DYNA CALC

This version of DYNACALC is designed to operate under Disk Extended Color Basic on the TRS-80 Color Computer. No other operating system software is required. When DYNACALC is in use on your computer, all built-in ROM software is totally disabled. Therefore, DYNACALC works equally well on any combination of ROM versions.

Most serious computer 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.

DYNACALC requires that 64k-bytes of RAM be installed in your computer. Most "32k" computers built since fall, 1982, are actually 64k models. See your hardware supplier for details on memory expansion.

If you have version 1.1 or later of Disk Extended Color Basic, you may enter DYNACALC simply by typing 'DOS' instead of the more complicated 'RUN"DYNACALC"'. This applies anywhere in this manual that entering DYNACALC is mentioned.

Use of a printer with DYNACALC is entirely optional, and you can use any hard copy device which you currently use under Disk Extended Color Basic. The user has control of all important printer parameters: communications (baud) rate, auto line-feed, handshaking enable/disable, column width (up to 255), number of lines per page, multiple spacing, pagination on/off, and DYNACALC borders on/off.

This version of DYNACALC includes full high-resolution graphics capability. With only a few keystrokes, you can create several different types of graphic displays based on information contained on your DYNACALC worksheet. These graphs are always displayed on your computer screen. If you have a printer capable of doing individual-dot graphics, you may generate hard copies of these graphs as well as the standard alpha-numeric output.

You may prefer to use your computer's arrow keys to move DYNACALC's cursor from cell to cell. However, DYNACALC allows a joystick or mouse to be used instead. If you have a joystick or mouse, try it to see if you prefer this method of cursor movement.

The DYNACALC package includes two items: this manual and a single 5.25" diskette. before you attempt to use DYNACALC, make a copy of THE SUPPLIED DISKETTE, and STORE THE ORIGINAL IN A SAFE PLACE. Please note that the supplied diskette cannot be copied by the BACKUP or COPY commands. Instead, DYNACALC has a

command built-in to make backup copies.

You should never use the DYNACALC diskette for anything other than producing backup copies (for your own use only, of course). Use only the backup copies for all other DYNACALC operations. To make a backup copy of DYNACALC, follow these simple steps:

1) Turn on your computer and make sure that the disk system is working. Try doing a 'DIR' command on one of your diskettes.

2) Put the original DYNACALC in drive 0. Do not remove the write protect tab.

3) Type RUN"UPDATE" to see if there are any last-minute additions or corrections to this manual.

4) Type RUN"CREATE"

5) If you have only a single disk drive, remove the original DYNACALC diskette from the drive, and replace it with a freshly-formatted diskette. If you have two or more drives, leave the original diskette in drive 0, and put a freshly formatted diskette in drive 1, 2, or 3.

6) CREATE will ask you a number of questions about how you want the runnable copy set up (printer, etc.), and will tell you when to insert and remove diskettes if you have a single drive system. Note that you can run CREATE as many times as you like, and each time it will create one runnable copy of DYNACALC.

7) When you are finished running CREATE, put the runnable copy of DYNACALC in drive 0.

8) Try the copy by typing RUN"DYNACALC" - it should function as described in this manual. This runnable copy is not copyable by the BACKUP or COPY commands. You must use the original release diskette to make additional copies.

DYNACALC is now ready for use. 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.

You should know that imbedded in your copy of DYNACALC is a serial number that is registered in your name. This number is part of any copies of DYNACALC made from your master disk. Don't risk trouble by letting others copy your registered copy of DYNACALC.

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 48-49.

To enter a value, expression, or label into a cell you must first move the 'cursor' (pointer) to the cell you wish to use.

Using the arrow 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), 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', followed by (enter), 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' (shift-up-arrow) has been implemented to do just that. Normally, 'home' will cause 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.

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 (enter) key, the new information will be transferred to the current cell.

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, .09, -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 (enter) 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 the 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 (shift-7), 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 (enter) 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 cells 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 & 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 alphabetical 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 (enter) 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

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your Disk Extended Color Basic computer and, when you see the 'OK' prompt, type 'RUN"DYNACALC"'. After a few seconds you will see the 'Hello' screen, which displays DYNACALC's version and serial numbers. If the file HELP/BIN is present on your DYNACALC diskette, this file containing the text of the HELP messages will then be loaded into memory, which will take a few more seconds. Type any key to continue.

When the screen is rewritten you will see the basic worksheet, as shown on page 48. If you already have DYNACALC running, type /CY to clear the current worksheet (don't forget to save it first, if it's anyting 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 (enter). 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 (enter), 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.

Line 2 of the DYNACALC screen displays information about the current operating mode and the settingsof 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 (break) 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 (break).

Whenever you are typing in data to be put into a cell, you can use the (clear) key to correct recent errors without retyping whole lines. Note that (clear) and (left-arrow) are two different keys and produce totally 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 ones, all without retyping the entire line.

