MAGICALC™

Reference Guide

artsci inc™

MAGICALC™

by
William G. Graves

Published by:

ARTSCI, Inc.
5547 Satsuma Ave.
North Hollywood, Ca. 91601

Documentation:

Steve Ross

Consultant:

Wm. V.R. Smith III

MAGICALC Reference Guide—Contents

1. INTRODUCTION

This Reference Guide is designed for those who have finished the Tutorial or are otherwise comfortable with MAGICALC. The Guide assumes that you are familiar with the Apple Disk Operating System and know basically how to use MAGICALC. Use the Reference Guide for looking up complete explanations of each command available in MAGICALC.

This reference is organized in order of *subsystems*, in the order they appear on the System Menu. In every case except the Calculate Subsystem, the items are discussed in the order they appear in the menu for that particular subsystem. In the Calculate Subsystem, the commands appear alphabetically.

2. Type-Ahead in MAGICALC

Sometimes, you will be able to type faster than MAGICALC can update the screen. This is particularly evident if you use repeating marker move sequences when in 70 or 80 column mode (see the Tutorial if you do not know how to move the marker). It also crops up when you have Global Recalculation set to Automatic, and are entering data in a reasonably large work-sheet.

MAGICALC has a built-in type-ahead buffer. This feature allows you to go ahead and enter data, or move the marker. Your keystrokes will be remembered, and whatever you have done will be entered into your worksheet in the order that you typed it.

Because of MAGICALC's speed, it is doubtful that you will be able to exceed its response speed for very long, and when you slow down to think or turn a page in your data, MAGICALC will catch up.

Should you find this feature disturbing, you have several options to speed up response:

1. For large worksheets, enter data with Recalculation set to Manual (see the Global command).
2. For long-range marker moves, use the > (Go To) command, and/or 40 column mode.

3. SUPPORTED HARDWARE

MAGICALC is capable of supporting a wide variety of hardware on your Apple][or Apple *IIe*. Let's take the most popular types of hardware:

3.1 RAM cards or Language Cards

MAGICALC will find *any* common RAM card or Language Card no matter what slot it is in. The only restriction on this is that the card must be Apple Language System compatible. This restriction rules out some "pure" disk emulators (those that are designed to look just like a floppy disk to your Apple). Fortunately, many RAM cards of varying memory capacity do utilize the Apple Language System protocols.

You may use any combination up to four 128K boards (or 512K plus the 14K main memory). These boards will be found by MAGICALC in *any* slot. This enables the construction of very large, complex models without the constraints of limited memory.

You may confirm MAGICALC's identification of your RAM card(s) by checking the *memory indicator* on an empty worksheet (see MAGICALC Tutorial or the section on the Display in this manual for more information on the memory indicator). The number displayed should be the amount of RAM you have added with supplemental RAM cards plus 14 (or plus 2 if you are using the 70 column Hi-Res display).

If, For example, you have a 16K language card in slot 0, and a 128K RAM card in slot 2, the memory indicator should display 158.

3.2. Printers

MAGICALC will send output to most popular printers, either through a parallel or serial interface card, or by use of a custom printer driver. For more information about printers and printer drivers, see the section in this manual on the Configuration Subsystem.

3.3 80 Column Video Display Boards

MAGICALC supports most 80 column video display boards. For more information on 80 column boards, see the section in this manual on the Configuration Subsystem.

3.4. Hard Disks

MAGICALC supports the most commonly used hard disk operating systems (as well as high density floppy disk operating systems).

There is little, if any, advantage in storing the program on a hard disk, because once the program has been loaded, the program diskette is never again referenced—in fact, you should remove the program diskette after the initial program load.

The main advantage of hard disk is increased data storage capacity. In order to run MAGICALC on a system equipped with a hard disk, we recommend you take the following steps, assuming the hard disk is in slot 6, and at least one floppy drive in slot 4:

1. Boot from the hard disk, as you normally do.
2. From DOS (or Applesoft) prompt, simply type:
   BRUN HELLO,S4,D1

This will load the entire MAGICALC program, and you will not have to go back to the floppy drive unless you power down, or leave the program.

In order to access specific volumes on the hard disk, simply make use of the volume option in the File Subsystem. For more information on the File Subsystem, refer to the appropriate section in this manual.

3.5. Disk Emulators

Some RAM disk emulators are compatible with MAGICALC. The only way you can determine if yours is compatible is to try it as follows:

1. Perform any initialization steps your RAM disk emulator requires.
2. Type: BRUN HELLO,S6,D1

where slot 6, drive 1 is the floppy drive containing the MAGICALC program diskette. If you do not encounter any problems, it's a safe bet that the DOS modifications necessary to enable the disk emulator do not conflict with MAGICALC.

4. THE BOOT PROCESS

MAGICALC may be started by placing MAGICALC program disk in the first disk drive on the controller card in the highest numbered slot and turning on the power.

You may also start MAGICALC from the Applesoft prompt (]) by typing:

PR#6

where 6 is the slot that contains the controller card.

4.1. The Title Page

You will be greeted by a page that reads:

<div align="center">

MAGICALC (VERSION 2.00)

© COPYRIGHT 1983

WILLIAM G. GRAVES

PUBLISHED BY

ARTSCI INC.

INSERT CONFIGURATION/DRIVER DISKETTE

< RETURN >   OR ,S,D,V

</div>

You may now load a configuration file, printer driver, and/or video driver.

MAGICALC will find these files on the diskette (or hard disk volume) specified by ,S,D,V;B.

For example, if your configuration and driver data were on the floppy disk drive in slot six, drive two, you would simply type:

,S6,D2

If your configuration and driver data were on a single drive hard disk in slot six, and they resided on volume 006, you would type:

,S6,D1,V006

Note: The leading comma is required.

Note: If you do not specify a slot, drive or volume, they will default to the slot and drive from which you booted, and the volume number will not be checked on floppies, or will remain the same as your current volume or hard disk.

4.2. Configuration Files

MAGICALC looks for a file called SYS.OPTIONS to define its initial configuration. Configuration will be covered in depth in the section on the Configuration Subsystem.

The initial configuration file saves you the time of reconfiguring the system every time you boot up to use an 80 column card, or accept lower case input from the keyboard, etc.

4.3. Driver Files

There are two types of driver files loaded by MAGICALC in the boot process:

* Printer drivers (for making use of special printer options).
* Video drivers (to enable special features of the video display).

Ordinarily, neither printer nor video drivers are necessary.

4.3.1. Printer Drivers

You might want a printer driver to recognize special controls you code into your worksheets, or to drive a non-standard printer interface. The printer driver must meet the following requirements:

* The driver must load at location $800, and be no longer than $200 bytes in length.
* The file name of the driver must be PRINTER

4.3.2. Video Drivers

For most video boards, a driver is not necessary, but for a very few, such as the Videx Videoterm, a special driver is necessary to enable inverse video (if you have an inverse PROM on your board). The requirements for video drivers are:

- The driver must load at location $1F00, and be no longer than $100 bytes in length.
- The file name of the driver must be **VIDEO**.

Three drivers are supplied on the program disk:

VIDEO.STB80

VIDEO.WIZARD80

VIDEO.VIDEX

Installation of these drivers is quite simple:

- Boot a DOS 3.3 System Master (or any other plain DOS disk), and type the following:

BLOAD VIDEO. *your board* (Specify the correct file name from the list above)

BSAVE VIDEO,A$1F00,L$100

If you are not sure that you need a driver for your 80 column board, try it without one — it will probably work.

5. THE MAGICALC SYSTEM MENU

```
MAGICALC SYSTEM MENU

   1. CALCULATE SUBSYSTEM
   2. FILE SUBSYSTEM
   3. PRINT SUBSYSTEM
   4. FORMAT SUBSYSTEM
   5. CONFIGURATION SUBSYSTEM
   6. BOOT NEXT PROGRAM

SELECT NUMBER OR LETTER, PRESS RETURN
```
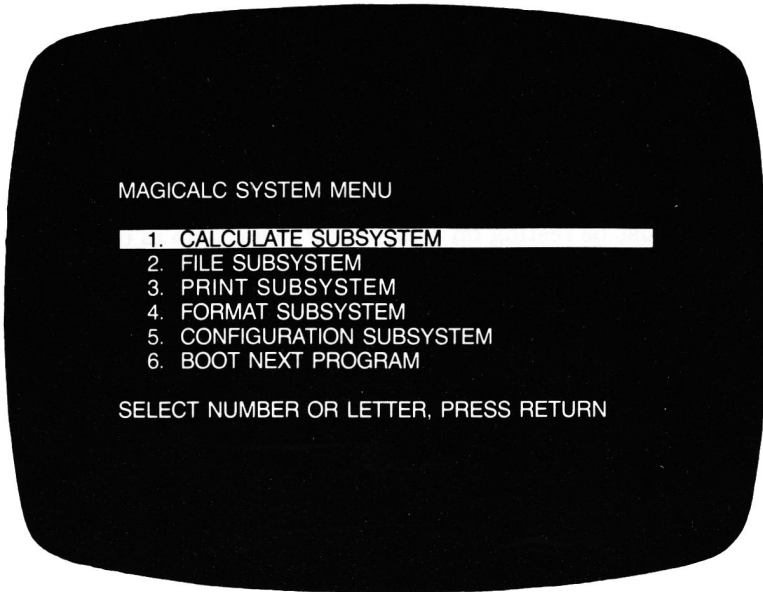
The MAGICALC *system menu* is your route to all the various *subsystems* of MAGICALC. Before getting into the menu itself, let's define a few terms:

Menu: A list of items and options from which you may choose. In a "menu-driven" system, all the available options appear on the screen, and you may choose one, much the same way as you would order a menu item in a restaurant (I'll have a number 1 dinner, please!).

Subsystem: A component of a larger system. MAGICALC is an example of the larger system. Within MAGICALC are a number of smaller systems, or *subsystems*, that handle such items as printing, disk I/O, and configuration of system parameters.

5.1. Selecting An Item

All the subsystems except the calculate subsystem present menus much like the one seen in the System Menu. The rules for moving about in the menus, and for making selections from the menus are consistent from one menu to the other.

One line in the menu will have a white background with black lettering—every other line will have a dark background with white lettering. The white background bar is known as the *highlight bar*. This bar must be resting on a particular menu item in order to select it.

5.1.1. Moving the Highlight Bar

There are two ways to move the highlight bar.

* Use the right and left arrows on the Apple keyboard to move the highlight bar up and down in the menu.
* Type the item number or letter of your choice.

5.1.2. Selecting a Menu Item

Once the highlight bar is resting on the item you wish to select, you must confirm that selection either by pressing the RETURN key, or by pressing the number or letter of the option once more.

5.1.3. The ESCape Key in Menus

When you are moving about in the various menus, the ESC (for ESCape) key has a special significance: it automatically selects menu item 1 when pressed, or if you are in the lettered options, it moves the highlight bar to menu item 1 of the menu. Since menu item 1 is always MAGICALC SYSTEM MENU, except on the system menu, pressing ESC repeatedly will eventually place you in the system menu, then pressing ESC once more will select menu item 1 from the system menu, which is CALCULATE SUBSYSTEM.

5.2. The Items of the System Menu

Each subsystem on the System Menu is described in detail in this manual in a separate section. Here is a brief overview of the function of the subsystems.

Subsystem	Function
CALCULATE	The Calculate Subsystem is the actual interactive worksheet. You will be spending most of your time using this subsystem.
FILE	The File Subsystem is the section of MAGICALC that handles disk operations such as loading and saving worksheets.
PRINT	The Print Subsystem handles the printing of data from the worksheet.
FORMAT	The Format Subsystem allows you to define the format of your output (hardcopy and softcopy) in terms of page layout (width, length, margins).
CONFIGURATION	The Configuration Subsystem allows you to define certain options to MAGICALC. This includes video display, printer slot, upper/lower case generation, etc.
BOOT NEXT PROGRAM	This option allows you to leave MAGICALC and run another program. In order to safely exit, you must select this option, or power down the system.

6. THE CALCULATE SUBSYSTEM

6.1. The Display

The Calculate Subsystem is the only subsystem that does not use menus. To exit the Calculate Subsystem, press Ctrl-Shift-P.

The worksheet display consists of the following parts:

The *information box* displays information about what you are doing and what you can do next.

The *entry line* displays information typed from the keyboard for entry into the worksheet.

The *worksheet window* displays a portion of the worksheet itself.

6.1.1. The Contents Line

The *contents line* is the top line of the information box. It shows information about the contents of the current cell. It includes the following parts:

The Current Cell Indicator

The *current cell indicator* shows the coordinate of the current cell in the form: Column letter, Row number. For example, the top left cell of the worksheet is column A, row 1. The current cell indicator will display this as:

A1.

The Type Indicator

The *type indicator* shows the format of the cell (if specified at the cell level), the attribute of the cell (if specified at the cell level), and the type of data in the cell (if any).

For example, if you had specified cell A1 as a label, had used the format command to right justify it, and had used the attribute command to lock it, the type indicator would appear as follows:

/FR/AL L:

These are the commands to set the format to right, the attribute to locked, and the L: indicates that the contents of the cell are a label.

The possible types of a cell are label (**L:**), and value (**V:**).

The remainder of the contents line shows the actual contents of the current cell, so if the label you had entered was "MAGICALC," the contents line would read:

A1 /FR/AL L: MAGICALC

6.1.2. The Prompt Line

The prompt line shows what you can do next. It includes the following parts:

The Memory Indicator

The *memory indicator* tells you the number of available locations the Apple has remaining for data storage in thousands. These cells are not to be confused with cells in the worksheet. Each cell of the worksheet can take many computer locations, and will never take fewer than twelve. If you have an Apple][with a 16K RAM card, the memory indicator on an empty worksheet will read 30, indicating that you have 30,000 remaining locations available for data storage.

The Command Name

In most circumstances, if there is anything on the prompt line, it will consist of two parts: the *command name*, and the *command prompt*. The command name will always be separated from the command prompt by a colon (:). For example, when you press the slash (/) key, indicating that you wish to enter a command, the command name will appear as:

/:

or if you are performing a Reproduce command, the command name will appear as:

REPRO:

The Command Prompt

The *command prompt* completes the prompt line by informing you of the options available for the particular command you are using. For example, if you had invoked the Reproduce command, the command prompt would read:

(, SOURCE RANGE OR RETURN

The complete prompt line for this command might appear as follows:

REPRO: (, SOURCE RANGE OR RETURN

6.1.3. The Entry Line

The *entry line* displays characters, either labels or values, as you type them. When you enter information into the worksheet (by pressing RETURN or a marker movement key), all characters on the entry line are transferred to the current cell. Until you enter the information with one of these keys, the actual data in the current cell is unaffected.

In order to backspace when making an entry, use the special key marked ESC (for ESCape), or for Apple //e users, the DELETE key.

If you back completely out of an entry using the ESC or DELETE keys, the current cell will remain as it was before you began. If, however, you press RETURN, or any of the marker movement keys, the data on the entry line will be transferred to the current cell, destroying forever what was previously there.

6.1.4. The Worksheet Window

The *worksheet* is an area of 254 rows by 63 columns. The 16,002 units formed by the intersections of rows and columns are known as cells.

Along the left edge of the screen is a vertical white column containing the row numbers. These row numbers range from 1 to 254. Above the column of numbers is a white horizontal stripe containing the column letters. These column letters range from A to BK. These white borders mark the boundaries of your *window* into the worksheet. Notice that only a portion of the entire worksheet is available for viewing at any given time.

6.1.5. The Status Information Box

On the very left of the horizontal window border (containing the column letters) are three characters in a black box. This box of three characters is called the *status information box.*

There are three components in the status information box:

The Recalculation Order Indicator

The leftmost character in the status information box is the *recalculation order indicator*. This indicates the order in which MAGICALC will perform recalculations of the worksheet. Its normal value is C, for column–wise recalculation. This means that all values in column A will be recalculated before beginning column B, etc. The alternate value for the recalculation order indicator is R, for row-wise recalculation. Column-wise recalculation is the most common recalculation mode for spreadsheet planning. Sometimes, however, you will want MAGICALC to perform recalculation in a row-wise manner. A good example of this is a model that has time going down the rows, and products across the columns. You will most likely want to calculate the entire row for a given time period before beginning the next one.

The recalculation order is changed using the Global command.

15

The Recalculation Mode Indicator

The middle character in the status information box is the *recalculation mode indicator*. This indicates whether recalculation will take place automatically (the indicator will display an A), or manually (the indicator will display an M). Manual recalculation mode is selected from the Global command, and is often desirable when working with large models to eliminate the time-consuming recalculation every time the contents of a cell change.

Note: When recalculation mode is manual (the indicator displays an M), the formulas dependent upon other cells will *not* be updated as the contents of the cell change — the recalculation must be requested manually by pressing the exclamation point (!).

The Direction Indicator (or marker direction)

The rightmost character in the status information box is the *direction indicator* (which is otherwise known as the *marker direction*).

This character displays the direction the marker will move when a right or left arrow key is pressed. It will take on the value of – (a dash) for horizontal marker movement, or ! (an exclamation point) for vertical marker movement.

