, however. This is because the comparison value will never be 'greater than' any of the table entries. This is one case when the exact matching comparison of @INDEX is most valuable. As an example, '@INDEX(@MIN(B6...B20), B6...B20,A1' would return from column A the value or label associated with (in the same row as) the lowest-value entry in the range B6...B20.

Memory conservation:

DYNACALC allows your worksheet to have up to 256 columns or up to 256 rows. It doesn't take a mental giant to figure that a given worksheet can't have both 256 columns and 256 rows; 64k cells is a little beyond the range of a FLEX computer. A machine with 56k will have about 30k of DYNACALC workspace, or room for about 3000 numeric cells.

How can you tell how much memory a cell takes? Simple...just watch the memory indicator on line 2 of the screen. You'll notice that the available memory drops a certain amount each time you put some data in a cell. Each active cell requires a two-byte pointer, plus a variable amount of memory for the actual cell contents. Any numeric entry uses a total of 10 bytes (8 for the number, and 2 for the pointer). Any label uses x+2 bytes, where x is the number of characters in the string. An expression uses 2 bytes for its pointer, 2 bytes for each cell reference, 1 byte for each function call, 8 bytes for each numeric constant (even 0 or 1), and 1 byte each for any other characters (commas, parentheses, etc.). In addition, DYNACALC maintains a table of the active portion of the worksheet, as reported by /AS. Each entry in this table uses another two bytes.

Now one fact that should be immediately obvious from the above is that you should avoid using large numbers of numeric constants in expressions. If a value is used repeatedly in lots of expressions, put it into a cell, and use the cell address instead.

Since the label entry mode (see /AL) makes it so easy to enter long strings, you may be tempted to enter your borders that way. This will use up more room than necessary. If you think you need the space, just put in one border character, set continuous format in that cell (/FC), then replicate (see /R) to the border area(s). This will also expand automatically if you later change column width(s).

Another important consideration is that DYNACALC allocates worksheet space in rectangular areas only. For example, if your sheet has an active cell at H27, all cells from A1....A27 through H1...H27 are put into the cell table at two bytes per. This means that a single entry, poorly placed, could eat half the available memory. The idea is to keep your worksheet as compact as possible, and to avoid scattering entries around. Use /AS to see the current size of your worksheet at any time, and try to keep new entries within this range. This will result in maximum usage of available memory.

If you delete extreme-right columns and/or bottom rows, space is still reserved for them (try /AS to see for yourself). To free up this unneeded space for other uses, Save your worksheet (/SS), clear it from memory (/CY), and reload it from scratch (/SL). Now try /AS and see how the sheet has shrunk. You will also notice that the free memory is greater than before.

Making your worksheet bullet-proof:

You never mess up a worksheet once it's set up, do you? Not very often. But what about your helper(s)? How many times have you had to demonstrate that you're not SUPPOSED to type in part numbers in a title row? DYNACALC has a number of features built in to protect your worksheet from accidents.

First of all, put any necessary operating instructions off to the side where they will be seen by the operator. Hopefully you will be able to find room in the title areas. Use the titles command to turn on column and/or row titles. Then you can't even move the cursor into those areas. Then, turn on the type-protection feature (toggled by /AT). This will prevent accidental changes of any cell from one type to another. Next, set the window division (if appropriate for your worksheet), and make sure the window formats are the way you want them. Make sure all your columns are wide enough to display worst-case data without overflow. Then put the cursor at the place most likely to be used to begin data entry, and save the worksheet on diskette. When it is reloaded, all the above things are ready to go, and hopefully your operator will be able to breeze right through the job you have set up.

You can make it even easier by putting a command like 'P DYNACALC INVENTRY' in your system startup file, so that the operator need only boot and type the correct date to get going.

## DYNACALC Error Messages

>AE< Argument error.

>DØ< Divide by zero attempted.

>ER< General purpose error.

>EX< Exponent too large.

>HO< Holder overflow error.

>LN< Negative or zero logarithm attempted.

>NA< Not available.

>NR< Negative root attempted.

>OV< Arithmetic overflow error.

>RE< Reference error.

>RN< Range error.

>SN< Syntax error.

Machine-generated errors are displayed as @ERROR? on the top line of the display, when pointed to.

## Screen Layout

```
A1
Mode=C,A  Memory=xxxxx    Ready

    [   A   ][   B   ][   C   ][   D   ][   E   ][   F   ][   G   ][   H   ]
  1-
  2-
  3-
  4-
  5-
  6-
  7-
  8-
  9-
 10-
 11-
 12-
 13-
 14-
 15-
 16-
 17-
 18-
 19-
 20-
```

This is how your crt screen will look when DYNACALC takes over.