When you are using the editor, the (LEFT-ARROW) and (RIGHT-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.

The (UP-ARROW) and (DOWN-ARROW) keys also have special functions when you are using the editor: (UP-ARROW) will move the cursor to the beginning of the edit line, and (DOWN-ARROW) will move the cursor to the end of the line. These keys, in conjunction with the (LEFT-ARROW) and (RIGHT-ARROW) keys, permit reaching any desired part of the edit line with a minimum of keystrokes.

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 (CLEAR) key. the character will disappear and the right side of the line will move one position to the left.

To truncate the edit line, move the cursor to the first character to be deleted, then type (SHIFT-CLEAR). The character at that position, and any characters to its right, will disappear.

To overlay, hit the overlay key (SHIFT-RIGHT-ARROW) 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 (CLEAR) key is ignored in this mode. To exit overlay, hit the overlay key again.

When you are finished editing, hit (ENTER) 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 (SHIFT-LEFT-ARROW). 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.

This version of DYNACALC works with standard Disk Extended Color Basic files. Actually, since DYNACALC disables all built-in ROM software when it is running, DYNACALC contains its own integral Disk Operating System (DOS), but this DOS is designed to work just like the original ROM software.

Filenames therefore are constructed just as usual, with the format 'FILENAME/EXT:D', where 'FILENAME' is an alphanumeric (A-Z, 0-9) name arbitrarily assigned by the user (that's you), 'EXT' is an extension used to indicate the type of data in the file, and 'D' is the drive number (0-3).

The filename itself must always be specified to reference a file, but the extension and drive number can be omitted, in which case default values will be supplied automatically by DYNACALC. The default extension depends on the activity

involved, and will be one of 'CAL', 'DAT', 'TXT', or 'GRF'. The
'CAL' extension is used by default for worksheet files, which
are saved and loaded by /SS and /SL. The 'DAT' extension is
used by default for data files, which are saved and loaded by
/S#S and /S#L. The 'TXT' extension is used by default by /O,
the text file output command. The 'GRF' extension is used by
default for graphics screens, which are saved and loaded by /GFS
and /GFL. 'CAL' and 'GRF' files are binary, and their format is
not documented. Only 'DAT' and 'TXT' files are intended to
communicate with user-written programs.

Please note that any alphanumeric extension may be used for
any of the above purposes; however, using the defaults will save
time and will help keep your directories organized.

Whenever DYNACALC asks you for a filename, you can respond
by typing the name, or by hitting (SPACE), which will cause
DYNACALC to list in sequence all the filenames of the proper
extension on the default drive. Keep hitting (SPACE) until you
see the name you want, then hit (ENTER), and that name will be
used. Names displayed by hitting (SPACE) can be edited (see
Error Correction) before you hit (ENTER).

Whenever you load a worksheet file with /SL, DYNACALC
remembers its name, and will automatically use this name if you
just hit (ENTER) after the filename prompt when you subsequently
save the file with /SS. In this case, DYNACALC will ask if the
old file can be deleted before anything is written to the
diskette.

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 G I K L M O P Q R S T W ?

You can 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 (/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: D G H K L M O P R S T W ?

Attribute D (/AD) is a good one to start with, since it is
very simple. Each time you type /AD you 'toggle' (reverse) a
switch which is checked by DYNACALC whenever trigonometric

calculations are performed.   This switch defaults to 'degrees',
but its current state is saved with /SS.   Whenever trig
calculations are made, 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 (ENTER) 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.
Please note that /AG has nothing to do with the high resolution
graphics command /G.

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.

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

If you frequenly need lots of workspace, you can
permanently turn off HELP by deleting or renaming the file
HELP/BIN on your runnable DYNACALC diskette.

Attribute K (/AK) toggles the switch which controls the
audible key click.   Most users find the ksy click very helpful,
especially when using DYNACALC's typeahead feature, but /AK is
provided for those who may find the clicks annoying.   This
switch is saved with /SS.

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 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 (0) - 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 allows you to use single (1) or multiple (2-8) spacing for the printed or textfile output. Command W (/APW) lets you change the maximum number of print positions across the page (deafult is 80). If you find yourself frequently changing to a particular configuration, remember that all five of the DEFAULT values can be changed when you run 'CREATE'. All printer/textfile parameters are saved by /SS. See /SP for physical printer set-up.

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 other cell 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 your 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.

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.

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.

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 (BREAK) and think about it for awhile (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!

The edit cell command (/E) allows you to edit the contents of any cell. See the full description under Error Correction on page 7.

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 cells 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. See /G for high resolution graphics.

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.

The graphics command (/G) allows you to use worksheet data, whether entered as constant values or calculated, as the basis for several types of high resolution graphs. These graphs are displayed on the screen, and may be copied to your printer, if dot-addressable graphics are supported by your hard-copy device.