This direction indicator is changed from horizontal to vertical and vice versa by pressing the space bar.

Note: If you have an Apple //e, the marker direction is ignored, and the direction indicator has no significance for you.

6.1.6.   The Cell

The *cell* is the smallest division into which labels and values can be entered.

The *rows* of cells are numbered from 1 to 254 and the *columns* are lettered from A to BK.

The cell's *coordinate* consists of a column letter and a row number; it describes the cell's location on the worksheet.

6.1.7. The Window

The *window* has three important features:

The *frame*, which brackets the top and left edges of the window; it contains the row numbers and column letters of the cells you can see.

The *current cell* is the cell into which you can enter labels or values.

The *marker* is the white rectangle that marks the current cell.

6.2. Moving the Marker

When at command level, the marker can be moved to any location on the worksheet using these commands:

- Left and right arrows move the marker one cell horizontally (if the marker direction is horizontal), or one cell vertically (if the marker direction is vertical).

Note: The marker direction is changed from horizontal to vertical, or vice versa, by pressing the space bar.

- Using Ctrl keys in the following table.

Keystroke	Function
Ctrl–Q	Move the marker one cell up.
Ctrl–A	Move the marker one cell left.
Ctrl–S	Move the marker one cell right.
Ctrl–Z	Move the marker one cell down.
Ctrl–W	Move the marker ten cells up.
Ctrl–X	Move the marker ten cells down.
Ctrl–E	Move the marker to the top left of the worksheet (inside the titles).
Ctrl–C	Move the marker to the bottom right of the worksheet.

Note: If you have an Apple *IIe*, the space bar does not change the marker direction for your right and left arrows, however, you have up and down arrows that are recognized by MAGICALC.

The window slides with the marker, so that you can see the area of the worksheet containing the marker.

6.3. Entering Labels and Values

Entering labels and values into MAGICALC is as simple as moving the marker to the desired location, then typing the value or text entry. Let's take the two separately.

6.3.1. Entering Labels

Before you can enter any data into your worksheet, you must first position the marker on the cell into which you want to place that data. You must do this using the marker movement keys described above in the section entitled Moving the Marker.

When the marker is positioned properly, you are free to type in text. Labels are detected by MAGICALC as any sequence of characters beginning with a letter (and in certain cases, a special character). MAGICALC places the word LABEL on the prompt line to confirm that it has recognized your entry as such. If your label begins with a number (for example, a date), or a space, your must take a special step before entering a label.

If your label begins with a space, a number, or a special character that has particular significance to MAGICALC, you must first get into label entry mode by typing a quote mark ("). The word LABEL will appear on the prompt line confirming the fact that your entry will be treated as a label.

Your label will not be transferred to the current cell until you press the RETURN or marker movement keys.

6.3.2. Display of Labels

MAGICALC will accept extremely long labels (up to 229 characters, in fact), but will only display as many characters as can fit in the column in which the label was entered.

When entering titles that will take up more than one column, it is best to watch the characters you type, as they appear in the current cell, to determine when you have exhausted the room you have allocated. At this point, you should move to the next adjacent cell to continue the label.

6.3.3. Entering Values

When entering values, just as when entering labels, the marker must be positioned on the current cell (the cell in which you want the value to appear).

At this point, you may simply key in the number you wish to enter. MAGICALC will display the word VALUE on the prompt line to confirm that it has recognized your entry as such.

6.3.4. Display of Values

MAGICALC displays values with at least one leading space for clarity. Under no circumstances will two adjacent value cells appear run together.

If there is insufficient room within the cell to display the value, and dollar format has been selected (see Format Command), MAGICALC will display an "overflow" symbol in place of the number. The special overflow symbol is the less-than ($<$) sign. To correct this problem, simply widen the column, or change the format.

If there is insufficient space to display the whole value, and dollar format has not been selected, the number will shift into exponential format, retaining as much significance as possible within the current cell width.

Exponential notation is a shorthand for expressing extremely large, or extremely small numbers in terms of a factor and a power of ten. For example, 15978 can be expressed as 1.5978E4, and .00001348 can be expressed as 1.348E-5. The "E" in this notation can be read as "times ten to the".

You may also enter values in exponential notation. For example, to enter 1 billion, rather than entering all the zeros necessary to fill out the correct value, you may key in 1E9.

MAGICALC is capable of retaining values to eleven significant digits within the range -10E62 to 10E63. In some cases, you might be able to get twelve digits of significance, but it is not reliable.

As with label entry, values are not transferred to the current cell until either the RETURN or marker movement keys are pressed.

6.3.5. Entering a Formula

Formulas are entered in much the same manner as labels and values. The marker must be positioned on the cell into which you wish to enter your formula.

Formulas are regarded as values, and as such require a bit of care in entry. You may not begin a formula with the letter portion of a cell coordinate. For example, if we wanted to multiply B7 by C7, rather than simply entering:

B7*C7

we are forced to enter:

+ B7*C7

in order to signify that we are entering a value.

6.3.6. Special Keys That Affect Label Entry

Key	Meaning
RETURN	Enter label and leave the marker on the current cell.
Marker Movement Keys	Enter label, then move the marker in the appropriate direction, the appropriate distance (see Moving the Marker).
ESC	Destructive backspace (erases character immediately to the left of the cursor).
Ctrl-E	Enter edit mode (see Editing).

6.3.7. Special Keys That Affect Value Entry

During value entry, the following keys have special meanings:

Key	Meaning
RETURN	Enter the value, and leave the marker on the current cell.
Marker Movement Keys	Enter the value, and move the marker in the appropriate direction, the appropriate distance (see Moving the Marker).
ESC	Destructive backspace (erases character immediately to the left of the cursor).
Space Bar	Enter value, then change entry direction.
Ctrl-E	Enter edit mode (see Editing).

6.3.8. Special Keys That Affect Formula Entry

During formula entry, several keys have special meanings.

Key	Meaning
RETURN	Enter formula, and leave marker on current cell.
Marker Movement Keys	If pressed after an arithmetic or relational operator, move the marker in the appropriate direction, the appropriate distance (see Moving the Marker), and copy the marker's new coordinate onto the entry line. This operation does *not* enter the formula.
	If pressed after a number (not a coordinate or an operator), enter the formula, then move the marker in the appropriate direction, the appropriate distance (see Moving the Marker).

Space Bar

If pressed after an arithmetic or relational operator, change the entry direction, and copy the marker's current coordinate to the entry line.

If pressed after a number (not a coordinate or an operator), enter the formula, then change the entry direction.

\#

If pressed after a coordinate, copies the value found at that coordinate into the entry line in place of the coordinate.

If pressed after a number or an operator, the \# key is meaningless and will not be allowed.

!

Replace a formula with calculated value if formula is still on the entry line, and has not yet been entered. Also called *immediate calculation* key.

ESC

Destructive backspace (erases character immediately to the left of the cursor).

Ctrl-E

Enter edit mode (see Editing).

6.4.   Data and MAGICALC

MAGICALC accepts two generic types of data:

- Values

- Labels

6.4.1   VALUES

A Value cell may contain any or all of these:

- A number

- A formula

- A function

Numbers

A *number* is a series of digits of any length. The value of a number may lie anywhere in the range E+63 to E-62. "E" is used here to mean "times 10 to the." So, E63 is the same as 10^{63}. The following are examples of numbers:

- Integer   5   804

- Floating point   12.8931   -.55

- Exponential   12.E55   -15E+25

Formulas

A *formula* is made up of numbers and cell references which can be combined using the following operators.

( )	Calculates insides first
+ -	Positive and negative signs
∧	Exponentiation
* /	Multiplication and division
+ -	Addition and subtraction
> < = >= <= <>	Comparison Operators (see following section)

Note: Calculations are made strictly left-to-right, except where modified by parentheses. For example:

1 + 2 * 3 = 9

1 + (2 * 3) = 7

6.4.2   Functions

A *function* takes zero or more values in, and puts one value out. Functions take three types of arguments between the parentheses:

A *value*, which can be

1. A *number*, for example: 5

2. A *cell coordinate*, for example: A6

3. A *formula*, for example: 1+A6 * 3

4. A *function*, for example: @SUM (A1 . . . A3)

A *range*, which is described by:

1. The coordinate of one cell, for example: A7.

2. The coordinates of two cells in either the same row or the same column separated by three periods, for example: A7 . . . A23. The second coordinate must be greater in magnitude than the first, or the range will be misinterpreted.

A *list*, which is:

A series of coordinates, ranges, or formulas, separated by commas.

For example:

(A1 . . . A10, B1 . . . B10, C1 . . . C10) is a list of ranges.

(A1,B3,C9,D14) is a list of cells.

Note: In most cases, individual cells and ranges can be freely intermixed in a list.

6.5. Command Reference—Introduction

The Calculate Subsystem has many commands to enable you to manipulate the data you enter into your worksheets, and to control the display of that data.

A command is begun by pressing the slash (/) key. The slash key may be thought of as the "command" key.

As soon as you press the slash key, the prompt line changes to show your options:

/: A B C D E F G I L M P R S T W –

These are the basic commands available in the Calculate Subsystem. Each has its own section in this manual, and will be discussed in order. The following is a brief list, for your reference.

A –Set Attribute

B –Blank a Cell

C –Clear Worksheet

D –Delete a Row or Column

E –Edit a Cell

F –Format a Cell

G –Set Global Parameters

I –Insert a Row or Column

L –Set Column Width

M–Move a Row or Column

P –Enter Print Subsystem

R –Reproduce Cell or Range

S –Enter File Subsystem

T –Set Titles

W–Set Windows

– –Enter Repeating Label

Ctrl-Shift-P—Invoke System Menu

6.6. /A–Set Attribute

Use: To set either the type of data allowed or the display characteristics of the current cell. The Attribute command does not address format of display (see the /F –Format command for formatting).

To cancel this command, press the ESC key.

Prompt Line Response:

ATTRIBUTE: D A L V P H

Contents Line Response:

The contents line will change to show the Attribute command, just as you entered it in front of the type indicator.

Options:

D *Default*—Set cell's attribute to the default attribute. The default attribute is the same as the Global attribute (originally none).

A *All*—Accept any data keyed in.

L *Labels*—Accept labels only. No values or formulas may be keyed in for this cell.

V *Values*—Accept values only. No labels will be accepted for this cell.

P *Protect*—Protect cell. Nothing may be entered in this cell while this attribute is in effect. Useful for protecting data from accidentally being overwritten.

 The protect attribute also marks the cell as one that will be skipped by the Ctrl-I, Ctrl-Y, or TAB keys.

H *Hide*—Hide the value contained in the cell. The value is retained, but the user cannot see it. Useful if some of the data on your worksheet is confidential. Note: the contents of the cell will be hidden on printouts and on the contents line.

29

Example:

1. **Type:** /CY to clear the worksheet.

2. Type: /AV to set the attribute to values only.

3. Type: OOPS.

MAGICALC will beep at you, and the prompt line will change to read:

CELL ATTRIBUTES CONFLICT WITH COMMAND

4. Type: /AP to set the attribute to protected.

5. Type: PROTECTED

MAGICALC will beep at you, and the prompt line will change to read:

CELL ATTRIBUTES CONFLICT WITH COMMAND

Note: The only way to remove an attribute is to replace it with another one. Attribute D returns the cell to the global attribute, while attribute A overrides the global attribute.

6.7. /B-Blank Cell

Use: To remove the contents of the current cell, and replace them with a blank cell.

To cancel this command press the ESC key.

Prompt Line Response:

BLANK

Example:

1. Move the marker to the cell you wish to blank.

2. Type /B.

    When you press the RETURN key, or any of the marker movement keys, the previous contents of the cell are removed forever.

31

6.8. /C-Clear Worksheet

Use: To clear the entire contents of the current worksheet and restore all defaults.

If you execute this command, and you have not saved your worksheet, it will be irretrievably lost.

To protect you from mistakenly clearing a worksheet before it has been saved, you will be asked to confirm the Clear command by typing **Y**.

To cancel the Clear command, type any key except **Y**.

Prompt Line Response:

CLEAR: TYPE Y TO ERASE EVERYTHING

Example:

1. Type: /C.

The prompt line will display the above message.

2. Type: Y.

The screen will blink, then be "repainted" with an empty worksheet.

Note: Column widths will be reset to the default of 7, and the memory indicator will be reset to the full amount of available memory. All windowing and titling options will have been forgotten as well as any global or local attributes or formats.

6.9.   /D—Delete a Row of Column

Use: To remove the row or column on which the marker current-ly rests. The Delete command *completely and irretrievably removes the row or column in question from your worksheet.*

When the Delete command is issued for a row, MAGICALC moves all rows below the deleted row upward to fill the space, renumbers them, and adjusts any formula references to the rows that are moved.

When the Delete command is issued for a column, MAGICALC moves all columns to the right of the deleted column left, re-letters them, and adjusts any formula references to the columns that are moved.

Note: If there are formula references to a cell in a row or column, and that row or column is deleted, the reference to the cell will be changed to the function @ERROR, and the word ERROR will be displayed in the cell containing the reference.

To cancel the Delete command, press ESC, rather than **R** or **C**.

Prompt Line Response:

DELETE: R(-) C(!)

Options:

R- Delete the row upon which the marker currently rests.

C- Delete the column upon which the marker currently rests.

Example:

Assuming you wanted to delete row 7:

1. Move the marker to row 7 (the column is not important).

2. Type: /D.

The prompt line will change to read:

DELETE: R(−) C(!)

3. Type: R (for row).

6.10. /E-Edit Cell

Use: Labels or values can be *edited* to correct errors or to make changes for any reason. You can do this either before the characters have actually been entered into the cell (that is while they are on the entry line, but not in the cell), or after they have been entered.

Prompt Line Response:

EDIT A LABEL

EDIT A VALUE

Editing During Entry

You can make changes before the contents of the entry line have been entered into the current cell by using the ESC key (or the DELETE key on the Apple //e) to erase characters backwards from the current cursor position, then reentering the correct characters.

In addition, you may "jump" into edit mode while you are entering data by pressing Ctrl-E. Once you are in edit mode, it is functionally the same as if you had actually entered the data, then typed /E.

Use the following keystrokes for editing text or values in a cell:

Left arrow   Backspaces cursor one character; this is known as a *non-destructive* backspace because it does not erase the characters it backspaces over.

Right arrow   Advances cursor one position to right.

ESC   Deletes the character immediately to the left of the cursor; this is know as a *destructive* backspace because it erases the characters it backspaces over.

Ctrl-T   Deletes all characters from the cursor position to the end of the line.

Any	Inserts character on keycap of key pressed at cur-
Other	sor position.
Key	

Note: On the Apple //e, the DELETE key serves the same function in edit mode as the ESC key.

Example:

If cell C6 contains 132.56, and you determine that it should actually contain 1320.46:

1. Move the marker to cell C6.

2. Type: **/E.**

The prompt line will change to read:

EDIT A VALUE

and there will be a blinking curson over the first character.

3. Press the right arrow key three times to position the curson over the . in the number 132.56.

4. Type: 0

The 0 will be inserted before the character the cursor is resting on, pushing all the following characters over one place.

5. Press the right arrow key twice to move the cursor to the 6.

6. Press the ESC key once to delete the 5.

7. Type: 4

You will not have the number 1320.46 on the entry line. Pressing RETURN will enter that number into the current cell.

Editing labels and formulas is done exactly the same way.

Assume cell B10 contained the formula:

@ SUM(B1...B8) * 1.07/A3.

MAGICALC does check to make certain that your changes make sense. For example, assume you wanted to change this formula so that you were dividing by A4.

1. Move the marker to B10.

2. Type: E.

The prompt line will change to read:

EDIT A VALUE

3. To demonstrate the error handling, press the right arrow key twice to position the cursor over the U in SUM. Now type: 1.

Obviously, MAGICALC will not understand @S1UM, but let's see what happens when we try to enter it.

4. Press RETURN.

MAGICALC beeps, and the cursor is positioned over the first of-fending character, in this case the 1.

5. Press the right arrow key to move the cursor over 1 place.

6. Press the ESC key to delete the 1.

7. Press the right arrow key until the cursor is at the end of the line (19 times).

8. Press the ESC key to delete the 3 in A3.

9. Type: **4**.

When you press RETURN, your entry will be accepted.

6.11.   /F-Set Cell's Format

Use: The Format command is used to modify the display of data
in an individual cell from the default format. The default
format for a cell is whatever you set the Global format to
be. If you have not modified the Global format, the format
is General.

Prompt Line Response:

FORMAT: D G I L R $ *

Options:

D   *Default*—Use the Global format setting, or if none, display
in format G (general).

G   *General*—This is the default setting when you start
MAGICALC, and uses decimal or exponential notation to
display values to the largest number of significant digits
within the column width. General format is right justified in
the field, and allows at least one leading space, so if the col-
umn width is 7, the maximum number of digits that can be
displayed is 6. General format has no effect on labels.