Note that 'A1' is displayed in the top left corner. This means than the cursor is currently at cell A1. As you move the cursor with the arrow keys or the 'Goto : ' command, this value will be updated. You can tell at a glance at the top left corner of the screen exactly where the cursor is.

The balance of line 1 is used to display the contents of the current cell. Since when you start up DYNACALC (or clear an existing worksheet by typing /CY) the current cell (A1) is empty, nothing will be seen here.

Line 2 is used to display general information to the operator. The message 'Mode=C,A' means that the current mode is 'calculate Columns first', and 'Automatically recalculate after any numeric entry'. The attribute command can be used to change these modes. '/AO' will change the order of calculation, and '/AR' will toggle automatic recalculation on/off.

Also displayed on line 2 is the amount of system memory left. You will notice this number decrease as your worksheet gets larger.

The final message on line 2 at this time is 'Ready', which indicates that DYNACALC is ready to accept commands or data entries. If you type '/' to enter command mode, the 'Ready' will be replaced by the command menu.

The third line, blank at this time, is called the edit line, and it is here that you enter data before transferring it into a particular cell. Just point to the desired cell with the cursor, and start entering your data. It will automatically be displayed on line 3.

## Columns, Rows, and Cells

```
A1
'ode=C,A  Memory=xxxxx    Ready

    [   A   ][   B   ][   C   ][   D   ][   E   ][   F   ][   G   ][   H   ]
  1-[cell A1]  col B                                          col G
  2-           col B                                          col G
  3-   This is row 3, for example,row 3...row 3...row 3.....................>>
  4-           col B                                          col G
  5-           col B           [cell D5]                      col G
  6-           col B                                          col G
  7-           col B                     [cell E7]            col G
  8-           col B                                          col G
  9-           col B                                          col G
 10-           col B                                          col G
 11-           col B                                          col G
 12-           col B                                          col G
 13-           col B                                          col G
 14-           col B                                          col G
 15-           col B                                          col G
 16-   This is row 16, for example,row 16...row 16...row 16................>>
 17-           col B                                          col G
 18-           col B                                          col G
 19-           col B                                          col G
 20-           col B                                          col G
                etc                                            etc
```

The cell address, or location, is given by the column and row it intersects. Thus Cell D5 intersects both column D and row 5.

The current cell is always the cell to which the cursor points, and whose address is displayed at the extreme top left corner of the screen.

It is possible to have up to 256 rows or 256 columns, depending on available memory. Rows are numbered from 1 to 256, and columns are lettered from A-Z, then AA-AZ, BA-BZ, and so on up to IA-IV. The cell in the far bottom right corner of the DYNACALC worksheet is therefore IV256.

Display shown is from 24x80 crt. Actual number of columns and rows depends on characteristics of your terminal.

## Key Definitions

| | |
|---|---|
| up \ <br> down \ <br> left / <br> right / | Cursor positioning keys: <br> 'arrow' keys on most terminals (may require shift); or <br> { for up, } for down, [ for left, ] for right; or <br> 'control' + letter key on other terminals. |
| backspace | Backs up cursor to correct entry. NOT the same as left arrow! <br> 'rub' or 'del' on terminals without backspace key. |
| return | Causes value, expression, or label on edit line to be entered into current cell (can also be done with arrow key, which will enter AND move cursor with a single keystroke). |
| > | (shift-period) Enters 'Goto : ' command; now type in new address. |
| home | 'home' or 'top' on most terminals; causes jump to top left. <br> ^T (top) on terminals without other suitable key. |
| jump | Causes cursor to jump to other window, if two are displayed. <br> '`' or '^' on most terminals. |
| flush | (control-C) Empties contents of type-ahead buffer. |
| edit | (control-E) enters editor (same as /E in Ready mode). |
| overlay | In Edit mode, toggles overlay feature on/off. <br> When overlay is on, characters typed replace existing characters. When overlay is off, characters typed are inserted at current position. 'tab' or 'lf' on most terminals. |
| / | Enters Command mode, and displays main command menu. <br> If you need HELP with commands, type '?'. |
| @ | Indicates function (SIN, SQRT, NPV, etc.) to follow. |
| . | Prints as '...', and indicates a range of cells. |
| get address | Picks up address of current cell and inserts into expression. <br> 'tab' or 'lf' on most terminals. |
| # | In entry mode, causes a cell address to be replaced with the value in that cell. <br> In Ready mode, copies value of current cell to edit line. |
| ! | If in entry mode, causes current expression to be replaced by its current value. <br> If in command mode, causes entire worksheet to be recalculated, as though an entry had been changed. |
| ? | Causes 'help' message to be displayed for any command menu. |
| escape | Causes current operation to be aborted; returns to Ready mode. |

Any time a cell address is expected by DYNACALC, such as when you are entering an expression, you can enter the cell address manually, or you can move the cursor to the desired cell with the arrow keys. The address will then be picked up automatically (try it!). To pick up the address of the current cell without moving the cursor, simply hit the 'get address' key.