When you type /G to enter the graphics command, you will immediately be greeted with another menu: C F P R ? . We will discuss each of these options in the following paragraphs.

The continue (/GC) option requires that a range of data be entered first, and will be ignored if no range has been entered.

The file (/GF) option allows loading of previously saved graphics screens. The graphics information is displayed on the screen immediately as it is loaded. This screen can then be

edited, perhaps printed, and re-saved if desired.   Refer to the
section "Disk File Names" for information on supplying file
names for use with this command.

    The previous (/GP) option allows you to re-use previously
entered ranges.   If you need to change any range, or add a new
range, you must re-key all the ranges.

    The range (/GR) option will prompt you to enter the range
or ranges of cells to graph.   The minimum number of cells per
range is two, maximum is 121.   The range can extend over more
than one row or column.   For example, to graph A1...A10,
B1...B10, and C1...C10, you can enter A1...C10.   In this case,
you would actually type A1.C10, with DYNACALC adding the
additional periods as usual.

    At least one range must be specified, and as many as three
ranges may be given.   If you enter only one or two ranges and
wish to go ahead and graph them, use the C (continue) option.
If you enter a third range, the next menu will be displayed,
just as though you had typed a continue command.   This leads us
to the next menu, which is: B H L P ? . Each of these options
produces a different type of graph.   We will describe each one
in the following section.

If you specify the B (bar) graph option, DYNACALC will draw on the screen a vertical bar graph of the range or ranges given. Each vertical bar represents the contents of one cell, with the first cell at the left. If all the numbers in the range are positive, the bottom of the graph will be zero, and the top will be the largest value plotted. If any negative numbers are present in the range, the ZERO line will be moved as needed. Note that DYNACALC automatically scales the vertical size of all bars so that all will fit on the screen.

As many as 121 cells may be included in a single range for this type of graph. If fewer cells are given, they will be grouped on the left side of the graph, as the vertical bar width is not adjustable. If more than one range is given, the graphs will overlap. This can create some interesting effects on a color display!

The H (Hi/Lo) graph option is a special type of vertical bar graph, especially suited to display of stock and commodity market information. In this mode, DYNACALC draws a vertical bar for each group of 3 cells from the first (High) to the second (Low), then draws a small horizontal tick mark at the value of the third cell (Close). As many as 60 bars can be plotted in this mode.

To draw the Hi/Lo/Close graph, DYNACALC requires three ranges of cells. The first range given will be used as the high limit, the second as the low limit, and the third as the close marker. If only two ranges are given, DYNACALC will draw vertical bars without the close markers. If only a single range is given, a graph of single dots is produced. Each of these can be useful for a variety of purposes.

Probably the most frequently-used type of graph is the line graph, called up with option L. This graph uses the values of the cells specified in a range to locate single dots on the screen, and then connects the dots with straight lines. Unlike the vertical bar and Hi/Lo graphs, the horizontal axis is automatically scaled to accommodate any number of cells in a range, from 2 through 121. The vertical scaling works the same as in the vertical bar graph mode.

DYNACALC can also draw pie charts, if you type option P. This type of graph consists of a circle cut into slices proportional to the values contained in the cells in the given range. Only a single range is needed; others will be ignored. There will always be a vertical division at the top of the pie, and the first cell will be represented by the segment just clockwise of this division. Thus if you have a value of one in

the first cell, and three in a second, and give only these two
cells as the range, DYNACALC will draw a circle with two
segments: the first, representing the 1, will be from 12 to 3
o'clock, and the second, larger, segment, representing the 3,
will be from 3 around to 12 o'clock.

Please note that ranges containing negative numbers cannot
be used to create a pie chart.
Once the graph of your choice is on the screen, you will be
greeted by yet another menu, which will contain some of the
following: A B C D E F P S .

No question mark appears in this menu, as there is no place
to display help messages for these options. To do so would
destroy the graphics screen. Different combinations of these
options will be displayed depending on the type of graph
selected, and how much you have modified it, but we will discuss
all the options here together.

Option A will cause an Average line to be plotted on the
screen. This option is available on Bar, Hi/Lo, and Line
graphs, but not on pie charts, where it would be meaningless.

Option B will start or stop Blinking of plotted points in
the line graph mode. The blinking is to visually distinguish
the plotted points from their connecting lines. If a hard copy
is made with the blinking on, the plotted points will be omitted
from the printed copy. If printing is done with no blinking,
the plotted points will appear on the printed page. Sorry,
DYNACALC can't make the points on the page blink!

Option C puts you into Caption mode, in which you may add
whatever textual information you like to an existing graph. Use
the arrow keys to move the cursor to the desired spot, then type
in your caption. Use care with the space bar to avoid blanking
out desired parts of the graph. The (CLEAR) key works as a
backspace key, as usual in DYNACALC. To exit the caption mode,
type '/', and you will see a new menu consisting of parts of the
last one.