I   *Integer*—Display values as whole numbers. All values are
rounded to their closest whole number following the rule: less
than half rounds down, half or greater rounds up. Integer for-
mat has no effect on labels. If the number is too large to
display in the field, exponential notation is used.

L   *Left Justify*—Display both values and labels left justified in
the cell. Labels will be displayed starting in the first column
of the cell and padded with enough trailing spaces to fill out
the cell. Values will be displayed starting in the second col-
umn of the cell and padded with enough trailing spaces to fill
out the cell. For value display, format L acts as a left
justified format G.

R   *Right Justify*—Display both values and labels right justified
in the cell. Labels will be displayed with enough leading
blanks to force the last character of the label to the last space
of the cell. This format is very good for column headings.
Values will be displayed in format G.

$ *Dollars*—Display values in dollars and cents format. Values will be displayed to two decimal places significance (whether or not the number has that degree of significance). If the number is too large to fit in the column, an overflow symbol is printed instead as a warning. This symbol is the less-than (<) sign. Labels are unaffected by format dollars.

* *Line Graph Format*—This format takes the truncated value of the number and displays that number of asterisks (*) in the cell if they fit. Truncation involves taking the integer part of the number, and *dropping* the fractional part. No rounding takes place in this operation (see the @ INT function for examples). There will always be at least one leading blank in the cell, and only as many asterisks as can fit in the cell will be displayed. This means that the greatest number of asterisks that can be displayed is 35, if the cell is at its widest. This format is useful for getting a rough graphic picture of your data. Labels are unaffected by format *.

Examples:

1. Clear the worksheet by typing /CY.

2. In cell A1, type the number 123.456.

3. 123.46 is your value to the greatest number of significant digits that MAGICALC can fit in a cell 7 columns wide. Widen the column by typing: /L10.

You will note that the entire number is now displayed.

4. Type: /**FI** to set the format to Integer. Note that the whole number displayed rounded down.

5. Type: /F$ to set the format to dollars and cents.

6. Now to demonstrate the overflow symbol, enter the number: 1876587.56.

Notice the display now reads: <<<<<<. This indicates that your number will not fit in the column, at its current width.

7. To find out how this number would have been displayed in general format, type: /FG.

Note that since General format does not have to print the decimal point and two fractional digits, it can fit the number (rounded one digit shorter) into the cell.

8. Type: /L7.

The display shifts into exponential notation in order to fit in the cell.

9. Now, clear the worksheet by typing: /CY.

10. Move the marker to cell A1, then type the number 1.

11. Move the marker to cell A2, and type the formula:

    + A1 + 1

12. Move the marker to cell A1, and type: /F* to set the format to graphic. Move the marker to cell A2, and repeat this process.

13. Reproduce the formula in A2 by moving the marker to A2, if it is not already there, and entering the following keystrokes:

    /R:A3.A10
    RETURN
    R

You should see a rough graphic representation of your data. Notice how the data all seems to be the same starting at cell A6 and continuing down to A10? That is because MAGICALC can only display as many asterisks (*) as will fit in the cell with one leading space.

14. Widen the display by typing: /L15.

Now your cells should all display the correct number of asterisks.

6.12. /G–Set Global Parameters

Use: Set certain defaults for the entire worksheet. If windowing is in effect, both windows may have different global parameters in effect. When   windowing is cleared (set to 1), the global parameters will be taken from the window in which the marker was resting when the /W1 command was issued.

Certain of these options are available either at the individual column, or individual cell level. In these cases, the option set for the individual column, or cell has precedence over the Global setting.

To cancel the Global command, press the ESC key, rather than one of the options keys.

Prompt Line Response:

GLOBAL: C O R F A

Options:

C *Set column width* for the entire worksheet. This option may be overridden for an individual column by the /L command.

Prompt Line Response: COLUMN WIDTH: 1–36   D

You may enter any column width from 1 to 36, or the letter D (default). The default column width is 7, so specifying D is the same as specifying 7.

O *Set calculation order.* Ordinarily, the worksheet will be calculated column by column. This is because in MAGICALC planning applications, column dependencies are more common than row dependencies. A good example of a column dependent model would be one that calculated sales (rows) across time (columns) given a growth factor. Should you wish to alter the model to show the sales items across the columns and the time periods down the rows, you would want to alter the calculation order to row-wise.

41

Prompt Line Response: CALCULATION ORDER R(-) C(!)

Options:

R   Set order to row-wise.

C   Set order to column-wise.

Note: It is possible to create a model that will require more than one calculation. This is because, try as we might, it is not always possible to organize a model so it breaks cleanly into either a row-wise, or a column-wise order. In these cases, you must force a recalculation by pressing the exclamation point (!) key.

It is also possible to create a calculation that cannot, under any circumstances, be resolved. This is done by entering a formula that depends upon the cell it is in. For example: if row 3 had the projected costs for 1983 through 1985, in columns B through D, and column F was to be the percentage of total costs, the correct formula, assuming total costs were in cell E11, would be: $+E11/@SUM(B3...D3)*100$. If you made a slight error, and entered the formula as: $+E11/@SUM(B3...F3)/100$, you would have a formula the could not be resolved. No matter how many times you press the ! key, the result will not be correct. These errors are somewhat difficult to detect, as they do not generate an outright error message, just erroneous results. They can be avoided by careful entry of formulas.

R   *Set recalculation mode.* Normally, recalculation of the entire worksheet will take place each time an entry is made. When you begin to work with larger models, this recalculation is not quite so instantaneous, and impedes quick data entry. For this reason, there is a Global option to set recalculation to manual.

Prompt Line Response: RECALCULATION: A M

Options:

A   Set recalculation to *automatic*.

M   Set recalculation to *manual*

Note: When recalculation is set to manual, the only way to update your calculated cells is to press the recalculate key (!)

F   *Set Global format.* You may set the format of the entire
    worksheet using the Global format option. The Global for-
    mat will be overridden by any individual cell format you
    might specify.

    Prompt Line Response: FORMAT: D G I L R $ *

    Options:

    See the /F—Format command for a complete description of
    the formatting options.

A   *Set Global attributes.* You may set the attributes of the en-
    tire worksheet using the Global attribute option. The Global
    attribute will be overridden by any individual cell attribute
    you might specify.

    Prompt Line Response: ATTRIBUTE: D A L V P H

    Options:

    See the /A—Attribute command for a complete description of
    the attribute options.

Example:

Assume you wanted to design a template for easy data entry. The
first thing you would want to do is to make certain data could not
be entered in cells that contained formulas or constant data. You
might do this by setting the Global attribute to protected.

1. Type: /GAP.

Now that all the cells are protected, you would want to modify
the cells that are designated for data entry using the /A com-
mand —remember, individual cell attribute settings take
precedence over the Global setting.

2. Move the marker to the first cell designed for data entry and
    type: /AV (assuming it is value entry).

3. Repeat the process in step (2) for all other cells designated for
    data entry.

Now, to speed up the process of data entry, we would make Global recalculation manual.

4. Type: /GRM.

What we have accomplished is to set up a worksheet that will allow data entry only in the cells we have specified, and that will only recalculate the worksheet on request, rather than every time an entry is made.. A fringe benefit of this process is that the person using this model can tab to the next entry field using Ctrl-I, and tab to the previous entry field by using Ctrl-Y (on the Apple //e the TAB and Open Apple-TAB keys accomplish this).

Say most of the fields are dollars and cents. We would wish to set the Global format to dollars and cents.

5. Type: /GF$.

Now all your numbers appear with two decimal places.

6.13. /I-Insert a Row of Column

Use: To insert a row above the current marker position, or a column to the left of the current marker position.

When the Insert command is issued for a row, MAGICALC moves all rows below the deleted row downward to make space, renumbers them, and adjusts any formula references to the rows that are moved.

When the Insert command is issued for a column, MAGICALC moves all columns to the right of the deleted column right to make space, re-letter them, and adjusts any formula references to the columns that are moved.

To cancel the Insert command, press ESC, rather than **R** or **C**.

Prompt Line Response:

INSERT: R(-) C(!)

Options:

R   Insert a row above the row in which the marker currently rests.

C   Insert a column to the left of the column in which the marker currently rests.

Example:

Assuming you wanted to insert a row between row 7 and row 8:

1. Move the marker to row 8 (the column is not important).

2. Type: /I.

The prompt line will change to read:

INSERT: R(-) C(!)

3. Type: R (for row).

45

6.14.   /L–Set Individual Column Width

Use: This command allows individual columns to have widths other than the width specified in the Global command. This enables the worksheet to contain more information displayable on the same screen, improves readability, and ease of data entry.

Note: If your worksheet has more than one window specified, the individual column widths can be different from window to window. The widths adopted when the windows are united (/W1) are taken from the window in which the marker is resting when the /W1 command is issued.

To cancel the /L command, press the ESC key.

Prompt Line Response:

COLUMN WIDTH: 0–36 D

Options:

You may enter any number from 0 through 36 to set the width of the column on which the marker is currently resting. Notice that if you set the width to 0, the column will no longer be displayed on the screen or in printouts. You will not be able to move the marker to the column with the marker movement keys. Instead, you have to use the > (Go To) command to reach it.

When you move the marker to a column of width 0, the marker will disappear from the worksheet, and will reappear on the contents line over the current cell indicator.

If you enter **D** (for default), the column width will be set to the width specified in the Global command (if any), or 7 (if none).

Example:

If you wanted to type row labels in column A, and you have determined that the widest label you will have is 14 characters:

1.   Move the market to column A.

2.   Type: /L

46

The prompt line will change to read:

COLUMN WIDTH: 0–36 D

4. Enter 14.

When you press RETURN, column A will expand to 14 characters. All columns to the right will be pushed over to make room for the new column width.

Note: In order to make a zero column visible again, you must first Go To (>) that column, then use the/L command to give it a length.

6.15. /M–Move a Row or Column

Use: The Move command is used to rearrange the order in which you present your data. You may decide that it makes more sense to present a given row or column in a different place than it appears in your working model. Rather than retyping the entire changed portion of the model, you can simply move the row or column to the desired location.

To cancel the Move command, press the ESC key until the MOVE prompt disappears from the prompt line.

Prompt Line Response:

MOVE: FROM.TO

You will note that as soon as the /M command is typed, the current cell coordinate is copied onto the entry line. This may be edited using the ESC key, if you so desire.

For row moves:

If you are moving a row to a position below it in the worksheet, specify the coordinate of the cell directly below the place you want the row to appear.

For example, if you wish to move row 7 such that it appears just before row 11 (it will take on the number 10,

1. Position the marker on row 7 (say cell A7).

2. Type: /M.

The coordinate A7 will be copied into the entry line.

3. Now type: .

The expected three dots will appear. Now you will be entering a destination cell.

4. Move the marker to row 11—the row below where you wish row 7 to appear.

The coordinate A11 will be copied into the entry line.

48

Note: In the Move command, the fact that the column is the same tells MAGICALC that you wish to move a row. It is not important which column you choose so long as the FROM column is the same as the TO column.

When you press RETURN, the rows that were 8, 9, and 10 will be moved up and renumbered 7, 8, and 9, respectively.

If you had wanted to move the row to a position above its original position, for the TO location specify the exact row number where you wish the row moved (notice the difference between moving rows up and down on the worksheet).

For column moves:

Column moves are specified in much the same manner as row moves except that the FROM and TO rows must be the same in the specification. If the FROM and TO rows are the same, MAGICALC knows it must move the entire column.

The same rules apply to specification of a TO column as to a TO row, except the whole process is tipped on its side.

If you are moving a column to a location to its right, place the marker on the column immediately to the right of the actual column you wish the column to occupy.

If you are moving a column to a location to its left, place the marker on the exact column you wish the column to move to.

With either row or column moves, the value references throughout the worksheet are adjusted to reflect the new location of the row or column.

Warning: If you move a row upwards or a column leftwards, be certain that you are not moving it above some of the calculated values it needs for its calculations — this is one of the easiest ways to generate a situation where multiple recalculations are required to cause a model to converge.

6.16.   /P–Invoke the Print Subsystem

Use: This command is used to enter the Print Subsystem direct-
ly from the Calculate Subsystem.

To cancel the /P command, press the ESC key.

Prompt Line Response:

ENTER LOWER RIGHT OR RETURN

If you enter a coordinate for lower right, the Print Subsystem will
automatically use the coordinate as the lower right of the work-
sheet, unless subsequently changed. You may specify this coor-
dinate by pointing with the marker.

This feature is useful if you wish to print only a portion of the
worksheet.

The Print Subsystem will be discussed in detail below.

6.17 /R-Reproduce

Use: The Reproduce command copies a cell, a range of cells, or a block of cells (with or without formats, attributes, or blank entries) to another cell, or another range of cells. This is particularly handy in the case of formulas, since Reproduce has the option of adjusting the coordinate references so that they are correct relative to the coordinate of the cell.

To cancel the Reproduce command, press the ESC key until the prompt line clears.

Prompt Line Response:

REPRO: (, SOURCE RANGE OR RETURN

(The parenthesis command specifies to MAGICALC that you wish to exercise the special reproduce options. The following will appear on the prompt line:

LIMIT: A F C V N R)

A   Copy attributes only (no data).

F   Copy formats only (no data).

C   Copy contents of cell only (no formats or attributes).

V   Copy values and labels only (leave formulas behind).

N   Copy all cells NO CHANGE, and do not prompt.

R   Copy all cells RELATIVE, and do not prompt.

)   Exit options section of Reproduce command.

The C (contents) option is exclusive of the A (attributes) and the F (format) options. That is they may not both be invoked (and do not make sense together). You may, however, use the A and F options together.

The N (NO CHANGE) and R (RELATIVE) options are exclusive, and may not be specified together.

Complete information on the NO CHANGE and RELATIVE options is contained below.

51

When the /R (Reproduce) command is entered, the current cell coordinate is copied onto the entry line. You are being prompted to enter a *source* cell or range of cells.

The source range specification is terminated either by pressing the RETURN key, or by pressing the colon (:) key.

Examples of a source cell are:

A22
B36

Examples of a source range are:

A1...A10 A1...D1

A range must be either in the same row, or in the same column.

A source range that is specified with a different beginning and ending row, and a different beginning and ending column is called a *block*. A block is a rectangle of cells described by an upper left cell (the beginning cell of the range), and a lower right cell (the ending cell of the range).

A1...B7 C1...D11

When either the RETURN or colon (:) keys are pressed, the prompt line changes to read:

REPRO: ENTER TARGET RANGE OR RETURN

Cell and range specification rules are the same for the target range as for the source range.

Several cases are possible:

1. A single cell was specified as the source range, and a single cell was specified as the target range.

    In this case, the contents of the source cell will be copied to the target cell.

2. A single cell was specified as the source range, and a range was specified as the target range.

   In this case, the contents of the source cell will be copied into each of the cells in the target range.

3. A range was specified as the source range, and a single cell was specified as the target range.

   In this case, the contents of each cell in the source range will be copied starting in the cell specified as the target range, and proceeding row-wise, if the source was a row, or column-wise if the source was a column until there is a complete replica of the source range.

4. A range was specified as the source range, and a range was specified as the target range.

   In this case, the contents of each cell in the source range will be copied starting in the first cell of each member or the target range.

Note: If you specify a range to a range Reproduce, the two ranges should be opposite directions. In other words, if the source range spans a row, the target range should span a column, and there should be no overlap.

5. A block was specified as the source range, and a cell was specified as the target range.

   In this case, the contents of each cell in the block will be copied using the target cell as the new upper left cell.

6. A block was specified as the source range, and a range was specified as the target range.

   If the range is smaller than the block size in the direction of the range , the block will be copied only once. If the range is larger than the block size in the direction of the range, the block will be copied as many times as necessary to make sure that all cells in the range are filled.

For example: assume you specified the source range as A1...C7, and the target range as D1. The cells A1...C1 will be copied into D1...F1; A2...C2 will be copied into D2...F2; etc. through A7...C7 copied into D7...F7.

Assuming the same source range, if the target range were specified as D1...F1 the result would be the same. If, however, the target range were D1...G1, two copies of the block would occur. The upper left cells would be D1 and G1. In this case it took two copies of the block to cover the entire range.

The above example of reproducing a block into a range covered range of column reproduction. Reproducing a block into a range of rows follows the same rules.

Once you have specified both source and target ranges, you will, under certain circumstances encounter a new prompt:

REPRODUCE: N = NO CHANGE, R = RELATIVE

When you see this prompt, it means you have encountered a formula. What MAGICALC wants to know is how to reproduce the coordinates of the source formula.

Note: This prompt will not appear if you exercised either the N or the R options, or if you are reproducing constant data rather than formulas.

For example:

If, in cell F1, you had the formula

+ B1 + C1

and you Reproduce F1 to F2 through F5, the cursor will appear over the 1 in B1 and the

REPRODUCE: N = NO CHANGE R = RELATIVE

prompt will appear.

What you want to do is reproduce the formula using the *relative* option. If you had typed **N** instead of **R**, the formulas in each cell (F2 through F5) would read **+ B1 + C1**.