## Key Assignments

Here are the standard key assignments for several popular crt terminals, as set up in the supplied .TRM files. Any of these assignments can be changed by answering appropriate questions in the INSTALL utility.

| | up | down | left | right | backspc | home |
|---|---|---|---|---|---|---|
| SWTPC CT-82 | + | + | + | + | backspc | home |
| SWTPC 82xx | + | + | + | + | backspc | top |
| SWTPC 8212W | + | + | + | + | backspc | top |
| Hazeltine H-1400 | cntrl-U | cntrl-D | cntrl-L | cntrl-R | rubout | cntrl-T |
| Hazeltine H-1420 | { * | } * | [ | ] | backspc | cntrl-T |
| Hazeltine H-1500 | { * | } * | [ | ] | backspc | cntrl-T |
| Adds Viewpoint | + * | + * | + * | + * | backspc | home * |
| Heath H-19 | { * | } * | [ | ] | backspc | cntrl-T |
| Micro Term ACT-IV | + * | + | + * | + | rubout | send |
| LSI ADM-3A | { * | } * | [ | ] | rub | home * |
| ANSI standard | { * | } * | [ | ] | backspc | cntrl-T |

| | jump | flush | edit | overlay | get addr |
|---|---|---|---|---|---|
| SWTPC CT-82 | ^ | cntrl-C | cntrl-E | lf | lf |
| SWTPC 82xx | ^ | cntrl-C | cntrl-E | form | form |
| SWTPC 8212W | ^ | cntrl-C | cntrl-E | nxtpag | nxtpag |
| Hazeltine H-1400 | : | cntrl-C | cntrl-E | ; | ; |
| Hazeltine H-1420 | ` | cntrl-C | cntrl-E | tab | tab |
| Hazeltine H-1500 | ^ | cntrl-C | cntrl-E | tab | tab |
| Adds Viewpoint | ` | cntrl-C | cntrl-E | tab | tab |
| Heath H-19 | ` | cntrl-C | cntrl-E | tab | tab |
| MicroTerm ACT-IV | lf | cntrl-C | cntrl-E | tab | tab |
| LSI ADM-3A | ^ | cntrl-C | cntrl-E | lf | lf |
| ANSI standard | ` | cntrl-C | cntrl-E | tab | tab |

+ = use arrow key
* = shifted key
^ = caret character
` = grave accent character

## System Configuration

### The INSTALL Utility

DYNACALC is supplied to you in a diskette file named DYNACALC.COR. This file contains the 'CORE' of DYNACALC, which is everything but terminal-specific information. The crt terminal information must be appended to DYNACALC.COR to form a usable program. This is done automatically by the supplied utility, INSTALL.

DYNACALC needs to 'know' several things about your terminal. These things fall into two categories: keyboard character assignments and their resulting ASCII codes, and crt screen characteristics. INSTALL automatically assigns standard values for popular crt terminals, but allows you to change any or all of them. In addition, INSTALL lets you set up DYNACALC for any other crt terminal, provided it has the required characteristics.

INSTALL also lets you assign a 'kiss-off' string, which is sent to your terminal whenever you exit DYNACALC. You can use this string (up to 7 bytes) to reconfigure your terminal for other uses. This string is empty in the supplied .TRM files. It's up to you to think of something useful for your system.

Finally, INSTALL also allows you to change the printer/textfile defaults, printer on/off strings, the timer delay constant, and console port information.

There are five printer/textfile parameters. First is the Border flag, which tells DYNACALC whether or not to print the column and row indicators. Normally you will want to leave the borders off, but they can be very helpful in troubleshooting a worksheet, or sending a copy of a useful worksheet to others (maybe even for publication). You can also control whether or not DYNACALC Paginates its output. Your printer's capabilities will help you decide this one. If pagination is enabled, the number of Lines per page becomes important. For regular size paper (11 inches long), use 58 lines per page. Maximum is 255 lines. You can also set DYNACALC to multiple Spacing of printed (or textfile) output. Finally, you have control over the Width of the printed (or output) line. In general, this should be set to as high a value as your printer will permit. Maximum is 255 characters per line.

To create a personalized version of DYNACALC, copy the master diskette to a blank one, and insert the copy into your System drive. Type the FLEX command, 'INSTALL xxx', where 'xxx' is the name of your terminal, if supported by CSC. If your terminal is not one of those currently supported, just type 'INSTALL', and answer the questions asked. You will want to have a copy of your terminal's operating manual handy.