Option D is available only after being in the caption mode,
and allows you to transfer Data from your worksheet to the
graphics screen. To use this feature, enter the caption mode,
then move the cursor to the spot where you want the data to
appear. Next, type 'D', and enter the address of the cell
containing the desired number or label. When you hit (ENTER),
the data wil appear on the graphics screen, and the cursor will
be advanced to the end of the displayed data. At that point you
are back in the caption mode, so you can add more captions, or

use /D to get more data from the worksheet.

Option E is provided to allow you to Exit back to the caption mode, if you hit the / key by accident. Other menus in DYNACALC are exited by hitting (BREAK), but this would return to Ready, and you would lose your graphics screen.

Option F allows loading or saving graphics information from or to a diskette file. This option will present you with another choice: L S , for load or save. The Load choice will load a specified file (see the section on Disk File Names) into the graphics screen memory, overlaying whatever else is on the screen. The save choice saves to diskette whatever is on the graphics screen.

The ability to overlay one graphics screen with another opens lots of possibilities for developing standard captions, combining graphs, whatever you can dream up!

Option P copies the graphics screen to your printer. This of course assumes that you have a printer with dot-addressable graphics. Make sure that you have set up the printer correctly with /SP. If you can print worksheets normally, but not graphics, you may have /SPT set incorrectly, or your printer may not have dot-addressable graphics.

To interrupt printing, type (SHIFT-@) once (listen for the key-click, if it's enabled). To resume printing, hit (ENTER), or hit (BREAK) to abort (graphics page is lost).

Option S causes the graph to be Scaled to eliminate 'mud' areas. For example, if the numbers you are graphing hover in the 900 range, they are still graphed from zero to 1000 or so. Scaling will magnify the active area to occupy 8/9 of the graphics screen, so the displayed area would be maybe 800 to 1000. This of course doesn't work on pie charts.

Insert Colunm or Row

The insert (/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.

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 (ENTER), 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 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 (BREAK). That will enter the command mode, and quickly exit to ready. Now type whatever commands you want repeated, in the correct order, then /K, and the number of EXTRA times you want the sequence done. Remember that its 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 (ENTER). 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.

Move colunm or Row

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). 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 DOS 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. See "Disk File Names" for information on file name conventions. 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. Hitting (ENTER) without entering a range will cause the entire worksheet to be sent. When you see the ready prompt re-appear, you know that the textfile has been written.

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

There are five parameters that you can adjust to alter the way DYNACALC outputs to the textfile: Borders (no/yes), number of lines per page, pagination (no/yes), 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 (ENTER)) 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. Hitting (ENTER) without entering a range will cause the entire worksheet to be printed.

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), and multiple spacing, and column width. See attributes (/AP) section for details. Current settings are displayed before continuing. There are also three physical printer parameters that need to be correct for your printer. See /SP for details on auto LF, Baud rate, and Handshaking. The printer type is important only for graphics.

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

To interrupt printing, type (SHIFT-@) once (listen for the key-click, if it's enabled). To resume printing, hit (ENTER), or hit (BREAK) to abort.

For further information on printer operation, refer to the section "Printer Considerations"

Quit

The quit command (/Q) is used to exit DYNACALC and return to basic. This of course will destroy your current worksheet, so make sure it's saved on diskette if it's of any value. DYNACALC will ask 'are you sure?'.

Replicate Cell(s)

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 (ENTER). If the single cell you want to copy happens to be the current cell, just hit (ENTER). 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 (ENTER). For a range of cells, enter the first cell, a period (.), and the last cell, then hit (ENTER). 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 (ENTER). If the source is to be copied a number of times, enter the first address, a period (.), and the last address, followed by (ENTER).

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 occurrences 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 seperate 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 develope 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 (ENTER) 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 Commands

System commands (/S) let DYNACALC communicate with your

disk hardware, using its own built-in disk operating system (DOS). Using /S, you can save and load full or partial worksheets, and do other system-related tasks. This command is also used to do the physical set-up of the printer. Entering /S, you will see the following menu A C D F K L P S # ?

The first of these choices, (/SA), lets you Assign the current default disk drive. When you enter this command, DYNACALC will ask you for a drive number. Enter the number (0-3) of the disk drive you wish to use by default for all DYNACALC data operations.

Note that the runnable DYNACALC diskette should normally be left in the drive from which DYNACALC was called, since certain operations (such as Replicate, Graphics, Printing, Move, etc.) require program overlays that are loaded from this diskette. By the way, the reason for these overlays is to conserve your precious worksheet memory space. The runnable DYNACALC diskette can be removed if it's necessary to load a file from another diskette, however.