In some cases, you will want to reproduce one coordinate relative to the target cell, and another with no change. That is why you will be prompted for each coordinate reference.

6.18. /S–Invoke File Subsystem

Use: The /S (or storage) command is used to invoke the File Sub-
system. This allows you to perform many useful functions
such as:

* Loading a worksheet from disk.

* Saving a worksheet to disk.

* Deleting a disk file.

* Locking or unlocking a disk file.

* Obtaining a catalog of disk files.

* Initializing a new storage diskette.

To cancel the /S command, press the ESC key.

Prompt Line Response:

ENTER LOWER RIGHT OR RETURN

Under certain circumstances, you will not want to save the entire
worksheet to disk. This option is only available for DIF files, and
will be discussed under the File Subsystem. If you enter a lower
right coordinate, the File Subsystem will take it as the lower
right cell to save in the DIF file. If no coordinate is specified, the
lower right cell of the worksheet will be assumed.

For further discussion of the options available in the File Sub-
system, see the section on that subsystem.

6.19.   /T–Set Titles

Use: MAGICALC allows you to fix titles on the screen such that when you move the marker far enough to cause the window to slide, the titles will remain on the screen. This is particularly handy for clear display of large models where your titles would ordinarily disappear when viewing certain portions of the worksheet.

Note: You may specify separate titles in different windows if you are working with multiple windows. When you unite the windows using the /W1 command, the titling is taken from the window in which the marker is resting when the command is issued.

The /T (titles) command affects the marker movement keys. If you fix titles, MAGICALC assumes that they will not be changed, and prevents you from moving the marker into the title region any way except with the > (Go To) command. If you attempt to do so, you will hear a "thump," indicating that you have reached the edge of the worksheet.

Since the Ctrl–E key moves the marker to the top left cell of the worksheet, its function is modified by the /T (titles) command such that it moves the marker to the top left cell that is not fixed as a title.

To cancel the /T (titles) command, press the ESC key.

Prompt Line Response:

TITLES: H V B N

Options:

H   *Horizontal Titles*. Define the row the on which the marker is currently resting, and every row above it as a title row. These titles will remain on the screen as you move the marker down the worksheet. You will not be able to move the marker back to the row you used to define the titles once it has been moved into your worksheet space (the part that is not titles).

V   *Vertical Titles*. Define the column in which the marker is currently resting, and every column to the left of it as a title column. These columns will remain on the screen as you move the marker to the right across the worksheet. You will not be able to move the marker back to the column you used to define the titles once it has been moved into your usable worksheet space.

B   *Both*. Define the row on which the marker is currently resting, and all rows above it, and the column in which the marker is currently resting, and all rows to the left of it as titles. In this manner, you may keep both your row and column titles on the screen at all times.

N   *None*. Remove all title definitions.

Under certain circumstances MAGICALC will remove vertical title definitions for you. For example, if you had column B as the first column on your screen (the window has already slid one column), and fixed vertical titles, then issued a   (Go To) command to column A, the title definition would be removed. The rule in this case is that if you cause the title column to scroll, the title definition will be removed. The other circumstance under which vertical titles will be removed is when you modify the width of the title columns so that they will not all fit on the screen at the same time.

Examples:

1. Type: /CY to clear the worksheet.

2. Type the following:

Cell	Label
B1	JAN
C1	FEB
D1	MAR
E1	APR
A2	COST
A3	SALES $
A4	PROFIT

Now, to fix the titles horizontally, move the marker to row 1 and

3. Type: /TH.

4. Now, move the marker down until the window scrolls (the row numbers will change). The titles should stay in place.

5. To fix the titles both ways, move the marker to cell A1.

6. Type: /TB.

7. Now, move the marker around on the worksheet—the titles should stay in place, both horizontally and vertically.

8. Press Ctrl–E. The marker will move to cell B2, which is the top left usable cell, as you have defined it.

9. Press the left arrow key. You should hear a "thump', indicating that you have bumped into the edge of the worksheet.

10. Now, type: /TN to remove the titles.

6.20. /W–Set Window

Use: MAGICALC allows you to take a look at your model through multiple "windows." The normal mode is single window. If you have a large worksheet, and you want to keep a totals line in view at all times, you might want to split the screen horizontally, so that the totals appeared in the lower window, and the components of those totals were in the upper window.

If you wanted to keep an annual total in view, you might want to split the screen vertically so that the year to date figure was always in view in the right hand window, and the monthly figures were in the left hand window.

To cancel the /W (window) command, press ESC.

Prompt Line Response:

WINDOW: H V 1 S U

Options:

H *Horizontal split.* This command will split the screen horizontally at the marker position. The row the marker is resting on, and all below it will appear in the bottom window, and the rows above the marker position will appear in the upper window. When the H is pressed in the /W command, a new row of column headings will appear above the row the marker was resting on, and the marker will be moved up one row into the top window.

V *Vertical split.* This command will split the screen vertically at the marker position. The column the marker is resting in, and all to the right of it will appear in the right hand window, and the columns to the left of the marker position will appear in the left hand window. When the V is pressed in the /W command, a new column of row headings will appear to the left of the column the marker was in, and the marker will be moved one column to the left, into the left hand window.

1   *Use one window.* This command unites the window (if you have multiple windows active), and the worksheet assumes the formatting, attributes, and global settings of the window the marker is in when the /W1 command is issued.

S   *Synchronize windows.* This command specifies that if one window scrolls, the other must be dragged along with it. In the case of a vertical split, this means that if you move the marker up or down far enough to make the window slide, the other window will slide along with it. In the case of a horizontal split, the /WS command specifies a left-right synchronization.

U   *Unsynchronize windows* (default). This command specifies that the two windows will scroll independently of one another. This is useful if you want to see two separate portions of your worksheet independently of one another.

To move from one window to another, simply press the semicolon (;) key. If you are in synchronized mode, the marker will remain in the same row for a vertical split, or column for a horizontal split. If you are in unsynchronized mode, the marker will jump to wherever it was last in the alternate window.

Note: You may set Column Width (/L), Global Column Width (/GC), Global Format (/GF), and Global Attribute (/GA) separately for each window. If you wish to display the worksheet in several different formats (for example, numeric and graphic), this is very handy. When you issue a /W1 command, the worksheet format, attributes, etc. are taken from the window in which the marker is resting when the command is issued.

Example:

1. Type: /CY to clear the worksheet.

2. Enter the following in your worksheet:

Cell	Label
B1	JAN
C1	FEB
D1	MAR
E1	APR
F1	YTD
A2	COST-A
A3	COST-B
A4	COST-C
A5	T-COST
A6	SALES$
A7	PROFIT

Now, suppose you wanted to play with the monthly numbers, while retaining the year to date totals on the screen.

3. Move the marker to column F. You will note that one column is required to display the totals, so move the marker to column G to obtain the space, then back to column F.

4. Type: /WV.

A new column of row numbers appears just to the left of column F, and the marker is placed in column E.

5. Move the marker to A1.

Notice that the other window is still in place.

6. Press the semicolon (;) key.

The marker will jump to the other window.

7.   Press the semicolon (;) key again.

The marker will return to the original window.

The key to using windows effectively is the allocation of the proper amount of space in each window. For example, if we had wanted to see two columns in the right window, we would have had to position the marker such that there were two columns to the right of it before typing the /WV command.

6.21. /-Repeating Label

Use: The /- command is used to enter a repeating label, one or
more characters in length. This label will occupy the entire
width of the cell. The advantage of the repeating label is the
fact that if you change the width of the cell, the label ex-
pands to fill it.

Prompt Line Response:

REPEAT LABEL

Example:

If you wanted to fill a cell with dashes, you would type:

/—

7. Functions—Introduction

MAGICALC has a very convenient way of performing operations that occur frequently in planning models. Rather than entering these operations as complex formulas every time they are needed, you may invoke one of MAGICALC's built-in functions.

A *function* follows the following rules:

- Accepts zero or more *arguments* and returns a value. An argument is defined as a value, a cell coordinate, a range of cells, or a formula.

- Begins with the special character @ (the commercial "at" sign).

7.1   @ABS–Return Absolute Value

Form of Reference: @ABS (value)

Use: Return the magnitude of a number, or formula.

Note: You may only specify one value for the @ABS function.

Example:

If the value in cell C1 is –16,

@ABS(C1) returns the value 16.

@ABS(C1*3/2) returns the value 24.

7.2. @ AND-Return the "AND" of Multiple Logical Values

Form of Reference: @ AND (logical values)

Note: Return TRUE if all logical values are TRUE, or FALSE if any of the logical values are FALSE. If any values in the list are not of type logical, the result will be ERROR.

Notes: You may specify a list of logical values, separated by commas, or you may specify a range of the form:

beginning cell...ending cell

All values *must* be logical, or logical expressions, otherwise the result will be ERROR.

Example:

@ AND(@ TRUE,@ TRUE) yields TRUE

@ AND(@ TRUE,@ FALSE) yields FALSE

@ AND(3 = 1,5 = 5) yields FALSE

7.3. @AVERAGE-Return the Average of a List

Form of Reference: @AVERAGE (list)

Use: @AVERAGE is used to obtain the average of a list, a range of cells, or a list of ranges of cells. Only cells having values will be used in the average. Labels and blank cells are ignored.

Example:

@AVERAGE(B3,B9,C14) returns the average of the cells B3, B9, and C14.

@AVERAGE(B3...H3) returns the average of the cells B3 through H3 inclusive (range of cells).

@AVERAGE(B3...H3,B4...H4) returns the average of the cells B3 through H3 and B4 through H4 (list of ranges).

7.4. @ CHOOSE-Choose an Element From a List of Values.

Form of Reference: @ CHOOSE(index, list)

Use: The @ CHOOSE function is useful for picking a value out of a pre-determined list. It is somewhat analogous to @ LOOKUP, except that the table need not be in your worksheet.

Example:

Assume you knew that for case 1 you wanted to use a 17% discount rate on your merchandise, for case 2 a 13% discount rate, and for case 3, an 11% discount rate. You might define cell B3 to be the case number, then the discount rate might be obtained anywhere else in the worksheet in the following manner:

@ CHOOSE(B3,.17,.13,.11)

Now, if cell B3 contains a 1, the value returned is .17, if B3 contains a 2, the value returned is .13, etc.

7.5. @ COL–Return Column Number

Form of Reference: @ COL

Use: @COL is useful to index certain things such as dates. For column A, the value returned by @COL is 1, for column B, 2, etc.

Note: @COL takes *no* arguments.

Example:

For quick generation of date headings across a worksheet, try this technique:

1979 + @COL

If you reproduce this formula across the worksheet, you will get 1981 in column B, 1982 in column C, etc.

7.6 @COUNT-Count the Number of Values in a Range

Form of Reference: @COUNT(range)

Use: @COUNT will tell you how many values were actually used in an average, an NPV, or any other calculation. In certain formulas, it is important to know the N, or number of values upon which a result is based.

Note: @COUNT will only count values, not labels or blank cells, so if labels or blank cells fall within the specified range, they are not included in the result returned by @COUNT.

For the range argument, you may specify a range, a list, or a list of ranges.

Example:

(@COUNT(C3...F3)/10)

@COUNT(C3...F3,C4...F4)

7.7. @ERROR–Return the value ERROR

Form of reference: @ERROR

Use: @ERROR displays the word ERROR in the current cell, as well as all cells containing formulas with value references to the current cell.

You may use this function in combination with the @IF or @LOOKUP functions to generate error messages for values that you wish to exclude from the acceptable range.

Note: @ERROR does not accept any arguments.

Example:

If you wanted to calculate a formula only if cell C1 is between 50 and 100, you might write the following formula for cell:

@IF(@AND(C1>= 50,C1< = 100), your formula, @ERROR)

7.8 @EXP-Return the Value of *e* Raised to a Power

Form of Reference: @EXP(value)

Use: The @EXP function returns the value of *e* to the valueth power. @EXP is the inverse function to @LN.

Note: You may only specify a single value, coordinate, or formula as an argument of @EXP.

Example:

@EXP(B5)

7.9. @FALSE-Return the value FALSE

Form of Reference: @FALSE

Use: This function returns the value FALSE. Use the @FALSE
function for comparison operations (@IF).

Example:

@IF(B3 = @FALSE,B6,B9)

7.10. @IF–Conditional Evaluation of Expressions

Form of Reference: @ IF(logical expression, true, false)

Use: The @IF function is used to test the contents of another cell, or cells for various *logical conditions.* If the logical expression evaluates to TRUE, the formula represented by *true* is evaluated. If the logical expression evaluates to FALSE, the formula represented by *false* is evaluated.

Note: Logical operators are:

Operator	Name	Example	Meaning
>	Greater Than	value1>value2	TRUE if value1 is larger than value2, otherwise FALSE.
<	Less Than	value1<value2	TRUE if value1 is smaller than value2, otherwise FALSE
=	Equal To	value1 = value2	TRUE if value1 equals value2 exactly, otherwise FALSE.
>=	Greater Than or Equal To	value1> = value2	TRUE if value1 is larger than value2, or if value1 is exactly equal to value2, otherwise FALSE.
<=	Less Than or Equal To	value1< = value2	TRUE if value1 is exactly equal to value2, otherwise FALSE.
<>	Not Equal	value1<>value2	TRUE if value1 is not equal to value2, otherwise FALSE.

value1 and value2 must follow the rules for a value. That is: they may be constant values, they may be cell references, and they may be formulas. The formulas may contain the logical operators @AND, @OR, @NOT, @ISNA, @ISERR.

Example:

Assume your freight rates are $50/ton for quantities up to and including 500 tons, and $35/ton over 500 tons. If your quantity is contained in cell C3, you express your freight rate as follows:

@ IF(C3< = 500,50,35)

You may use formulas as either side of the logical expression, and in either the "true" or "false" conditions. For example:

@ IF(C3/100*A5 = D3/100*A6,B7*C3,B8*C3)

Note: You may be able to better visualize how some of these logical tests work by using the following trick:

First, evaluate all the formulas in the logical expression. Take our first example. Assuming C3 contains the number 350, we have the expression 350< = 500.

Next, determine the truth of the expression. In this case 350 is smaller than 500, the expression evaluates to TRUE.

Now, if the result is true (which it is in this case), evluate the "true" expression, otherwise evaluate the "false" expression.

7.11. @ INT–Return the Integer Portion of a Value

Form of Reference: @ INT(value)

Use: To obtain an integer by *truncating* the decimal portion of a number. This option allows you to discard significant digits you either do not need or do not want in your calculations or displays.

Note: The fractional portion of the value is discarded entirely in the result, and will not, under any circumstances be available for future calculations. Since this is a truncation operation, no rounding takes place—the fractional part of the number is simply dropped.

Example:

If you want to obtain the remainder from a division, you might employ the following technique (assuming the dividend is in cell B4, and the divisor in cell B3):

$$+B_4 - (B_3 * @INT(B_4/B_3))$$

7.12. @ISERROR-Is Value ERROR

Form of Reference: @ ISERROR(value)

Use: The @ISERROR function takes an argument of any type, and returns the value TRUE if the argument is ERROR, and the value FALSE if the argument is not ERROR.

This is a good way to test whether one or more of your calculations has generated an ERROR condition.

Example:

@IF(@ISERROR(C3),0,C3*D5)

7.13. @ISNA-Is value NA

Form of Reference: @ ISNA(value)

Use: The @ISNA function takes an argument of any type and returns TRUE if the argument has the value NA, otherwise, FALSE.

This is a good way of making your calculations conditional on the availability of the data.

Example:

@IF(@ISNA(C3),@NA,C3*D5)

7.14 @ LN-Natural (base *e*) Logarithm

Form of Reference: @ LN(value)

Use: The @LN function returns the natural, or base e logarithm of a value.

Example:

@ LN(C3)

@ LN(D4/C1)

7.15.   @LOG10-Common (base 10) Logarithm

Form of Reference: @LOG10(value)

Use: The @LOG10 function returns the common, or base 10 logarithm of a value.

Example:

@LOG10(C3)

@LOG10(D4/C1)

7.16. @LOOKUP-Perform a Table Lookup

Form of Reference: @LOOKUP(value, range)

Use: @LOOKUP looks up a value in a table then returns the corresponding value in another table.

Example:

If we are printing a document and we know that there are price breaks based on quantity, and we have the following table:

Quantity	Price/Document
100	5.47
300	5.25
500	5.05
700	4.95
1000	4.75

we can enter this table in two columns (say E and F). Now we can look up the price per document in the table from elsewhere in the worksheet as follows:

@LOOKUP(C3,E1...E5)

The @LOOKUP function finds the value in cell C3, then looks through the table in E1...E5. @LOOKUP will search the table until it finds a value *larger* than the number specified (say the number in C3 was 350), then backs up one entry. The value returned will be that of the cell in the next column to the right of the range you specified, at the same row location, so the value returned will be 5.25.

It is possible to specify a range across a row, rather than down a column. In the case of a horizontal table, the return values are taken from the next row.

7.17. @MAX-Return the Largest Value in a List

Form of Reference: @MAX(list)

Use: The @MAX function returns the largest value in a list of values, a range of values, or a list of ranges.