INSTALL will ask you several questions about your crt and other system variables. The program is designed to be self prompting, but here are a few key points: if you are not using the SBUG (TM of SWTPC) monitor, you will be asked for the console address or a vector to it. If

your console is not connected through an ACIA device, you need to give the address of a routine in memory that gets a character from the keyboard without echoing to the screen. INSTALL will ask you for this information at the appropriate time.

When you are asked for keycodes or output bytes, you may respond by simply striking the key you wish to use for each function, or you may type in the ASCII code in hexadecimal with a leading '$' (the '$' will not be displayed). If the code you wish to use is a special character to the INSTALL utility (SPACE, for example), you can enter it anyway by preceding it with '&' (not displayed). To enter '&', type '&&'.

A few things about terminals deserve special comment: if your terminal does not have erase commands (ADM-3A and H-1400, for example), DYNACALC simulates these features by writing spaces to clear the desired areas. This will result in somewhat slower operation on these terminals. The way DYNACALC simulates the erase commands also limits use of these terminals to one character per line less than normal. For example, the ADM-3A or H-1400 will have a usable area of 24 lines by only 79 characters. This means that you may sometimes see one column less than on other 80-column terminals. The basic ADM-3A doesn't have lower case display capability, so the ADM-3A.TRM file forces upper case. If your particular ADM-3A has the lower-case option, you should use INSTALL to let DYNACALC know.

If you put ANY characters into the 'printer on' string, DYNACALC will rewrite the whole screen after any printing operation. This allows using the 'printer passthrough' feature of some terminals, such as SWTPC. A driver is available from SWTPC (it's a part of later releases of FLEX) that allows connecting the printer in this way. SWTPC's driver is called 'T.CMD', and it's used just like 'P.CMD'. Connect it to DYNACALC by typing 'T DYNACALC' on the FLEX command line.

Your release diskette also has files Cxxxx-92.TRM, which correspond to the SWTPC Cxxxx.TRM files, except that they take advantage of the 22x92 graphics mode of these terminals. No lower case or bright/dim control is available in this mode, but you do get a wider display. CT-82 users will gain two rows, but the newer terminals will display two fewer rows than normal in the graphics mode. If you want to return to the regular display when you exit DYNACALC, put the appropriate bytes in the 'kiss-off' string with INSTALL.

There is a routine in DYNACALC that establishes a time delay after certain messages are displayed. INSTALL will ask you for a constant for this routine. Select 3 (1 MHz clock) or 6 (2 MHz clock) for normal operation. Lower values will shorten the delay, and higher values will increase it. Allowable range is 0-9.

Don't worry if you make a mistake in entering values into INSTALL, as you are always given another chance before any disk writing is done.

INSTALL's output file is ALWAYS DYNACALC.CMD on the System drive. If you want two or more runnable versions on the same System diskette, you must rename the existing one(s) before INSTALLing.

## Using Data Files

DYNACALC can read and write FLEX data files, with its /S#S and /S#L commands. All such operations default to .DAT extension on the Work drive, but of course you may override the defaults by typing in a more complete file specification.

The data file format is very simple: it is a standard FLEX text file, which can be read or written to by any system software as a simple sequential file. Worksheet data (numbers and/or strings) is put into this text file one textfile line per worksheet cell.

Here's a simple example:

```
   [   A   ][   B   ][   C   ][   D   ][   E   ][   F   ][   G   ][   H   ]
 1-STRING          34                      5.6e9                    THE
 2-     1.23     27.5                   MESSAGE                    6END
```

The command /S#S was used to save the block A1...H4 (any rectangular area of the worksheet can be used). Here is the resulting data file:

```
*DYNACALC Data File  5-25-82          this is a comment line
/Col                                  /C indicates saved by column
STRING                                first cell contents (A1)
1.23                                  next cell in column (A2)
@                                     @ indicates end of column
34                                    first cell in next column (B1)
27.5                                  next cell in column (B2)
@
>                                     > indicates blank cell (C1)
>                                     C2
@
>                                     D1
>                                     D2
@
5600000000                            E1 full precision always saved
MESSAGE                               E2
@
>                                     F1
>                                     F2
@
>                                     G1
6                                     G2 may be constant or calculated
@                                        value
THE                                   H1
END                                   H2
@
```

This same simple format is used for both saving and loading; DYNACALC can always read what it has written. When you are preparing other programs to write a .DAT file for DYNACALC, however, there are a few additional options at your disposal.

First, DYNACALC always puts a '>' symbol at the beginning of any data file line representing a blank cell. Such a line, when read back into a worksheet, will clear the previous contents of that cell. However, if the textfile line is completely blank, the contents of that cell will be left undisturbed. This permits you to overlay other data if desired. This also means that you cannot leave blank lines in your data file without affecting the worksheet. Any line beginning with an asterisk will be ignored, if you want to space things apart, or include comments.