The catalog command (/SC) asks you for a drive number, then displays the filename (including extension) of all files on the diskette in that drive. To catalog a diskette other than the runnable DYNACALC diskette in a single-drive system, wait until the 'Drive?' message appears before switching diskettes. Hit any key to return to ready.

The set Date command (/SD) reports the last date set and asks you for a new one. To leave the date unchanged, just hit (BREAK). If a date is set, it will be included in the title line when printouts are made.

The Free command (/SF) asks you for a drive number, then reports the number of free granules remaining on the diskette mounted on that drive.

The Kill command (/SK) allows you to delete individual disk files. This command defaults to 'CAL' extension on the current drive.

The worksheet load command (/SL) loads a previously-saved worksheet into your current worksheet. 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. Refer to 'Disk File Names' for information on allowable file names. All /SL operations default to 'CAL' extension on the current 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.

The physical Printer command (/SP) leads to yet another menu: A B H T ? which allows you to change the following printer characteristics. Note that you can change the defaults with the CREATE program when you make a runnable copy of DYNACALC.

The Auto LF command (/SPA) toggles the setting of the auto LF switch. If this switch is 'off', DYNACALC assumes that your printer generates its own linefeed on receipt of a carriage-return character (most printers do). Turn this switch 'on', and DYNACALC will output a linefeed character after each carriage-return. Having this switch 'on' when it should be 'off' will result in double spacing of all printed output. Setting the switch 'off' when it should be 'on' will result in no linefeeds, which will jumble all printed output together on a single line.

The baud rate command (/SPB) gives you a menu of available communications rate options. The rate selected must match the rate set on the printer itself, or chaos will result. To pick a baud rate, enter /SPB, then simply move the marker to the desired speed with the (UP-ARROW) and (DOWN-ARROW) keys, then hit (ENTER).

The Handshaking command (/SPH) toggles the setting of the handshaking switch, which controls whether or not DYNACALC waits for an acknowledge signal from the printer before sending another character. This switch should be 'on' for most of the faster printers. If it is on, and the printer does not send an acknowledge signal, the computer will lock up, and must be reset. Before resorting to this drastic action, make sure your printer is turned on and 'selected' or 'on-line'.

The printer Type command (/SPT) is used to allow for the great difference in dot-addressable graphics control. This command has no effect on non-graphics printers, and no effect on output of columnar worksheet information. It is used only for the /G Graphics command, to allow copying the screen graphics to the printer.

When this manual was prepared, the following printers were supported by this feature of DYNACALC - Type 1- Radio Shack DMP-100, Line Printer vii, etc. - Type 2- Epson MX-80 (with graphics), Gemini Star, etc. - Type 3- Okidata Microline 93, etc. - Type 4- C. Itoh 8510A, NEC 8023A, etc.

If your printer has dot-addressable graphics, and does not seem to work with DYNACALC, first make sure it does correctly print columnar worksheet information (all printers will, if they are connected and set up correctly), then send us a copy of the printer manual, along with your release DYNACALC diskette. We will do our best to add your printer to the above list. See the section 'Warranty and Update Service' for details on this procedure.

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 current drive. Refer to 'Disk File Names' for information on allowable file names. 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, key click, degrees/radians, label entry mode, and column/row order flags are also saved, and will be restored when the file is loaded. Physical printer parameters (the ones set by /SP) are NOT saved with the worksheet. To save a partial worksheet, refer to /S#S.

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 BASIC software.

When you type /S#L, DYNACALC will ask you for a filename. Refer to 'Disk File Names' for information on allowable file names. DYNACALC 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 id 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. Hitting (ENTER) without entering a range will cause the entire worksheet to be sent.

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 0-9, 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 drive. For formatting information, see the section 'Using Data Files'. Refer to 'Disk File Names' for information on allowable file names.

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 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, (not your television set). 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 formating
comtrols. Normally, the screen displays a single window,or
portipon, 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 menue: 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 formuls or aconstant. Of cource, you could examine
each cell bypointing 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 (SHIFT-DOWN-ARROW) to jumpback and forth between
the two windows. Whenyou 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'. Ccommands 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 windowm 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 (SHIFT=DOWN=ARROW) to jump back and forth between the two windows. When you type /WV, the screen is split vertically at the current columnm 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 mot possible tohave 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 willbe ignored, unless you exit to BASIC and re-enter DYNACALC. To disable HELP permanently, delete or rename the file HELP/BIN on your runnable DYNACALC diskette.

Arithmetic 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.
Aminority of DYANACALC math 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 involked. This can really
waste some time if you have a lot of cells with function once,
then place the value of the function in the current cell. YOu do
this by typing '!' after the function, but before the (ENTER).
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 math 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 G%. 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
timeonly, and not subsequent changes, you can type '!' before
hitting (ENTER), 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 math 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 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 ab alphabetic character is required. The letter is always displayed as upper case in the function name.