Example:

@MAX(B3...G3)

@MAX(B3...G3,B4...G4,H5)

7.18. @MIN–Return the Smallest Value in a List

Form of Reference: @MIN(list)

Use: The @MIN function will return the smallest value in a list of values, a range of values, or a list of ranges.

Example:

@MIN(B3...G3)

@MIN(B3...G3,B4...G4,H5)

7.19.   @NA-Return the value NA (Not Available)

Form of Reference: @NA

Use: The @NA function is useful if you are creating a "template" that will be used for data entry. The cells that have @NA in them, and all cells referencing those cells will display the value NA. As real data is entered over the NA's, the formulas throughout your worksheet will be resolved. You may use the @IFNA function to determine whether data has been entered for a particular cell.

Example:

@NA

7.20. @NOT–Return the Logical Complement

Form of Reference: @ NOT(condition)

Use: Some logical conditions are more clearly or more concisely expressed with a NOT operator. @NOT returns a value of TRUE if the condition is false, and a value of FALSE if the condition is true.

Example:

@IF(@NOT(@AND(A3 = A9,B3 = B9)),2,5)

7.21.   @NPV–Calculate Net Present Value

Form of Reference: @NPV(discount,range)

Use: The @NPV function calculates the net present value of the range of cash flows at the given discount rate. The discount rate must be expressed as a decimal.

Note: The formula used for calculating the Net Present Value is as follows:

$$\frac{cash_1}{(1+i)} \quad + \quad \frac{cash_2}{(1+i)^2} \quad \ldots + \quad \frac{cash_n}{(i+i)^n}$$

Where: i = effective discount rate (expressed as a decimal fraction).

7.22. @OR–Return the "OR" of Multiple Logical Values

Form of Reference: @ OR(logical values)

Use: Returns TRUE if any logical values are TRUE, and FALSE if all of the logical values are FALSE. If any values in the list are not of type logical, the result will be ERROR.

Notes: You may specify a list of logical values, separated by commas, or you may specify a range of the form:

beginning cell...ending cell

All values *must* be logical, or logical expressions, otherwise the result will be ERROR.

Example:

@OR(A1 = B3,B1≑B3)

If A1 = 3, B1 = 5, and B3 = 5, the result is TRUE (at least one expression evaluated to TRUE).

If A1 = 3, B1 = 5, and B3 = 7, the result is FALSE (all expressions evaluated to FALSE).

7.23. @PI–Return the Value of Pi

Form of Reference: @PI

Use: Use the @PI function to obtain the value of PI to 11 significant digits.

Example:

If the radius of a circle is in cell B3, to obtain the area use the following formula:

@PI*(B3^2)

7.24. @ROUND–Round a Number

Form of Reference: @ROUND(value, number decimals)

Use: Often it is desirable to round a number to a certain decimal precision using the financial rounding algorithm: less than half rounds down; half or greater rounds up. The ⁹ROUND function allows you to define the decimal significance of your result.

Note: The value specified for number of decimals must be between–61 and 61 (inclusive).

Example:

If cell B3 contains the value 1234.5678:

@ROUND(B3,2) yields the value 1234.57

@ROUND(B3,0) yields the value 1235—Note: this is different from @INT because it performs rounding.

@ROUND(B3,-2) yields the value 1200 (if you wanted your precision to the nearest hundred).

7.25. @ROW–Return the Row Number

Form of Reference: @ ROW

Use: @ ROW is used to get constantly increasing index (much
like @COL) for numbering items like a list or dates.

Example:

If you want a numbered list starting in row 7, you might use the
following formula:

@ ROW–6

7.26. @ SQRT–Obtain the Square Root of a Number

Form of Reference: @ SQRT(value)

Use: The @ SQRT function obtains the square root of positive values. If a negative value is entered the result will be ERROR.

Example:

@ SQRT(B3)

7.27.   @SUM-Obtain the Sum of the Values in a List

Form of Reference: @SUM(list)

Use: @SUM returns the sum of the values in a list of values, a range, or a list of ranges. Any labels or blank cells encountered in the argument list are ignored.

This is particularly useful for totalling columns or rows.

Example:

Assuming you have a column of figures for January in column B, to obtain the total, without regard to labels (repeating labels or normal labels), or blank cells, use the following notation:

@SUM(B1...B10)

It should be noted that if an @AVERAGE function had not been provided, it would have been easy to duplicate it in the following manner:

@SUM(B1....B10)/@COUNT(B1...B10)

7.28. @TRUE–Return the value TRUE

Form of Reference: @TRUE

Use: The @TRUE function is useful in comparison statements
(@IF) to test against the value TRUE.

Example:

@IF(B3 = @TRUE,B5,B10)

7.29. Short Forms of Entry

When you are specifying a function, you need enter only as many characters as it takes to make it unique. For example:

@SU is the same as @SUM.

@S can be interpreted as @SUM or @SQRT.

MAGICALC will pick a function if you do not enter enough characters for a unique specification. For example, @S will be interpreted as @SUM. The order in which these functions are picked (when not specified uniquely) is *not* alphabetical order, but rather in order of most frequent use.

Function Access Order

@A   – @AVERAGE, @ABS, @AND

@C   – @COUNT, @CHOOSE, @COL

@E   – @EXP, @ERROR

@F   – @FALSE

@I   – @INT, @ISNA, @ISERR, @IF

@L   – @LOOKUP, @LOG10, @LN

@M   – @MIN, @MAX

@N   – @NPV

@O   – @OR

@P   – @PI

@R   – @ROUND, @ROW

@S   – @SUM, @SQRT

@T   – @TRUE

For functions that require arguments, you need not include the closing parenthesis if the function falls at the end of a line. For example:

@SUM(A1...D1   is the same as   @S(A1...D1
                    is the same as   @SUM(A1...D1)

8. File Subsystem

```
FILE SUBSYSTEM
    A. STARTING  CELL......................... A1
    B. ENDING  CELL.......................... A1
    C. USE  DIF  FORMAT...................... NO
    D. ROW  ORDER  FOR  DIF................... NO
    E. DISK  SLOT............................. 6
    F. DISK  DRIVE............................ 1
    G. DISK  VOLUME........................... 0

    1. MAGICALC SYSTEM MENU
    2. CHANGE OPTIONS
    3. SAVE WORKSHEET
    4. LOAD WORKSHEET
    5. FILE CATALOG
    6. LOCK A FILE
    7. UNLOCK A FILE
    8. INITIALIZE DISK
    9. DELETE A FILE

SELECT NUMBER OR LETTER, PRESS RETURN
```
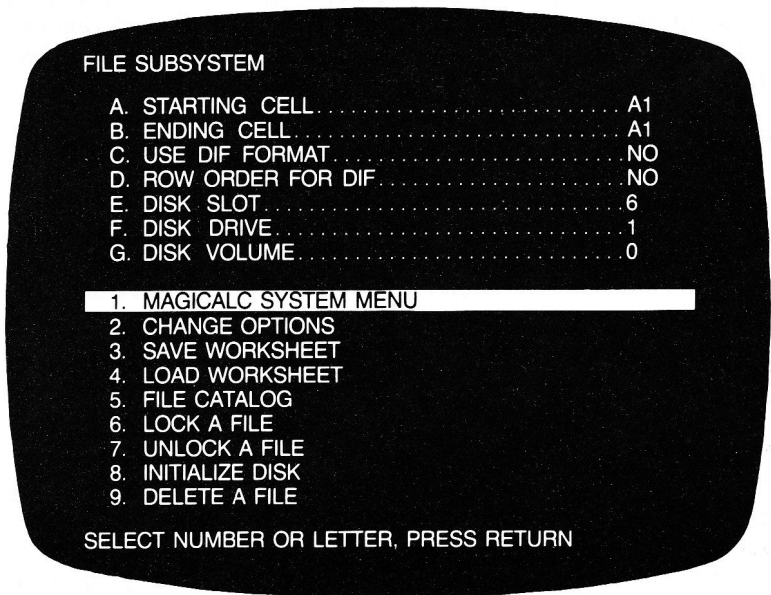
The *File Subsystem* is your means of storing and retrieving data from disk. Since you will almost certainly wish to store your models to disk, and later recall them, you will need to use the File Subsystem.

The File Subsystem is invoked either by selecting option 2 from the System Menu (FILE SUBSYSTEM), or by using the /S (storage) command in the Calculate Subsystem.

The File Subsystem is completely menu-driven, and follows the menu rules set forth in the section on the System Menu.

8.1. DIF™ Files

DIF™ is an acronym for Data Interchange Format. Many programs by various publishers can read and write files in this format. If you want to move data from one program to another, DIF™ files can be extremely useful to you.

Note: DIF™ is a trademark of Software Arts, Inc.

DIF™ files serve another, very important purpose: moving blocks of data from one model to another.

One common business function is the consolidation of multiple models into one summary model. For example, say you owned a chain of 10 shoe stores. The manager of each store is required to create a plan that details his sales of each style of shoe, his expenses, and his profits. You, as the owner want to know how each style of shoe did overall, total expenses, and total profits.

The best way to do this is to have the values written out in a DIF™ file, then read into a model that will summarize them.

Another use for DIF™ files is to transpose rows and columns. That is to write a column out to disk, then read it back in as a row (or vice versa). This option is invoked by using the ROW ORDER FOR DIF option of the File Subsystem.

There are several books on spreadsheet modelling that describe this process in greater detail, and provide examples.

8.1.1. Format of DIF™ Files

DIF™ files contain three types of records:

- *Header Records*-Which define the parameters of the file.

- *Data Records*-Which contain the actual data values. Note: no calculations are carried over into the DIF™ file, only values.

- *End of Data Records*-Which signal the end of the DIF file.

The Header Record

The header record has four sets of three records that specify how much of what sort of information to expect in the file. It has the following format.

TABLE
0,1
" "

This is a standard header record

VECTORS
0,V
" "

This portion specifies the number of vectors. A *vector* is defined as a column or row. V = number of vectors to expect.

TUPLES
0,T
" "

This portion specifies the number of elements or *tuples* contained in each vector. T = number of tuples to expect. This actually specifies how wide the vector is. A handy way to think of this is as a V-long by T-wide rectangle.

DATA
0,0
" "

The Data Record

The data record consists of a pair of special header records that identify the beginning of the tuple, then a pair of records for each tuple.

-1,0
BOT

This is the standard header record for each element in a vector. BOT = Beginning of Tuple records.

T_1, N_1
$string_1$

Value for first element of the tuple.

T_2, N_2
$string_2$

Value for second element of the tuple.

.
.
.

T_n, N_n
$string_n$

Value for last element of the tuple.

The End of Data Record

The End of Data record signals end of a DIF™ file, and has the following formats:

-1, 0
EOD

8.2   MAGICALC SYSTEM MENU

Selection 1—MAGICALC SYSTEM MENU simply returns you to the System Menu. You may also return to the system menu by pressing the ESC key, unless you are in the options section (lettered menu items), in which case you will have to press the ESC key twice.

8.3. CHANGE OPTIONS

Selection 2—CHANGE OPTIONS moves the highlight bar into the options section of the menu (the options section is the section containing lettered menu items).

8.4. SAVE WORKSHEET

Selection 3—SAVE WORKSHEET allows you to save the worksheet currently in memory to disk.

The worksheet will be saved *in its entirety* unless you specify USE DIF FORMAT (see Option C, *p 116*). The file will be saved on the disk drive, in the slot specified in the options portion of the menu.

Once you select the 3—SAVE WORKSHEET menu item, a list of files on the disk will be displayed on your screen. If the list of files exceeds one screen, the prompt:

<RETURN> TO CONTINUE

will appear at the bottom of the screen.

Each file is given a number that you can use to select with, so that you can give your files meaningful names, yet not have to type the entire name each time.

ENTER FILE NAME OR NUMBER, OR <RETURN
= = >

will appear at the bottom of the screen. You may select an existing file by number, type in the file name of an existing file, or type in a completely new file name.

If you press the RETURN key, the save command is cancelled, and you will be back in the File Subsystem menu.

Warning: If you choose an existing file name, the previous contents of that file will be erased, and there will be no way to recover the data that was previously stored there.

At the completion of the save process, the catalog will be redisplayed to confirm the fact that your file has indeed been put on disk, and to inform you of its length.

At the bottom of the screen, the prompt:

<RETURN> TO CONTINUE

will be displayed. When you press the RETURN key, you will be in the File Subsystem.

Note: You may interrupt the catalog that is displayed on the screen at any time by pressing the ESC key. You will proceed directly to the next prompt. You may not select a file by number that has not yet been displayed on the screen. You may, however, select a file that has not yet been displayed by name.

Note: If, at any point in the save process, you decide that you would rather not complete the save, you may interrupt it by pressing the ESC key. The file saved to disk will not be a complete file, so it will give you an error if you try to load it.

If your disk should fill up, an error message will be displayed:

SYSTEM ERROR NUMBER 9

your file name

DISK IS FULL

A NEW DISK IS NEEDED

HIT <RETURN> TO CONTINUE

    <ESC>   TO ABORT

    OR ,S,D,V

At this point, you have the following choices:

- Press the RETURN key to continue on another disk.

- Press the ESC key to terminate the file save.

- Switch the continuation of this file save to a new diskette specified by ,S,D,V (for example: ,D2).

If you choose to continue the save, the following message will appear on your screen:

HIT <RETURN> TO USE DISK

    <ESC>   TO ABORT

    Y   TO INIT DISK

The ESC key will return you to the File Subsystem.

If you press the **Y** key, you will initialize the disk in the slot and drive specified (see INITIALIZE DISK, below). This option is provided in case you did not have an initialized data disk handy.

If you choose to continue the save, MAGICALC makes the following assumptions:

If the last character of the file name is a letter, the continuation file name will be the same name with the number 1 appended. For example, if you were saving file TOO BIG, the first continuation file name would be TOO BIG1.

If the last character of the file name is a number, the continuation file name will be the same file name except the number will be incremented by 1. For example, if you were saving file TEST1, the first continuation file name would be TEST2.

The real purpose of this scheme is to deal with worksheets that are extremely large (it is possible to create a worksheet in MAGICALC that is larger than the capacity of a diskette if you have enough RAM cards!).

If you do create models that must be saved to files that span multiple diskettes, please read the section under LOAD WORKSHEET on loading such files.

8.5.   LOAD WORKSHEET

Selection 4—LOAD WORKSHEET allows you to retrieve your files from disk for further manipulation, or printing.

The worksheet you load will be loaded starting in cell A1, regardless of the STARTING CELL you specify, unless you are using DIF™ format (option C). If you specify DIF™ format, the file will load starting at whatever cell appears as STARTING CELL in option A.

The file will be loaded from the drive and slot specified in the options portion of the menu.

Once you select the 4—LOAD WORKSHEET item from the menu, a catalog of files on the disk will appear on your screen. These files will be numbered, just like the files in the SAVE WORKSHEET catalog display.

You may now select the file you want to load by name or number, as outlined above. You still cannot specify a file number that has not been displayed on the screen.

The prompt:

OVERLAY OR DESTROY WORKSHEET

HIT < RETURN > TO CONTINUE

   < ESC >   TO ABORT

This is your last chance to back out of the file load. If you had a worksheet in memory, and had forgotten to clear it out (/CY), two things will happen when you initiate the load:

1.   The worksheet that is currently in memory will be overlaid, and the integrity of the old data will be corrupt.

2.   Any places in the model you load that do not contain data that did contain data in your previous worksheet will retain their old values, thus corrupting the new data.

Your choices are to press the RETURN key, which allows you to go ahead with the load, or the ESC key which will return you to the File Subsystem menu.

Should you choose to go ahead with the load, the cells that are loading in will be displayed in the upper left corner of the screen as they are loaded in, and you will be returned to the File Subsystem menu upon completion.

Note: The STARTING CELL and ENDING CELL specifications will be updated to reflect the specifications of the new model.

Note: Under some rare circumstances you may wish to load a worksheet over an old one to combine the data from the two models. There is a good argument for doing this rather than using DIF™ files if the formulas are necessary. If you intend to do such overlaying of worksheets, it is of paramount importance to design the worksheets with space for the data to be overlaid.

If your file was so large it had to be saved to more than one floppy (see SAVE WORKSHEET, above), the load process will halt in the following error message:

SYSTEM ERROR NUMBER 5

your file name

SUDDEN END OF DATA

CONTINUATION FILE IS

continuation file name

<RETURN> TO CONTINUE

The continuation file name will follow the conventions listed under SAVE WORKSHEET, above. The display of the continuation file name is purely informational.

When you press the RETURN key, you will be returned to the File Subsystem menu.

You must then select item 4—LOAD WORKSHEET again to load the continuation file.

When the message:

OVERLAY OR DESTROY WORKSHEET

HIT <RETURN> TO CONTINUE

   <ESC>   TO ABORT

is displayed, press the RETURN key. You actually wish to overlay the portion of the worksheet that is currently in memory with the rest of the worksheet from the continuation file.