The '@' symbol can be followed by a 'skip count', which is a decimal number optionally used to indicate to DYNACALC how many columns (or rows) to skip before entering the next column (or row) of data.

The first non-comment line in the file should begin with '/C' or '/R' to indicate how the file is to be loaded. If this indicator is omitted, DYNACALC defaults to loading the same as the last /S# operation.

You may sometimes need to input a string which begins with a number (an address, for example). If you don't include a leading quote ('), an error will be generated. DYNACALC will 'swallow' the quote, so it won't clutter up your worksheet.

If a format error is detected during an /S#L operation, loading will halt at the bad cell, and the cell's contents will be displayed on the edit line, with the cursor pointing to the problem. If you wish, you can correct the error, as DYNACALC has put you into the edit mode. (Note that at this point, inserting a single quote at the beginning of the line will NOT allow you to load the line as a label, since DYNACALC has already decided that it's a number.) Then hit 'return' to continue loading. If you prefer, just hit 'escape'. The loading operation will be terminated, and you can check the sheet to see how much of the file was loaded. You can then exit to FLEX and remedy the problem.

If you want to transfer data from an RMS data base to a DYNACALC worksheet, set up a .REP file including lines like these:

```
L 1,1 ;
T "* MAILING LIST"@1 ;
T "/Rows"@1 ;
P NAME@1 ;
P CITY@1 ;
P "'"@1 STREET@2 ;
P "!"@1 PHONE@2 ;
P "@"@1 ;
X ALPHA ;
```

Of course, getting data back into the RMS file isn't quite that simple. For this you need a program (possibly in BASIC) to figure out where in the .RMS file each record needs to go. DYNACALC will give you a text file, but the rest is up to you.

## Command Cross-Reference

DYNACALC is an original software product designed by CSC for operation with the 6809 microprocessor. However, its command structure is similar to that of VisiCalc, a popular spread-sheet program used on several brands of personal computers. DYNACALC, being a newer product, has many enhancements, and this has necessitated a slightly different command structure. The differences are listed below:

| VisiCalc | | DYNACALC | |
|---|---|---|---|
| /F* | bar graph format | /FP | plotting format |
| /GC | global column width | /AWW<br>also /AWC | window column width<br>individual column width |
| /GF | global default format | /WF | window default format |
| /GOC<br>/GOR | set column order<br>set row order | /AO<br>/AO | toggle to set order<br>toggle to set order |
| /GRA<br>/GRM | set automatic recalc.<br>set manual recalc. | /AR<br>/AR | toggle to set mode<br>toggle to set mode |
| /SD | delete file | /SX | use FLEX delete command |
| /SI | initialize diskette | n/a | exit DYNACALC first |
| /SQ | exit to DOS | /QF | exit to FLEX |
| /V | display version number | n/a | restart to see version number |
| /W1 | single display window | /WN | no window division |
| /- | repeating label | /FC | continuous format |

In addition to these differences, DYNACALC also has many added commands. See the Commands section beginning on page 9.

VisiCalc is a trademark of VisiCorp

DYNACALC is a trademark of Computer Systems Center

## Bibliography

1. Executive Computing, by John M. Nevison, Addison-Wesley, 319 pp, $11.95. Good section on Net Present Value, BASIC-language oriented.

2. VisiCalc Home and Office Companion, by Castlewitz & Kronberg, Osborne/McGraw-Hill, 181 pp, $15.99. A collection of fifty worksheets for various common applications.

3. The Power of: VisiCalc, by Williams & Taylor, Management Informations Source, 88 pp, $9.95. Gets into advanced applications. Good information on @LOOKUP and data block moving.

4. An Introduction to VisiCalc Matrixing for Apple and IBM, by Harry Anbarlian, McGraw-Hill Book Company, 252 pp, $22.95. Tutorial, including practical examples.

Above books are available from CSC.
Please add $3.00 per order for shipping.
No foreign orders, please.

VisiCalc is a trademark of VisiCorp

## Warranty and Update Service

Although DYNACALC has been extensively tested by many users, it is not impossible that the version you received has an undiscovered problem. Any such problem will be fixed by CSC as soon as it is reported.

If you experience difficulties, please make sure it's really DYNACALC and not some other part (software or hardware) of your computer. If you need help, be sure to let us know what hardware you have and what version of FLEX you are using, and your DYNACALC version and serial numbers. You can read the version number with SWTPC's VER utility, or get it from DYNACALC when it signs on. The serial number is printed on your master DYNACALC diskette, and on the front of this manual.