DYNACALC's trigonometric functions @COS,and @TAN require angular arguments expressed in degrees of radians, depending on the current setting of the degrees/radians switch. the inverses of these 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 additional pages. 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 returnes 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 representing numbers count as items, so blank 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 cellB5 is returned; if it's 2, that of cellC5, and so on.But you are not limited to such a simple use if @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, cellG4, 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 of 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),B#...B%' 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 Index. this is about as
simple a demonstration of @INDRX 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 Aa1 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 (ENTER) 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 below). 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 conditions.

@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 '@CHIISE(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 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 the first item in
the Bibliography is a good place to start.

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

@RND(x) is used to generate random numbers. this fumction 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 valaues, 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 A!, then type / (BREAK) # (ENTER) (DOWN-ARROW) /K255(ENTER). 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.

@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 returnes the sine of x, where x is an angle expressed in degrees or radians

@SQRT(x) is the square root function. It returnes 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, of ranges of cella. 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 functio.

@SUM(x...y) is the summation function. It returnes the total value of all cells in range x...y. As in @AVERAGE (see above), 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. Since the Color Computer has no ' ' key, DYNACALC lets you enter this important charactr by typing (SHIFT-@).

Note that all these operatiors 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 (0-X). In other words, Instead of typing '-G5', type '0-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 abouit 15 digits for reasons of speed and memory consumption.

numbers are limited to the range +/- 1.0e-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.

Unlike some programming languages, DYNACALC evaluates all mathematical expressions strictly left-to-right, except as modified by parentheses. there is no built-in hierarchy. this permits compatibility with expressions developed for use with

other spread-sheet programs, which mostly work the same way.

Logical Functions

                    In addition to its built-in math
functions described on the preceding pages, 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=0" 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 @IFERROR and @IFNA, 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 @IFERROR. 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 example 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 with only 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.

Operating Tips

Determining Function Ranges

Some Dynacalc funtionw such as @SUM, @AVERAGE, @MAX, LOOKUP,
@AND, FOR , 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 byu typing "/MAA2.A11". The screen is re-writen, 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 previouslyat A" 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, things won't
change.

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

 Moving Blocks of Data:

The 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 wantto 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 the 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 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 to 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.

Another way to accomplish the same thing is to set a single cell to the desired format, then use a Keysaver to repeat that command as many times as necessary. For large numbers of cells, this method will be slower than using replicate, but you may find it easier to remember.

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,×".

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,×" 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 reference whenever possible. that is, the value of any cell should normally not depend on the contents of any other cell whose value hasn't 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 dissapears. If not, you must look futher. The formula dump mode (toggled on/off by /WD) can be very useful for futher 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 todo 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 plan your equations for simplicity; avoid recalculating the same value over adn 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 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 recalculating feature (toggled on/off by A/R). Hit "!" in the "Ready" mode whenever you want to recalculate, or type A/R 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 (ENTER) 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. Wouldn't it be nice if you could just use the

(ENTER) 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 (ENTER), and the cursor will advance in the same direction as your initial arrow key. To get out of this mode, just hit (ENTER) while the "READY" prompt is showing, or execute any command.

Pointing to Cells:

Don't forget - whenever Dynacalc is expecting a cell address, with the one exception of the "get data" feature of the Graphics command, 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 towhere 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 arithmatic on the current value. To add $20.00 to a cell, for example, you must point to the cell, then type "#+20" and hit (ENTER). Of course, any other arithmatic 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 Color Computer. Your machine has about 33K of Dynacalc workspace, or room for about 2750 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 avaliable 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 expresion 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 fir any other characters (commas, parentheses, etc.).

Now one fact that should be immediatly 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

avaliable memory. The idea is to keep your worksheet as compact as possible, and to avoid scattering entries around. Use /AS to see the currant size of your worksheet at any time, and try to keep new entries within this range. This will result in maximum usage of avaliable 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.

Titling Graphics Screens:

Adding meaningful captions to a graph can be a lot of work, but they add a lot of value to the finished product. Captions help you remember key points about the data you plotted. To minimize your efforts, remember that Dynacalc allows you to save these captions in a "GRF" file. To make captions that are re-usable, graph a simple function that produces no unnecessary lines on the screen. An example is a bar graph where all the cells in the specified range are zero. Now get into the captions mode,and add some comments. When you're finished, save the screen by typing /FS and a filename from the captions mode. Now, using some real data, generate another bar graph. When you see the graph on the screen , type FL and the name of the file you just saved, and the captions will overlay the real graph.

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 show 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 all necessary operating insructions 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 toturn 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.

Error Messages

>AE< Argument Error.
>DO< Devide by zero attempted.
>ER< General purpose error.
>EX< Exponent too large.
>HO< Holder overflow error.
>LG< Error in logical function.
>LN< Negative or zero logarithm attempted.
>NA< Not avaliable.
>NR< Negative root attempted.
>OV< Arithmatic 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.