8.6. FILE CATALOG

Menu Selection 5—FILE CATALOG provides you with a complete list of all the files on the diskette.

As with all other catalogs that are presented in MAGICALC, this catalog may be interrupted at any time by pressing the ESC key.

When the screen fills up, you will receive the:

<RETURN> TO CONTINUE

prompt. You may press the RETURN key to view the rest of your catalog, or the ESC key if you have seen enough.

8.7. LOCK A FILE

Menu item 6—LOCK A FILE, allows you to mark a file on your disk as locked. This means it cannot be overwritten or deleted without first unlocking it.

The procedure for specifying the file name is identical to the Load and Save functions—you may either specify the name or the number (if the number has been displayed in the catalog).

8.8. UNLOCK A FILE

Menu item 7—UNLOCK A FILE is the reverse of item 6—LOCK A FILE. It allows you to make a locked file available for deletion or overwriting.

The procedure for specifying the file name is identical to the Load and Save functions—you may either specify the name or the number (if the number has been displayed in the catalog).

8.9. INITIALIZE A DISK

Menu selection 8—INITIALIZE A DISK allows you to take a previously unformatted diskette and format it as a data storage diskette for MAGICALC.

Warning: If you initialize a diskette that has data on it, you will lose that data permanently. Take care when exercising this option.

Diskettes initialized in this manner should only be used for MAGICALC data storage, as there is no disk operating system image on the first three tracks. You may, however, use a disk initialized with the Apple DOS INIT command as a storage diskette.

The prompt:

INSERT DISK TO BE ERASED

HIT <RETURN> TO CONTINUE

   <ESC>   TO ABORT

will be displayed on your screen. Check to make certain the disk you want to initialize is the correct one before pressing the RETURN key.

Note: The disk in the slot and drive specified in the options portion of the File Subsystem menu will be the one that is initialized.

Warning: Hard disk users should *never* exercise this option.

When you press the RETURN key, the disk drive will turn on, and there will be some whirring and clicking sounds for a few seconds.

At the end of the initialization procedure, you will be returned to the File Subsystem menu.

8.10.   DELETE A FILE

Menu item 9—DELETE A FILE allows you to remove a file from the diskette. You might want to do this for several reasons:

• Housekeeping; it is never a wise idea to keep more versions of data around than absolutely necessary for backup purposes.

• To make room for new files.

Once you select the Delete function, a numbered catalog will be displayed, as in the Load and Save function.

You may select the file by name or number.

You will *not* be asked to confirm your selection. The file will be deleted as soon as you press the RETURN key.

Remember, once a file is deleted, it is very difficult to recover the data, so be absolutely certain you have made the correct selection before pressing the RETURN key.

8.11. STARTING CELL

Option A—STARTING CELL is only used when saving or loading DIF™ files. In all other cases, it is ignored.

The default value for the starting cell is the marker location when the /S command is executed from the Calculate Subsystem, or A1, if the Calculate Subsystem has not yet been entered.

You may modify the default to any cell you choose by simply selecting option A (press the A key), confirming your selection (RETURN or press the A key again), then entering the new value for the starting cell.

8.12. ENDING CELL

Option B—ENDING CELL is only used when saving or loading DIF™ files. In all other cases, it is ignored.

The default value for the ending cell is the bottom right of the worksheet (assuming one is in memory). You may modify the ending cell from the Calculate Subsystem /S (storage) command by entering an alternate value in response to the prompt:

ENTER LOWER RIGHT OR RETURN

In the File Subsystem, you may modify the ending cell by selecting option B, and entering the desired ending cell (if the value displayed there is incorrect).

8.13.   USE DIF FORMAT

Option C—USE DIF FORMAT is a YES/NO option. It defaults to NO, but may be modified if you wish to use DIF™ files (see above discussion of DIF files).

If you select option C, the NO will change to YES. If you press RETURN of C again, the YES will turn to NO. The only other key that is acceptable is the ESC key, which will return you to menu item 1 — MAGICALC SYSTEM MENU.

8.14. ROW ORDER FOR DIF

Option D—ROW ORDER FOR DIF is a YES/NO option. It defaults to NO (which implies column order). This option allows you to write a DIF™ file of a column in *row* order, so that you may read it back in as a row.

The key to this transposition is to write the data out in *row* order, and read it back in *column* order.

Note: You may reverse this procedure and write the data out in *column* order and read it back in *row* order. The point to remember is that the transposition only occurs if the order of the save is different from the order of the load.

8.15. DISK SLOT

Option E—DISK SLOT allows you to specify the slot of the disk
drive in which your data diskette resides.

Simply select option E. The prompt:

ENTER, (MIN = 0, MAX = 7):

will appear on your screen. You may select any slot in your com-
puter, but be careful, because unpredictable things may happen if
the slot you specify contains something other than your disk con-
troller card, and data loss may result.

8.16.   DISK DRIVE

Option F—DISK DRIVE allows you to specify which of the two drives possible on a controller card contains your data diskette.

Simply select option F. The prompt:

ENTER, (MIN = 1, MAX = 2):

will appear on your screen. Any values other than one or two are unacceptable, and MAGICALC will just beep at you.

8.17. DISK VOLUME

Option G—DISK VOLUME is primarily for the use of hard disk users. This allows you to select the volume on which your data resides.

Note: The disk volume parameter may also be used with floppies as a precaution against using the wrong diskette. If you specify an incorrect volume number, you will get an error message, and MAGICALC will not perform any functions except file catalog. If you specify 0 for the disk volume, it acts as a "wild card." In other words a volume number of 0 matches all volume numbers.

To set the disk volume, select option G. The prompt:

ENTER, (MIN = 0, MAX = 255):

will appear on your screen. Enter the number of the desired volume.

Note: Hard disk users should obtain a file catalog after switching volumes to ascertain that they are working with the correct volume.

9. Print Subsystem

```
PRINT SUBSYSTEM

    A.  STARTING  CELL.............................A1
    B.  ENDING  CELL..............................A1
    C.  USE  DIF  FORMAT.........................NO
    D.  ROW ORDER FOR DIF......................NO
    E.  SINGLE SHEET FEED......................NO

    1.  MAGICALC SYSTEM MENU
    2.  CHANGE OPTIONS
    3.  PRINT HARDCOPY
    4.  PRINT SOFTCOPY
    5.  PRINT IN SAVE FORMAT
    6.  ENTER SETUP STRING

SELECT NUMBER OR LETTER, PRESS RETURN
```
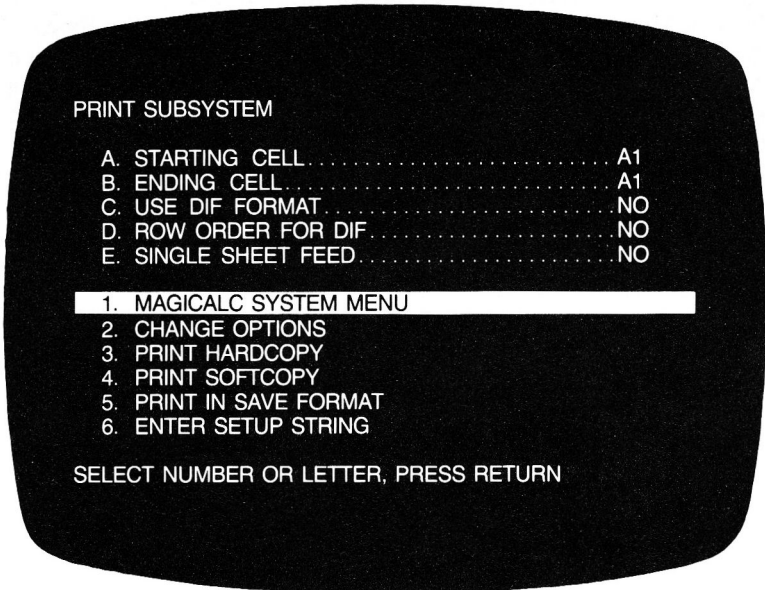
The *Print Subsystem* allows you to transfer your worksheets to a printer (hardcopy), or to disk in a format readable by your word processor (softcopy).

You have the additional option of printing in *save format,* which will allow you to see the formulas used in your models. This option is excellent documentation for worksheets you use often.

The Print Subsystem, like all the other subsystems except the calculate subsystem, is completely menu driven. The Print Subsystem menu follows the rules set forth in the section on the System Menu.

You may enter the Print Subsystem either by selecting item (PRINT SUBSYSTEM) on the System Menu, or by using the /P (invoke Print Subsystem) command from the Calculate Subsystem.

9.1. MAGICALC SYSTEM MENU

Selection 1—MAGICALC SYSTEM MENU returns you to the System Menu. The ESC key will also return you to the System Menu unless you are in the options section of the menu, in which case, the ESC key will cause the highlight bar to jump to the MAGICALC SYSTEM MENU item on the Print Subsystem menu.

9.2. CHANGE OPTIONS

Selection 2—CHANGE OPTIONS moves the highlight bar into the options section of the menu (the options section is the section containing lettered menu items).

9.3.   PRINT HARDCOPY

Selection 3—PRINT HARDCOPY, allows you to transfer your worksheet to your printer. The format MAGICALC uses is defined in the Format Subsystem (see the section on the Format Subsystem for more details).

The default format is for an 80 column 66 line page, and allows for six line top and bottom margins, and eight space left and right margins.

Once you select item 3, (PRINT HARDCOPY), the prompt:

POSITION DOCUMENT

THEN PRESS < RETURN >

will appear on your screen. Before pressing RETURN be sure your printer is on, and it is online. Also be certain that the paper in your printer is aligned properly.

When you press RETURN, your screen will clear, and the printer will come on. When the printing of your worksheet is complete, you will be returned to the Print Subsystem menu.

To interrupt the print process prematurely, simply press the ESC key. You will be returned to the Print Subsystem menu.

9.3.1.   What is Printed

When you enter the Print Subsystem from the Calculate Subsystem (using the /P command), the prompt:

ENTER LOWER RIGHT OR RETURN

is displayed on the prompt line. The lower right coordinate you enter (either by typing it in, or by pointing with the marker) becomes the ending cell displayed on the Print Subsystem options menu.

The position of the marker when the /P command is entered becomes the beginning cell displayed on the Print Subsystem options menu.

When you select options 3 or 4 (PRINT HARDCOPY, PRINT SOFTCOPY), the rectangle defined by the starting cell (upper left) and ending cell (lower right) is transferred to the printer or disk.

9.3.2. Order of Printing

If your document is wider than your page, or longer than your page, MAGICALC will split it up into multiple pages. This pagination is also discussed in detail in the Format Subsystem section.

The order in which this pagination is done is as follows:

1. MAGICALC determines how many columns will fit within the defined margins.

2. The correct number of lines are skipped to give you a top margin.

3. The columns that fit are printed until the bottom margin is reached.

4. The correct number of lines are skipped to provide a bottom margin, then a top margin for the next page.

5. The next page is printed, etc. until the bottom of the worksheet is reached.

6. MAGICALC skips over to the next set of columns (if any) and repeats the above process until the bottom right of the worksheet is reached.

The resultant printout is in a form that allows you to tape the sheets together to show the entire worksheet.

9.4. PRINT SOFTCOPY

Selection 4—PRINT SOFTCOPY allows you to "print" a copy of
your worksheet (as defined by the starting and ending cells in the
options portion of the Print Subsystem menu).

This is a tremendously useful option if you want to incorporate
some of the data from your spreadsheet model in a document. All
you have to do is print softcopy, and read the disk file you create
into your word processor.

You may also use this option for generating data files that can be
sent to another computer via modem.

When you select item 4 (PRINT SOFTCOPY), you will be
presented with a numbered catalog, just like most of the func-
tions in the file subsystem. The prompt:

ENTER FILE NAME OR NUMBER, OR < RETURN >
= = >

will appear on your screen. If you wish to overwrite an existing
file, you may select by number.

Warning: If you select an existing file, the previous contents of
that file will be permanently overwritten, and the data
lost. Exercise this option with care.

If you wish to create a new file, simply enter a new name.

Once you have entered a name or number, the disk drive selected
as your data drive in the File Subsystem menu will whir, and
upon completion, a new catalog of the disk will be shown.

As with the functions of the File Subsystem, the ESC key will
terminate the catalogs, and if you are in the middle of "printing"
the worksheet to disk, the ESC key will interrupt the process.

The softcopy will have the same format as hardcopy, including
margins, etc., and its content is defined by the rectangle describ-
ed by the starting cell and ending cell.

Hint: If you want to eliminate any pagination, simply enter the Format Subsystem and set the page length to 1, the text length to 1, and the top margin to 0. You may deal with the page width, text width, and left margin as you wish to see it in the file.

9.5. PRINT IN SAVE FORMAT

Option 5—PRINT IN SAVE FORMAT allows you to print a hardcopy of the actual contents of your worksheet. This includes the formulas, formatting, etc.

This option, like the other print options follows the formatting specifications set in the Format Subsystem.

Hardcopy of this nature is excellent for documentation of worksheets.

Unlike the other print options (hardcopy, softcopy), the PRINT IN SAVE FORMAT item ignores the starting and ending cell specifications.

When you select this menu item, you will receive the prompt:

POSITION DOCUMENT

THEN PRESS < RETURN >

As was noted for the PRINT HARDCOPY menu item, you must be certain that your printer is on and ready, and that the paper is aligned correctly before pressing the RETURN key.

Once you have pressed the RETURN key, your screen will go blank until the printing has completed.

Upon completion, you will be returned to the Print Subsystem menu.

9.6. ENTER SETUP STRING

Use menu item 6—ENTER SETUP STRING to enter any special printer characters you might wish to use.

For example, you might want to issue a special code that signals your printer to use condensed print mode (so you can fit more characters across a page).

Unfortunately, there are absolutely *no* standards in printer setup codes, so you will have to refer to your own printer manual to find out how to set it for the particular modes you might need.

Once you select this menu item, the prompt:

USE CTRL-R FOR <RETURN>

will appear at the bottom of your screen. You may begin entering your setup string.

The characters of the setup string will not be printed on the screen. If you need to generate the code for a RETURN, but do not wish to terminate the setup string, use the Ctrl-R keystroke.

To terminate the entry of the setup string, press the RETURN key.

Obviously, some compromises had to be made in setup string entry. The code for Ctrl-R is unavailable to you, as are all the codes that cannot be generated directly from the keyboard with the Ctrl key, the shift key, and any other given key. If your printer requires a setup string with either a Ctrl-R or an unaccessible code, your best bet is to set the printer up before starting MAGICALC, and leaving it in the particular mode you desire.

MAGICALC will remember your setup string, and use it each time any data is sent to the printer, until you either power down or enter a new setup string.

9.7. STARTING CELL

Option A—STARTING CELL is the upper leftmost cell to be printed in the PRINT HARDCOPY and PRINT SOFTCOPY commands.

When you enter the Print Subsystem from the Calculate Subsystem using the /P command, the starting cell defaults to the current marker location. If you have not been in the Calculate Subsystem, the starting cell defaults to A1.

9.8   ENDING CELL

Option B—ENDING CELL is the lower rightmost cell to be printed in the PRINT HARDCOPY and PRINT SOFTCOPY commands.

When you enter the Print Subsystem using the /P command, MAGICALC will prompt you:

ENTER LOWER RIGHT OR RETURN

If you enter a lower right coordinate, that coordinate is used for the ending cell. If you press RETURN, the ending cell will be set to the lower right cell of the worksheet.

9.9. USE DIF FORMAT

Option C—USE DIF FORMAT affects only the PRINT IN SAVE FORMAT operation. If this option is selected, the SAVE FORMAT print will be in DIF™ format, rather than save format.

Under normal circumstances, you will not want to print out DIF™ files, except as an example of how DIF™ format actually looks.

Warning: Printing worksheets of any size in DIF™ format will use a great deal of paper.

132

9.10. USE ROW ORDER FOR DIF

Option D—USE ROW ORDER FOR DIF applies only to the PRINT IN SAVE FORMAT option. If you select USE ROW ORDER FOR DIF, the printout will be done in row order.

Note: This option has no effect if you have not selected USE DIF FORMAT (option C).

9.11. SINGLE SHEET FEED

Option E—SINGLE SHEET FEED is a provision for printing cut sheets. If you are not using continuous form, fan-fold paper, and must load a new sheet for each page, select this option.

When printing hardcopy of any kind, the prompt:

POSITION DOCUMENT

THEN PRESS <RETURN>

will appear on your screen before the print process begins to allow you to align your paper and ascertain that the power to the printer is on and everything is set up correctly.

At the end of each page, the same prompt will appear to allow you to change paper.