In general, we will be able to provide you with better help if you report problems in writing. However, telephone assistance is available at the number listed below during our regular business hours, 10 am until 6 pm Central time, Monday through Friday.

An updated version of DYNACALC will be supplied to you at no charge if you return your original DYNACALC diskette to CSC at the address below within 90 days of purchase. If you bought your copy from a dealer, rather than directly from CSC, you must also include proof of purchase.

DYNACALC is designed to work with 6809 FLEX, at least 32k of memory, and any crt terminal with at least 80 characters per line and direct cursor addressing. If your terminal has the required characteristics, but you are unable to configure DYNACALC to work properly (using the INSTALL utility), send us your original DYNACALC diskette and a copy of the operator's manual for your crt. We will either make it work on your terminal, at no extra charge to you, or refund your full DYNACALC purchase price. This offer is valid for 90 days from the date you purchased DYNACALC, and only for copies of DYNACALC purchased directly from CSC. If you bought your copy of DYNACALC from a dealer, ask the dealer to contact CSC for help.

After 90 days, you may obtain an updated version of DYNACALC by returning to CSC your original DYNACALC diskette, proof of purchase (unless bought directly from CSC), and $15.00. Payment can be by check, money order, MasterCard, or VISA. No purchase orders, please.

This policy applies only to corrections and minor enhancements of DYNACALC. Completely new versions of DYNACALC, such as for a different computer or operating system, are considered separate products and must be purchased outright.

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# DYNACALC Update

## New Features in version 1.7:Ø

Your DYNACALC manual describes all the features in FLEX DYNACALC as of version 1.5:9. Since this version was released, several new features have been added to DYNACALC, partly as a result of our own experience in using DYNACALC in everyday work, and partly as a result of feedback from other users. We thank those of you who have contributed suggestions on improving DYNACALC, and we will be continue to be grateful for any user comments.

These update sheets are intended to be used with the original edition of the DYNACALC manual. The supplied DYNACALC reference card, however, is intended to replace the old reference card. We suggest that you destroy the old card to avoid confusion.

## Logical Functions

In addition to its built-in math functions described on pages 22-26, DYNACALC has a full complement of logical, or decision-making, functions. These functions are usually used with the logical comparison operators, so these operators are also described in this section.

In order to understand how the logical operators and functions work, you must first know that they work with a special data type: the "logical value". A cell which holds a logical value must hold one of two possible values, "true" or "false". There is no middle ground. The simplest way to put a logical value into a cell is to use the functions @TRUE and @FALSE. These functions do just what their names imply. @TRUE forces the cell to contain a logical value of true, while @FALSE forces a logical value of false. These functions are of the greatest use in initially setting up a worksheet, to force certain cells to have known logical values.

The next, and most frequently used, way to set a logical value is to use the logical operators, or comparison operators. The simplest of these is the "equals" operator, or "=". This operator is used to compare a number or the contents of a cell with another number or with the contents of another cell. For example, the logical expression "B6=C9" means "Compare the contents of cells B6 and C9. If they are equal, then return a logical 'true'. If they are unequal, return a logical 'false'." Load the sample worksheet "LOGIC" and see how simple it is to use the comparison operators. Note that they work on both numbers and labels.

There are several other logical operators to test for other relationships between numbers and/or cell contents. These are: "not equals", or "<>"; "greater than", or ">"; "less than", or "<"; "greater than or equal", or ">=" or "=>"; and "less than or equal", or "<=" or "=<".

All the logical operators can be used to test the relationship between numbers and/or cell contents. Constant numbers can be tested against cells: for example "Q12=Ø" will return "true" if the content of cell Q12 is zero, or "false" if the content of Q12 is anything other than zero. Even two constant numbers can be compared: for example "3=3" will return a "true" value, and "3>4" will return a "false" value.

In addition to testing numbers, the logical operators can also test the relationships between Labels, or strings of characters. Labels to be tested must be cell contents; constant labels are not allowed to be used like the constant numbers in the previous paragraph. For example: "C4=C5 would return "true" if cells C4 and C5 contain identical labels, and "false" if any characters are different (case is ignored, however). When used with labels, "greater than" means "comes after" in the alphanumeric sorting order.

Note that whenever a cell containing a label is referenced by any function or expression which expects a value, that cell contains an equivalent value of zero. This means that you shouldn't attempt to compare a value with a label, as they will always be unequal unless the value cell happens to contain zero.

DYNACALC provides two special logical functions for initially setting up a worksheet and detecting whether data has been entered. These are @ISERROR and @ISNA, which return "true" if the cell to which they refer contains an error or a "not available" condition, respectively.