Disk Errors

    4   File does not exist.
    7   Diskette is full.
    8   Read past end of file.
    9   Disk read error.
   10   Disk write error.
   11   Diskette is write protected.
   14   Seek error.
   16   Drive not ready.
   20   Disk I/O error.
   21   File name error.

If help messages are enabled, these messages will be displayed
on the screen. If Help is turned off, only the numeric error
code is given. Type any key to return to Ready after error.

Screen Layout

A1
Mode=C,A Mem=xxxxx   Ready

      (A   )(B   )(C   )(D   )(E   )

```
 1-
 2-
 3-
 4-
 5-
 6-
 7-
 8-
 9-
10-          This is how your crt screen will look
11-          when Dynacalc takes over
12-
13-
14-
15-
16-
17-
18-
19-
20-
```

Note that "A1" is displayed in the top left corner . Thi   means
that 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 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 display on line 2 is the number of bytes 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 tranferring it into a particular cell. Juct 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
Mode=C,A   Mem=xxxxx      Ready

    (    A    )(     B     )(     C    )(     D    )(     E     )
 1- (cell  A1 )  col  B
 2-              col  B
 3-     This is row 3, for example,row 3...row  3...>>
 4-              col  B
 5-              col  B                    ( cell D5 )
 6-              col  B
 7-              col  B                               ( cell E7 )
 8-              col  B
 9-              col  B
10-              col  B
11-              col  B
12-              col  B
13-              col  B
14-              col  B
15-              col  B
16-     This  is   row  16, for   example, row 3...row 3...>>
17-              col  B
18-              col  B
19-              col  B
20-              col  B
                 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. When Dynacalc asks for a cell address, always type the column letter(s) first: "D5", not "5D".

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

It is possible to have up to 256 rows or 256 columns, depending on available memory. In your 64K CoCo there is enough memory for about 2750 cells with the Help feature disabled. 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.

Using Data Files

Dynacalc can read and write BASIC data files, with its /S#S and
/S#L commands. All such operations default to 'dat'extension on
the current 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 BASIC 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 one textfile line per worksheet
cell.

Here's a simple example:

```
(    A    )(    B    )(    C    )(    D    )(    E    )
1-STRING              34                            5.6e9
2-    1.23       27.5                        MESSAGE
```

The command /S#S was used to save the block A1...E4
(any rectangular area of the wporksheet can be used). Here is
the resulting data file:

```
*DYNACALC DATA FILE       this is  comment line
*March 25, 1984           empty comment line if no date set
/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
@
```

This same simple format is used for both saving and loading;
DYNACALC can always read what it has written. When you are

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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 into a worksheet, will clear the previous contents of that cell. However, if the tesfile line is completely blank, the contents of that cell will beleft undisturbed. This permits you to overlay other data ifdesired. This also means that you cannot leave blank lines in your data file with;out affecting the worksheet. Any lline 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 "swollow" 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 curssor 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 (enter) to continue loading. If you prefer, just hit (break). The loading operation will be terminated, and you can check the sheet tosee how much of the file was loaded. You can then exit to BASIC and remedy the problem.

It's very simple to write a BASIC program to read the files made by /S#S. Here's one way to do it:

```
10 OPEN  "I",#1, "DATAFILE" open the file for input.
20 LINE input #1, A$        read one line (one cell).
30 PRINT A$                 print the line just read.
40 GOTO 20                  loop until error occurs.
```

This program will read a datafile one line at a time, printing
each line as it's read. When all the data in the datafile is
used up, the program will stop with an IE error code. the line
INPUT statement must be used rather than the normal INPUT
statement,so that commas may be input as data

Command Cross-Reference

DYNACALC is an original software product designed by CSC for
operation with the 6809 microprocessor. However, it's 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 window column width
                              also /AWC individual column width

/GF global default format   /WF window default format

/GOC set column order   /AO toggle to set order
/GOR set row order   /AO toggle to set order

/GRA set automatic recalc.   /AR toggle to set mode
/GRM set manual recalc.   /AR toggle to set mode

/SD delete file   /SK kill file

/SI initialize diskette   n/a exit DYNACALC first

/SQ exit to DOS   /Q exit to BASIC

/V display version number   n/a on copyright screen

/W1 single display window   /WN no window division

/- repeating label   /FC continuous format

In addition to these differences, DYNACALC also has many added
commands, functions, and other features. These enhancements in
no way alter your ability to use published spread-sheets
designed for operation with VisiCalc.

VisiCalc is a trademark of VisiCorp

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 William & Taylor, Management Information 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, includng practical examples.

5. Mastering VisiCalc, by Douglas Hergert, SYBEX, 217 pp, $11.95. Very good starter book with some good example worksheets.

6.   Doing Business with VisiCalc, by Stanley R. TRost, SYBEX, 259 pp, $11.95. Similar to previous title; includes examples of advanced VisiCalc features such as @IF.