10. Format Subsystem

```
FORMAT SUBSYSTEM
     A. PAGE  LENGTH . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 66
     B. TOP  MARGIN . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 6
     C. TEXT  LENGTH . . . . . . . . . . . . . . . . . . . . . . . . . . . 54
     D. PAGE  WIDTH . . . . . . . . . . . . . . . . . . . . . . . . . . . . 80
     E. LEFT  MARGIN . . . . . . . . . . . . . . . . . . . . . . . . . . . 8
     F. TEXT  WIDTH . . . . . . . . . . . . . . . . . . . . . . . . . . . . 66

     1. MAGICALC SYSTEM MENU
     2. CHANGE OPTIONS

SELECT NUMBER OR LETTER, PRESS RETURN
```
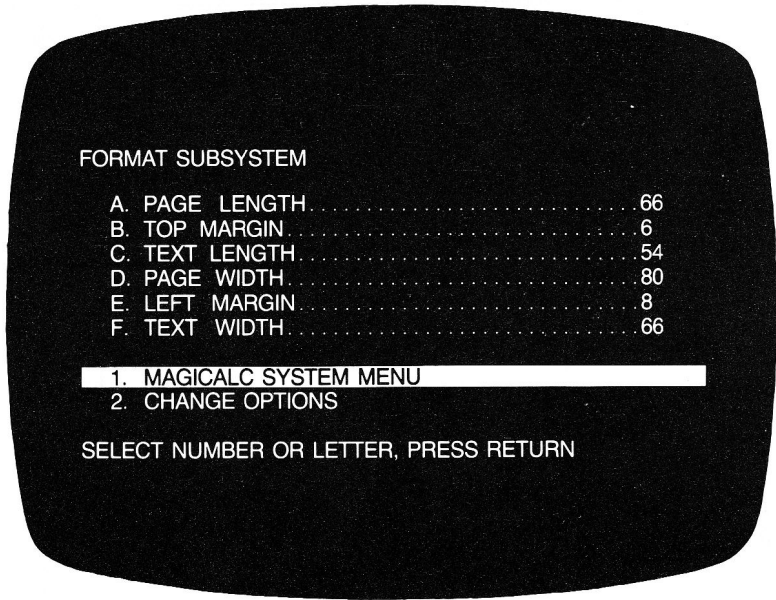
10.1. What Does the Format Subsystem Do?

The *Format Subsystem* allows you to specify the format in which
you wish your spreadsheets to be printed. This set of specifica-
tions will govern the output generated by the print subsystem.

10.2. The Page Layout
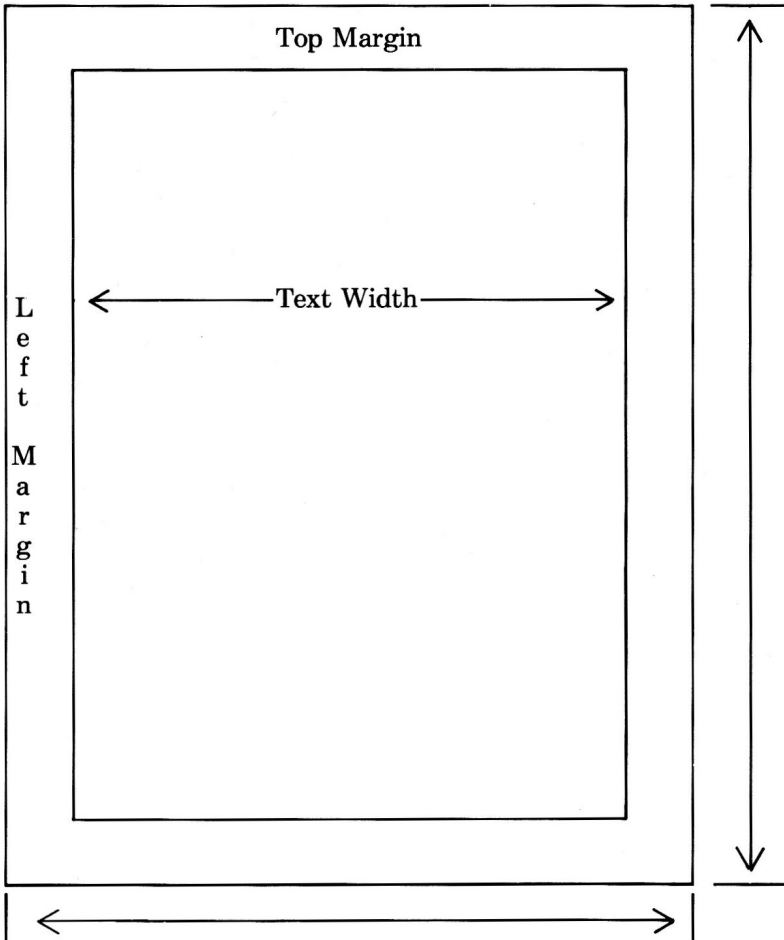
By *format*, we mean the actual page layout of the output. This includes the top and bottom margins, as well as the left and right margins. Let's refer to the picture above: the sample page layout.

As you can see in the figure above, there are six main specifiers required to define the centering of your printed data on a page:

- **Page Length:** The page length is the number of *lines* of print that can fit on a page if you print from the top to the bottom. This number is obtained by measuring the page (in inches) and multiplying by the number of lines per inch you intend to print (usually six). The normal page length for eleven inch forms is 66.

- **Top Margin:** The number of lines to skip from the actual top of the page before beginning to print the data.

- **Text Length:** The actual number of lines you wish to print on a page. MAGICALC will not allow you to enter a text length greater than the page length minus the top margin.

- **Page Width:** The actual number of characters you could put on a line if you printed from the very left of the page to the very right. For eight and one half inch paper, this is normally 80 to 85. Many printers have optional controls for varying the *pitch* or number of characters printed per inch. The most popular pitches are 10-pitch (80 characters/line), 12-pitch (96 characters/line), and 17-pitch compressed print (132 characters/line). Compressed print is very handy for getting a great deal of information across a page, but can be somewhat straining on the eyes, especially if the reports are long.

- **Left Margin:** The number of spaces from the actual left side of the page to skip before beginning to print the data. If you plan to put your printouts in a loose-leaf report folder, it is wise to allow a left margin of one to one and one half inches (normally 10 to 15 spaces).

- **Text Width:** The number of characters you actually wish to print across the page. MAGICALC will not allow you to enter a number for text width that is greater than the page width minus the left margin.

10.3.   What's Not There

If you are used to typing, you'll notice that the right and bottom margins are not discussed. The main reason for this is that MAGICALC calculates these settings from the six it already has as follows:

Bottom Margin = Page Length – Text Length – Top margin

Right Margin = Page Width – Text Width – Left Margin

For example, if you had the page length set to 66, the text length set to 54, and the top margin set to 6, the bottom margin would be 6 spaces.

10.4   How About Printing Big Worksheets?

If you read the previous material, and have been following along in this manual, you will already realize that MAGICALC is capable of handling worksheets that ar far greater in width and length than a single page of paper no matter how much the print is compressed. What happens when the program encounters such a problem?

MAGICALC uses the settings you supply it in the Format Subsystem to print as much of its worksheet area as it possibly can fit within the boundaries you specify, then goes to the next page. There are actually three cases that can occur here:

Case 1: The worksheet is too long for the printed page, but not too wide.

In this case, MAGICALC prints as many lines of your worksheet as you specified for Text Length, then goes on to the next page and resumes printing where it left off, taking as many pages as necessary to finish printing the worksheet out formatted and margined according to your specifications.

Case 2: The worksheet is too wide for the printed page, but not too long.

In this case, MAGICALC prints as many columns of your worksheet as it can fit in your specified Text Width, then goes on to the next page and resumes printing at the next column. MAGICALC will take as many pages as necessary to print the entire worksheet formatted and margined according to your specifications.

Case 3: The worksheet is both too long and too wide for the printed page.

In this case, MAGICALC prints as many columns of your worksheet as it can fit in your specified Text Width, for as many lines as it can fit in your specified Text Length. It continues printing these columns until it reaches the bottom, then it moves to the top of the next block of columns to resume the print process. In this way, the separate sections may be taped together to give a printed representation of the entire worksheet.

10.5. Hints on Page Formatting

The object of formatting your pages is to produce an attractive printed copy of your worksheet on which data are easy to find, and columns are attractively laid out. There are several key points to bear in mind when designing a format for your output:

- The printout of a spreadsheet is more attractive and more readable if you allow a certain amount of "white space' around the actual data. The actual amount of white space will vary depending on the way you wish to present your report. A loose-sheet report will require a narrower left margin than a bound one. If you intend to annotate your report further through the use of a word processor, you might wish to leave even more white space in the border areas. You may define the amount and distribution of white space, through the use of margin setting.

- You should try to format your page, and your worksheet so that if there is need to go to a separate page to print the entire width of the model, the column breaks occur in logical places. After all, if you have a cost estimate and the dollar values column does not appear on the same page as the hours, it will force the reader to skip to the next page to find out the actual costs (and that's what is really the focus of the model).

Note: MAGICALC has no way of knowing how many characters your printer can actually put on a page—this is a function of the size of the paper, the density of the type, etc. The purpose of the format subsystem is to allow you a flexible way of defining these settings.

If you fail to define the settings correctly, MAGICALC will attempt to print the data as you have specified it, and may run off the edge of the paper to the right (if you specified too large a text width), or it may print over the perforation (if you specified too large a text length).

10.6. When Do You Need to Set New Format Specifications?

When you start MAGICALC, the settings for the margins and page length will be appropriate for most printers using $8\frac{1}{2} \times 11$ paper. You only need change these if you are using a different size paper, compressed or expanded print, or wish to achieve special effects. The following are the "default," or normal settings MAGICALC uses if you make no changes.

Default Format Specifications

Page Length	66
Text Length	54
Page Width	80
Text Width	64

10.7. How Do You Redefine The Specifications?

In order to redefine any of the format specifications, you must be *in* the Format Subsystem. In order to enter the Format Subsystem, you must first get to the System Menu. This is accomplished by choosing option 1 from any of the subsystem menus except the Calculate Subsystem. If you are in the Calculate Subsystem, you must type Ctrl-Shift-@, followed by a RETURN.

Once in the System Menu, select option 4-Format Subsystem. This may be done by moving the highlight bar with the arrow keys, or by typing the number 4. Once the highlight bar is resting on option 4-Format Subsystem, press either the RETURN key or the 4 key to accept your choice. You will immediately be transferred to the Format Subsystem menu.

Now that you are in the Format Subsystem, you may change any setting you wish simply by following the menu selection rules:

Move the highlight bar to the appropriate item by either typing the number or letter of your selection or using the arrow keys. You will note that when you enter the Format Subsystem, the highlight bar is resting on 1. RETURN TO MAGICALC SYSTEM MENU. You may use the arrow keys to move the highlight bar to item 2. CHANGE OPTIONS using the arrow keys, but you must either select CHANGE OPTIONS or type the letter of the option you wish to move the highlight bar into the options portion of the menu.

As with all the menus in MAGICALC, you must either type the RETURN key, or the selection letter or number to confirm your choice once the highlight bar is resting in the proper place. For example, assume we wished to choose 2. CHANGE OPTIONS. We could move the highlight bar to the appropriate line using the arrow keys, then hit the RETURN key to confirm the selection. Alternatively, we could type 2, to move the highlight bar, then 2 to confirm the selection.

If you select one of the options, you will be prompted to enter a replacement value for the current setting. You will also be informed of the acceptable values. If you type conflicting information, MAGICALC will catch you and your Apple will beep at you. You will have an opportunity to enter correct information.

As with all menus in MAGICALC, if a value is being changed, and you simply type RETURN, the original value is left unchanged.

Again, following the rules of the menus, typographical errors may be corrected by using the ESC key (or the DELETE key on the Apple //e) to back up. If you back completely out of the entry, you will leave the original value unchanged.

Typing ESC repeatedly will progress you back through the menus to the Calculator Subsystem.

11. Configuration Subsystem

```
CONFIGURATION SUBSYSTEM

    A. LOWER  CASE  VIDEO.....................YES
    B. LOWER CASE KEYBOARD.................YES
    C. ONE WIRE SHIFT KEY....................NO
    D. PRINTER  SLOT...........................1
    E. PRINTER  DRIVER.......................NO
    F. VIDEO SLOT.............................0
    G. VIDEO DRIVER..........................NO

    1.  MAGICALC SYSTEM MENU
    2.  CHANGE OPTIONS
    3.  LOAD CONFIGURATION FILE
    4.  SAVE CONFIGURATION FILE

SELECT NUMBER OR LETTER, PRESS RETURN
```
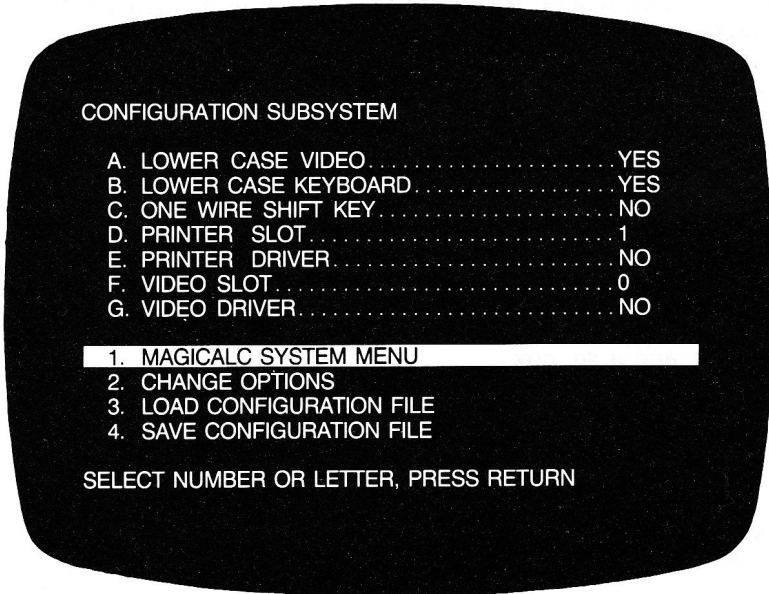
The *Configuration Subsystem* allows you to configure MAGICALC to your Apple][. Although MAGICALC is able to recognize some of the hardware options on your Apple, there are some you have to explicitly define to use.

You may save the configuration options to disk so that you do not have to reenter the Configuration Subsystem each time you boot MAGICALC. You may also load configuration files after the program is running.

11.1. MAGICALC SYSTEM MENU

Selection 1—MAGICALC SYSTEM MENU simply returns you to the System Menu. You may also return to the system menu by pressing the ESC key, unless you are in the options section (lettered menu items, in which case you will have to press the ESC key twice.

Some of the key items you will define in the Configuration Subsystem are:

- Whether or not you can display lower case on your monitor.

- Whether or not you can generate lower case from your keyboard, and if so, how.

- In what slot your printer interface is located.

- Whether or not a printer driver is necessary.

- In what slot your 80 column board is located (if you have an 80 column board).

- Whether or not a video driver is required.

Implicit in these definitions is the selection of the "soft' seventy column display mode. If you set the VIDEO DRIVER option to YES, and the VIDEO SLOT to 0, MAGICALC will automatically select the Hi-Res 70 column display mode.

11.2. CHANGE OPTIONS

Selection 2—CHANGE OPTIONS moves the highlight bar into the options section of the menu (the options section is the section containing lettered menu items).

11.3. LOAD CONFIGURATION FILE

Selection 3—LOAD CONFIGURATION FILE allows you to load a file that contains the configuration for the system on which you are currently working.

The configuration file is named **SYS.OPTIONS**, and can only be created by the Configuration Subsystem.

When you select item 3 (LOAD CONFIGURATION FILE), the following prompt will appear at the bottom of your screen:

INSERT CONFIGURATION/DRIVER DISKETTE

 < RETURN > OR ,S,D,V

At this point, you may change the diskette with the proper configuration file on it, or specify a slot, drive, and volume for the correct SYS.OPTIONS file.

If you specify a slot, drive, or volume, you must enter a comma (,), then your slot, drive, and volume parameters. All of these parameters are optional, and the default values are the slot, drive, and volume settings from the File Subsystem.

For example, if you wanted to tell MAGICALC to look for the configuration file on drive 2, slot 6, you would type:

,S6,D2

Note: The leading comma (,) is required, as are the letters **S** for slot, **D** for drive, and **V** for volume.

If the default slot, drive, and volume are correct, you may simply press the RETURN key.

In some cases, your configuration file will specify the loading of video drivers (see below for more on drivers). If this is the case, the message:

CHANGE OF VIDEO DRIVER WILL

OVERLAY OR DESTROY WORKSHEET

HIT <RETURN> TO CONTINUE

   <ESC> TO ABORT

This message is your last warning. The room required for a video driver will ordinarily be utilized for data, unless otherwise specified. If you have created a worksheet in 40 column mode, then decide to switch to, for example 70 column mode, the driver code will overlay the worksheet, thus destroying the integrity of the data. When you invoke a video driver load, you may expect the worksheet to be cleared. If you have an active worksheet that you wish to preserve, this is your chance to back out of the configuration option and save it.

If you press the RETURN key, the configuration file will be loaded, and you will be placed in the MAGICALC System Menu. All your configuration options will have been updated as specified in your configuration file.

Note: If you are not specifying the load of a video driver, the above warning message will not be displayed, and the configuration will simply take place automatically, with no extra confirmation step.