Up to now we have seen how to generate a logical "true" or "false" value. Now, what do you do with these logical values? The answer lies in the @IF function. @IF is used to test a logical value, and return one of two possible results, depending on the state of the logical value. @IF takes three arguments, in this order: first, the logical value to be tested. This can be a cell reference or a logical function like @ISERROR. The second argument is the result to return if the first argument is "true". The final argument is the result to return if the first argument is "false". The second and third arguments can be constant numbers or cell references. If a cell reference is used, the target cell may contain a number or a label. For example: @IF(AB3,X1,Y2) will test the logical value of cell AB3. If it's true, @IF will return the number or label in cell X1, otherwise the number or label in cell Y2.

Since @IF can return labels, you can use it to automatically copy labels from one part of your worksheet to another, thus saving effort (and worksheet memory space). For example, the function @IF(@TRUE,A1) will cause whatever is in A1 to appear wherever this function is placed. The absent third argument causes no error because @TRUE is always true, so the false argument is never needed.

You can use @IF in conjunction with other DYNACALC functions and operators to produce expressions of any degree of complexity. The sample worksheet "LABELIF" is provided on the release diskette to give you some ideas. This worksheet uses the "=" operator to test strings, and @IF to return a label formatted to look like a number. The result is a highly readable and easy-to-use worksheet.

DYNACALC can also perform operations on logical values, using the functions @NOT, @OR, @AND, and @EOR. @NOT takes a single argument, and returns the logical complement, or opposite, of the supplied logical value. For example, @NOT(@TRUE) will return "false", and @NOT(A6=B5) will return "false" if cells A6 and B5 have equal contents. In other words, @NOT reverses the sense of logical expressions.

@OR and @AND are normally used with two or more cells. @OR will return true if ANY of the logical values referenced are true, while @AND will return true only if ALL the logical values referenced are true. These two functions will accept a list of cells, or ranges of cells, just like the math functions @AVERAGE, @SUM, etc. For example, @OR(A4...B9) will return true if at least one cell in A4...A9 or B4...B9 is true.

@EOR (exclusive-or) should be used only with two arguments, as @EOR(E4,J17). This example would return true only if the logical values held by cells E4 and J17 are DIFFERENT.

These logical functions represent the basic building blocks of any logic system. Using them, you can construct any kind of network imaginable.

One of DYNACALC's error messages, >LG<, is provided especially for the logic functions. This error message will be displayed whenever DYNACALC encounters a logical value where it is expecting a numeric value, or vice versa. If you encounter an >LG< error in a place you wouldn't expect one, such as in an @SUM function, look for a stray logic cell within the area expected to contain only numbers.

## Keysaver

DYNACALC's Keysaver (trademark of Computer Systems Center) feature permits multiple execution of typed commands. For example, to delete 12 rows from a worksheet without Keysaver, you must type /DR 12 times, and watch the screen to make sure you don't go too far. With Keysaver, you enter the command once, then type /K11. When you hit (RETURN), DYNACALC will do the command 11 more times (the first execution takes place as soon as the first command is typed).

Keysaver can be used with any DYNACALC command, although it's more appropriate for some than for others. Not just command keys can be saved: arrow and other special keys are remembered as well. Just remember that the Keysaver buffer is cleared whenever you hit '/' from the Ready mode. Any keys typed between that and the /K are remembered, and will be re-executed in sequence.

To initialize Keysaver, type '/' and (ESC). That will enter the command mode, and quickly exit to Ready. Now type whatever keys you want repeated, in the correct order, then /K, and the number of EXTRA times you want the sequence done. Remember that it's already been done the first time.

Suggested uses for Keysaver include setting column formats, deleting and inserting rows and columns, with '#' for converting expressions into values, and blanking ranges of cells.

## Locate Label

The Locate label command lets you quickly determine the location of a specified label. This is very useful, especially with large worksheets extending over several screens.

When you type /L to enter this command, DYNACALC will ask you for the text string (sequence of characters) for which to search. Enter the desired string and hit (RETURN). Now DYNACALC searches your worksheet for any occurrence in a LABEL of the specified string. This is a substring search, so the target label does not have to contain only the search string. For example, if you enter 'bath' as the search string, DYNACALC might report the existence of labels 'bathroom' and 'bathtub' (but not 'bat').

When Locate finds a match, it displays the address of the cell containing the found label, and the entire contents of that cell, on the top line of the screen. On line two the prompt 'Move?' is displayed. Answer this prompt with 'N' to continue searching, or 'Y' to move the cursor to the displayed cell.

Locate starts at the current cell, and goes vertically through the worksheet in its search for a match. If no match is found before it returns to the starting cell, the command is aborted.