Sorry, books are not available from CSC.

Printer Considerations

The use of a printer with DYNACALC is optional, but highly desirable. Here are a few tips on selecting printer for use with this version of DYNACALC.

Any ASCII printer will work with this version of DYNACALC, as long as it is interfaced to the Color Computer through the computer's standard serial port: the one on the rear panel of

the computer. DYNACALC can be used with any printer that works when directly connected to this port, or to a parallel printer when interfaced through a serial-to-parallel converter such as the one sold by Botek instruments (4949 Hampshire, Utica, MI 48087 USA 313-739-2910).

DYNACALC does not work with printers interfaced to anyu other port.

To take advantage of DYNACALC's high-resolution graphics features , the printer must be capable of printing individual dots, rather than just characters. The buzz-worad to look for in specifications is 'dot-addressable' graphics.

Most better-quality dot matrix printers have selectable printing pitch, which allows you to change the number of characters printed on each line, at the expence of character size. this can be very desirable, since many spread-sheets will be wider than will fit into 80 columns.

Changing printing pitch is usually done by sending out control characters to the printer. You can put the printer into the desired mode before entering DYNACALC with a BASIC statement such as

   PRINT #-2, CHR$(27), "Q";

which will send an 'escape' character followed by 'Q'. This happens tobe the command to put a C . Itoh model 8510Aprinter into the compressed print mode, in which it will print 17 characters per inch. Check your own printer manual for details on how to do these kinds of tricks on your printer.

When you run CREATE (see page 3) to make a runnable copy of DYNACALC, you are given the chance to change the default printer parameters, both those in /AP, which have to do more with worksheet characterisrics, and /SP, which have more to do with physical printer attributes. Refer to the /AP and /SP sections of this manual while you are running CREATE.

Joystick or mouse operation

To use a Joystick or Mouse with DYNACALC, simply plug it into either Joystick port on the rear panel of your Color Computer. To transfer cursor control to the Joystick or Mouse, just hit the 'fire' button on the Joystick or Mouse. To return control to the keyboard, hit the 'fire' button again, or hit any of the arrow keys.

NOte that the cursor cannot be moved off the current screen ares
with the Joystick or Mouse. To move to a differint part of the
worksheet, use 'Goto', /L, or the arrow keys. Youmay then return
to the Joystick or Mouse by hitting the 'fire'button again.

        Disk drive stepping rates

This is our one concession to those of you with non-standard
hardware. There is a great range of performance among the
various disk drive units on the market. Most software is
designed for the slowest drives, so as to be compatible with all
types of drive.

DYNACALC's CREAT utility contains an option to allow you to
speed up disk accesses, if your drives can handle the greater
speed. Proceed with caution if you don't know how fast your
drives are. If you set the speed too fast, you will get I/O
errors and garble your diskettes.

You run CREATE to make working (runnable) copies of DYNACALC
(see page 3). When CREATE asks you if you want to change disk
step rate, answer 'Y', then when it asks you for the rate, type
in a number from zero to three, with zero being the fastest, and
three the slowest speed available. The new step rate will be
coded into the runnable copy of DYNACALC that you are making.
Then, when you run this copy, the selected rate will be in
effect.

It is not possible to change the step rate while you are running
DYNACALC.

                    Key definitions

(UP-ARROW)   move cursor up (normal)
                       move to beginning of line (edit)

(SHIFT-UP-ARROW)   move cursor to home (usually A1)

(DOWN-ARROW)   move cursor down (normal)
                       move to end of line (edit)

(SHIFT-DOWN ARROW)   jump to other window (see/w)

(LEFT ARROW)   move cursor left (normal)
                       move cursor left on edit line (edit)

(SHIFT-LEFT-ARROW)	enter Edit mode (from entry mode)
(RIGHT-ARROW)	move cursor right (normal) move cursor right on edit line (edit)
(SHIFT-RIGHT-ARROW)	get address of current cell (entry mode) overlay (edit)
(CLEAR)	backspace - not the same as (LEFT-ARROW)
(shift-clear)	truncate edit line (edit)
(ENTER)	general-purpose entry terminator
(BREAK)	abort any operation (except printing)
(SHIFT-BREAK)	flush typehead buffer
/	enter command mode
@	prefix for all functions
(SHIFT-O)	toggles shift-lock mode
(SHIFT-7)	' allows starting labels with number
(SHIFT-@)	enters '( ) for raising number to power pause printer (ENTER) continues (BREAK) aborts
.	prints as '...' to indicate range
(SHIFT-.)	> 'Goto' command - enter new address
#	get contents of address (entry mode) get current cell contents (Ready)
!	evaluate expression (entry mode) recalculate worksheet (Ready mode)
(SPACE)	search directory when filename needed
?	call for HELP