11.4. SAVE CONFIGURATION FILE

Selection 4—SAVE CONFIGURATION FILE, allows you to create a file on disk called SYS.OPTIONS that contains all the parameters displayed in the Configuration Subsystem menu.

You have two opportunities to reload this file:

- When initially booting MAGICALC (at the prompt **INSERT CONFIGURATION/DRIVER DISKETTE**)

- From the Configuration Subsystem, by exercising item 3 — LOAD CONFIGURATION FILE.

The advantage of saving a configuration file is that you will be able to have MAGICALC boot in the configuration your system requires, saving you the trouble of entering the Configuration Subsystem each time you use the program.

The only time you should have to use the Configuration Subsystem is when you first begin using MAGICALC (to define the system parameters), and when you make a modification to your Apple.

You might, however, decide to enter the Configuration Subsystem to change certain parameters periodically if you are more comfortable entering data in 40 column mode, but prefer to view the worksheet in 70 or 80 column mode.

When you select item 4 (SAVE CONFIGURATION FILE), the following prompt will appear at the bottom of your screen:

INSERT CONFIGURATION/DRIVER DISKETTE

< RETURN > OR ,S,D,V

At this time, you may insert a diskette that will contain the configuration file, or specify the slot, drive, and volume of the disk to contain the configuration file.

For example, if you wanted to place the configuration file the on disk in slot 6, drive 1, volume 52, you would respond:

,S6,D1,V52

If you press RETURN, the default slot, drive, and volume are selected (as last defined in the File Subsystem).

11.5. LOWER CASE VIDEO

Option A—LOWER CASE VIDEO is a YES/NO option, and specifies to MAGICALC whether or not your Apple has the capability of displaying lower case. This option is "toggled" (i.e. switched from YES to NO) by pressing the option letter, or RETURN key.

If LOWER CASE VIDEO is set to NO, your worksheets may contain lower case, but it will be converted to upper case for display purposes. You will still be able to enter lower case in several ways. The methods of lower case data entry will be discussed below in the section under LOWER CASE KEYBOARD.

Note: Regardless of the setting of LOWER CASE VIDEO, if your worksheet contains lower case characters, and you printer is capable of printing true lower case, the data will print in its true case.

Note: If you are using an 80 column board, or the "soft" 70 column display, this option should be set to YES.

Note: Due to a restriction of the Apple, it is impossible to display lower case text in inverse mode on the 40 column text screen. If you have specified a lower case video capability, any lower case characters displayed under the marker will be converted to nonsense characters. The characters will be displayed properly as soon as you move the marker to another cell.

11.6. LOWER CASE KEYBOARD

Option B—LOWER CASE KEYBOARD tells MAGICALC whether your keyboard can generate true upper and lower case.

True upper and lower case are generated by the Apple //e, the Franklin Ace, and the Apple][with the Videx Enhancer][.

This option is a YES/NO "toggle," and is activated either by pressing the letter B twice, or by positioning the highlight bar on option B, and pressing the RETURN key.

MAGICALC allows you to enter lower case with a normal Apple][keyboard by using the Ctrl-L key to toggle case. The blinking cursor on the entry line will show you what case you have selected as follows:

Blinking underline: Lower case data entry

Blinking Box: Upper case data entry

In order to make the first letter of a word upper case, and the rest lower case, simply press Ctrl-L, then begin typing. The first letter will be capitalized, and the rest lowercase.

To enter shift lock mode, press Ctrl-L twice. All subsequent data entry will be in upper case (Caps Lock).

To exit shift lock mode, press Ctrl-L once. You will be in lower case mode, once again.

11.7. ONE WIRE SHIFT KEY

Option C—ONE WIRE SHIFT KEY specifies to MAGICALC whether to look for the "one wire," or "push button 2" shift key modification. This modification uses the PB2 game I/O port to signal whether or not your shift key is depressed. If you do not have a one-wire shift key modification in your Apple, and want one, you should contact your dealer to investigate having one installed.

Option C (ONE WIRE SHIFT KEY) is a YES/NO "toggle," and is activated either by pressing C twice, or by moving the highlight bar to option C and pressing RETURN.

11.7.1. Special Character Generation

With the one-wire shift key modification in effect, the following special characters are available by pressing Ctrl-B, then another character:

Keystroke		Result
Ctrl-B 1	|	(vertical bar)
Ctrl-B 2	@	(commercial "at" sign)
Ctrl-B 4	~	(tilde)
Ctrl-B 5	\	(back slash)
Ctrl-B 6	^	(up arrow)
Ctrl-B 7	'	(open quote)
Ctrl-B 8	[	(left square bracket)
Ctrl-B 9	]	(right square bracket)

11.8.   PRINTER SLOT

Option D—PRINTER SLOT, allows you to inform MAGICALC which slot your printer interface card is in.

Warning: If you specify an incorrect slot, you may "hang" the computer, lose data, or worst of all, clobber a diskette. Be very careful that the slot you specify is the slot the printer interface card is in.

11.9. PRINTER DRIVER

Option E—PRINTER DRIVER is a YES/NO "toggle" that specifies to MAGICALC whether or not you have a custom printer driver.

Under normal circumstances, the answer to this question is NO.

If you specify YES, in answer to this option, the file named PRINTER (which must be a machine language printer driver designed to load at $800, and may be no longer than $200 bytes in length) will be loaded, and printing will be done by your routine.

11.10. VIDEO SLOT

Option F—VIDEO SLOT specifies the slot in which your video display board resides. If you do not have an 80 column board, specify zero (0) for your video slot.

Warning: If you specify a value other than 0 for your video slot, be certain that the number you specify is the actual number of the slot of your 80 column board. If you make an incorrect specification, you will probably lose your data, or find the program inoperable.

11.11. VIDEO DRIVER

Option G—VIDEO DRIVER is a YES/NO "toggle," and specifies to MAGICALC whether or not you need to load a driver program for display generation.

11.11.1. 80 Column Board Video Drivers

The video driver for 80 column boards must be named VIDEO, and reside on your configuration/driver diskette. Under most circumstances, you will not need a driver program for video display. If, however, you are unable to successfully generate the video display you want using MAGICALC's default display handler, you should try using the video drivers supplied on the disk. Experience has shown that most 80 column boards do not require a driver of any sort.

11.11.2. 70 Column Video Drivers

If you want to use the "soft" seventy column display capability, simply set the VIDEO DRIVER option to YES, and the VIDEO SLOT option to 0. The seventy column drivers will automatically be selected.

Warning: Do not, under any circumstances, delete or rename the seventy column video display drivers (VIDEO70), because if you do, MAGICALC will be unable to provide a seventy column display.

Note: The seventy column video display drivers occupy approximately 12K of space that would ordinarily have been available for data storage.

11.11.3. Requirements for Video Drivers

Custom 80 column board drivers must be machine language programs designed to load at location $1F00. They must be $100 bytes in length or shorter.

To use any of the three supplied drivers (VIDEO.STB80, VIDEO.WIZARD80, or VIDEO.VIDEX), boot a standard DOS disk, and perform the following steps:

BLOAD VIDEO.your board

BSAVE VIDEO,A$1F00,L$100

Where: *your board* may be STB80, WIZARD80, or VIDEX.

Note: Most 80 column boards do *not* need video drivers.

12. Boot Next Program

If you select menu item 6—BOOT NEXT PROGRAM on the System Menu, the following prompt will appear:

INSERT MASTER DISK THEN PRESS RETURN

You must then insert the disk that you wish to boot, and press the RETURN key.

If you press the ESC key, you will be placed in the System Menu.

If you press the RETURN key, the disk will be booted.

Note: If you are in 80 column mode, you will not be switched back to 40 columns, so when some programs boot, you may see no display. This is because they are sending their display to the 40 column text screen. The safest thing to do in this case is power down the computer, and power back up again.

13. MAGICALC Error Messages

MAGICALC is designed to be easy to use, but occasionally something will happen that simply does not make sense (Disk I/O error, for example). In these cases, MAGICALC informs you with an error message.

The following error messages appear on a screen by themselves, and if they are file related, a file name is provided so you know where the problem occurred.

Message Number	File Name Provided	Reason
0-3	no	Software Error
4	no	Disk Write Protected
5	yes	Sudden End of Data (During Load)
6	yes	File Not Found
7	no	Wrong Disk Volume
8	no	Disk I/O Error
9	yes	Disk Is Full
10	yes	File Is Locked (During Save)
11	no	Out of Memory (During Disk Load or in Calculate Subsystem)
12	yes	Wrong File Type
13	no	No B (No Buffers Available)
14	no	Not a DIF File

In the Format Subsystem, several specifications can be set so they do not make sense. MAGICALC will detect these problems and let you know so you can correct the error.

The following are the Format Subsystem errors:

TOP + TEXT > PAGE   This error message is displayed when you have set a page length that is shorter (in lines) than the top margin plus the number of lines of text you have specified.

LEFT + TEXT > PAGE   This error message is displayed when you have set a page width that is narrower (in characters) than the left margin plus the text width you have specified.

In the Calculate Subsystem, there are three messages that can be displayed on the prompt line.

Message	Meaning
COLUMN WIDTH IS ZERO	The marker is currently on a cell that is invisible (zero width).
COLUMN IS TOO WIDE TO SHOW	The column cannot fit on the screen due to titles.
CELL ATTRIBUTES CONFLICT WITH COMMAND	The cell is protected, or data of an illegal type is bing entered.

MOVING THE MARKER
If Direction Indicator Is Horizontal:

Left Arrow	Move the Marker one cell to the left.
Ctrl-A	(Direction indicator independent)
Right Arrow	Move the Marker one cell to the right.
Ctrl-S	(Direction indicator independent)

If Direction Indicator Is Vertical:

Left Arrow	Move the Marker one cell up.
Up Arrow	(Direction indicator independent. Apple *IIe* only)
Ctrl-Q	(Direction indicator independent)
Right Arrow	Move the Marker one cell down.
Down Arrow	(Direction indicator independent. Apple *IIe* only)
Ctrl-Z	(Direction indicator independent)

Other Marker Moves

Ctrl-W	Move the Marker 10 cells up.
Ctrl-X	Move the Marker 10 cells down.
Ctrl-E	Move the Marker to top left of worksheet (within titles).
Ctrl-C	Move the Marker to bottom right of worksheet.
Ctrl-I	Tab to next unprotected field.
TAB	(Apple *IIe* only)
Ctrl-Y	Tab to previous unprotected field.
Open-Apple-TAB	(Apple *IIe* only)
;	Move marker to alternate window (if defined with /W command).
>coord	Go To command. Sends marker directly to a coordinate.

CALCULATION

+	Addition
–	Subtraction
*	Multiplication
/	Division
∧	Exponentiation
#	Replaces coordinate immediately to the left of cursor on the entry line with its *value*.
!	If pressed when a formula is on the entry line, replaces the formula with its calculated value.
!	If pressed when the entry line is empty, causes the entire worksheet to be recalculated.

EDITING

ESC	ESCAPE key deletes the character on the entry line immediately preceding the edit cursor. Also called *destructive backspace*.
Ctrl-E	Invokes *edit mode*. For more information on editing data in the entry line, see the /E (edit command.
Ctrl-T	Truncates from cursor position to end of line.
Any Other Key	Insert character on keycap.

FUNCTIONS

@ ABS *(value)*	Return absolute value.
@ AND *(list)*	Return TRUE if *all* values are TRUE, otherwise FALSE.
@ AVERAGE *(list)*	Return the average of a list of values, a range, or a list of ranges.
@ CHOOSE *(index, list)*	Return the value in the *list* corresponding to the value of *index*.
@ COL	Return the numerical value of the current column.
@ COUNT *(range)*	Return the number of values in a range. Labels and blank cells are not counted.
@ ERROR	Return the value ERROR.
@ EXP *(value)*	Return the value of *e* raised to the valueth power.
@ FALSE	Return the value FALSE.
@ IF *(condition, value1, value2)*	Return *value1* if condition is true, otherwise return *value2*.
@ INT *(value)*	Return the integer portion of value.
@ ISERROR *(value)*	Return TRUE if value is ERROR, otherwise FALSE.
@ ISNA *(value)*	Return TRUE if value is NA, otherwise FALSE.
@ LN *(value)*	Return the natural (base *e*) logarithm of value.
@ LOG10 *(value)*	Return the common (base 10) logarithm of value.

@ LOOKUP *(value, range)*	Compare *value* to the table specified by *range* and return the lookup value corresponding to the last table value less than or equal to *value*.
@ MAX *(list)*	Return the maximum value in a list.
@ MIN *(list)*	Return the minimum value in a list.
@ NA	Return the value NA
@ NOT *(logical)*	Return TRUE if *logical* is FALSE, otherwise return FALSE.
@ NPV *(discount,* *range)*	Return net present value of a *range* of cash flows discounted at *discount*. *Discount* must be a decimal fraction.
@ OR *(list)*	Return TRUE if *any* values in the list are TRUE, otherwise return FALSE.
@ PI	Return the value of Pi.
@ ROUND *(value,* *ndec)*	Return *value* rounded to *ndec* decimal places.
@ ROW	Return the row number.
@ SQRT *(value)*	Return the square root of *value*.
@ SUM *(list)*	Return the sum of a list of values. Blank cells and labels are ignored.
@ TRUE	Return the value TRUE.

CALCULATE SUBSYSTEM COMMAND SUMMARY

/A   Set Attribute

   D   Default

   A   All. Accept all data.

   L   Labels. Accept only labels.

   V   Values. Accept only values.

   P   Protect. Do not allow data entry in cell.

   H   Hide contents of cell.

/B   Blank Contents of Cell

/C   Clear Worksheet. Must be confrmed with a Y.

/D   Delete Row or Column

   R   Delete row on which the marker rests.

   C   Delete column on which the marker rests.

/E   Edit a Cell

   Arrow keys   Non-destructive cursor movement.

   ESC   Destructive backspace.

   Other keys   Insert characters.

/F   Format a Cell

   D   Default

   G   General. As much precision as possible within column
        boundaries.

   I   Integer. Display values as integers, but retain decimal
        significance to 11 digits.

L   Left Justify. Display values and labels flush left in a column.

R   Right Justify. Display values and labels flush right in a column.

$ Dollars. Display values to two decimal places (dollars and cents).

*   Graphic. Display rough line graph format for values.

/G Set Global Parameters

C   Set Global Column Width. Set column width for the entire worksheet.

O   Calculation Order. Set the order in which the worksheet is calculated.

R   Calculate the worksheet row by row.

C   Calculate the worksheet column by column.

R   Recalculation. Should the entire worksheet be recalculated every time a new value is entered.

        A   Automatic. Recalculate the entire worksheet every time a new value is entered.

        M   Manual. Recalculate the entire worksheet only when the exclamation point (!) is pressed.

F   Set Global Format. Set cell format for the entire worksheet. For options, see the /F (Format) command.

A   Set Global Attributes. Set cell attributes for the entire work sheet. For options, see the /A (Attribute) command.

/I   Insert Row or Column

    R   Insert row above the row on which the marker rests.

    C   Insert column to the left of the column on which the marker rests.

/L   Set Individual Column Width. Set the width of the column on which the marker currently rests.

    Column width may be any value 0 through 36. A column width of 0 will produce a "hidden" column which will be skipped when moving the marker. "Hidden" columns are only accessible using the Go To ( ) command. When the marker is resting on a "hidden" column, it vanishes from the worksheet and appears on the contents line.

/M   Move a Row or Column to another position on the worksheet. A cell in the row or column to be moved must be specified as the "from" location, and a cell in the row or column below or to the right of the desired location must be specified as the "to" location.

    A column move will take place if both cells have the same row number.

    A row move will take place if both cells have the same column number.

/P   Invoke the Print Subsystem

/R   Reproduce. Reproduces a cell, a range of cells, or a block of cells to other locations on the worksheet.

    (Invoke Reproduce options.

        A   Copy attributes only.

        F   Copy formats only.

        C   Copy contents of cell only (no formats or attributes).

        V   Copy values and labels (no formulas).

        N   Copy all formulas with no change in the cell references, and no prompting.

R   Copy all formulas with relative change in the cell references, and no prompting.

)   Exit options section.

/S   (Storage command) Invoke the File Subsystem.

/T   Set Titles for Worksheet.

H   Define horizontal titles as the row on which the marker is currently resting, and all rows above it.

V   Define vertical titles as the column on which the marker is currently resting, and all columns to the left of it.

B   Both horizontal and vertical titles are fixed as the row on which the marker is currently resting and above; the column on which the marker is currently resting and left.

N   None. Remove all title definitions.

/W   Set Window.

H   Horizontal window split occurs at the current marker position, creating two windows.

V   Vertical window split occurs at the current marker position, creating two windows.

1   Any window splits in effect are removed, and the worksheet is displayed as one large window.

S   Synchronize Windows. When windowing is in effect, synchronized windows force the two to scroll together.

U   Unsynchronize Windows. When windowing is in effect, the unsychronize command causes the two windows to scroll independently of one another.

/—   Repeating Label. Causes a character or string of characters to be repeated as many times as necessary to fill a cell. This function is independent of column width.