There are two special characters that can be included in the search string. A question mark (?) at any position in the search string serves as a wild card. Thus a search string of 'c?t' might result in finding 'cat', 'cot', or 'cut'. Any number of wild card characters can be included in the search string. The other special character is the at-sign (@). This character, when used in the FIRST character position of the search string, causes DYNACALC to require an exact match (INCLUDING CASE) between search and target strings. Normally case (the difference between 'a' and 'A') is ignored.

## Random Number Generator

@RND(x) is used to generate random numbers. This function is very useful in generating test data, and for certain statistical applications. You could even use @RND to make DYNACALC play games! @RND requires a single argument, which can be a constant, a cell reference, or an expression of any degree of complexity. @RND uses the argument to determine the maximum value of the random number to be returned. The range is from zero to x-1, where x is a positive argument. If x is negative, the range is from zero to x+1. @RND always returns integer values, except when x is zero, in which case a fractional random number from zero to approaching one is returned. This function works with any size number for x, but the maximum recommended value for good distribution is 65535.

@RND is evaluated each time your worksheet is recalculated, so the returned number will change. If you need to generate random numbers that don't keep changing, save the numbers with the # key. DYNACALC's Keysaver feature makes it easy to do this on even a large group of random numbers. For example, if you have column A full of @RND functions that you wish to freeze, move the cursor to A1, then type / (ESC) # (RETURN) (DOWN-ARROW) /K255 (RETURN). You will probably want to turn off DYNACALC's automatic recalculation feature (/AR) before you do this, to keep the random numbers from changing every time the # key is executed.

# DYNACALC Update

## Editor Command Enhancements

Three new features have been added to DYNACALC's editor command, which can be entered with /E (from Ready) or with the Edit key during data entry. Each of these features is implemented by adding a special function to one of three already-defined keys.

Within the editor mode, the (UP-ARROW) key will move the edit cursor to the beginning of the edit line, (DOWN-ARROW) will move to the end of the line, and (HOME) will truncate the edit line from the current cursor position. Using these new features in combination with the other editor keys will allow speedier editing than ever.

## File Name Defaulting

When you load a worksheet file with /SL, DYNACALC now remembers its name, and uses this name as the default file name for subsequent /SL load and /SS save commands. To use the default, just hit (RETURN) in response to the filename prompt after you type /SL or /SS.

## Default output area for /O, /P, and /S#S

When you are using the /O (textfile), /P (printer), or /S#S (data file save) commands, typing (RETURN) in response to the 'Range ?' prompt will cause the entire worksheet to printed or saved rather than just the current cell. We believe you will find this a great convenience.

## Initial Page Eject Control

A new attribute command, /APF, has been added to give you the ability to eliminate the initial form-feed sent out before anything is printed. This affects both /O (text file) and /P (printer) operations, but only when pagination is enabled. Just type /APF to toggle the initial form-feed on and off. The state of this switch is saved with /SS.

## Vertical Pagination

DYNACALC will now automatically break wide worksheets into pieces as required to fit onto available printer width. Just enter the entire range to be printed (or output to text file), and DYNACALC will split it up as needed.

## Cursor On/Off

The INSTALL utility now asks for cursor on/off strings. If your terminal allows its cursor to be turned on and off (about half the terminals we know of do), DYNACALC will use this opportunity to turn its cursor off when it's not needed, thus improving (we think) the appearance of the screen. The cursor on/off strings may be up to three characters each, and can both be the same if your terminal toggles between on and off with a single command string.

If you are upgrading an old version of FLEX DYNACALC, make sure you use a new .TRM file when you run INSTALL. Old ones don't work!

## Disk Error Messages

When DYNACALC encounters any type of disk error (disk full, etc.), an error message is displayed on the screen. Formerly these messages were erased after a few seconds, and DYNACALC returned to 'Ready'. Now the messages are displayed permanently until you hit any key. This will eliminate the possibility of missing important messages.

## Filter Program to Update Old Worksheets

Included on your DYNACALC release diskette is a filter program to modify worksheets created by older versions of DYNACALC for proper operation with version 1.7:Ø or later. The modification is necessary because of the functions that have been added. Actually, you don't need to worry about this on any of your old worksheets unless you have used the @NA or @ERROR functions, which have been assigned new tokens.

To update an old worksheet, simply type 'NEW-DC SHEET', where 'SHEET' is the name of the old worksheet file to be updated. The NEW-DC utility automatically supplies the .CAL extension. After the program is run, that worksheet file will correctly run with the newer DYNACALC. You may specify several .CAL files on the command line if you wish.

The NEW-DC utility also displays worksheet size information as it runs. This information may be useful to you in keeping track of different versions of similar worksheets. This utility reports the number of cells containing values, labels, and expressions, and the maximum column and row usage of any worksheet.

The NEW-DC utility can be run on any worksheet file; if the file has already been updated, no further changes will be made to it, but the worksheet size information will still be displayed.